



Stellenbosch
UNIVERSITY
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UNIVERSITEIT

2026

Science

Academic programmes
and faculty information

Yearbook, Part 5

Accuracy, liability and changes

- Stellenbosch University has taken reasonable care to ensure that the information provided in the Yearbook 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 Yearbook parts.
- The University reserves the right to change the Yearbook parts at any time when necessary.

The division of the Yearbook

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

Part	Yearbook
Part 1	General Rules
Part 2	Bursaries and Loans
Part 3	Student Fees
Part 4	Arts and Social Sciences
Part 5	Science
Part 6	Education
Part 7	AgriSciences
Part 8	Law
Part 9	Theology
Part 10	Economic and Management Sciences
Part 11	Engineering
Part 12	Medicine and Health Sciences
Part 13	Military Science

Availability of the Yearbook parts

- The electronic versions of the Yearbook parts are available at www.su.ac.za/yearbooks.
- 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 Yearbook part

This section gives you guidelines for finding particular information in the different chapters in this Yearbook 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 concepts "application number" and "student number" as well as relevant contact details where you can refer important enquiries to;
 - The University's Language Policy and Plan; and
 - The qualifications that you can obtain.
- Undergraduate Programmes chapter contains information about:
 - The degree programmes that you can enrol for as well as important assessment provisions that are applicable to programmes and modules;
 - The minimum admission requirements for the various study programmes;
 - A summary of undergraduate modules and their requirements;
 - 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 modules, prerequisite modules and corequisite modules.
- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Yearbook 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 concepts "application number" and "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 Yearbook 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; and
 - The University's Language Policy and Plan.
- Undergraduate Programmes chapter contains information about:
 - The Faculty's undergraduate study programmes;
 - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable; and
 - Undergraduate assessment, promotion and Faculty provisions, as well as the granting of dean's

concession assessments to final-year students.

- 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; and
 - Definitions of prerequisite pass modules, prerequisite modules and corequisite modules, as well as an indication at each module which of the requisites apply to it, if any.
- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Yearbook part.

1.4 Registered postgraduate students

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

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.

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
Stellenbosch
7599

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

Dean's physical address

2nd floor, Al Perold Building, Stellenbosch main campus

Contact persons and details

Staff	Telephone number	Email address
Dean Prof B Fielding	021 808 3071	bfielding@sun.ac.za
Dean's Office Ms H Drying	021 808 3072	hdrying@sun.ac.za
Director: Faculty Management Mr M Dlodlu	021 808 3901	dludlumk@sun.ac.za
Coordinator: Student and Academic Affairs Ms L Onraët	021 808 3931	scienceadmin@sun.ac.za
Postgraduate Administrative Officer Ms H du Plessis	021 808 3063	duplessisha@sun.ac.za

Staff	Telephone number	Email address
NARGA: IT Manager Ms I de Kock	021 808 2682	idk@sun.ac.za
Media and Marketing Ms WE Fourie-Basson Ms JM Schoeman	021 808 2684 021 808 3465	wiidabasson@sun.ac.za science2@sun.ac.za

For more information on the Faculty of Science, visit us at www.su.ac.za/en/faculties/science.

Enquiries about academic administration

Staff	Telephone number	Email address
Faculty Administrator Ms S Ruiters	021 808 4832	shivvon@sun.ac.za

2.3 Contact details of Departments

Department	Telephone number	Email address
Biochemistry	021 808 5862	biochemistry@sun.ac.za
Botany and Zoology	021 808 3236	botzoo@sun.ac.za
Chemistry and Polymer Science	021 808 3331	cheminfo@sun.ac.za
Earth Sciences	021 808 3219	gstrydom@sun.ac.za
Mathematical Sciences Mathematics Applied Mathematics Computer Science	021 808 3282 021 808 4215 021 808 4232	maths@sun.ac.za appliedmaths@sun.ac.za secretary@cs.sun.ac.za
Microbiology	021 808 5847	wendyw@sun.ac.za
Physics	021 808 3391	physqueries@sun.ac.za
Physiological Sciences	021 808 3146	gas@sun.ac.za

Please note: Access to the various departments' information on the web is available from the Faculty's website www.su.ac.za/en/faculties/science.

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). More information on the Committee can be found in the following ways:

- On the Faculty's website www.su.ac.za/en/faculties/science, or
- By contacting the Committee electronically at nsk@sun.ac.za

3. How to communicate with the University

3.1 Prospective students

- The University allocates an application number (e.g. APP/1234567) to you when you apply to study at the University.
- The application number is your unique identification to simplify future communication regarding your programme applications with the University.
- Use your application number every time you communicate with the University.

3.2 Current or former Stellenbosch University students

- The University allocates a student number to you when you are admitted to a programme and register 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.

3.3 Contact details for enquiries about your studies, bursaries, loans and residence placements

- Email: info@sun.ac.za
- Tel: 021 808 9111
- Visit the University's website at <http://www.su.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 English and Afrikaans.

More information concerning language at SU is available at www.su.ac.za/language. For the Faculty Language Implementation Plan, consult the [Science Faculty website](#). Look under "Current Undergraduate Students" to find the link to "Faculty Language Implementation Plan".

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:

Degree	Length of degree
BSc	3 years
BSc (ECP)	4 years
BScHons	1 year
MSc (Mathematical Sciences) (AIMS)	3 semesters
MSc	1 or 2 years
PhD	2 years
DSc	1 or 3 years

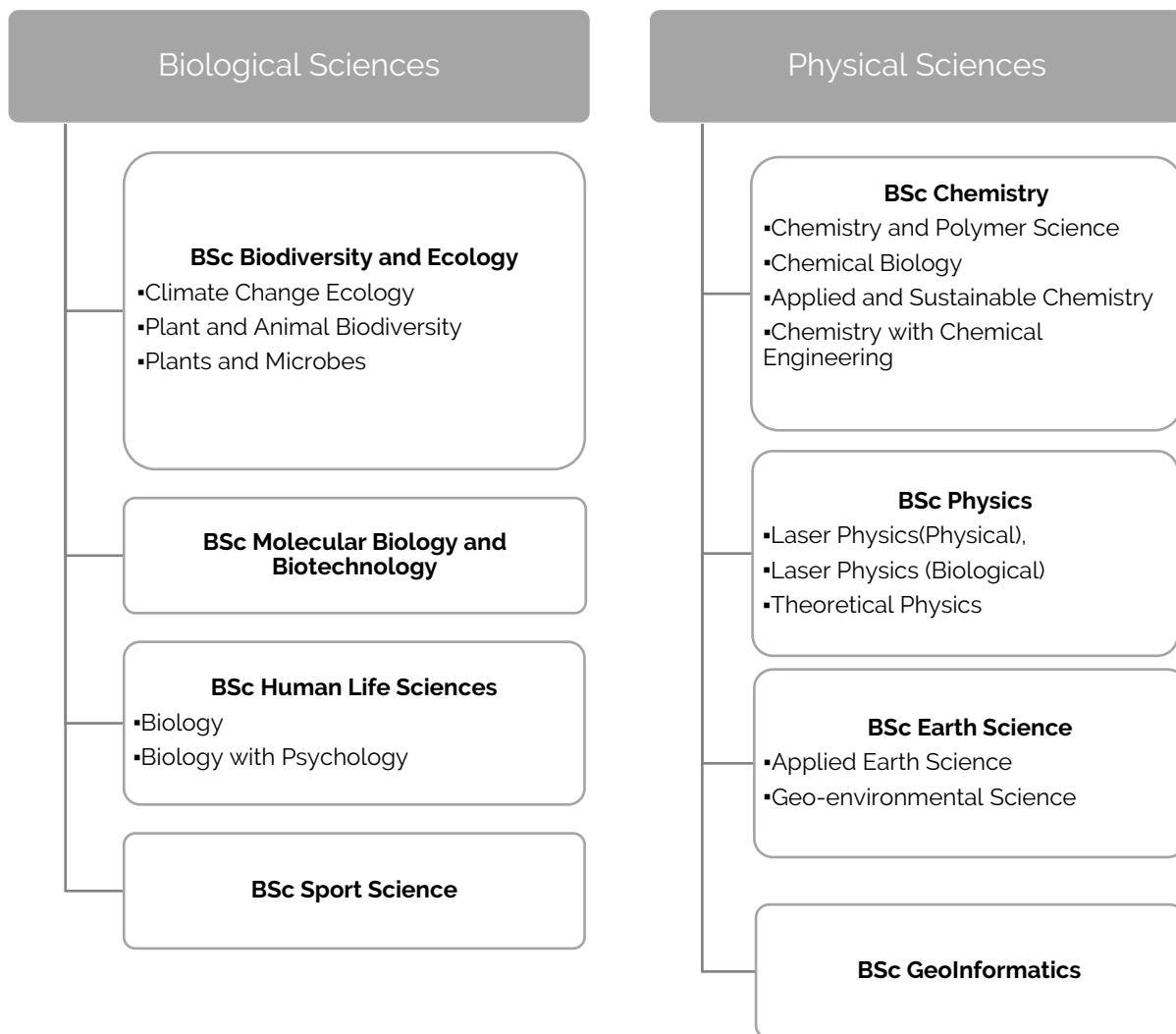
Take note: You can follow up the BSc degree with an honours degree in a specific subject discipline. After this an MSc and then a PhD, which are both more research focused, can follow. More information on this may be found in the chapter "Postgraduate programmes".

Undergraduate programmes

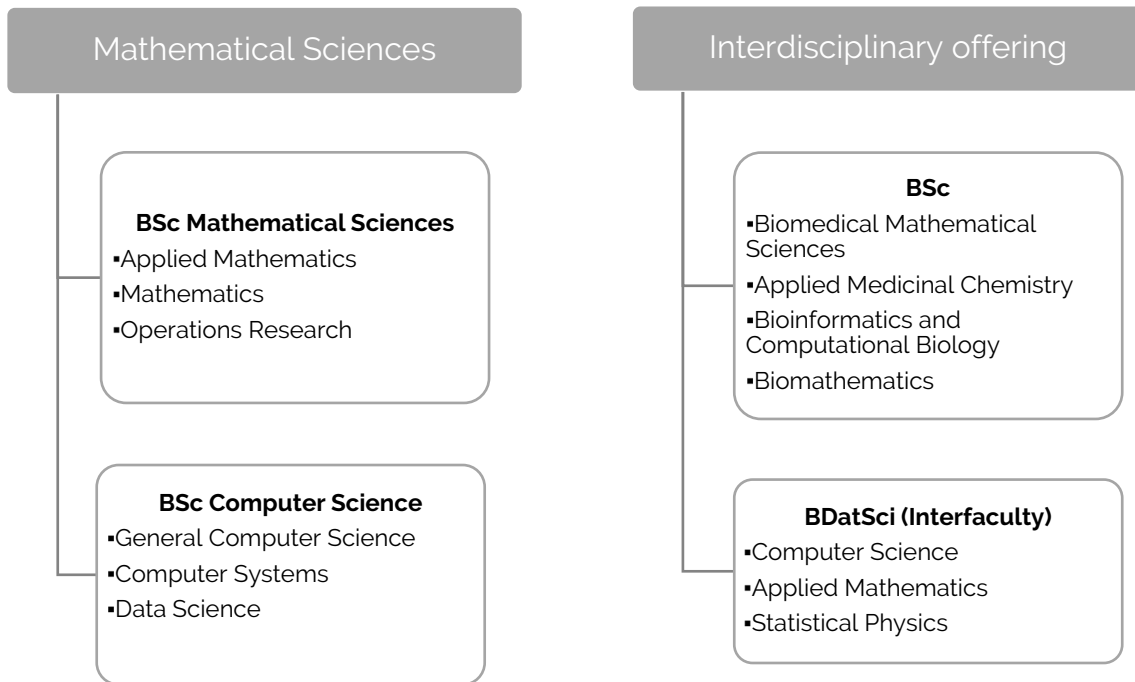
The curricula or combination of subjects that you can take for a BSc degree are represented in terms of programmes. A programme can consist of a number of prescribed curricula, where each specific curriculum is known as a focal area.

The two diagrams below offer a representation of the programmes and focal areas for a BSc degree. We offer eleven degree programmes, grouped together in four main fields, namely the Biological, Physical and Mathematical Sciences, and an interdisciplinary field. We also offer three of the focal areas in the BDatSci programme.

The Faculty's programmes and focal areas



The Faculty's programmes and focal areas



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

To be considered for selection for the BSc degree programmes in the Faculty, you must meet the minimum admission requirements with your school-leaving qualification, as provided in the tables under 1.2.1 below.

It is important to note that:

- If you want to register for a programme in the **Biological or Physical Sciences**, you must have taken **Physical Sciences** or **both Chemistry and Physics** as school subjects.
- If you want to register for any module in **Chemistry** or **Physics**, you must have taken **Physical Sciences** or **both Chemistry and Physics** as school subjects.
- If you want to register for a programme in the **Biological Sciences**, it is recommended that you have taken **Life Sciences** as a school subject, although this is not an admission requirement. Please also note that you may be required to work with animal, plant, and/or human-biological material. In the case of animals, it may also include primary sample collection.

1.2.1 Table with minimum admission requirements for all school-leaving certificates: National Senior Certificate (NSC), Independent Examination Board (IEB) and international curricula

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
BIOLOGICAL SCIENCES		
Biodiversity and Ecology 1. Focal area: Climate Change Ecology 2. Focal area: Plant and Animal Biodiversity 3. Focal area: Plants and Microbes Molecular Biology and Biotechnology Human Life Sciences 1. Focal area: Biology 2. Focal area: Biology with Psychology Sport Science	An average final mark of 65% (excluding Life Orientation) Afrikaans OR English (Home Language or First Additional Language) 4 Physical Sciences 4 Mathematics 5 (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics 6 (If you enrol for Mathematics 114, 144 and Physics 114, 144)	An average performance level of at least 65% HIGCSE and Namibian NSSC Afrikaans or English, First or Second Language, 3 on HL or B on OL Physical Sciences 3 OR Chemistry AND Physics 3 Mathematics 3 (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics 2 (If you enrol for Mathematics 114, 144 and Physics 114, 144) AS Level Afrikaans or English, First or Second Language, C on AS Level or B on GCSE/O Level Physical Sciences D OR Chemistry AND Physics D

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
		Mathematics C (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics B (If you enrol for Mathematics 114, 144 and Physics 114, 144) A Level Afrikaans or English, First or Second Language, E on A Level, or B on GCSE/O Level Physical Sciences E OR Chemistry AND Physics E Mathematics E (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics D (If you enrol for Mathematics 114, 144 and Physics 114, 144) IB HL English 4 on HL or 5 on SL Physical Sciences 2 OR Natural Sciences 2 OR Chemistry AND Physics 2 Mathematics 3 (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics 4 (If you enrol for Mathematics 114, 144 and Physics 114, 144)
Physical Sciences		
Chemistry 1. Focal area: Chemistry and Polymer Science 2. Focal area: Chemical Biology 3. Focal area: Applied and Sustainable Chemistry 4. Focal area: Chemistry with Chemical Engineering Physics 1. Focal areas: Laser Physics (Physical) 2. Focal area: Laser Physics (Biological) 3. Focal area: Theoretical	An average final mark of 65%, excluding Life Orientation Afrikaans OR English (Home Language or First Additional Language) 4 Physical Sciences 4 Mathematics 6	An average performance level of at least 65% HIGCSE and Namibian NSSC Afrikaans or English, First or Second Language, 3 on HL or B on OL Physical Sciences 3 OR Chemistry AND Physics 3 Mathematics 2 AS Level Afrikaans or English, First or Second Language, C on AS Level or B on

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
Physics		GCSE/O Level Physical Sciences D OR Chemistry AND Physics D Mathematics B A Level Afrikaans or English, First or Second Language, E on A Level, or B on GCSE/O Level Physical Sciences E OR Chemistry AND Physics E Mathematics D IB HL English 4 on HL or 5 on SL Physical Sciences 2 OR Natural Sciences 2 OR Chemistry AND Physics 2 Mathematics 4
Earth Science 1. Focal area: Applied Earth Science 2. Focal area: Geo-environmental Science Geoinformatics	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 enrol for Mathematics 114, 144 and Physics 114, 144) OR Mathematics 5 (If you enrol for Mathematics (Bio) and Physics (Bio))	An average performance level of at least 65% HIGCSE and Namibian NSSC Afrikaans or English, First or Second Language, 3 on HL or B on OL Physical Sciences 3 OR Chemistry AND Physics 3 Mathematics 3 (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics 2 (If you enrol for Mathematics 114, 144 and Physics 114, 144) AS Level Afrikaans or English, First or Second Language, C on AS Level or B on GCSE/O Level Physical Sciences D OR

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
		Chemistry AND Physics D Mathematics C (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics B (If you enrol for Mathematics 114, 144 and Physics 114, 144) A Level Afrikaans or English, First or Second Language, E on A Level, or B on GCSE/O Level Physical Sciences E OR Chemistry AND Physics E Mathematics E (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics D (If you enrol for Mathematics 114, 144 and Physics 114, 144) IB HL English 4 on HL or 5 on SL Physical Sciences 2 OR Natural Sciences 2 OR Chemistry AND Physics 2 Mathematics 3 (If you enrol for Mathematics (Bio) and Physics (Bio)) OR Mathematics 4 (If you enrol for Mathematics 114, 144 and Physics 114, 144)
Mathematical Sciences		
Mathematical Sciences 1. Focal area: Applied Mathematics 2. Focal area: Mathematics 3. Focal area: Operations Research Computer Science 1. Focal area: General Computer Science 2. Focal area: Computer Systems 3. Focal area: Data Science	An average final mark of 65%, excluding Life Orientation Afrikaans OR English (Home Language or First Additional Language) 4 Mathematics 6 Physical Sciences 4 (if Physics and/or Chemistry is in your curriculum)	An average performance level of at least 65% HIGCSE and Namibian NSSC Afrikaans or English, First or Second Language, 3 on HL or B on OL Mathematics 2 on HL Chemistry AND Physics 3 on HL (If you enrol for Physics and/or Chemistry)

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
		AS Level Afrikaans or English, First or Second Language, C on AS Level or B on GCSE/O Level Mathematics B Physical Sciences D OR Chemistry AND Physics D (If you enrol for Physics and/or Chemistry) A Level Afrikaans or English, First or Second Language, E on A Level or B on GCSE/O Level Mathematics D Physical Sciences E OR Chemistry AND Physics E (If you enrol for Physics and/or Chemistry) IB HL English 4 on HL or 5 on SL Mathematics 4 Physical Sciences 2 OR Natural Sciences 2 OR Chemistry AND Physics 2 (If you enrol for Physics and/or Chemistry)
Interdisciplinary offering		
Interdisciplinary BSc Offering 1. Focal area: Biomedical Mathematical Sciences 2. Focal area: Applied Medicinal Chemistry 3. Focal area: Bioinformatics and Computational Biology 4. Focal area: Biomathematics	An average final mark of 65%, excluding Life Orientation Afrikaans OR English (Home Language or First Additional Language) 4 Physical Sciences 4 Mathematics 6	An average performance level of at least 65% HIGCSE and Namibian NSSC Afrikaans or English, First or Second Language, 3 on HL or B on OL Physical Sciences 3 OR Chemistry AND Physics 3 Mathematics 2 AS Level Afrikaans or English, First or Second Language, C on AS Level or B on GCSE/O Level Physical Sciences D

Programmes and their focal areas	Admission requirements for NSC and IEB	Admission requirements for international curricula
		OR Chemistry AND Physics D Mathematics B A Level Afrikaans or English, First or Second Language, E on A Level, or B on GCSE/O Level Physical Sciences E OR Chemistry AND Physics E Mathematics D IB HL English 4 on HL or 5 on SL Physical Sciences 2 OR Chemistry AND Physics 2 Mathematics 4 (If you enrol for Mathematics 114, 144 and Physics 114, 144)
BDatSci (Interfaculty) 1. Focal area: Computer Science 2. Focal area: Applied Mathematics 3. Focal area: Statistical Physics	An average final mark of 80%, excluding Life Orientation Mathematics 80% <i>One of the following:</i> • Afrikaans Home Language 60% • English Home Language 60% • Afrikaans First Additional Language 75% • English First Additional Language 75%	University exemption with 80% average HIGCSE and Namibian NSSC English First Language 3 on HL or A on OL or as a Second Language 2 on HL Mathematics 1 on HL AS Level English First Language C on AS Level/GCSE/O Level or as a Second Language C on AS Level or A on GCSE/O Level Mathematics A A Level English First Language E on A Level or C on GCSE/O Level Mathematics C IB HL English First Language 4 on HL or as a Second Language 5 on HL or 6 on SL Mathematics 5 on HL or 6 on SL

1.3 Application and selection procedures

1.3.1 The three-year BSc programmes and four-year BDatSci programme

- Apply online at SUNStudent (<https://student.sun.ac.za>) and follow the prompts to submit your completed application before **31 July** of the year preceding your intended studies.
- The closing date means that your application must be finalised, and all documentation handed in by this date. No applications that reach the University after the closing date will be considered for selection.
- Your admission to the Faculty of Science is dependent on the availability of places per programme and the Faculty follows a selection process in order to meet enrolment targets.
- Meeting the minimum admission requirements of the programme means that you will be considered for selection and does **not** guarantee admission. See tables in 1.2.1. above for the minimum admission requirements.
- You **must also** meet the specific selection requirements for a specific year to receive an offer for admission. The Faculty's selection policy and procedure are available at maties.com.
- If your school-leaving certificate is older than five years, you must provide evidence of Mathematics and Physical Sciences education (see table 1.2.1 above) in the past five years.

1.3.2 The four-year BSc (extended curriculum programmes) (ECP)

These programmes offer an alternative route into programmes in the Biological, Physical, Mathematical Sciences and interdisciplinary BSc.

A 4-year BSc (extended curriculum programme) (ECP) has a foundational year, followed by the curriculum for one of the mainstream programmes of the BSc degree. In the first year of study, your knowledge base is strengthened, and your skills are developed to prepare you to enter the mainstream modules from your second year of study. If you complete a BSc (ECP) successfully, you will receive a degree certificate from the University that is exactly the same as those received by the BSc students following the 3-year BSc.

- Applicants from the designated diversity groups and socio-economic categories who are not meeting the selection requirements, will receive an offer to change to an ECP in **October**.
- Applicants from the designated diversity groups and socio-economic categories who did not meet the selection requirements **to receive a final offer**, may submit a request for admission to an ECP in **January**.

2. Apply for admission to the BSc degree programme with prior tertiary learning

Take note: Recognition of prior learning (RPL) is only taken into account after admission is granted and will not be used for selection.

If you have already completed applicable modules before enrolling for a BSc programme in the Faculty of Science, you may apply for the recognition and exemption of modules after accepting a final offer for admission.

Your application for recognition of prior learning (RPL/CAT) will be considered by the Academic Committee, and you will receive written feedback. Refer to the document "Recognition of Prior Learning and Credit Accumulation and Transfer (RPL/CAT) Procedures for the Faculty of Science" for details. Contact scienceadmin@sun.ac.za for access to the document.

- **Take note:** Only credits completed in the preceding **five years** are 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;
- 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; and
- The content and outcomes of the modules (module framework or syllabus guide) that you are asking recognition for, must be included in the application.

2.1 Applicants from other programmes; or with a qualification obtained at Stellenbosch University

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

Admission requirements

To change in the middle of an academic year

- You must meet the minimum admission requirements, as well as the selection requirements as applied in that specific year (also applicable to applicants without any prior tertiary learning). (See Section 1.2 and 1.3 above.)
- You must comply with the Faculty of Science specific minimum 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.
- Your study record is important in the consideration of your application.
- 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 minimum admission requirements as well as the selection requirements that also apply to applicants without any prior tertiary learning. (See Section 1.2 and 1.3 above.)
- You must comply with the Faculty of Science specific minimum credit requirements.
- Your study record is important in the consideration of your application.
- Transferring module credits already obtained in another programme will be evaluated on an individual basis.

Application procedure

Contact scienceadmin@sun.ac.za 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.

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

Admission requirements

- You must meet the admission requirements, as well as the selection requirements that also apply to applicants without any prior tertiary learning. (See Section 1.2 and 1.3 above.)
- See Section 2.1 above and refer to the document "RPL/CAT Procedures for the Faculty of Science" for more details relating to RPL/CAT. Contact scienceadmin@sun.ac.za to request access to this document.
- Transferring module credits already obtained in another programme will be evaluated on an individual basis.
- Less than 50% of the credits already obtained will be recognised as credits for the new degree programme.
- Your study record is important in the consideration of your application.

Application procedure

Apply online at SUNStudent (<https://student.sun.ac.za>) and follow the prompts to submit your completed application before **31 July** of the year preceding your intended studies.

2.2 Applicants from programmes of, or with qualifications from, other universities in South Africa

2.2.1 This section applies to you if you began your studies at another university, but want to **continue your studies in a BSc programme in the Faculty of Science at 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 in the Faculty of Science on the basis of your prior studies at another university, you must meet the following requirements:

- You must meet the minimum admission requirements as well as the selection requirements that also apply to applicants without any prior tertiary learning (see Section 1.2 and 1.3 above); or
- If you do not meet the admission requirements, you may apply for admission based on prior learning. See Section 2.1 above and refer to the document "RPL/CAT Procedures for the Faculty of

Science" for more details. Contact scienceadmin@sun.ac.za to request access to this document.

- You must meet the requirements to continue with your studies at the university where you studied before or where you are studying at the time of your application.
- Your study record is important in the consideration of your application, and you must have passed at least 80% of the registered credits in your latest academic year.
- Transferring modules already obtained in another programme will be evaluated on an individual basis.

Application procedure

Apply online at SUNStudent (<https://student.sun.ac.za>) and follow the prompts to submit your completed application before **31 July** of the year preceding your intended studies.

2.2.2 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 in the Faculty of Science, 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 in the Faculty of Science on the basis of your prior studies at another university, you must meet the following requirements:

- You must meet the admission requirements as well as the selection requirements that also apply to applicants without any prior tertiary learning (see Section 1.2 and 1.3 above); or
- If you do not meet the admission requirements, you may apply for admission based on prior learning. See Section 2.1 above and refer to the document "RPL/CAT Procedures for the Faculty of Science" for more details. Contact scienceadmin@sun.ac.za to request access to this document.
- Your study record is important in the consideration of your application.
- Transferring modules already obtained in another programme will be evaluated on an individual basis.

Application procedure

Apply online at SUNStudent (<https://student.sun.ac.za>) and follow the prompts to submit your completed application before **31 July** of the year preceding your intended studies.

2.3 Applicants from universities outside South Africa

Admission requirements

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

- You must meet the minimum admission requirements as well as the selection requirements that also apply to applicants without any prior tertiary learning (see Section 1.2 and 1.3 above).
- See Section 2.1 above and refer to the document "RPL/CAT Procedures for the Faculty of Science" for more details relating to recognition of prior learning/credit accumulation and transfer. Contact scienceadmin@sun.ac.za to request access to this document.
- In the event of an incomplete qualification, you must meet the requirements to continue with your studies at the university where you studied before or where you are studying at the time of your application.
- Your study record is important in the consideration of your application.
- Transferring modules already obtained in another programme will be evaluated on an individual basis.

Application procedure

Apply online at SUNStudent (<https://student.sun.ac.za>) and follow the prompts to submit your completed application before **31 July** of the year preceding your intended studies.

The Stellenbosch University International (SUI) Services Centre will assist with the assessment of foreign qualifications and prior learning.

2.4 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 2.1, 2.2 or 2.3 above, contact scienceadmin@sun.ac.za 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.

Take 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

3. Summary of undergraduate modules and their requirements

3.1 Prerequisite pass, prerequisite and corequisite modules

For most undergraduate modules there are admission requirements given in terms of prerequisite pass, prerequisite and corequisite modules. These terms are explained below:

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 **final mark of at least 40**, before you can take the module for which it is a prerequisite module.
- If you have once complied with a prerequisite rule, your compliance will remain valid for the period given in the applicable assessment rules, even if you repeat the prerequisite module and do not meet the minimum level when repeating the module.
- **Take note:** You must pass all the modules you took as prerequisites in the programme before the relevant degree, certificate or diploma can be awarded to you.

Corequisite module

- A corequisite module is a module that you must register for in an earlier semester than the module for which it is a corequisite, or in the same semester.
- **Take note:** You must pass all the modules you took as corequisites in the programme before the relevant degree, certificate or diploma can be awarded to you.

Before choosing and registering for any module, you must make sure that you meet the applicable corequisite, prerequisite and prerequisite pass requirements provided in the tables below. There may also be no class or assessment timetable clashes.

3.2 Subjects in the BSc degree programmes offered by the Faculty of Science

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
52078	Applied Chemistry 316	PP Chemistry 234, 264 P Chemistry 214
52078	Applied Chemistry 333	P Chemistry 214, 264
52078	Applied Chemistry 354	PP Chemistry 264 P Chemistry 214, 234
52078	Applied Chemistry 365	P Chemistry 214, 264 P Applied Chemistry 333

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
20710	Applied Mathematics 144	P Mathematics 114 C Mathematics 144
20710	Applied Mathematics 214	P Mathematics 144
20710	Applied Mathematics 244	P Mathematics 114, 144
20710	Applied Mathematics 314	P Applied Mathematics 214 or Mathematics 214
20710	Applied Mathematics 324	P Mathematics 114
20710	Applied Mathematics 354	P Applied Mathematics 144
20710	Applied Mathematics 364	PP Mathematics 114, 144 or Engineering Mathematics 115, 145
20710	Applied Mathematics 476	None
20710	Applied Mathematics 482	None
20710	Applied Mathematics 483	None
20710	Applied Mathematics 492	None
20710	Applied Mathematics 493	None
20753	Applied Mathematics B 224	P Applied Mathematics 144 or Applied Mathematics B 154
11053	Biochemistry 214	PP Chemistry 124 or 164, 144 PP Biology 124
11053	Biochemistry 244	P Biochemistry 214
11053	Biochemistry 315	PP Biochemistry 214, 244 PP Mathematics (Bio) 124 or Mathematics 114
11053	Biochemistry 323	PP Biochemistry 214, 244 PP Mathematics 114 or Mathematics (Bio) 124
11053	Biochemistry 345	P Biochemistry 315
11053	Biochemistry 365	P Biochemistry 315
53953	Biodiversity and Ecology 212	C Science in Context 178 or Computer Skills 171
53953	Biodiversity and Ecology 214	PP Biology 124 or 144 and a final mark of at least 40% in the other Biology module C Biodiversity and Ecology 212 or an equivalent statistical module
53953	Biodiversity and Ecology 224	PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module
53953	Biodiversity and Ecology 244	PP Biology 124 or 144 and a final mark of at least 40% in the other Biology module
53953	Biodiversity and Ecology 254	PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module
53953	Biodiversity and Ecology 264	PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module
53953	Biodiversity and Ecology 311	None
53953	Biodiversity and Ecology 315	PP Biodiversity and Ecology 212 or 214 and a final mark of at least 40% in the other Biodiversity and Ecology module
53953	Biodiversity and Ecology 324	PP any two of the following three modules: Biology 124, 144, 154
53953	Biodiversity and Ecology 341	None
53953	Biodiversity and Ecology 342	None

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
53953	Biodiversity and Ecology 344	PP Biodiversity and Ecology 212 or 214 and a final mark of at least 40% in the other Biodiversity and Ecology module C Biodiversity and Ecology 244
53953	Biodiversity and Ecology 354	PP any three of the following six modules: Biodiversity and Ecology 212, 214, 224, 244, 254, 264
12555	Bioinformatics 312	None
12555	Bioinformatics 322	P Bioinformatics 312
25046	Biology 124	None
25046	Biology 144	C Biology 124
25046	Biology 146	None
25046	Biology 154	C Biology 124
66176	Biomathematics 374	None
11479	Chemistry 124	None
11479	Chemistry 144	C Chemistry 124
11479	Chemistry 164	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%.
11479	Chemistry 176	None
11479	Chemistry 214	PP Chemistry 124 or 164; and 144
11479	Chemistry 234	PP Chemistry 124 or 164
11479	Chemistry 254	PP Chemistry 124 or 164 P Mathematics 114 C Mathematics 144
11479	Chemistry 264	PP Chemistry 124 or 164; and 144 P Mathematics 114 or 144 or Mathematics (Bio) 124 or Engineering Mathematics 115 or 145
11479	Chemistry 314	PP Chemistry 264
11479	Chemistry 324	PP Mathematics 114, 144 P Chemistry 254
11479	Chemistry 344	PP Chemistry 214
11479	Chemistry 364	PP Chemistry 234 P Chemistry 264
18139	Computer Science 113	C Actuarial Science 112 C Mathematics 114
18139	Computer Science 114	C Mathematics 114
18139	Computer Science 144	P Computer Science 113 or 114
18139	Computer Science 214	PP Computer Science 144 P Mathematics 114
18139	Computer Science 244	P Computer Science 214
18139	Computer Science 313	P Computer Science 214, 244

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
18139	Computer Science 314	P Computer Science 214, 244 For programmes in Engineering: P Computer Science E 214 P Computer Systems 245
18139	Computer Science 315	P Computer Science 144 or Computer Science E 214 P Mathematics 214 or Applied Mathematics 214 or Engineering Mathematics 214 AND P Mathematical Statistics 245 and 246 or C Statistics 318
18139	Computer Science 343	P Computer Science 214 For programmes in Engineering: P Computer Science E 214 P Computer Systems 245
18139	Computer Science 344	P Computer Science 214
18139	Computer Science 345	P Computer Science 214
18139	Computer Science 411	P Computer Science 214, 244
18139	Computer Science 412	PP Computer Science 214, 244 PP Mathematics 114, 144 PP Probability Theory and Statistics 114 or 144
18139	Computer Science 441	PP Computer Science 144 PP Mathematical Statistics 245, 246
18139	Computer Science 491	PP Computer Science 214, 244 PP Mathematics 114, 144
18139	Computer Science 495	PP Computer Science 214, 244 PP Mathematics 114, 144
18139	Computer Science 472	PP Computer Science 144, 214 C Computer Science 315
18139	Computer Science 471	C Data Science Research Assignment 471
50040	Computer Skills 176	Only for students selected for the BSc extended curriculum programmes
50040	Computer Skills 272	P Computer Skills 171 or P Science in Context 178
50040	Computer Skills 372	P Computer Skills 272
14736	Data Science Research in Applied Mathematics 472	PP Applied Mathematics 314, 354, 364 PP Mathematical Statistics 312 PP Data Science 346
14738	Data Science Research in Computer Science 471	PP Computer Science 343, 344 PP Mathematical Statistics 312 PP Data Science 346
14739	Data Science Research in Statistical Physics 473	PP Physics 314, 334, 344 PP Mathematical Statistics 312 PP Data Science 346
12239	Earth Science Field Skills 172	C Geo-environmental Science 124, 154

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
12239	Earth Science Field Skills 272	PP Earth Science Field Skills 172 PP Geo-environmental Science 154 P Geo-environmental Science 124 C Geology 224, 244, 254 C Environmental Geochemistry 214
12239	Earth Science Field Skills 374	PP Earth Science Field Skills 272 PP Geology 224, 244, 254 C Geology 314, 324, 344, 354
38571	Engineering Mathematics 214	PP Mathematics 114 or Engineering Mathematics 115 or Mathematics 144 or Engineering Mathematics 145 P Mathematics 144 or Engineering Mathematics 145
38571	Engineering Mathematics 242	PP Mathematics 144 or Engineering Mathematics 145 or 214 P Engineering Mathematics 214
13622	Environmental Field Skills 271	P Geo-environmental Science 124,154 P Chemistry 124 or 164; and 154 C Environmental Geochemistry 214 C Geology 244
13622	Environmental Field Skills 372	P Environmental Geochemistry 214 P Environmental Field Skills 271 C Geology 324, 364 C Environmental Geochemistry 314
63991	Environmental Geochemistry 214	PP Geo-environmental Science 154 P Geo-environmental Science 124 P Chemistry 124 or 164; and 144
63991	Environmental Geochemistry 314	PP Mathematics 114 or Mathematics (Bio) 124 P Environmental Geochemistry 214 P Chemistry 264 C Chemistry 234
56842	Financial Mathematics 378	PP Mathematics 214, 244 P Mathematical Statistics 214, 245, 246
64165	Geo-environmental Science 154	None
13374	Geology 224	PP Geo-environmental Science 154 P Geo-environmental Science 124 P Chemistry 124 or 164
13374	Geology 244	PP Geo-environmental Science 124, 154 PP Geology 224 C Earth Science Field Skills 272 or Environmental Field Skills 271
13374	Geology 254	PP Geo-environmental Science 124, 154 PP Geology 224 PP Chemistry 124 or 164
13374	Geology 314	PP Geology 224,244,254 PP Chemistry 124 or 164 P Chemistry 144 C Earth Science Field Skills 374

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
13374	Geology 324	PP Geology 224, 244 PP Chemistry 124 or 164 P Chemistry 144 C Earth Science Field Skills 374 or Environmental Field Skills 372
13374	Geology 344	PP Geology 224, 244 PP Chemistry 124 or 164 P Chemistry 144
13374	Geology 354	PP Geology 224, 244, 254 PP Chemistry 124 or 164 P Chemistry 144
13374	Geology 364	PP Environmental Geochemistry 214 PP Geology 244 C Environmental Field Skills 372 or Earth Science Field Skills 374
21547	Mathematics (Bio) 124	None
21547	Mathematics (Bio) 176	Only for students selected for the BSc extended curriculum programmes
21539	Mathematics 114	None
21539	Mathematics 144	P Mathematics 114
21539	Mathematics 154	None
21539	Mathematics 186	Only for students selected for the BSc extended curriculum programmes
21539	Mathematics 214	PP Mathematics 114, 144
21539	Mathematics 244	P Mathematics 214
21539	Mathematics 279	Admission subject to approval by the Department of Mathematical Sciences
21539	Mathematics 314	PP Mathematics 214, 244
21539	Mathematics 318	Admission subject to approval by the Department of Mathematical Sciences
21539	Mathematics 324	PP Mathematics 214, 244
21539	Mathematics 344	PP Mathematics 214, 244 or equivalent modules
21539	Mathematics 345	PP Mathematics 114, 144 or equivalent modules
21539	Mathematics 365	PP Mathematics 214, 244
21539	Mathematics 378	Admission subject to approval by the Department of Mathematical Sciences
16284	Microbiology 214	PP Biology 124 or 144 PP Chemistry 124 or 164; and 144
16284	Microbiology 244	PP Biology 124 or 144 PP Chemistry 124 or 164; and 144
16284	Microbiology 314	PP Microbiology 214 P Microbiology 244 P Biochemistry 214, 244

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
16284	Microbiology 324	PP Microbiology 214 P Microbiology 244 P Biochemistry 214, 244
16284	Microbiology 354	PP Microbiology 214 P Microbiology 244
16284	Microbiology 364	PP Microbiology 214 P Microbiology 244
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 P Mathematics 114 C Mathematics 144
12998	Physics 176	Only for students selected for the BSc extended curriculum programmes
12998	Physics 224	PP Physics 114, 144 P Mathematics 114, 144
12998	Physics 234	PP Physics 114, 144 P Mathematics 114, 144
12998	Physics 254	P Mathematics 114, 144 P Physics 224
12998	Physics 314	P Physics 254 P Mathematics 214, 244 or Applied Mathematics 214, 244
12998	Physics 334	PP Physics 224 P Physics 254 P Mathematics 214, 244 or Applied Mathematics 214, 244
12998	Physics 342	P Physics 224, 254 P Mathematics 214, 244 or Applied Mathematics 214, 244
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
12998	Physics 412	None
12998	Physics 421	None
12998	Physics 457	None
12998	Physics 458	None

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
13080	Physiology 214	For the Human Life Sciences programme, and the interdisciplinary focal area Applied Medicinal Chemistry: P Biology 124, 154 C Biochemistry 214 For the interdisciplinary focal area Biomedical Mathematical Sciences: P Biology 124 C Biochemistry 214
13080	Physiology 244	P Physiology 214 C Biochemistry 244
13080	Physiology 314	PP Physiology 214, 244 P Biochemistry 214, 244
13080	Physiology 334	PP Physiology 214, 244 P Biochemistry 214, 244
13080	Physiology 344	P Biochemistry 214, 244 P Physiology 314
13080	Physiology 364	PP Physiology 214, 244 P Biochemistry 214, 244
56820	Probability Theory and Statistics 114	None
13623	Science in Context 179	None
12263	Scientific Computing 272	None
12263	Scientific Computing 372	P Scientific Computing 272
64007	University Practice in the Natural Sciences 176	Only for students selected for the BSc extended curriculum programmes

3.3 Subjects in the BSc degree programmes offered by other faculties

Take note: Please see the specific Faculty's Yearbook part for module descriptions and to verify the prerequisites listed below.

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
43214	Actuarial Science 112	Grade 12 Mathematics mark of at least 70%	Economic and Management Sciences, 10
12558	Anatomy 214	P Biology 124, 144 or 154 A limited number of students will be selected on merit.	Medicine and Health Sciences, 12
12558	Anatomy 244	P Anatomy 214	Medicine and Health Sciences, 12
12558	Anatomy 314	P Anatomy 214, 244	Medicine and Health Sciences, 12
12558	Anatomy 324	P Anatomy 214, 244	Medicine and Health Sciences, 12
12558	Anatomy 344	P Anatomy 214, 244, 314	Medicine and Health Sciences, 12
12558	Anatomy 364	P Anatomy 214, 244	Medicine and Health Sciences, 12
54429	Applied Kinesiology 313	PP Kinesiology 182	Medicine and Health Sciences, 12

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
54429	Applied Kinesiology 314	None	Medicine and Health Sciences, 12
54429	Applied Kinesiology 324	None	Medicine and Health Sciences, 12
54429	Applied Kinesiology 344	None	Medicine and Health Sciences, 12
54429	Applied Kinesiology 352	None	Medicine and Health Sciences, 12
54429	Applied Kinesiology 353	PP Kinesiology 182	Medicine and Health Sciences, 12
11061	Biometry 212	P Mathematics (Bio) 124 or Mathematics 114	AgriSciences, 7
11061	Biometry 242	P Biometry 212	AgriSciences, 7
54410	Biotechnology 215	None	AgriSciences, 7
54410	Biotechnology 245	None	AgriSciences, 7
54410	Biotechnology 315	P Genetics 245	AgriSciences, 7
54410	Biotechnology 345	None	AgriSciences, 7
48550	Business Management 113	None	Economic and Management Sciences, 10
11576	Chemical Engineering 224	P Engineering Chemistry 123 or 143	Engineering, 11
11576	Chemical Engineering 254	PP Chemical Engineering 224 P Thermodynamics A 224	Engineering, 11
11576	Chemical Engineering 264	P Applied Mathematics B224 P Thermodynamics A 224 P Engineering Mathematics 214	Engineering, 11
36153	Computer Systems 214	P Computer Programming 143; or P Computer Science 114 and 144	Engineering, 11
36153	Computer Systems 245	C Computer Systems 214	Engineering, 11
14019	Data Engineering 245	P Computer Programming 143 or P Computer Science 144	Engineering, 11
14019	Data Engineering 314	P Engineering Mathematics 214 or Mathematics 214 or Applied Mathematics 214 P Systems and Signals 344 or Mathematical Statistics 214	Engineering, 11
14026	Data Science 141	None	Economic and Management Sciences, 10
14026	Data Science 241	PP Data Science 141 PP Mathematical Statistics 214 OR PP Probability Theory and Statistics 114 or 144 with at least 60% AND P Mathematical Statistics 214	Economic and Management Sciences, 10
14026	Data Science 316	PP Data Science 241 C Mathematical Statistics 312	Economic and Management Sciences, 10

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
14026	Data Science 346	P Data Science 316 or 344 P Mathematical Statistics 312	Economic and Management Sciences, 10
46833	Design E 314	C Computer Systems 245	Engineering, 11
12084	Economics 114	None	Economic and Management Sciences, 10
12084	Economics 144	C Economics 114	Economic and Management Sciences, 10
12084	Economics 217	PP Economics 114	Economic and Management Sciences, 10
12084	Economics 248	PP Economics 114, 144 C Economics 217	Economic and Management Sciences, 10
12084	Economics 318	PP Economics 214 P Economics 244	Economic and Management Sciences, 10
12084	Economics 348	PP Economics 214 P Economics 244 C Economics 318	Economic and Management Sciences, 10
12599	Electrotechnique 143	None	Engineering, 11
10294	General Linguistics 178	None	Arts and Social Sciences, 4
10294	General Linguistics 278	PP General Linguistics 178	Arts and Social Sciences, 4
10294	General Linguistics 318	PP General Linguistics 278	Arts and Social Sciences, 4
10294	General Linguistics 348	PP General Linguistics 278	Arts and Social Sciences, 4
13285	Genetics 214	PP Biology 124 P Mathematics (Bio) 124 or Mathematics 114 or 144 P Animal Science 144 or Biology 144 or 154 or Crop Protection 152 or Probability Theory and Statistics 114	AgriSciences, 7
13285	Genetics 244	P Genetics 214	AgriSciences, 7
13285	Genetics 314	PP Genetics 244	AgriSciences, 7
13285	Genetics 324	PP Genetics 214 C Genetics 244	AgriSciences, 7
13285	Genetics 344	PP Genetics 244	AgriSciences, 7
13285	Genetics 354	P Genetics 324 P Biometry 212 and 242 or P Psychology 243 and 253 or P Mathematical Statistics 214 or P Biodiversity and Ecology 212	AgriSciences, 7
64165	Geo-environmental Science 124	None	Arts and Social Sciences, 4

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
12923	Geographical Information Technology 141	None	Arts and Social Sciences, 4
12923	Geographical Information Technology 211	C Mathematics 114 or Mathematics (Bio) 124	Arts and Social Sciences, 4
12923	Geographical Information Technology 214	C Mathematics 114 or Mathematics (Bio) 124	Arts and Social Sciences, 4
12923	Geographical Information Technology 241	P Geographical Information Technology 141 or 214 or Geography and Environmental Studies 214	Arts and Social Sciences, 4
12923	Geographical Information Technology 242	P Geographical Information Technology 211 P Mathematics 114 or Mathematics (Bio) 124	Arts and Social Sciences, 4
12923	Geographical Information Technology 311	P Geographical Information Technology 241	Arts and Social Sciences, 4
12923	Geographical Information Technology 312	P Geography and Environmental Studies 214 or Geographical Information Technology 214 or 241	Arts and Social Sciences, 4
12923	Geographical Information Technology 341	P Geographical Information Technology 312	Arts and Social Sciences, 4
12923	Geographical Information Technology 342	P Geographical Information Technology 211	Arts and Social Sciences, 4
56502	Geography and Environmental Studies 265	P Geo-environmental Science 124	Arts and Social Sciences, 4
56502	Geography and Environmental Studies 334	P Geography and Environmental Studies 265 or P Geographical Information Technology 214	Arts and Social Sciences, 4
56502	Geography and Environmental Studies 358	P Geography and Environmental Studies 265 or P Environmental Geochemistry 214	Arts and Social Sciences, 4
14879	Introduction to Intellectual Property Law 314	None	Law, 8
14879	Introduction to Intellectual Property Law 344	None	Law, 8
14289	Introduction to Statistical Learning 441	PP Mathematical Statistics 312 PP Data Science 346	Economic and Management Sciences, 10
19305	Kinesiology 162	None	Medicine and Health Sciences, 12
19305	Kinesiology 182	None	Medicine and Health Sciences, 12
19305	Kinesiology 312	None	Medicine and Health Sciences, 12

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
19305	Kinesiology 332	None	Medicine and Health Sciences, 12
19305	Kinesiology 342	None	Medicine and Health Sciences, 12
19305	Kinesiology 352	None	Medicine and Health Sciences, 12
19305	Kinesiology 372	None	Medicine and Health Sciences, 12
22853	Mathematical Statistics 214	PP Probability Theory and Statistics 114 or 144 PP Mathematics 114, 144 with an average final mark of at least 60% OR PP Mathematics 214 with a final mark of at least 55% (if you have passed Engineering Mathematics 115 and 145 with an average mark of at least 60% for the two together; or Engineering Mathematics 214 with a final mark of at least 55% you are exempt from this)	Economic and Management Sciences, 10
22853	Mathematical Statistics 245	PP Mathematical Statistics 214	Economic and Management Sciences, 10
22853	Mathematical Statistics 246	PP Mathematical Statistics 214	Economic and Management Sciences, 10
22853	Mathematical Statistics 312	PP Mathematical Statistics 245 P Mathematical Statistics 246 with a final mark of at least 40% P Mathematics 214 or Engineering Mathematics 214	Economic and Management Sciences, 10
22853	Mathematical Statistics 316	PP Mathematical Statistics 246 P Mathematical Statistics 245 with a final mark of at least 40% P Mathematics 214 or Engineering Mathematics 214	Economic and Management Sciences, 10
22853	Mathematical Statistics 344	P Mathematical Statistics 312, 316	Economic and Management Sciences, 10
22853	Mathematical Statistics 364	P Mathematical Statistics 312, 316	Economic and Management Sciences, 10
44229	Movement Education, Sport and Recreation 212	None	Medicine and Health Sciences, 12
44229	Movement Education, Sport and Recreation 222	None	Medicine and Health Sciences, 12
44229	Movement Education, Sport and Recreation 242	None	Medicine and Health Sciences, 12
44229	Movement Education, Sport and Recreation 282	PP Kinesiology 182	Medicine and Health Sciences, 12
50652	Music Technology 112	None	Arts and Social Sciences, 4

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
50652	Music Technology 142	None	Arts and Social Sciences, 4
50652	Music Technology 222	None	Arts and Social Sciences, 4
50652	Music Technology 252	None	Arts and Social Sciences, 4
50652	Music Technology 379	None	Arts and Social Sciences, 4
55336	Operations Research 214	P Mathematics 114, 144	Economic and Management Sciences, 10
55336	Operations Research 244	P Mathematics 114 PP Mathematics 144	Economic and Management Sciences, 10
55336	Operations Research 314	P Operations Research 244 OR PP Business Analytics 214 and 244 with an average final mark of at least 80% for the two together P Mathematics 114, 144	Economic and Management Sciences, 10
55336	Operations Research 322	PP Probability Theory and Statistics 114 or 144 OR PP Business Analytics 214 and 244 with an average final mark of at least 80% for the two together P Mathematics 114, 144	Economic and Management Sciences, 10
55336	Operations Research 344	C Operations Research 244 OR PP Business Analytics 214 and 244 with an average final mark of at least 80% for the two together P Mathematics 114, 144	Economic and Management Sciences, 10
55336	Operations Research 352	PP Probability Theory and Statistics 114 or 144 OR PP Business Analytics 214 and 244 with an average finale mark of at least 80% for the two together P Mathematics 114, 144	Economic and Management Sciences, 10
14689	Organisational Informatics 214	None	Arts and Social Sciences, 4
14689	Organisational Informatics 244	This module may not be taken simultaneously with or following Computer Science 113 or 114.	Arts and Social Sciences, 4
14689	Organisational Informatics 318	P Organisational Informatics 214 and P Organisational Informatics 244 or P Computer Science 113 or P Computer Science 114	Arts and Social Sciences, 4
14689	Organisational Informatics 348	P Organisational Informatics 318 and PP Organisational Informatics 244 or PP Computer Science 113 or PP Computer Science 114	Arts and Social Sciences, 4
56820	Probability Theory and Statistics 144	None	Economic and Management Sciences, 10

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
18414	Psychology 114	None	Arts and Social Sciences, 4
18414	Psychology 144	None	Arts and Social Sciences, 4
18414	Psychology 213	PP Psychology 114, 144	Arts and Social Sciences, 4
18414	Psychology 223	PP Psychology 114, 144	Arts and Social Sciences, 4
18414	Psychology 243	PP Psychology 114, 144	Arts and Social Sciences, 4
18414	Psychology 314	PP – any three of the following four modules: Psychology 213, 223, 243, 253	Arts and Social Sciences, 4
18414	Psychology 324	PP – any three of the following four modules: Psychology 213, 223, 243, 253	Arts and Social Sciences, 4
18414	Psychology 348	PP – any three of the following four modules: Psychology 213, 223, 243, 253	Arts and Social Sciences, 4
64866	Scientific Communication Skills 116	Only for students selected for the BSc Extended Curriculum Programmes	Language Centre
64866	Scientific Communication Skills 146	Only for students selected for the BSc Extended Curriculum Programmes	Language Centre
58173	Socio-Informatics 214	None	Arts and Social Sciences, 4
58173	Socio-Informatics 348	None	Arts and Social Sciences, 4
14176	Soil Science 214	P Chemistry 144	AgriSciences, 7
54607	Sport Science 222	None	Medicine and Health Sciences, 12
54607	Sport Science 232	None	Medicine and Health Sciences, 12
54607	Sport Science 252	None	Medicine and Health Sciences, 12
54607	Sport Science 262	PP Kinesiology 162	Medicine and Health Sciences, 12
54607	Sport Science 382	None	Medicine and Health Sciences, 12
19658	Statistics 318	PP Statistics 214, 224, 244 or PP Mathematical Statistics 214, 245, 246	Economic and Management Sciences, 10
19658	Statistics 348	P Statistics 318	Economic and Management Sciences, 10
14223	Statistics and Data Science 188	None	Economic and Management Sciences, 10
65250	Stochastic Simulation 441	PP Mathematical Statistics 312,316,344,364	Economic and Management Sciences, 10

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules	Faculty and Yearbook part
46779	Systems and Signals 214	C Electrotechnique 143	Engineering, 11
46779	Systems and Signals 244	C Electrotechnique 143 C Engineering Mathematics 214, 242	Engineering, 11
33863	Thermodynamics A 224	P Engineering Mathematics 145 C Applied Mathematics B154 P Engineering Chemistry 123 or 143	Engineering, 11
14309	Time Series Analysis 441	PP Mathematical Statistics 312, 316, 344, 364	Economic and Management Sciences, 10

3.4 Subjects offered by the Faculty of Science for other faculties

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
52078	Applied Chemistry 334	P Chemistry 214, 264
20753	Applied Mathematics B 124	None
20753	Applied Mathematics B 154	P Applied Mathematics B 124 C Engineering Mathematics 115
20753	Applied Mathematics B 224	P Applied Mathematics 144 or Applied Mathematics B 154
20753	Applied Mathematics B 242	P Engineering Mathematics 145 C Applied Mathematics B 224
20753	Applied Mathematics B 252	None
48321	Chemistry C 152	P Engineering Chemistry 123 or 143
48321	Chemistry C 224	PP Engineering Chemistry 123 or 143 PP Chemistry C 152
48321	Chemistry C 254	P Chemistry C 224
65692	Chemistry for Health Sciences 112	None
59536	Computer Science E 214	PP Computer Programming 143 P Engineering Mathematics 115, 145
59536	Computer Science E414	P Computer Science 144 or Computer Science E214 P Mathematical Statistics 245 and 246; or Systems and Signals 344 P Mathematics 214 or Applied Mathematics 214 or Engineering Mathematics 214
50040	Computer Skills 136	None
50040	Computer Skills 146	Only students who have failed Computer Skills 136 in a particular year, will be allowed to register for Computer Skills 146 in the same academic year.
38571	Engineering Mathematics 115	None
38571	Engineering Mathematics 145	P Engineering Mathematics 115
38571	Engineering Mathematics 214	PP Mathematics 114 or Engineering Mathematics 115 or Mathematics 144 or Engineering Mathematics 145 P Mathematics 144 or Engineering Mathematics 145

Subject number	Module name	Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules
38571	Engineering Mathematics 242	PP Mathematics 144 or Engineering Mathematics 145 or 214 P Engineering Mathematics 214
59420	Engineering Physics 113	None
59420	Engineering Physics 152	P Engineering Physics 113
36323	Numerical Methods 262	P Engineering Mathematics 214
19267	Special Physics 111	None

4. Principles used to compile the curriculum of a BSc degree programme

4.1 General provisions

The three-year BSc degree programme consists of at least 24 standard semester modules (after this named standard modules) of from 8 to 16 credits each, plus the module Science in Context 179.

You must take at least 18, but preferably more, of these standard modules from the core subjects. The Science Faculty Board will consider approving acknowledged equivalent modules for non-final year modules.

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

- First-year curriculum: Your prescribed curriculum will have at least 8 standard modules at first-year level.
- Second-year curriculum: You must take at least 8 standard modules with at least 6 modules at second-year level.
- Third-year curriculum: You must take at least 8 standard modules at third-year level. At least 4 of these 8 standard modules must be from the core subjects, generally leading to 2 majors making provision for at least 2 postgraduate options.

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. 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 a specified postgraduate programme.

Take 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" in this Yearbook part.

4.2 Occasional modules

An occasional module is a module you have registered for although the module is not part of the curriculum of your degree programme, nor is it a corequisite, prerequisite pass or prerequisite module for any prescribed modules in the curriculum of the particular degree programme.

- There are restrictions on taking occasional modules. See "Assessments and Promotions" in Part 1 (General Rules) of the Yearbook.
- You can only take occasional modules if:
 - you meet the applicable corequisite, prerequisite and prerequisite pass requirements (see Tables 3.2, 3.3 and 3.4, above); and
 - the class and assessment timetables allow for it, and
 - your request has been submitted to and approved by the Faculty Academic Committee before the start of the semester in which the module is offered.

4.3 Modules in arrears

A module in arrears is a module that you have not yet passed, but forms part of the curriculum for the specific degree programme.

4.3.1 Repeating compulsory and elective modules

- For modules offered by the **Faculty of Science**, you must **repeat** (a) module(s) not already passed.
- If you are not in your final year of your curriculum and have credits in arrears from a preceding year, you may only take 16 credits per semester in addition to the normal credit load of your curriculum for that year.
- You can only take, in the same calendar year, modules from different years of study in your approved curriculum if:
 - you meet the applicable corequisite, prerequisite and prerequisite pass requirements (see Tables 3.2, 3.3 and 3.4 above); and
 - the class and assessment timetables allow for it.

4.3.2 Repeating modules for improvement of marks

- For modules offered by the **Faculty of Science**, you will **not** be allowed to repeat (a) module(s) already passed.
- Under exceptional circumstances, the Dean may grant permission that (a) module(s) could be repeated. For the Dean to consider the request, the head of the relevant department must submit a motivation to the Dean.
- 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 for admission to higher degree programmes.

5. Undergraduate assessment, promotion and Faculty provisions

5.1 Undergraduate assessment rules

The Faculty undergraduate assessment rules, together with the Stellenbosch University assessment rules apply to all modules:

- For the assessment guidelines for a specific module, consult the module framework.
- For the Faculty's undergraduate assessment rules, consult the [Science Faculty website](#). Look under "Teaching and Learning 2025" to find the link to "Faculty of Science Assessment Rules and Recommendations".
- For more information and the general rules on assessment, see Part 1 (General Rules) of the University Yearbook, under "Assessments and Promotions".

5.2 Minimum requirements for academic promotion and readmission

Please consult Part 1 (General Rules) of the Yearbook.

5.3. Absence from academic activities

Please consult section 12 under the Admission and Registration chapter in Part 1 (General Rules) of the Yearbook.

5.4. Dean's concession assessments (DCAs)

5.4.1 General information

- DCAs are special assessments for final-year students who fall just short of meeting the programme requirements to graduate.
- DCAs are granted only at the start of the academic year (January/February).
- Each **module framework** will specify whether a DCA might be granted for the specific module.
- DCAs shall be granted only with the approval of the Dean. **No student shall be granted a DCA by any department under any circumstances.** No lecturer can give an undertaking to you in this matter.
- The highest final mark you can obtain after having passed a DCA is 50%.
- DCAs are moderated internally and externally, and no re-evaluation or further concessions will be granted. If unsuccessful in a DCA, you must reregister for the module.

5.4.2 Eligibility criteria

You may be considered and qualify for a DCA if:

- You are a **registered final-year** undergraduate student.
- You are in arrears of **no more than two modules**, with a total maximum of **33 credits**.
- You obtained a final mark of at least **40%** in the failed module(s).
- You were registered for the affected module(s) **in the year immediately prior** to the DCA period.

5.4.3 Application procedure

- If you are eligible for a DCA, you must complete the **official DCA application form online**.
 - The submission deadline is within one week after A3 assessment marks are announced.
- A non-refundable **fee** of R1350 will be charged upon approval of the DCA.

5.4.4 Arrangements

- The **module-offering department** will communicate the date, time, venue and content of the DCA, scheduled for **January or February**.

6. Curricula for the BSc (extended curriculum programmes) (ECPs)

First-year curriculum for the four-year BSc (ECPs)

YEAR 1 (146 CREDITS)

Compulsory Modules

Biology	146(16)
Chemistry	176(32)
Computer Skills	176(8)
Physics	176(32)
Scientific Communication Skills	116(12), 146(6)
University Practice in the Natural Science	176(8)

And ONE of the following modules

Mathematics (Bio)	176(32)
Mathematics	186(32)

YEARS 2, 3 AND 4

Once you have successfully completed your first year in the extended curriculum 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.

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

Each programme or focal area of a programme will list the compulsory modules and elective modules, if any of the latter, for each academic year. To obtain the BSc degree, you must follow and pass the prescribed curriculum (subjects and modules) of your chosen programme or focal area.

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

7.1 Programmes in the Biological Sciences

There are four programmes in the Biological Sciences group. Consult the sections below for more information on each of the programmes as well as the various focal areas, where applicable.

7.1.1 Biodiversity and Ecology

This programme consists of three focal areas, namely Climate Change Ecology, Plant and Animal Biodiversity, and Plants and Microbes.

7.1.1.1 Focal area: Climate Change Ecology

Specific Minimum 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, which 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

(credits = 108)

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Mathematics (Bio)	124(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 32)

Choose one of the following options.

Option 1

Geo-environmental Science	124(16)
Geographical Information Technology	141(16)

or

Option 2

Physics (Bio)	134(16), 154(16)
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2ND YEAR (CREDITS 128)

Compulsory Modules

(credits = 112)

Biodiversity and Ecology	212(16), 214(16), 224(16), 244(16), 254(16), 264(16)
Geographical Information Technology	214(16)

plus

Elective Module

(credits = 16)

Choose one of the following modules.

Geographical Information Technology	241(16)
Geography and Environmental Studies	265(16)

3RD YEAR (128 CREDITS)**Compulsory Modules**

(credits = 128)

Biodiversity and Ecology	311(16), 315(16), 324(16), 341(16), 342(16), 344(16), 354(16)
Geographical Information Technology	312(16)

7.1.1.2 Focal area: Plant and Animal Biodiversity**Specific Minimum 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, which 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 Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

(credits = 108)

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Mathematics (Bio)	124(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 32)

Choose one of the following options.

Option 1

Geo-environmental Science	124(16)
Geographical Information Technology	141(16)

or

Option 2

Physics (Bio)	134(16), 154(16)
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2ND YEAR (CREDITS 128)**Compulsory Modules**

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

3RD YEAR (128 CREDITS)**Compulsory Modules**

Biodiversity and Ecology	311(16), 315(16), 324(16), 341(16), 342(16), 344(16), 354(16)
Genetics	314(16)

7.1.1.3 Focal area: Plants and Microbes**Specific Minimum 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, which leads to a master's programme in Botany or Zoology.
- An honours programme in Applied Plant Physiology.
- An honours programme in Microbiology, which leads to a master's 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 Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

Biology	124(16), 144(16), 154(16)
Chemistry	124(16), 144(16)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)
Science in Context	179(12)

2ND YEAR (128 CREDITS)**Compulsory Modules**

Biodiversity and Ecology	212(16), 214(16), 244(16), 264(16)
Biochemistry	214(16), 244(16)
Microbiology	214(16), 244(16)

3RD YEAR (128 CREDITS)**Compulsory Modules**

Biodiversity and Ecology	311(16), 324(16), 341(16), 354(16)
Microbiology	314(16), 324(16), 354(16), 364(16)

7.1.2 Molecular Biology and Biotechnology**Specific Minimum 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

(credits = 76)

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Science in Context	179(12)

plus

Option 1

(credits = 64)

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

or

Option 2

(credits = 64)

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

2ND YEAR (144 CREDITS)

Compulsory Modules

(credits = 128)

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Biotechnology	245(16)
Genetics	214(16), 244(16)
Microbiology	214(16), 244(16)

plus

Elective Modules

(credits = 16)

Choose one of the following modules.

Chemistry	214(16)
Biotechnology	215(16)

3RD YEAR (128 CREDITS)**Compulsory Modules**

Choose two of the major subject options below. You must take all the modules of your chosen options. You are not allowed to choose option 2 AND 3 (both Genetic options).

Major subject: option 1

Biochemistry	315(16), 323(8), 345(16), 365(16)
Bioinformatics	312(8)

Major subject: option 2

Genetics	314(16), 324(16), 344(16), 354(16)
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Major subject: option 3

Biotechnology	315(16), 345(16)
Genetics	314(16), 344(16)

Major subject: option 4

Microbiology	314(16), 324(16), 354(16), 364(16)
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7.1.3 Human Life Sciences

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

7.1.3.1 Focal area: Biology**Specific Minimum 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 focal area leads to an honours programme in Physiological Sciences.
- If you take applicable elective modules, this focal area also leads to an honours programme in Anatomy, Biochemistry 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 Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

(credits = 76)

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Science in Context	179(12)

plus

Option 1

(credits = 64)

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

or

Option 2**(credits = 64)**

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

2ND YEAR (144 CREDITS)**Compulsory Modules****(credits =112)**

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16)
Physiology	214(16), 244(16)

plus

Elective Modules**(credits = 32)**

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

Anatomy*	214(16), 244(16)
Microbiology	214(16), 244(16)

*The Faculty of Medicine and Health Sciences selects a limited number of students per year.

3RD YEAR (128 CREDITS)**Compulsory Modules****(credits = 64)**

Physiology	314(16), 334(16), 344(16), 364(16)
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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.

Anatomy	314(16), 324(16), 344(16), 364(16)
Biochemistry Bioinformatics	315(16), 323(8), 345(16), 365(16) AND 312(8)
Genetics	314(16), 324(16), 344(16), 354(16)

7.1.3.2 Focal area: Biology with Psychology**Specific Minimum Admission Requirements**

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

Continued Study Possibilities

- This focal area 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 Yearbook part. For more information on admission to the honours programme in Psychology, please consult the Faculty of Arts and Social Sciences Yearbook, Part 4. For more information on admission to the honours programme in Genetics, please consult the Faculty of AgriSciences Yearbook, Part 7.

1ST YEAR (148 CREDITS)**Compulsory Modules**

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)
Psychology	114(12), 144(12)
Science in Context	179(12)

2ND YEAR (136 CREDITS)**Compulsory Modules**

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Genetics	214(16), 244(16)
Physiology	214(16), 244(16)
Psychology	213(8), 223(8), 243(8)

3RD YEAR (144 CREDITS)**Compulsory Modules**

(credits = 112)

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

plus

Elective Modules

(credits = 32)

Choose one of the following two options:

Option 1

Physiology	334(16), 344(16)
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or

Option 2

Genetics	324(16), 354(16)
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7.1.4 Sport Science**Specific Minimum 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 or continue with this programme.
- 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.

Continued Study Possibilities

This programme leads to:

- An honours programme in Biokinetics.
- An honours programme in Sport Science, Specialisation: Performance Sport.
- An honours programme in Sport Science, Specialisation: Kinderkinetics.
- 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 Yearbook part.

Please note: The BScHons in Biokinetics has been granted professional accreditation by the Health Professions Council of South Africa (HPCSA) until (and including) 2028, after which the programme will be discontinued. Therefore, to apply for the HPCSA registration as a professional biokineticist, you must successfully complete your BSc in Sport Science by such time that you are able to successfully complete the BScHons in Biokinetics programme by the end of the 2028 academic year, and an internship at an HPCSA-accredited practice within two years of completing the BScHons in Biokinetics. The Faculty of Medicine and Health Sciences is in the process of designing a new professional bachelor's degree to replace the BScHons in Biokinetics.

1ST YEAR (140 CREDITS)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Kinesiology	162(8), 182(8)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16), 154(16)
Science in Context	179(12)

2ND YEAR (128 CREDITS)

Compulsory Modules

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

3RD YEAR (134 CREDITS)

Compulsory Modules

(credits = 110)

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

plus

Elective Modules

(credits = 24)

Choose one of the following options (24 credits) of the subject Applied Kinesiology. **Take note:** Not all modules are offered every year. Please contact the Department of Exercise, Sport and Lifestyle Medicine for more information.

Applied Kinesiology (Adapted Physical Activity)	324(12), 344(12)
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or

Applied Kinesiology (Sport Coaching)	313(12), 353(12)
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or

7.2 Programmes in the Physical Sciences

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

7.2.1 Chemistry

This programme consists of four focal areas, namely Chemistry and Polymer Science; Chemical Biology; Applied and Sustainable Chemistry; and Chemistry with Chemical Engineering.

7.2.1.1 Focal area: Chemistry and Polymer Science

Specific Minimum Admission Requirements

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

Continued Study Possibilities

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

1ST YEAR (140 CREDITS)

Compulsory Modules

(credits = 108)

Chemistry	124(16), 144(16)
Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 32)

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

Applied Mathematics	144(16)
Biology	124(16), 144(16) or 154(16)
Computer Science	114(16), 144(16)
Geo-environmental Science	124(16), 154(16)
Probability Theory and Statistics	114(16)

2ND YEAR (133 CREDITS)

Compulsory Modules

(credits = 69)

Chemistry	214(16), 234(16), 254(16), 264(16)
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plus

Computer Skills	272(5)
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or

Scientific Computing	272(5)
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plus

Elective Modules

(credits = 64)

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

Applied Mathematics	214(16), 244(16)
Biochemistry	214(16), 244(16)
Computer Science	214(16), 244(16)
Environmental Geochemistry	214(16)
Genetics	214(16), 244(16)
Geology	224(16), 244(16), 254(16)
Mathematics	214(16), 244(16), 279(16)
Microbiology	214(16), 244(16)
Physics	224(16), 254(16)

3RD YEAR (125 - 133 CREDITS)

Compulsory Modules

(credits = 69)

Chemistry	314(16), 324(16), 344(16), 364(16)
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plus

Computer Skills	372(5)
-----------------	--------

or

Scientific Computing	372(5)
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plus

Elective Modules

(credits = 56 - 64)

Choose modules to the minimum value of 56 or maximum value of 64 credits from the following subjects.

If you want to take Applied Chemistry as a second major, you must take all four Applied Chemistry modules.

Applied Chemistry	316(16), 333(12), 354(16), 365(12),
Applied Mathematics	314(16), 324(16), 354(16), 364(16)
Computer Science	313(16), 314(16), 343(16), 344(16)
Environmental Geochemistry	314(16)
Geology	324(16), 344(16), 364(16)
Mathematics	314(16), 324(16), 344(16), 345(16), 365(16), 378(32)*
Microbiology	314(16), 324(16), 354(16), 364(16)
Physics	314(16), 334(16), 342(8), 352(8), 344(16) OR 384(16)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

7.2.1.2 Focal area: Chemical Biology

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

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	179(12)

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)
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or

Scientific Computing	272(5)
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3RD YEAR (133 CREDITS)

Compulsory Modules

(credits = 112)

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

plus

Computer Skills	372(5)
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or

Scientific Computing	372(5)
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plus

Elective Module

(credits = 16)

Choose one of the following modules.

Applied Chemistry	354(16)
Biochemistry	345(16)

7.2.1.3 Focal area: Applied and Sustainable Chemistry

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area 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 Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

(credits = 108)

Chemistry	124(16), 144(16)
Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 32)

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

Applied Mathematics	144(16)
Biology	124(16), 144(16) or 154(16)
Computer Science	114(16), 144(16)
Probability Theory and Statistics	114(16)

2ND YEAR (MINIMUM 133, MAXIMUM 137 CREDITS)**Compulsory Modules**

(credits = 69)

Chemistry	214(16), 234(16), 254(16), 264(16)
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plus

Computer Skills	272(5)
-----------------	--------

or

Scientific Computing	272(5)
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plus

Elective Modules

(credits = minimum 64)

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

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

3RD YEAR (133 CREDITS)**Compulsory Modules**

(credits = 125)

Applied Chemistry	316(16), 333(12), 354(16), 365(12)
Chemistry	314(16), 324(16), 344(16), 364(16)

plus

Computer Skills	372(5)
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or

Scientific Computing	372(5)
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7.2.1.4 Focal area: Chemistry with Chemical Engineering

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area leads to an honours programme in Chemistry or Polymer Science.
- If you have completed the relevant subjects, this also leads to registration for a bachelor's degree programme in Chemical Engineering at third-year level.

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 Yearbook part.

Please note: Transferring to Chemical Engineering is also dependant on the selection criteria of the Faculty of Engineering.

1ST YEAR (140 CREDITS)

Compulsory Modules

Applied Mathematics	144(16)
Chemistry	124(16), 144(16)
Computer Science	114(16)
Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Science in Context	179(12)

2ND YEAR (MINIMUM 124, MAXIMUM 138 CREDITS)

Compulsory Modules

(credits = 108)

Applied Mathematics	214(16), 244(16)
Chemistry	214(16), 234(16), 254(16), 264(16)
Physics	234(12)

plus

Elective Modules

(credits = minimum 16, maximum 30)

Choose one of the options below.

Please note: If you are considering transferring to Chemical Engineering after completion of the BSc degree programme, you have to take Option 1.

Option 1

Chemical Engineering	224(15), 264(15)
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or

Option 2

Physics	254(16)
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3RD YEAR (MINIMUM 120, MAXIMUM 150 CREDITS)

Compulsory Modules

(credits = 120)

Applied Chemistry	333(12), 365(12)
Applied Mathematics	324(16), 364(16)
Chemistry	314(16), 324(16), 344(16), 364(16)

and

If you are considering transferring to Chemical Engineering after completion of the BSc degree programme, you also have to take the modules below.

Elective Modules

(credits = 30)

Chemical Engineering	254(15) AND
Thermodynamics A	224(15)

7.2.2 Physics

This programme consists of the focal areas of Laser Physics (Physical), Nuclear Physics, Radiation and Health Physics, Laser Physics (Biological), and Theoretical Physics.

7.2.2.1 Focal areas: Laser Physics (Physical), Nuclear Physics, Radiation and Health Physics

Specific Minimum 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).
- **Option 1 modules** also lead to an honours programme in Chemistry.
- **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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

(credits = 76)

Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 64)

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

Applied Mathematics	144(16)
Chemistry	124(16), 144(16)
Computer Science	114(16), 144(16)
Probability Theory and Statistics	114(16)

2ND YEAR (133 CREDITS)**Compulsory Modules**

(credits = 69)

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

plus

Elective Modules

(credits = 64)

Choose modules to the value of 64 credits from the following list, depending on the first-year curriculum you followed. Also take into consideration the additional major subject modules that you will be taking in your third year.

Applied Mathematics	214(16), 244(16)
Chemistry	214(16), 234(16), 254(16), 264(16)
Computer Science	214(16), 244(16)
Mathematics	279(16)
Mathematical Statistics	214(16), 245(8), 246(8)

3RD YEAR (MINIMUM 133, MAXIMUM 165 CREDITS)

You can choose from the following three options:

Option 1: (133 credits)**Compulsory Modules**

(credits = 69)

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

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)
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or

Applied Mathematics	324(16), 354(16), 364(16) AND
Mathematics	324(16) OR 344(16) OR 378(32)*

*Mathematics 378(32) will be replaced with 318(16) in 2027.

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

(credits = 101)

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

plus

Elective Modules

(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.

Applied Mathematics	324(16), 354(16)
Computer Science	313(16), 314(16), 343(16)
Mathematics	324(16), 378(32)*
Physics	372(8)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

Option 3: (minimum 133, maximum 165 credits)

Compulsory Modules

(credits = 117)

Computer Science	313(16), 314(16), 343(16)
Physics	314(16), 334(16), 342(8), 344(16), 352(8)
Scientific Computing	372(5)

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.

Applied Mathematics	324(16), 364(16)
Computer Science	344(16)
Physics	384(16)

7.2.2.2 Focal area: Laser Physics (Biological)

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

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	179(12)

2ND YEAR (133 CREDITS)**Compulsory Modules**

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

3RD YEAR (133 CREDITS)**Compulsory Modules**

(credits = 85)

Biochemistry	315(16)
Physics	314(16), 334(16), 342(8), 352(8), 384(16)
Scientific Computing	372(5)

plus

Elective Modules

(credits = 48)

Choose one of the following options.

Option 1

Applied Mathematics	364(16)
Biochemistry	323(8)
Bioinformatics	312(8)
Chemistry	314(16) or 344(16)

or

Option 2

Biochemistry	323(8)
Bioinformatics	312(8)
Chemistry	314(16), 344(16)

or

Option 3

Applied Mathematics	364(16)
Physiology	214(16), 244(16)

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.

Biochemistry	323(8), 345(16), 365(16)
Bioinformatics	312(8)

7.2.2.3 Focal area: Theoretical Physics

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area leads to an honours programme in Theoretical Physics.
- If applicable elective modules are taken, this focal area 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

Applied Mathematics	144(16)
Computer Science	114(16), 144(16)
Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

2ND YEAR (133 CREDITS)

Compulsory Modules

(credits = 69)

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

plus

Elective Modules

(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.

Applied Mathematics	214(16), 244(16)
Computer Science	214(16), 244(16)
Mathematics	279(16)
Mathematical Statistics	214(16), 245(8), 246(8)

3RD YEAR (133 CREDITS)

Compulsory Modules

(credits = 101)

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

plus

Elective Modules

(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.

Applied Mathematics	324(16), 354(16)
Computer Science	313(16), 314(16), 315(16), 343(16)
Mathematics	314(16), 345(16), 365(16), 378(32)*
Physics	384(16)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

7.2.3 Earth Science

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

7.2.3.1 Focal area: Applied Earth Science

Specific Minimum 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 Yearbook part.

1ST YEAR (148 CREDITS)

Compulsory Modules

(credits = 84)

Chemistry	124(16), 144(16)
Earth Science Field Skills	172(8)
Geo-environmental Science	124(16), 154(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 64)

Choose one of the following three subject combinations.

Subject Combination 1

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

or

Subject Combination 2

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

or

Subject Combination 3

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

2ND YEAR (133 CREDITS)**Compulsory Modules**

(credits = 117)

Computer Skills	272(5)
Earth Science Field Skills	272(16)
Environmental Geochemistry	214(16)
Geographical Information Technology	214(16), 241(16)
Geology	224(16), 244(16), 254(16)

plus

Elective Modules

(credits = 16)

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

Chemistry	234(16), 264(16)
Geographical Information Technology	211(16)

3RD YEAR (133 CREDITS)**Compulsory Modules**

(credits = 101)

Computer Skills	372(5)
Earth Science Field Skills	374(16)
Geographical Information Technology	312(16)
Geology	314(16), 324(16), 344(16), 354(16)

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)

7.2.3.2 Focal area: Geo-environmental Science**Specific Minimum 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 Yearbook part.

1ST YEAR (148 CREDITS)**Compulsory Modules**

(credits = 84)

Chemistry	124(16), 144(16)
Earth Science Field Skills	172(8)
Geo-environmental Science	124(16), 154(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 64)

Choose one of the following three subject combinations.

Subject Combination 1

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

or

Subject Combination 2

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

or

Subject Combination 3

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

2ND YEAR (141 CREDITS)**Compulsory Modules**

Chemistry	234(16), 264(16)
Computer Skills	272(5)
Environmental Field Skills	271(8)
Environmental Geochemistry	214(16)
Geographical Information Technology	214(16), 241(16)
Geography and Environmental Studies	265(16)
Geology	224(16), 244(16)

3RD YEAR (141 CREDITS)**Compulsory Modules**

Computer Skills	372(5)
Environmental Field Skills	372(8)
Environmental Geochemistry	314(16)
Geographical Information Technology	312(16), 341(16)
Geography and Environmental Studies	334(16), 358(16)
Geology	324(16), 344(16), 364(16)

7.2.4 Geoinformatics

Specific Minimum 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. The combined BSc and BScHons in Geoinformatics is endorsed by the South African Geomatics Council (SAGC) for registration as a Candidate Geomatics Professional in Geographical Information Science (CGPr GISc).
- If you take applicable elective modules, this programme also leads to a honours programme in Information Systems Management (Faculty of Arts and Social 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

(credits = 44)

Geo-environmental Science	124(16)
Geographical Information Technology	141(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 96)

Choose one of the options below.

Option 1

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

or

Option 2

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

2ND YEAR (135 CREDITS)

Compulsory Modules

(credits = 87)

Geographical Information Technology	211(16), 214(16), 241(16), 242(16)
Scientific Computing	272(5)
Statistics and Data Science	188(18)

plus

Elective Modules

(credits = 48)

Choose one of the following options.

Option 1

Computer Science	214(16), 244(16)
Socio-Informatics	244(16)

or

Option 2

Organisational Informatics	214(16), 244(16)
Socio-Informatics	214(16)

or

Option 3 (only if you have successfully completed Computer Science 114 and 144)

Organisational Informatics	214(16)
Socio-Informatics	214(16), 244(16)

3RD YEAR (MINIMUM 133, MAXIMUM 141 CREDITS)

Compulsory Modules

(credits = 69)

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

plus

Elective Modules

(credits = minimum 64, maximum 72)

Choose one of the following options.

Option 1

Computer Science	313(16), 314(16), 343(16), 344(16)
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or

Option 2

Organisational Informatics	318(24), 348(24)
Socio-Informatics	348(24)

7.3 Programme in the Mathematical Sciences

This programme consists of three focal areas, namely Applied Mathematics, Mathematics, and Operations Research.

7.3.1 Focal area: Applied Mathematics

Specific Minimum 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 focal area leads to an honours programme in Applied Mathematics.
- If applicable elective modules are taken, this focal area also leads to honours programmes in Computer Science, Economics, Mathematics (focus in Mathematics, or focus in Biomathematics),

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 Yearbook part.

1ST YEAR (MINIMUM 132, MAXIMUM 140 CREDITS)

Compulsory Modules

(credits = 76)

Applied Mathematics	144(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 56 to 64)

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

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

plus

Choose additional modules to a minimum value of 24 credits from the list below to reach the required credit total.

Biology	124(16), 144(16) or 154(16)
Chemistry	124(16), 144(16)
Computer Science	114(16), 144(16)
Economics	114(12), 144(12)
General Linguistics	178(24)
Geo-environmental Science	124(16), 154(16)
Mathematics	154(16)
Music Technology	112(6), 142(6)
Physics	114(16), 144(16)

2ND YEAR (MINIMUM 125, MAXIMUM 133 CREDITS)

Compulsory Modules

(credits = 69)

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

plus

Elective Modules

(credits = 56 to 64)

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

Computer Science	214(16), 244(16)
Mathematical Statistics	214(16), 245(8), 246(8)
Operations Research	214(16), 244(16)
Physics	224(16), 254(16)

plus

Choose additional modules to a maximum value of 32 credits from the list below to reach the required credit total.

Chemistry	234(16), 254(16)
Economics	217(16), 248(16)
Geographical Information Technology	211(16), 241(16), 242(16)
Mathematics	279(16)
Music Technology	222(8), 252(8)

3RD YEAR (133 CREDITS)

Compulsory Modules

(credits = 69)

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

plus

Elective Modules

(credits = 64)

Choose any of the modules below that follow your second-year modules.

Biomathematics	374(16)
Chemistry	324(16), 364(16)
Computer Science	313(16), 314(16), 315(16), 343(16), 344(16)
Economics	318(24), 348(24)
Financial Mathematics	378(32)
Geography and Environmental Studies	358(16)
Mathematics	314(16), 324(16), 344(16), 345(16), 365(16), 378(32)*
Music Technology	379(48)
Operations Research	314(16), 322(16), 344(16), 352(16)
Physics	314(16), 342(8), 344(16), 352(8), 384(16)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

7.3.2 Focal area: Mathematics

Specific Minimum 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 focal area leads to an honours programme in Mathematics.
- If applicable elective modules are taken, this focal area also leads to honours programmes in Applied Mathematics, Mathematics (focus in Biomathematics), Computer Science, and Mathematical Statistics.

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

1ST YEAR (MINIMUM 132, MAXIMUM 140 CREDITS)**Compulsory Modules**

(credits = 44)

Mathematics	114(16), 144(16)
Science in Context	179(12)

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.

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

2ND YEAR (133 CREDITS)**Compulsory Modules**

(credits = 37)

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

plus

Elective Modules

(credits = 96)

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

Applied Mathematics	214(16), 244(16)
Computer Science	214(16), 244(16)
Mathematical Statistics	214(16), 245(8), 246(8)
Operations Research	214(16), 244(16)
Physics	224(16), 254(16)

You can choose additional modules to a maximum value of 32 credits from the list below to reach the required credit total.

Chemistry	234(16), 254(16)
Economics	217(16), 248(16)
General Linguistics	278(32)
Mathematics	279(16)

3RD YEAR (133 CREDITS)**Compulsory Modules**

(credits = 69)

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

plus

Elective Modules

(credits = 64)

Choose any of the modules to the value of 64 credits from the list below that follow your second-year modules.

Applied Mathematics	314(16), 324(16), 354(16), 364(16)
Biomathematics	374(16)
Chemistry	324(16), 364(16)
Computer Science	313(16), 314(16), 315(16), 343(16), 344(16), 345(16)
Economics	348(24)
Financial Mathematics	378(32)
General Linguistics	318(24), 348(24)
Mathematical Statistics	312(16), 316(16), 344(16), 364(16)
Mathematics	345(16), 378(32)*
Operations Research	322(16), 352(16)
Physics	314(16), 334(16), 342(8), 352(8)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027

7.3.3 Focal area: Operations Research**Specific Minimum 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 focal area leads to an honours programme in Operations Research.
- If applicable elective modules are taken, this focal area also leads to honours programmes in Applied Mathematics, Mathematics (focus in Biomathematics), Computer Science, 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 Yearbook part.

1ST YEAR (MINIMUM 132, MAXIMUM 140 CREDITS)**Compulsory Modules**

(credits = 76)

Applied Mathematics	144(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 56 to 64)

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

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

plus

You can choose more modules to a minimum value of 24 credits and a maximum of 32 credits from the list below to reach your required credit total.

Biology	124(16), 144(16) OR 154(16)
Chemistry	124(16), 144(16)
Computer Science	114(16), 144(16)
Geo-environmental Science	124(16), 154(16)
Mathematics	154(16)
Physics	114(16), 144(16)

2ND YEAR (133 CREDITS)

Compulsory Modules

(credits = 37)

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

plus

Elective Modules

(credits = 96)

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

Applied Mathematics	214(16), 244(16)
Computer Science	214(16), 244(16)
Mathematical Statistics	214(16), 245(8), 246(8) (only an option if you enrolled for this focal area before 2023)
Mathematics	214(16), 244(16)
Physics	224(16), 254(16)

You can choose additional modules to a maximum value of 32 credits from the list below to reach your required credit total. Please note that most of the modules on the list below have prerequisite modules that are elective modules in your first year.

Economics	217(16), 248(16)
Geographical Information Technology	211(16), 214(16), 241(16), 242(16)
Mathematics	279(16)

3RD YEAR (133 CREDITS)

Compulsory Modules

(credits = 69)

Operations Research	314(16), 322(16), 344(16), 352(16)
Scientific Computing	372(5)

plus

Elective Modules

(credits = 64)

Choose any of the modules from the list below.

Applied Mathematics	314(16), 324(16), 354(16), 364(16)
Biomathematics	374(16)
Computer Science	313(16), 314(16), 343(16), 344(16)
Economics	348(24) (only an option if you enrolled before 2023)
Financial Mathematics	378(32)
Mathematical Statistics	312(16), 316(16), 344(16), 364(16) (only an option if you enrolled before 2023)
Mathematics	378(32)*
Physics	314(16), 334(16), 342(8), 344(16), 352(8), 384(16)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

7.4 BSc Computer Science

This programme consists of three focal areas, namely General Computer Science, Computer Systems, and Data Science.

7.4.1 Focal area: 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

- If you take applicable elective modules, this focal area leads to honours programmes in Applied Mathematics, Computer Science, Economics, General Linguistics, Genetics, GeoInformatics, Mathematical Statistics, Mathematics, Operations Research or Statistics.

Take note: Should you follow up the BSc Computer Science (focal area: General Computer Science) with an honours in GeoInformatics, you can only register as a professional with the South African Geomatics Council when you have also completed Physics 114(16) and 144(16). However, you can register as a professional with SACNASP as a Natural Scientist in Geospatial Science without these Physics modules.

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 Yearbook part.

1ST YEAR (MINIMUM 124, MAXIMUM 140 CREDITS)

Compulsory Modules

(credits = 92)

Computer Science	114(16), 144(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

plus

Elective Modules

(credits = minimum 32, maximum 48)

Choose at least one of the following modules.

Applied Mathematics	144(16)
Mathematics	154(16)

plus

Choose any modules from the list below to reach your required credit total.

Applied Mathematics	144(16)
Biology	124(16), 144(16) or 154(16)
Chemistry	124(16), 144(16)
Economics	114(12), 144(12)
General Linguistics	178(24)
Geo-Environmental Science	124(16), 154(16)
Geographical Information Technology	141(16)
Mathematics	154(16)
Music Technology	112(6), 142(6)
Physics	114(16), 144(16)

2ND YEAR (128 CREDITS)

Compulsory Modules

(credits = 32)

Computer Science	214(16), 244(16)
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plus

Elective Modules

(credits = 96)

Choose any modules from the list below to reach your required credit total.

Applied Mathematics	214(16), 244(16)
Chemistry	214(16), 234(16), 254(16), 264(16)
Economics	217(16), 248(16)
General Linguistics	278(32)
Genetics Biometry	214(16), 244(16) AND 212(8), 242(8)
Geographical Information Technology	211(16), 214(16), 241(16), 242(16)
Mathematical Statistics	214(16), 245(8), 246(8)
Mathematics	214(16), 244(16), 279(16)
Music Technology	222(8), 252(8)
Operations Research	214(16), 244(16)
Physics	224(16), 254(16)

3RD YEAR (128 CREDITS)**Compulsory Module**

(credits = 64)

Computer Science	313(16), 314(16), 343(16), 344(16)
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plus

Elective Modules

(credits = 64)

Choose any modules from the list below to reach your required credit total.

Applied Mathematics	314(16), 324(16), 354(16), 364(16)
Biomathematics	374(16)
Chemistry	344(16)
Computer Science	315(16), 345(16)
Economics	318(24), 348(24)
General Linguistics	318(24), 348(24)
Genetics	314(16), 324(16), 344(16), 354(16)
Geographical Information Technology	311(16), 312(16), 341(16), 342(16)
Mathematical Statistics	312(16), 316(16), 344(16), 364(16) These modules may not be taken with Statistics 318 or 348.
Mathematics	314(16), 324(16), 344(16), 345(16), 365(16), 378(32)*
Music Technology	379(48)
Operations Research	314(16), 322(16), 344(16), 352(16)
Physics	314(16), 334(16), 344(16), 384(16)
Statistics	318(24), 348(24)

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027.

7.4.2 Focal area: Computer Systems

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

Specific Minimum 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)

Continued Study Possibilities

- This focal area 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 Yearbook part.

1ST YEAR (139 CREDITS)**Compulsory Modules**

Applied Mathematics	144(16)
Computer Science	114(16), 144(16)
Electrotechnique	143(15)
Mathematics	114(16), 144(16)
Physics	114(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

2ND YEAR (130 CREDITS)**Compulsory Modules**

Applied Mathematics B	224(15)
Computer Science	214(16), 244(16)
Computer Systems	214(15), 245(15)
Engineering Mathematics	214(15), 242(8)
Systems and Signals	214(15), 244(15)

3RD YEAR (127 CREDITS)**Compulsory Modules**

Applied Mathematics	324(16), 364(16)
Computer Science	313(16), 314(16), 343(16), 344(16), 345(16)
Design E	314(15)

7.4.3 Focal area: Data Science

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

Specific Minimum 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)

Continued Study Possibilities

- **All Options: Option 1, 2 and 3 modules** lead to an honours programme in Computer Science.
- **Option 2 modules** also lead to an honours programme in Statistics.
- **Option 3 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's Yearbook part.

1ST YEAR (MINIMUM 124, MAXIMUM 140 CREDITS)**Compulsory Modules**

(credits = 108)

Computer Science	114(16), 144(16)
Data Science	141(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Science in Context	179(12)

plus

Elective Modules

(credits = minimum 16, maximum 32)

Choose any modules from the list below to reach your required credit total.

Applied Mathematics	144(16)
Economics	114(12), 144(12)
Mathematics	154(16)
Physics	114(16), 144(16)

2ND YEAR (MINIMUM 124, MAXIMUM 128 CREDITS)**Compulsory Modules**

(credits = 112)

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

plus

Elective Modules

(credits = minimum 12, maximum 16)

Choose one of the modules below.

Data Engineering	245(12)
Data Science	241(16)

3RD YEAR (MINIMUM 127, MAXIMUM 128 CREDITS)**Compulsory Modules**

(credits = 64)

Computer Science	314(16), 315(16), 343(16), 344(16)
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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

Computer Science	345(16)
Data Science	316(16), 346(16)

Mathematical Statistics	312(16)
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or

Option 2

Data Engineering	314(15)
Statistics	318(24), 348(24)

or

Option 3

Mathematical Statistics	312(16), 316(16), 344(16), 364(16)
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7.5 Interdisciplinary BSc programme**7.5.1 Focal area: Biomedical Mathematical Sciences****Specific Minimum Admission Requirements**

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

Continued Study Possibilities

- This focal area leads to an honours programme in Mathematics or Physiological Sciences.
- This focal area can 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's Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

Applied Mathematics	144(16)
Biology	124(16)
Chemistry	124(16), 144(16)
Mathematics	114(16), 144(16)
Science in Context	179(12)

plus

Elective Modules

(credits = 32)

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

Biology	154(16)
Computer Science	114(16), 144(16)
Physics	114(16), 144(16)
Probability Theory and Statistics	114(16)

2ND YEAR (MINIMUM 128, MAXIMUM 144 CREDITS)**Compulsory Modules**

(credits = 112)

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Physiology	214(16), 244(16)

Mathematics	214(16), 244(16)
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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.

Applied Mathematics	214(16), 244(16)
Computer Science	214(16), 244(16)
Mathematics	279(16)

3RD YEAR (128 CREDITS)

Compulsory Modules

(credits = 80)

Biomathematics	374(16)
Physiology	314(16), 334(16), 344(16), 364(16)

plus

Elective Modules

(credits = 48)

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

Applied Mathematics	324(16), 354(16)
Mathematics	314(16), 324(16), 344(16), 365(16), 378(32)*

*Mathematics 378(32) will be replaced with Mathematics 318(16) in 2027

7.5.2 Focal area: Biomathematics

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area leads to an honours programme in Mathematics (with a focus in Biomathematics), Biochemistry, or Botany and Zoology.

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's Yearbook part.

1ST YEAR (MINIMUM 124, MAXIMUM 140 CREDITS)

Compulsory Modules

(credits = 108)

Applied Mathematics	144(16)
Biology	124(16)
Chemistry	124(16), 144(16)
Mathematics	114(16), 144(16)
Science in Context	179(12)

plus

Elective Modules

(credits = minimum 16, maximum 32)

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

Biology	144(16), 154(16)
Computer Science	114(16), 144(16)
Physics	114(16), 144(16)
Probability Theory and Statistics	114(16)

2ND YEAR (128 CREDITS)

Compulsory Modules

(credits = 32)

Mathematics	214(16), 244(16)
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plus

Elective Modules

(credits = minimum 96)

Choose modules to a minimum value of 96 credits from the subjects below. You must take all the modules of your chosen subjects.

Biochemistry	214(16), 244(16)
Biodiversity and Ecology	212(16), 214(16), 244(16)
Computer Science	214(16), 244(16)
Genetics	214(16), 244(16)
Mathematics	279(16)

3RD YEAR (128 CREDITS)

Compulsory Modules

(credits = 48)

Applied Mathematics	314(16), 324(16)
Biomathematics	374(16)

plus

Elective Modules

(credits = 80)

Choose one of the options below.

Option 1

Applied Mathematics	354(16)
Biochemistry	315(16), 323(8), 345(16), 365(16)
Bioinformatics	312(8)

or

Option 2

Applied Mathematics	364(16)
Biodiversity and Ecology	315(16), 334(16), 344(16), 354(16)

7.5.3 Focal area: Applied Medicinal Chemistry

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area 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 Yearbook part.

1ST YEAR (140 CREDITS)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Mathematics	114(16), 144(16)
Physics	114(16), 144(16)
Science in Context	179(12)

2ND YEAR (144 CREDITS)

Compulsory Modules

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Chemistry	214(16), 234(16), 254(16), 264(16)
Physiology	214(16), 244(16)

3RD YEAR (MINIMUM 128 CREDITS, MAXIMUM 136 CREDITS)

Compulsory Modules

(credits = 128)

Applied Chemistry	354(16)
Biodiversity and Ecology	324(16)
Chemistry	314(16), 324(16), 344(16), 364(16)
Physiology	314(16), 364(16)

plus

It is advised that you also take an elective module.

Elective Module

Choose one of the modules below.

(credits = 8)

Introduction to Intellectual Property Law	314(8) or 344(8)
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7.5.4 Focal area: Bioinformatics and Computational Biology

Specific Minimum Admission Requirements

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

Continued Study Possibilities

- This focal area leads to an honours programme in Bioinformatics and Computational Biology.

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 Yearbook part.

1ST YEAR (140 CREDITS)**Compulsory Modules**

Biology	124(16)
Chemistry	124(16), 144(16)
Computer Science	114(16), 144(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	144(16)
Science in Context	179(12)

2ND YEAR (128 CREDITS)**Compulsory Modules**

Biochemistry	214(16), 244(16)
Biometry	212(8), 242(8)
Computer Science	214(16), 244(16)
Genetics	214(16), 244(16)
Mathematics	214(16)

3RD YEAR (128 CREDITS)**Compulsory Modules**

Biochemistry	315(16), 345(16)
Bioinformatics	312(8), 322(8)
Computer Science	314(16), 343(16), 344(16)
Genetics	314(16), 344(16)

7.6 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 Minimum Admission Requirements

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

Duration of Programme

Four years

Changing focal areas within BDatSci

You can change focal areas at the end of the 1st and 2nd years of the BDatSci programme, provided that you have met the prerequisite pass, prerequisite and corequisite requirements for the compulsory modules in the subsequent years of study in the new focal area.

The 3rd and 4th years of the programme include a research component, and foundational concepts and knowledge are acquired during those years. Therefore, if you change focal areas during your 3rd or 4th year, your programme will be extended by further years of study because you will need to complete additional modules.

Programme Structure

The data science programme, BDatSci, comprises several focal areas, each of which spans four years. For each year, there is a set of compulsory modules shared by all focal areas. There will also be further compulsory and/or elective modules in each year, which are specific to the individual focal area. You will register for BDatSci in the faculty that offers your chosen focal area. After completing your BDatSci degree, you will be able to apply for a master's programme, since BDatSci is a four-year qualification at honours level (NQF level 8).

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 Yearbook 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 general enquiries about the programme:

Prof Paul Mostert

Department of Statistics and Actuarial Science

Tel: 021 808 3536

Email: 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

Email: wbrink@sun.ac.za

Computer Science focal area

Prof Steve Kroon

Computer Science Division

Tel: 021 808 9375

Email: kroon@sun.ac.za

Statistical Physics focal area

Dr Gurthwin Bosman

Department of Physics

Tel: 021 808 2525

Email: gwb@sun.ac.za

Focal areas within the BDatSci programme

7.6.1 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

Actuarial Science	112(8)
Computer Science	114(16), 144(16)
Data Science	141(16)
Mathematics	114(16), 144(16), 154(16)
Probability Theory and Statistics	114(16)

2ND YEAR (128 CREDITS)

Compulsory Modules

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

3RD YEAR (128 CREDITS)

Compulsory Modules

Computer Science	314(16), 315(16), 343(16), 344(16), 345(16)
Data Science	316(16), 346(16)
Mathematical Statistics	312(16)

4TH YEAR (132 CREDITS)

Compulsory Modules

(credits = 100)

Computer Science	411(16), 412(16), 441(16)
Data Science Research in Computer Science	471(40)
Introduction to Statistical Learning	441(12)

plus

Elective Modules

(credits = 32)

Choose modules to the value of 32 credits from the list below. Not all modules will be offered every year. Contact the Focal area coordinator from 15 November of the previous year for the availability of modules.

Applied Mathematics	492(16)
Computer Science	471(16), 472(16), 491(16), 495(16)

7.6.2 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

(credits = 112)

Applied Mathematics	144(16)
Computer Science	114(16), 144(16)
Data Science	141(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)

plus

Elective Module

(credits = minimum 8, maximum 16)

Actuarial Science	112(8)
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or

Physics	114(16)
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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), 343(16)
Data Science	316(16), 346(16)
Mathematical Statistics	312(16)

4TH YEAR (132 CREDITS)

Compulsory Modules

Applied Mathematics	476(16), 482(16), 492(16), 493(16)
Computer Science	441(16)
Data Science Research in Applied Mathematics	472(40)
Introduction to Statistical Learning	441(12)

7.6.3 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

Computer Science	114(16), 144(16)
Data Science	141(16)
Mathematics	114(16), 144(16)
Probability Theory and Statistics	114(16)
Physics	114(16), 144(16)

2ND YEAR (128 CREDITS)

Compulsory Modules

Computer Science	214(16), 244(16)
Data Science	241(16)
Mathematics	214(16)
Mathematical Statistics	214(16), 245(8), 246(8)
Physics	224(16), 254(16)

3RD YEAR (128 CREDITS)

Compulsory Modules

Computer Science	315(16), 343(16)
Data Science	316(16), 346(16)
Mathematical Statistics	312(16)
Physics	314(16), 334(16), 344(16)

4TH YEAR (132 CREDITS)

Compulsory Modules

(credits = 124)

Applied Mathematics	483(16)
Data Science Research in Statistical Physics	473(40)
Introduction to Statistical Learning	441(12)
Physics	412(16), 421(16)
Stochastic Simulation	441(12)
Time Series Analysis	441(12)

plus

Elective Module

(credits = 8)

Choose one of the modules below.

Physics	457(8), 458(8)
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Postgraduate programmes

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

1. Summary of postgraduate programmes

The undergraduate programmes offered in the Faculty of Science lead to postgraduate programmes in the Faculty of Science, or postgraduate programmes offered by other faculties.

For more information regarding postgraduate programmes offered by other faculties, please consult the relevant Faculty Yearbook part.

Postgraduate Programmes	Faculty of Science
BScHons (Biological Sciences)	Biochemistry; Biodiversity and Ecology; Microbiology; Physiological Sciences
BScHons (Physical Sciences)	Chemistry; Earth Sciences; Physics; Polymer Science; Theoretical Physics
BScHons (Mathematical Sciences)	Applied Mathematics; Computer Science; Mathematics
BScHons (Interdisciplinary)	Bioinformatics and Computational Biology
MSc (Biological Sciences)	Biochemistry; Botany; Exercise Science; Microbiology; Physiological Sciences; Zoology
MSc (Physical Sciences)	Chemistry; Earth Sciences; Polymer Science; Physics
MSc (Mathematical Sciences)	Applied Mathematics; Computer Science; Mathematics;
Structured MSc	Machine Learning and Artificial Intelligence
MSc (Interdisciplinary)	Bioinformatics and Computational Biology;
Structured MSc	Bioinformatics of Infectious Diseases and Pathogen Genomics
PhD	Applied Mathematics; Biochemistry; Bioinformatics and Computational Biology; Botany; Chemistry; Computer Science; Earth Sciences; Mathematics; Microbiology; Physics; Physiological Sciences; Polymer Science; Zoology
DSc	Applied Mathematics; Biochemistry; Botany; Chemistry; Computer Science; Geology; Mathematics; Microbiology; Physics; Physiological Sciences; Polymer Science; Zoology

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 at 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.

Take note: For the regulations regarding attendance, examiners, thesis requirements, submission and binding of theses, etcetera, consult the Section "Postgraduate Qualifications" in Part 1 (General Rules) of the University's Yearbook.

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.

Take note: For the regulations regarding attendance, examiners, dissertation requirements, submission and binding of dissertations, etcetera, consult the Section "Postgraduate Qualifications" in Part 1 (General Rules) of the University's Yearbook.

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, 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, 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

Programme	The year of enrolment					
	1	2	3	4	5	6
MSc full-time	M	N	F	X	-	-
PhD full-time	M	M	N	F	X	-

The Faculty does not offer part-time postgraduate studies, but in exceptional cases, a student can motivate for extension of studies based on personal circumstances. In these approved cases, the student will only be allowed to extend the studies to N+2 years (X). See table above.

Legend

M	Minimum enrolment period
N	Normal maximum enrolment period
F	Final concessional year (May register without having to apply for readmission)
X	Enrolment only if readmission has been approved by the Faculty Board or, for PhD, the Senate (Allowed in exceptional circumstances)
-	Further registration not allowed

Take 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 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 administrator 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 head 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. The supervisor

must provide a motivation for the request and propose an upgrade panel. The request is then sent to the departmental head for approval;

5.5.1 if the request is supported by the departmental head, it is sent to the Vice-dean: Research for approval of the request and the upgrade panel.

5.5.2 The department can then proceed with the upgrade process which consist of the following steps:

- (i) You must compile a report of the progress you have made with the master's study (progress reports may be used),
- (ii) You must submit a written PhD research proposal that justifies the expansion of the philosophical or conceptual component of the study,
- (iii) You will be required to defend the research proposal in an oral presentation,
- (iv) The panel will draft a final report with a clear recommendation for upgrade or not.

The final form with the panel report and necessary documentation is submitted to the Faculty Committee for consideration, and the report of the upgrade panel and recommendation is then presented to 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

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 <https://student.sun.ac.za> 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)

Subject Number	Module Code	Credits	Module Name	Semester
14234	713	5	Current Topics in Bioinformatics	1
14235	714	40	Advanced Bioinformatics	1
14236	715	5	Bioinformatics Seminar	1
14237	716	5	Algorithms in Bioinformatics	1
14238	717	5	Machine Learning in Bioinformatics	1
14240	721	50	Project in Bioinformatics	2

plus

Elective Module

Choose one of the following modules.

Subject Number	Module Code	Credits	Module Name	Semester
14241	711	10	Scientific Computing in Bioinformatics	1
14242	712	10	Cell Biology in Bioinformatics	1

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

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

Subject Number	Module Code	Credits	Module Name	Semester
14165	828	180	Thesis Bioinformatics and Computational Biology	Both

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

Email: hpatterton@sun.ac.za

6.1.3 Structured MSc in Bioinformatics of Infectious Diseases and Pathogen Genomics

Programme description

This structured postgraduate programme is offered as a multidisciplinary programme in the Faculties of Science, Medicine and Health Sciences, and AgriSciences. It is aimed at students with a biology background. It will equip you with a suite of sophisticated Bioinformatics techniques, concepts and tools that are used in the infectious diseases and pathogen genomics research fields. You enrol in the faculty where your research focus is situated and graduate with a degree from that faculty.

Specific Admission Requirements

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

- A BScHons degree (NQF level 8) in Bioinformatics, Data Science, Statistics, Mathematics, Computer Science, Biochemistry, Genetics, Molecular Biology, or a related field; or
- A professional 480 credit bachelor's degree (NQF level 8) In Bioinformatics, Data Science, Statistics, Mathematics, Computer Science, Biochemistry, Genetics, Molecular Biology, or a related field; or
 - Any other academic degree qualification and appropriate experience (assessed using the regular Recognition of Prior Learning (RPL) procedures) approved by the Faculty Board of the AgriSciences, Medicine and Health Sciences, or Science Faculty.

A minimum of 65% in the preceding qualifications is required to be considered for this MSc degree programme. Candidates are selected on academic merit and only a limited number of candidates will be admitted to the programme. Applications are considered by the Centre for Bioinformatics and Computational Biology.

Closing Date for Applications

Apply online at <https://student.sun.ac.za> by 31 August of the previous year for international students, and 30 September for South African students. 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

Approximately the first 9 months of the degree programme is dedicated to lectures and training and the remaining 15 months to a research project agreed to by an assigned supervisor.

Duration of Programme

The programme extends over two years on a full-time basis.

Programme Content

The programme is composed of a taught (90 credit) and a research (90 credit) component. The following modules are offered:

Compulsory Modules

(credits = 155)

Subject Number	Module Code	Credits	Module Name	Semester
12555	811	35	Bioinformatics	1
71024	812	10	Algorithms and Machine Learning in Bioinformatics	1
71025	813	10	Python for Bioinformatics	1
71026	814	10	R language for Bioinformatics	1
71042	871	90	Bioinformatics Research project in Natural Sciences	1,2,3,4

plus

Elective Modules

Choose one of the modules below.

Please note: An elective module will only be offered if a minimum of five students has enrolled for the module.

Subject Number	Module Code	Credits	Module Name	Semester
71030	845	25	Infectious Diseases	2
71031	846	25	Pathogen Genomics	2

Assessment and Examination

- All the modules (except for the research project) will be assessed by means of flexible assessment, which may include a combination of assignments and summative assessments.
- All summative assessments will be moderated internally and externally. The taught part of the degree programme contributes 50% to the final mark. The contribution of the individual modules is weighted by credit value. You must pass each module with at least 50% to obtain the degree.
- You must complete a 90-credit research project and submit a thesis for examination. The thesis will be examined by one internal and one external examiner, according to University guidelines. The average mark of the two examiners contributes 50% to the final mark. You must pass the research project with at least 50% to obtain the degree.
- Note that taught modules may be repeated, but that the research project module cannot be repeated if it is not passed.
- The final mark for the degree is calculated from the average of the taught modules (50%) and the research project (50%).
- After the thesis has been examined, you must present a seminar detailing your research results to the satisfaction of the examination committee.

Enquiries

Programme leader: Prof Hugh Patterton

Centre for Bioinformatics and Computational Biology

Tel: 021 808 2774

Email: hpatterton@sun.ac.za

6.1.4 PhD in Bioinformatics and Computational Biology

Module 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

Specific Admission Requirements

- A BSc degree with a major in Biochemistry.
- 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 <https://student.sun.ac.za> 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.

Compulsory Modules

Subject Number	Module Code	Credits	Module Name	Semester
54895	741	60	Research project (Biochemistry)	2
18325	742	10	Seminar	2

plus

The Department selects five modules annually to the value of 50 credits from the list below. The selection is also compulsory

Subject Number	Module Code	Credits	Module Name	Semester
11412	711	10	Practical Protein Biochemistry	1
11413	712	10	Steroid Hormones	1
14046	713	10	Soft Skills	1
11415	714	10	Systems Biology	1
14069	715	10	Advanced Gene Expression	1
14047	716	10	Biophysical and Bio-analytical Techniques	1
11418	717	10	Specialised Topics	1
11420	718	10	Chemical Biology Topics	1

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

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

Subject Number	Module Code	Credits	Module Name	Semester
66206	828	180	Thesis Biochemistry	Both

Assessment and Examination

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

6.2.3 PhD in Biochemistry

Module 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

Module 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

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 <https://student.sun.ac.za> 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

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

Assessment and Examination

- Assessment includes two oral examinations, written examinations, assignments, book reviews, seminars, a research project, and 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 of 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

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.

Programme Content

This programme consists of a 100% thesis.

Compulsory Module

Subject Number	Module Code	Credits	Module Name	Semester
66303	828	180	Thesis Botany	Both

Assessment and Examination

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

6.3.2.2 PhD in Botany

Module 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

Module 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

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 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

Subject Number	Module Code	Credits	Module Name	Semester
66338	828	180	Thesis Zoology	Both

Assessment and Examination

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

6.3.3.2 PhD in Zoology

Module 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

Module 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

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 <https://student.sun.ac.za> 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.

Compulsory Modules

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

Assessment and Examination

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

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

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

Subject Number	Module Code	Credits	Module Name	Semester
66214	828	180	Thesis Chemistry	Both

Assessment and Examination

After completion of the research, you must submit a thesis for examination to the satisfaction of the

examiners and do an oral presentation.

6.4.1.3 PhD in Chemistry

Module 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

Module 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

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 <https://student.sun.ac.za> 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.

Compulsory Modules

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

Assessment and Examination

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

mark of 50% and pass each module with 50%.

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 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

Subject Number	Module Code	Credits	Module Name	Semester
66230	828	180	Thesis Polymer Science	Both

Assessment and Examination

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

6.4.2.3 PhD in Polymer Science

Module 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

Module 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

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:
 - Focal area Applied Earth Science: Geology 314, 324, 344 and 354, and Earth Science Field Skills 374.
 - Focal area 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.
- **Take 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 <https://student.sun.ac.za> 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 focal areas. The focal areas 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 focal area depending on staff availability and student numbers. The specific content of focal areas 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)

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

Choose one of the following focal areas

Focal area A – Applied Geology (credits = 40)

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

Focal area B – Environmental Geochemistry (credits = 40)

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

Assessment and Examination

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

6.5.2 MSc in Earth Sciences

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

Subject Number	Module Code	Credits	Module Name	Semester
14314	828	180	Thesis Earth Sciences	Both

Assessment and Examination

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

6.5.3 PhD in Earth Sciences

Module 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

Module 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 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. Please contact the Mathematics Division in this regard.
- 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 <https://student.sun.ac.za> 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 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

You can, with the permission of the Mathematics Division, take elective modules to the value of 16 credits per semester, 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.

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 tables contains the modules for the focus in **Mathematics**.

First Semester (64 credits)

Compulsory Modules

(credits = 48)

Subject Number	Module Code	Credits	Module Name	Semester
10378	711	16	Algebra (Prerequisite pass module: Mathematics 314 or an equivalent third-year algebra module)	1
11202	712	16	Functional Analysis and Measure Theory (Prerequisite pass module: Mathematics 365 or an equivalent third-year real analysis module)	1
62871	714	16	Topology (Prerequisite pass module: Mathematics 365 or an equivalent third-year real analysis module or Mathematics 378)	1

plus

Elective Modules

(credits = 16)

Choose two of the modules below.

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

Subject Number	Module Code	Credits	Module Name
11493	747	8	Algebraic Number Theory
11494	748	8	Computational Algebra
20405	749	8	Wavelet analysis
66389	751	8	Functional Analysis II
66397	752	8	Measure Theory II
64400	753	8	Category Theory
66419	754	8	Logic
66427	755	8	Concrete Mathematics
66435	756	8	Topics in Algebra
12250	757	8	Complex Analysis II
62928	741	8	Capita selecta I
62979	742	8	Capita selecta II
62936	743	8	Capita selecta III
11204	744	8	Capita selecta IV
63002	745	8	Capita selecta V
11203	760	8	Advanced Analysis
12550	761	8	Advanced Abstract Algebra

Subject Number	Module Code	Credits	Module Name
12551	762	8	Number theory
14048	767	8	Advanced Combinatorics
14049	768	8	Algebraic Curves
14050	769	8	Algebraic Geometry
14051	771	8	Asymptotic Methods
14053	772	8	Categorical Algebra
14054	773	8	Differential Geometry
14055	774	8	Functional Analysis III
14056	775	8	Hilbert Spaces and C*-algebras
14057	776	8	Knot Theory
14058	780	8	Lie Groups and Lie Algebras
14059	784	8	Model Theory
14061	785	8	Operator Theory
14062	781	8	Universal Algebra
14063	782	8	Representation Theory
14064	783	8	Analytic Number Theory

Second Semester (64 credits)

Compulsory Modules

(credits = 48)

Subject Number	Module Code	Credits	Module Name
62944	746	32	Mathematics: Honours project
62987	713	16	Complex Analysis

plus

Elective Modules

(credits = 16)

Choose two of the modules below.

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

Subject Number	Module Code	Credits	Module Name
11493	747	8	Algebraic Number Theory
11494	748	8	Computational Algebra
20405	749	8	Wavelet analysis
66389	751	8	Functional Analysis II
66397	752	8	Measure Theory II
64400	753	8	Category Theory
66419	754	8	Logic
66427	755	8	Concrete Mathematics
66435	756	8	Topics in Algebra
12250	757	8	Complex Analysis II
62928	741	8	Capita selecta I
62979	742	8	Capita selecta II
62936	743	8	Capita selecta III
11204	744	8	Capita selecta IV

Subject Number	Module Code	Credits	Module Name
63002	745	8	Capita selecta V
11203	760	8	Advanced Analysis
12550	761	8	Advanced Abstract Algebra
12551	762	8	Number theory
14048	767	8	Advanced Combinatorics
14049	768	8	Algebraic Curves
14050	769	8	Algebraic Geometry
14051	771	8	Asymptotic Methods
14053	772	8	Categorical Algebra
14054	773	8	Differential Geometry
14055	774	8	Functional Analysis III
14056	775	8	Hilbert Spaces and C*-algebras
14057	776	8	Knot Theory
14058	780	8	Lie Groups and Lie Algebras
14059	784	8	Model Theory
14061	785	8	Operator Theory
14062	781	8	Universal Algebra
14063	782	8	Representation Theory
14064	783	8	Analytic Number Theory

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

First Semester (64 credits)

Specific modules are offered in collaboration with the African Institute for Mathematical Sciences (AIMS) at its campus in Muizenberg.

Compulsory Modules

(credits = 64)

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

Second Semester (64 credits)

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.

Compulsory Modules

(credits = 56)

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

plus

Elective Modules

(credits = 8)

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

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

Subject Number	Module Code	Credits	Module Name	Semester
11201	828	180	Thesis Mathematics	Both

Assessment and Examination

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

Enquiries

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

6.6.1.3 PhD in Mathematics

Module 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

Module 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

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 <https://student.sun.ac.za> 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:

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

Subject Number	Module Code	Credits	Module Name	Semester
14233	783	16	Applied Markov Processes	1 or 2

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

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

Subject Number	Module Code	Credits	Module Name	Semester
66354	828	180	Thesis Applied Mathematics	Both

Assessment and Examination

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

6.6.2.3 MSc in Machine Learning and Artificial Intelligence

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.

Final approval for admission rests with the departmental academic committee in collaboration with the programme coordinator, who also take into account the infrastructure and capacity of the Department.

Closing Date for Applications

Apply online at <https://student.sun.ac.za> by 31 October of the previous year.

Duration of Programme

The programme extends 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 bears 60 credits, bringing the programme total to 180 credits. The modules in a particular block may not all run in parallel over the entire block; scheduling will depend on intermodular 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

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

plus

Elective Modules

Choose 6 modules to the value of 60 credits. Not all of these modules will necessarily be offered every year.

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

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, also examine the project. Either the examiner or the moderator must be external and appointed by the Science Faculty Board.
- To pass the programme, you must obtain at least 50% for the research project and at least 50% for each module.

6.6.2.4 PhD in Applied Mathematics

Module 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

Module 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 Description

The minimum credits required 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.
- At least 32 credits at second-year or third-year level in quantitative modules (such as Mathematics, Applied Mathematics, Physics, Mathematical Statistics or Operations Research).

Closing Date for Applications

Apply online at <https://student.sun.ac.za> 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

This programme consists of 6 modules of 16 credits each, as well as a compulsory programming project of 32 credits. At most 2 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.

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

(credits = 128)

Compulsory Modules

(credits = minimum 32, maximum 64)

Subject Number	Module Code	Credits	Module Name	Semester
63444	771	32	Honours Project in Computer Science	Both

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

Subject Number	Module Code	Credits	Module Name	Semester
64963	714	16	Concurrent Programming I	1

Unless you have completed Computer Science 313 or an equivalent, the following Computer Science module is also compulsory.

Subject Number	Module Code	Credits	Module Name	Semester
14530	711	16	Computer Networks I	1

plus

Elective Modules

(credits = minimum 64, maximum 96)

Choose modules to a minimum value of 64 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.

Subject Number	Module Code	Credits	Module Name	Semester
63452	711	16	Automata Theory and Applications	1 or 2
64947	712	16	Advanced Algorithms	1 or 2
64955	713	16	Theoretical Computer Science	1 or 2
63401	715	16	Databases	1 or 2
64971	716	16	Advanced Topics in Computer Science 1	1 or 2
11788	741	16	Machine Learning	1 or 2
14195	742	16	Machine Learning A	1 or 2
64998	742	16	Computer Graphics	1 or 2
65013	744	16	Concurrent Programming 2	1 or 2
65021	745	16	Software Construction	1 or 2
65048	746	16	Advanced Topics in Computer Science 2	1 or 2
14531	771	16	Principles of Data Science	1 or 2
14533	771	16	Computing and Society	1 or 2
14232	791	16	Artificial Intelligence	1 or 2
62847	792	16	Computer Vision	1 or 2
64572	793	16	Digital Image Processing	1 or 2
13945	794	16	Search and Planning	1 or 2
13944	795	16	Functional Programming	1 or 2
14065	796	16	Software Verification and Analysis	1 or 2
14066	791	16	Space Science Algorithms	1 or 2
14888	743	16	Machine Learning and Artificial Intelligence I	1 or 2

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

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

Subject Number	Module Code	Credits	Module Name	Semester
66362	828	180	Thesis Computer Science	Both

Assessment and Examination

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

6.6.3.3 MSc in Machine Learning and Artificial Intelligence

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.

Final approval for admission rests with the departmental academic committee in collaboration with the programme coordinator, who also take into account the infrastructure and capacity of the Department.

Closing Date for Applications

Apply online at <https://student.sun.ac.za> by 31 October of the previous year.

Duration of Programme

The programme extends 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 bears 60 credits, bringing the programme total to 180 credits. The modules in a particular block may not all run in parallel over the entire block; scheduling will depend on intermodular 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

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

plus

Elective Modules

Choose 6 modules to the value of 60 credits. Not all of these modules will necessarily be offered every year.

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

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, also examine the project. Either the examiner or the moderator must be external and appointed by the Science Faculty Board.
- To pass the programme, you must obtain at least 50% for the research project and at least 50% for each module.

6.6.3.4 PhD in Computer Science

Module 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.

6.6.3.5 DSc in Computer Science

Module 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 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 (28 weeks) (120 credits)

Skills submodules (10 weeks):

Seven submodules of 30 hours each. The skills submodules have a broad focus that ranges from mathematical thinking and numeric computer programming to scientific writing.

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 and its applications to Artificial Intelligence, Computer Science, Machine Learning, Physics, Statistics and other interdisciplinary topics, such as Biomathematics. 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.

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

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

Assessment and Examination

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

6.7 Department of Microbiology

6.7.1 BScHons in Microbiology

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 <https://student.sun.ac.za> 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

Subject Number	Module Code	Credits	Module Name	Semester
10439	772	60	Experimental Microbiology	Both
10721	773	30	Techniques in Molecular Microbiology	Both
10483	774	30	Selected Topics	Both

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

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

Subject Number	Module Code	Credits	Module Name	Semester
66281	828	180	Thesis Microbiology	Both

Assessment and Examination

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

6.7.3 PhD in Microbiology

Module 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

Module 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

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 <https://student.sun.ac.za> 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 focal area 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 focal areas are offered:

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

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 focal areas are set out below.

Focal area 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.

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

plus

Elective Modules

(credits = 24)

Take 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 finalised 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.

Subject Number	Module Code	Credits	Module Name	Semester
10752	713	8	Solid State Physics	1
13940	742	8	Special Topics in Applied Photonics	Both
13939	743	8	Special Topics in Biophotonics	Both

Subject Number	Module Code	Credits	Module Name	Semester
12546	744	8	Laser Spectroscopy	2
13936	746	8	Quantum Optics	2
10610	747	8	Molecular Physics	2
13937	773	8	Nonlinear Optics	2
13938	774	8	Special Topics in Optics	Both

Focal area Nuclear Physics (128 credits)

Compulsory Modules

(credits = 112)

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

plus

Elective Modules

(credits = 16)

Choose two of the following modules.

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

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

Focal area 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.

Subject Number	Module Code	Credits	Module Name	Semester
10445	711	8	Electromagnetism	1
10590	712	8	Lagrange and Hamilton Mechanics	1
10752	713	8	Solid State Physics	1

Subject Number	Module Code	Credits	Module Name	Semester
10586	714	16	Quantum Mechanics B (Advanced Formalism and Applications)	1
10390	716	8	Atomic Physics	1
10708	718	8	Radiation Interaction	2
63274	741	32	Physics Project	2
10563	748	8	Nuclear Reactions and Nuclear Structure	2
10467	750	8	Physics of Radiation Dosimetry/Radiology	2
10465	751	8	Physics of Nuclear Medicine	2
10466	752	8	Physics of Radiotherapy	2
10706	753	8	Radiation Protection	2

Focal area Theoretical Physics (128 credits)

Compulsory Modules

(credits = 96)

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

plus

Elective Modules

(credits = 32)

Take 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 finalised 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.

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

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

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

Subject Number	Module code	Credits	Module Name	Semester
66249	828	156	Thesis Physics	Both
12278	838	24	Advanced Physics Seminar and Coursework	Both

Assessment and Examination

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

6.8.1.3 PhD in Physics

Module 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

Module Code

12998 – 998 (360)

Programme Description

The DSc degree requires already published scientific work of a high standard that has made a significant and outstanding contribution to the enrichment of knowledge in Physics. See also Section 2.4 in this chapter for general information on the DSc degree at the Faculty of Science.

6.9 Department of Physiological Sciences

6.9.1 BScHons in Physiological Sciences

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 <https://student.sun.ac.za> 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)

Subject Number	Module Code	Credits	Module Name	Semester
13237	774	20	Metabolism in Health and Disease	1
13235	772	20	Physiology and Pathophysiology	Both
54895	776	30	Research Project in Physiological Sciences	Both
66192	781	20	Research Methodology in Physiological Sciences	Both

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.

Subject Number	Module Code	Credits	Module Name	Semester
13233	771	10	Regenerative Physiology in Injury and Disease	1
13236	773	10	Signal Transduction in Physiology and Pathophysiology	1
11260	775	10	Stress Physiology	1
14067	780	10	Haematology and Coagulation	1

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 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

Subject Number	Module Code	Credits	Module Name	Semester
59803	828	180	Thesis: Physiological Sciences	Both

Assessment and Examination

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

6.9.3 PhD in Physiological Sciences

Module 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

Module 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.

7. Postgraduate programmes in other faculties

7.1 Faculty of Arts and Social Sciences

The Faculty of Arts and Social Sciences is the only SU faculty offering postgraduate programmes following the BSc GeoInformatics, as well as postgraduate programmes in Geography and Environmental Studies.

7.1.1 Department of Geography and Environmental Studies

7.1.1.1 BScHons in GeoInformatics

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

Subject Number	Module Code	Credits	Module Name	Semester
63398	712	30	Advanced Remote Sensing	1
49611	713	30	Geographical Information Systems	1
12187	716	30	Spatial Modelling and Geographical Communication	1
63363	742	30	Environmental Geography Research Application	2

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

Email: jkemp@sun.ac.za

7.1.1.2 MSc in GeoInformatics

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

Subject Number	Module Code	Credits	Module Name	Semester
12280	875	180	Thesis GeoInformatics	Both

Assessment and Examination

You must submit a thesis. Although the programme is presented in English, discussions and reports can be presented in English or Afrikaans. The 100% thesis is examined according to the University's provisions in Part 1 (General Rules) of the University Yearbook.

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

Email: avn@sun.ac.za

7.1.1.3 PhD in GeoInformatics

Module 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.

7.1.1.4 MSc in Geography and Environmental Studies

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 may do the thesis research on a full-time or part-time basis. The research topic is developed and approved by the Department.

Compulsory Module

Subject Number	Module Code	Credits	Module Name	Semester
49913	828	180	Thesis Geography and Environmental Studies	Both

Assessment and Examination

You may present the thesis in English or Afrikaans. The thesis is assessed according to the University's provisions set out in Part 1 (General Rules) of the University Yearbook.

Enquiries

Prof A van Niekerk

Tel: 021 808 3218/3103

Email: avn@sun.ac.za

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:

11053 Biochemistry

214 (16) Biomolecules: Structure-function Relationships (3L, 3P)

1.1 Explanation of the abovementioned terms

- *Five-digit subject number* **11053 Biochemistry**
Each subject is identified by this five-digit subject number.
- *Subject name* **11053 Biochemistry**
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* **214 (16) Biomolecules: Structure-function Relationships**
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: 114
Year 2: 214
Year 3: 314
 - 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: 214, 324, 334
 - **4, 5 or 6** – modules are presented in the second semester.
Semester 2: 342, 354, 364
 - **7, 8 or 9** – modules are presented in both semesters, which are year modules.
Year module (both semesters): 278, 288, 391
 - The third digit of the module code (4) in this case "4" serves as a distinguishing digit between various modules of the same subject in a particular year of study.
 - **Take note:** Some of the postgraduate module entries in this Yearbook part deviate from the abovementioned pattern. The five-digit subject number and the three-digit module code in these postgraduate modules are written continuously in the same block.
66184 715 (24) Generic Scientific Skills
- *Credit value* **214 (16) Biomolecules: Structure-function Relationships**
The number in brackets indicates the credit value of the particular module, for example Biochemistry 214 (16).
- *Module subject* – **214 (16) Biomolecules: Structure-function Relationships**
This indicates the subject that will be dealt with in this specific module.

- *Teaching load* – (3L, 3P)
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 according to the rules stipulated in [Stellenbosch University's Assessment Policy](#) and the Assessments and Promotion chapter in the SU Yearbook Part 1 (General Rules).

3. Prerequisite pass, prerequisite and corequisite modules

After the description of the module's content, the prerequisite pass, prerequisite and corequisite modules for that module are given, where applicable. The following terms are used:

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 **final mark of at least 40**, before you can take the module for which it is a prerequisite module.
- If you have once complied with a prerequisite rule, your compliance will remain valid for the period given in the applicable assessment rules, even if you repeat the prerequisite module and do not meet the minimum level when repeating the module.
- **Take note:** You must pass all the modules you took as prerequisites in the programme before the relevant degree, certificate or diploma can be awarded to you.

Corequisite module

- A corequisite module is a module that you must register for in an earlier semester than the module for which it is a corequisite, or in the same semester.
- **Take note:** You must pass all the modules you took as corequisites in the programme before the relevant degree, certificate or diploma can be awarded to you.

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.

- Before making a final selection of elective modules that you want to take in a specific academic year, consult the relevant class and assessment timetables closely. If any two modules occupy the same time slot on a particular timetable, or have assessments scheduled at the same time, you cannot register for both modules because they are an inadmissible combination.
For more information, please consult My.SUN.
- Also make sure that you meet the prescribed prerequisite pass, prerequisite and corequisite requirements for each module that you must follow in the prescribed curriculum of your degree programme.

For more information on these prerequisites, please consult the module contents below.

4. Undergraduate subjects, modules and module contents

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

Faculty of Science Teaching

13623 Science in Context

179 (12) Science in Context (2L, 1T)

This is a generic skills module in support of student success in Science. The module is divided into subunits categorised as compulsory, strengthening and enrichment. Benchmark tests written at the start of the academic year guide students as to which of the subunits they should take to make up the required 12 credits.

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 curriculum 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.

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.

322 (8) Intermediate Bioinformatics (3L, 3P)

Different BLAST methods, next-generation sequencing technologies, genome assembly, Eulerian paths and cycles, de Brijn 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 modelling, molecular dynamics, ligand docking.

Prerequisite module:

- *Bioinformatics 312*

Department of Biochemistry

11053 Biochemistry

Take note: Students intending to take Biochemistry as a subject are required to take modules such as Biology, Physics and Mathematics during their first year. Chemistry 124 plus Chemistry 144 are taken as the first-year equivalent of Biochemistry.

214 (16) Biomolecules: Structure-function Relationships (3L, 3P)

Introduction to the living cell, bio-elements, and the importance of water as the solvent for biochemical reactions and its role in living systems. Introduction to biomolecules (nucleic acids, proteins, carbohydrates, and lipids): their structures, functions and characteristics. An introduction to protein ligand binding, enzyme catalysis and enzyme kinetics.

The practical component covers basic laboratory skills, e.g. how to weigh, how to prepare a solution, dilutions, the use of a micro pipette, the use of a pH meter and a spectrophotometer. Students will investigate the principles of buffering and how to determine an unknown concentration using a standard curve.

Prerequisite pass modules:

- Chemistry 124 or 164, 144
- Biology 124

244 (16) Intermediary Metabolism (3L, 3P)

Bioenergetics of metabolism, the metabolism of biomolecules (carbohydrates, lipids and some nitrogen containing compounds). Glycolysis, citric acid cycle and glyoxylate cycle. Oxidative phosphorylation. Photosynthesis. Regulation and integration of metabolism: exploring the implications of metabolic abnormalities in different biological systems.

The practical component includes enzymatic assays, enzyme kinetics, the role of effectors on enzyme activity and the basic principles of chromatography.

Prerequisite module:

- Biochemistry 214

315 (16) Biophysical and Structural Protein Biochemistry (3L, 3T)

Biophysical analysis: quantitative, qualitative and structural analysis of biological molecules, with focus on amino acids, peptides and proteins, utilising techniques such as spectrophotometry, fluorescence, mass spectrometry, gel electrophoresis and chromatography.

Advanced protein biochemistry: Protein purification techniques and analysis of protein purity, composition and structure. Protein structure/function relationships are studied in the context of a number of specialised complex protein systems and enzymatic reaction mechanisms.

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.

Theoretical concepts are applied in tutorial sessions and computer practicals.

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 (two of the following three topics are selected for presentation every year):

Antibiotics: The biochemistry of selected antibiotics and antimicrobial agents.

Intracellular signal transduction pathways integrated with eucaryotic gene expression: ligand-activated receptor signalling; receptor binding theory; cell surface receptors; nuclear receptors; protein-protein interactions; signalling networks and cross talk; regulation of gene expression; chromatin remodelling; promoters and enhancers; transcription factors.

Immunology: Innate and specific acquired immunity; antibody structure and function; defence mechanisms against pathogenic organisms; vaccinations; allergies; immune disorders; differential gene expression in lymphocyte development and immune diagnostic techniques.

Prerequisite module:

- Biochemistry 315

365 (16) Practical protein expression, purification and analysis techniques (3L, 3P)

Molecular biology, recombinant protein expression and protein purification techniques. Analysis of DNA and protein purity and integrity. Techniques include plasmid DNA isolation, PCR, restriction enzyme digests, agarose gel electrophoresis, preparation of competent cells, transformation, induction of protein expression, immobilised-metal affinity chromatography, desalting, 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. By registering for this module

students confirm that they are available during both these periods.

Prerequisite module:

- *Biochemistry 315*

Biochemistry as a major for the BSc degree

The following modules are required: Biochemistry 214(16), 244(16), 315(16), 365(16), Bioinformatics 312(8), and either Biochemistry 323(8) or Bioinformatics 322(8), and either Biochemistry 345(16) or Applied Chemistry 354(16).

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, randomisation), 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.

Prerequisite pass module:

- *Biology 124 or 144 and a final mark of at least 40% in the other Biology module*

Corequisite module:

- *Biodiversity and Ecology 212 or an equivalent statistical module*

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.

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*

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.

Prerequisite pass module:

- *Biology 144 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.

Prerequisite pass module:

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

311 (16) Climate and Global Change Challenges (3L, 3P)

The study of global change with a biological perspective brings together historical and current evidence for such changes and summarises its main drivers. Topics include global climate change, anthropogenic drivers such as pollution, invasion biology, land use and ecosystem change. Data at different spatial and temporal scales and at different levels of biological organisation are covered (from species to communities and ecosystems, and from micro to macroscales), highlighting the technologies and numerical techniques used to study these processes. Examples will have a strong African focus, including case studies from the Western Cape province from both faunal and floral perspectives. Important areas of teaching include the relevance of understanding global climate change for African, in particular South African, ecosystems. There is a strong emphasis on appropriate communication regarding all the above topics, both among scientists and between scientists and other stakeholders, including the general public.

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.

Prerequisite pass modules:

- *Biodiversity and Ecology 212 or 214 and a final mark of at least 40% in the other Biodiversity and Ecology module*

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.

Prerequisite pass modules: - any two of the following three modules:

- *Biology 124,144,154*

341 (16) Climate and Global Change Solutions (3L, 3P)

This module builds on Global Change 311 (Global Change Challenges). It will expose students to the concepts of adaptation and mitigation of global and climate change, providing them with a variety of tools to develop solutions to the challenges of global change. Topics include the concepts of resilience and resistance from both a biological and a human perspective, spatial planning for biodiversity (with a focus on how conservation outcomes may change with changing climates and species responses), conservation genetics as a tool to support spatial planning and species conservation (including adaptive responses to environmental stressors), carbon storage and trading and their links to ecological restoration (with a focus on blue carbon ecosystems), managing invasive species at national as well as international level, restoration

ecology, and policy and legislation to support conservation and management outcomes.

Global Change 311 is not a prerequisite for Global Change 341 (especially for international students). However, it is highly recommended that students do take Global Change 311, because an understanding of the fundamentals of the drivers of climate change and their impact on biodiversity and well-being (which are covered in Global Change 311) will prepare students for the content of Global Change 341 and provide a stronger footing from which to start. Global Change 341 can be taken independently, if necessary, but this will require additional, independent work by students for them to be able to follow the content of the module.

342 (16) Integrative Marine Science (3L, 3P)

This module is presented as five sections that progress from understanding the physical, chemical, geological and biological nature of marine systems to the utilisation, management and protection of marine products systems. Exploration of the physical marine environment focusses specifically on ocean climate and circulation, tides and waves, and coastal and estuarine processes. This is followed by the chemical section, which examines the properties of seawater, focussing on salinity and dissolved gases. The geological section considers plate tectonics, marine provinces and marine sediments. The biological section explores biological life in oceans and adaptations of marine organisms to the different marine environments; productivity and how this feeds into energy and food webs; and benthic, pelagic, island, estuarine and mangrove systems. The final section explores the historical and contemporary reliance of humans on the ocean; consequences of harvesting marine products; the development of marine protected areas and how this often leads to conflict with people who rely on the ocean for their livelihoods or recreation. Throughout the module we will explore skills related to understanding and measuring different processes.

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.

Prerequisite pass modules:

- *Biodiversity and Ecology 212 or 214 and a final mark of at least 40% in the other Biodiversity and Ecology module*

Corequisite module:

- *Biodiversity and Ecology 244*

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.

Prerequisite pass modules - any three of the following six modules:

- *Biodiversity and Ecology 212, 214, 224, 244, 254, 264*

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), 311 (16), 315(16), 324(16), 341(16), 342(16), 344(16), 354(16).

25046 Biology

124 (16) Cell Biology (3L, 3P)

Origin and early history of life. Cytology. Cell chemistry, biological membranes and cellular respiration. Fixation, transfer and expression of genetic information. Evolution.

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 curriculum programmes).

Introducing biological concepts: 'What is life?', biological evolution, biodiversity and the Tree of Life. The chemical basis of life. Biological molecules. Enzymes. Biological membranes: Structure and function. Cell structure and function: Pro- and eukaryotes, as well as animal and plant cells. Mendelian genetics and inheritance. Introduction to animal phylogeny. Vertebrate life.

Responsible department: Botany and Zoology

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

Corequisite module:

- *Biology 124*

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 curriculum 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 and an introduction to thermodynamics. Examples that illustrate the importance and relevance of science as an everyday phenomenon will be highlighted.

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; and 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; and 144

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 ^1H 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 diastereo-selectivity, 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

316 (16) Green and Sustainable Chemistry (3L, 1T/1P)

In this module students will learn strategies and techniques of reducing environmental impacts of chemical products and processes, by applying green and sustainable chemistry principles. The module starts with background details, i.e., the history and development of green chemistry, and the principles and the tools of green chemistry, and explain how these help towards evaluating and achieving sustainability. They will learn about prevention or reduction of pollution and waste, green chemistry metrics, catalysis and sustainable processing, renewable and sustainable feedstocks, the development of sustainable polymer materials, and the recycling and upcycling of polymers.

Prerequisite pass modules:

- Chemistry 234, 264

Prerequisite modules:

- Chemistry 214

333 (12) Polymer Science 1 (3L, 1T, 1P)

This module introduces third-year students to the foundational principles of polymer chemistry, a critical component of the Applied Chemistry programme. Students will explore the basic characteristics of polymer molecules, including their classification, topologies, microstructure and the concepts of molecular weight averages and distributions. The module also covers the principles of polymerization, focusing on key synthesis methods such as chain-growth and step-growth polymerization. Emphasis is placed on understanding the structure-property relationships that influence polymer behaviour and performance, along with an introduction to the stabilization of polymer materials, industrial processing methods, and degradation mechanisms.

Prerequisite modules:

- Chemistry 214, 264

354 (16) Medicinal Chemistry (3L, 1T, 1P)

Medicinal chemistry is an interdisciplinary field that applies chemical and biological principles to the design, synthesis and development of new biologically active molecules that can be used to treat diseases. This module covers the core principles of drug discovery, including target selection, development, and use of relevant bioassays to identify hit compounds, computer-aided drug design, and the discovery and optimization of lead compounds, including natural products and repurposed drugs. Strategies to enhance the activity and ADME (absorption, distribution, metabolism, and excretion) properties of lead compounds through structural modification, as well as introductory drug metabolism and pharmacokinetics (DMPK) and the manufacture and delivery systems of drug are also covered. Students will be exposed to the latest advances in the development of therapeutic agents to address Africa's disease burden (e.g. tuberculosis, malaria, HIV/AIDS and cancer).

Prerequisite pass module:

- Chemistry 264

Prerequisite modules:

- Chemistry 214, 234

365 (12) Polymer Science 2 (3L, 2T, 2P)

Building on the foundational knowledge from Polymer Science 1, this module delves deeper into the study of polymers, one of the most versatile and widely utilized classes of materials. Polymers play a crucial role across numerous industries, with the polymer sector being a significant contributor to the chemical industry in South Africa. The module emphasizes the intrinsic relationship between the molecular structure of

polymers, both chemical and physical, and their resulting properties. Students will develop a comprehensive understanding of polymer structure, morphology and performance, with a strong focus on their practical applications. In addition, the module introduces key techniques for polymer analysis and characterization, equipping students with essential skills for research and industrial contexts.

Prerequisite modules:

- *Chemistry 214, 264*
- *Applied Chemistry 333*

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.

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.

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.

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.

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.

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)

Physical Earth Sciences. Planar and linear elements in structural geology. Uses of the geological compass. Principles of stereographic projection, content of topographic and geological maps, classification of fabrics, folds and fault zones, structural interpretation of geological maps, block diagrams, cross sections and strike-parallel sections. Geological mapping techniques, plane table, theodolite, GPS, photo geology.

Structural geology. Forces, stress and strain, rheology of geological materials, fissures and fracture planes, foliations and lineations, faults and fault zones, folding and boudinage, halokinesis, intrusion mechanisms, structural control of fluid flow, introduction to plate-tectonic principles, relationship between tectonics, metamorphism and sedimentation.

A sub-minimum of 50% for practical work is required.

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.

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.

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)

Origin, composition and classification of sedimentary rocks. Sedimentary textures and structures. Facies analysis and depositional environments. Basin analysis and palaeogeography. Sequence analysis and cyclicity. Stratigraphic principles. South African stratigraphy. Well log/core correlation/interpretation. Sedimentary log description.

A sub-minimum of 50% for practical work is required.

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)

Classification, global distribution and genesis of mineral deposits. Introduction to mineral economics. Mineral deposits and the environment. Mineral exploration including geochemistry, geophysics and project management. Introduction to ore microscopy.

A sub-minimum of 50% for practical work is required.

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.

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.

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 focal area 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.

Prerequisite modules:

- Geo-environmental Science 124, 154
- Chemistry 124 or 164; and 154

Corequisite modules:

- Environmental Geochemistry 214
- Geology 244

372 (8) Environmental Field Skills (2P)

A compulsory module for students taking the Geo-environmental Science focal area 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.

Prerequisite modules:

- Environmental Geochemistry 214
- Environmental Field Skills 271

Corequisite modules:

- Environmental Geochemistry 314
- 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).

Prerequisite pass module:

- Geo-environmental Science 154

Prerequisite modules:

- Geo-environmental Science 124
- Chemistry 124 or 164; and 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.

Prerequisite pass modules:

- Mathematics 114 or Mathematics (Bio) 124

Prerequisite modules:

- Environmental Geochemistry 214
- Chemistry 264

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).

Geography and Environmental Studies as 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).

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.

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.

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.

186 (32) Introductory Mathematics (3L, 3T)

For BSc (extended curriculum programme) and BEng (extended curriculum 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.

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.

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.

Prerequisite module:

- *Mathematics 214*

279 (16) Foundations of Abstract mathematics I (2L, 2P)

Take note: this module will be offered from 2026 as replacement for Mathematics 278(32). Admission is subject to approval by the Department of Mathematical Sciences.

This module is an introduction to axiomatic mathematics and mathematical exploration. Its goal is to build/reinforce your skills in composing deductive arguments, analysis of mathematical concepts, exploration of mathematical ideas, discovery of theorems, and mathematical abstraction, concretisation, creativity and problem-solving in general. This goal will be achieved through a selection of topics that may vary from year to year. Such topics could include set theory, number theory, order theory, and study of various basic mathematical structures.

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*

318 (16) Foundations of Abstract Mathematics II (3P)

Take note: this module will be offered from 2027 as replacement for Mathematics 378(32). Admission subject to approval by the Department of Mathematical Sciences.

This module is an advanced course on axiomatic mathematics and mathematical exploration. Its goal is to further your skills in composing advanced deductive arguments, analysis of advanced mathematical concepts, exploration of advanced mathematical ideas, discovery of advanced theorems, and mathematical abstraction, concretisation, creativity and problem-solving in general. This goal will be achieved through a selection of advanced topics that may vary from year to year. Such topics could include the study of mathematical structures arising across algebra and number theory, topology and geometry, functional analysis, combinatorics, logic and category theory.

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*

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.

Prerequisite pass modules:

- *Mathematics 114, 144 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)

Take note: this module will be replaced with Mathematics 318(16) in 2027. Admission subject to approval by the Department of Mathematical Sciences.

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.

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), 365(16) together with one module from Mathematics 344(16), 345(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.

Take 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, L_2 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)

Functions and their inverses: polynomial functions, rational functions, power functions, exponential functions, trigonometric functions. Solution of trigonometric equations. Composition of functions. Limits. Definition of the derivative of a function. Continuity. Rules of differentiation, certain formulae. Higher-order derivatives. Implicit differentiation. Applications of differentiation: processes of growth and decay, graph sketching, optimisation problems. Indefinite integrals. Techniques of integration: substitution, integration by parts. The

definite integral as the limit of a sum. The Fundamental Theorem of Calculus. Definite integrals as areas. Solution and use of simple differential equations.

176 (32) Introductory Mathematics for the Biological Sciences (3L, 3P)

For students in the BSc (extended curriculum 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.

38571 Engineering Mathematics

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.

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.

Prerequisite pass module:

- *Engineering Mathematics 145 or 214*

Prerequisite module:

- *Engineering Mathematics 214*

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.

Take 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.

Prerequisite module:

- *Mathematics 114*

Corequisite module:

- *Mathematics 144*

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

Linear systems. Orthogonality: application to curve fitting. Eigenvalues and eigenvectors: Application to

systems of difference and differential equations. Singular values: application to image processing. Numerical computations with matrices like LU and QR decomposition and the calculation of eigenvalues and eigenvectors. Matrix norms. Sensitivity of linear systems; condition numbers. The use of MATLAB for matrix computations.

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.

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.

Prerequisite module:

- *Applied Mathematics 214 or Mathematics 214*

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

Methods for the solution of nonlinear equations; analysis of convergence. Interpolation with polynomials and splines; error analysis. Numerical differentiation and integration. Case studies. The use of MATLAB or Python for numerical calculations.

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.

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.

Prerequisite pass modules:

- *Mathematics 114, 144 or Engineering Mathematics 115, 145*

476 (16) Numerical Methods (3L)

The module focuses on numerical methods for matrix computations. We look at the effective solution of square linear systems, least-squares problems, and the eigenvalue problem. We consider direct as well as iterative methods, with special attention to sparse matrices and structured matrices. Pitfalls such as numerical instability and ill-conditioning are pointed out. Model problems are drawn from partial differential equations and image processing. Theory, algorithmic aspects and applications are emphasised in equal measure.

482 (16) Graph Theory (3L)

This module serves as a broad introduction to the field of graph theory by exposing students to a number of important problems and subfields of the discipline, such as optimal paths in networks, optimal spanning trees, planarity, vertex and edge colouring, Eulerian graphs and Hamiltonicity, tournaments, domination and independence, and Ramsey theory. Although this module focuses on the theoretical aspects of these concepts, the applications thereof include optimal route planning and production scheduling, planning of communication network infrastructure, the construction of timetables, placement of facilities in networks, vehicle problems, and the travelling salesperson problem.

483 (16) Applied Markov Processes (3L)

This module gives an introduction to Markov processes, focusing on their application for modelling

dynamical systems perturbed by noise or manmade systems in which randomness or uncertainties play an important role. The theory covers Markov chains in discrete and continuous time, random walks, Brownian motion, stochastic differential equations, and stochastic calculus. Applications include population dynamics, queues, particle systems, diffusions, noise-perturbed dynamical systems, stochastic control, and finance. The module also has tutorials on simulation methods (in MATLAB or Python).

492 (16) Computer Vision

The first part of the module covers the basics of image processing, feature detection and matching, projective geometry, perspective transformations, robust model estimation with RANSAC, the pinhole camera model, and stereo vision for depth estimation. The second part focuses on deep neural networks, and specifically convolutional neural networks for image classification, object detection, and image segmentation. Relevant machine learning concepts, including training by stochastic gradient descent, are also introduced.

493 (16) Digital Image Processing

Basic greyscale transformations and image enhancement techniques in the spatial domain; Fourier analysis in two dimensions and image enhancement techniques in the Fourier domain; image restoration; morphological filters; image compression techniques; image segmentation, representation, description and recognition.

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).

14736 Data Science Research in Applied Mathematics

472 (40) Data Science Research Project

The research assignment provides students with a comprehensive learning experience that integrates knowledge from previous courses. Students will integrate knowledge and experiences gained from all previous modules and apply this to a data-rich research topic. They will have the opportunity to synthesise what they have learned and apply that knowledge to new, complex situations. Students should engage in the entire process of solving a real-world data science problem, from collecting and processing actual data and applying suitable and appropriate analytical methods to the problem, to communicating the results clearly and comprehensibly.

Prerequisite pass modules:

- *Applied Mathematics 314, 354, 364*
- *Data Science 346*
- *Mathematical Statistics 312*

20753 Applied Mathematics B

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.

Prerequisite module:

- *Applied Mathematics 144 or Applied Mathematics B 154*

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.

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).

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.

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.

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.

Prerequisite module:

- *Computer Science 214*

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

Introduction to networks in general and the internet in particular. Architecture and protocols. Allocation of resources and congestion control. Network security. Applications.

Prerequisite modules:

- *Computer Science 214, 244*

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.

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-maximisation estimates; modelling using logistic regression, Gaussian mixtures and hidden Markov models.

Prerequisite modules:

- *Computer Science 144 or Computer Science E214*
- *Mathematics 214 or Applied Mathematics 214 or Engineering Mathematics 214*

AND

Prerequisite modules:

- *Mathematical Statistics 245, 246*

OR

Corequisite module:

- *Statistics 318*

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

Introduction to relational databases. Mapping relational model onto object model. Implementing a database application in the context of the web. Web services.

Server-side scalability. Virtualisation. Cloud Computing.

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.

Prerequisite module:

- *Computer Science 214 or*
- *Computer Science E214 and Computer Systems 245*

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.

Prerequisite module:

- *Computer Science 214*

411 (16) Computer Networks (3L, 1P)

Introduction to networks in general and the internet in particular. Architecture and protocols. Allocation of resources and congestion control. Network security. Network applications. Network research technique.

Prerequisite modules:

- *Computer Science 214, 244*

412 (16) Advanced Algorithms

This module continues from Computer Science 214 and covers advanced topics in the design and analysis of algorithms and associated data structure. 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.

Prerequisite pass modules:

- Computer Science 214, 244
- Mathematics 114, 144
- Probability Theory and Statistics 114 or 144

441 (16) Machine Learning

This module is an introduction to selected topics in machine learning.

Prerequisite pass modules:

- Computer Science 144
- Mathematical Statistics 245, 246

491 (16) Space Science Algorithms

Algorithms and techniques in Space Science, with applications.

Prerequisite pass modules:

- Computer Science 214, 244
- Mathematics 114, 144

495 (16) Functional Programming

This module gives an introduction to the functional programming paradigm.

Prerequisite pass modules:

- Computer Science 214, 244
- Mathematics 114, 144

471 (16) Computing for Data Science

This module content will focus on advanced computing topics relevant to data science. The topics offered in a specific year may vary depending on the advancements in the field or the lecturers involved. Please take note that this module might not be offered every year, but this will be confirmed by the end of the previous year. A similar workload and assessment strategy to other modules in the fourth-year of the BDatSci programme's focal area for Computer Science will be followed.

Corequisite module:

- Data Science Research Assignment 471

472 (16) Machine Learning and Artificial Intelligence I

This module thoroughly covers some key areas in Artificial Intelligence (AI), focusing on logic, knowledge representation, probabilistic reasoning, automated planning, and reinforcement learning. Core concepts in logic-based agents are covered. The student will learn logic programming for representing problem domains and for implementing deterministic classical planning algorithms. The module progresses to probabilistic techniques, covering some probabilistic graphical models for reasoning over time, and Markov Decision Processes (MDPs) for probabilistic planning. Boolean and Arithmetic Circuits are covered - these are used for compact representation and tractable reasoning with Boolean and arithmetic/probabilistic knowledge. Students will learn a probabilistic logic programming language and will be expected to implement programs for solving complex problems involving uncertainty. The module concludes with reinforcement learning (RL) by building on MDP theory, covering fundamental RL algorithms for decision-making in stochastic environments. The module aims to equip students with advanced AI skills, enabling them to analyse and design intelligent agents effectively, contributing to the evolving field of AI."

Prerequisite pass modules:

- Computer Science 144, 214

Corequisite module:

- Computer Science 315

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), 343(16), 344(16), and two of 313(16), 314(16) and 315(16).

14738 Data Science Research in Computer Science

471 (40) Data Science Research Assignment

The research assignment provides students with a comprehensive learning experience that integrates knowledge from previous courses. Students will integrate knowledge and experiences gained from all previous modules and apply this to a data-rich research topic. They will have the opportunity to synthesise what they have learned and apply that knowledge to new, complex situations. Students should engage in the entire process of solving a real-world data science problem, from collecting and processing actual data and applying suitable and appropriate analytic methods to the problem, to communicating the results clearly and comprehensibly.

Prerequisite pass modules:

- *Computer Science 343, 344*
- *Data Science 346*
- *Mathematical Statistics 312*

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.

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.

Prerequisite module:

- *Scientific Computing 272*

50040 Computer Skills

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

This module is taken by students in the BSc (extended curriculum programmes). Utilisation of computers in computer users' areas on campus. Introduction to an operating system, internet, email, word processing, spreadsheet and presentation software.

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.

Prerequisite module:

- *Computer Skills 171 or Science in Context 178*

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:

(13 lectures): Problem solving using programming. Designing applications in Microsoft Office using Visual Basic Applications (VBA). Customise/Enhance Microsoft Office by creating Macros, Procedures and Functions.

Prerequisite module:

- *Computer Skills 272*

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; and 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; and 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.

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 curriculum programmes in AgriSciences and Science and for the BEng. The module focuses on the nature of physics with the following themes as content: Mechanics, electromagnetism, modern physics.

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.

Prerequisite pass modules:

- *Physics 114, 144*

Prerequisite modules:

- *Mathematics 114, 144*

234 (12) Classical Mechanics and Waves (3L)

This module is only intended for students following the BSc Chemistry focal area Chemistry with Chemical Engineering.

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.

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,

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.

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.

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.

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.

Prerequisite module:

- *Mathematics 214 or Applied Mathematics 214 or Physics 224*

352 (8) Applications of Quantum Mechanics (1.5L, 1.5P)

Magnetic dipole moments, spin-orbit coupling, radiation transition rates, Zeeman effect. Electrons in periodic crystal potentials. Nuclear structure and properties, radioactive decay, nuclear scattering.

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, focal area Theoretical Physics.

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.

Corequisite modules:

- *Physics 342, 352 or 372*

412 (16) Lagrange and Hamilton Mechanics

Degrees of freedom, generalised coordinates, Lagrange equations of the first and second kinds, applications. Small oscillations, variational calculus. Hamilton's principle, Noether's theorem.

421 (16) Statistical Physics B

Phase transitions and critical phenomena, phenomenological theories (Landau-Ginsburg, scaling hypothesis), simple model systems, approximation methods (mean-field theory, self-consistent approach). Statistical physics of liquid crystals and polymers. Simulation methods. Dynamic correlation and response functions, Langevin theory, stochastic differential equations (Fokker-Planck equations).

457 (8) Bayesian Physics

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.

458 (8) Dynamic Systems and Complexity (4L, 1T)

Introduction to nonlinear dynamic systems, modelling, continuous and discrete mappings, stability analysis, hierarchy of chaos, strange attractors, universality and Feigenbaum constants. Hamiltonian chaos, KAM theorem.

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).

14739 Data Science Research in Statistical Physics**473 (40) Data Science Research Assignment**

The research assignment provides students with a comprehensive learning experience that integrates knowledge from previous courses. Students will integrate knowledge and experiences gained from all previous modules and apply this to a data-rich research topic. They will have the opportunity to synthesise what they have learned and apply that knowledge to new, complex situations. Students should engage in the entire process of solving a real-world data science problem, from collecting and processing actual data and applying suitable and appropriate analytic methods to the problem, to communicating the results clearly and comprehensibly.

Prerequisite pass modules:

- *Physics 314, 334, 344*
- *Data Science 346*
- *Mathematical Statistics 312*

13005 Physics (Bio)

134 (16) Introductory Physics for Biological Sciences A (3L, 3P)

Selected topics, relevant to the biological sciences, from introductory mechanics, hydrostatics and optics.

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.

Prerequisite module:

- *Physics (Bio) 134*

Department of Physiological Sciences

13080 Physiology

214 (16) Physiological Principles and Systems (3L, 3P)

The module provides a comprehensive overview of various human physiological principles and systems, including homeostasis and body fluids, cell membranes, general physiological control systems, neurophysiology, special senses, endocrinology, and the digestive system. It also covers typical diseases related to these systems.

For the Human Life Sciences programme, and the interdisciplinary focal area Applied Medicinal Chemistry:

Prerequisite modules:

- *Biology 124, 154*

Corequisite module:

- *Biochemistry 214*

For the interdisciplinary focal area Biomedical Mathematical Sciences:

Prerequisite module:

- *Biology 124*

Corequisite module:

- *Biochemistry 214*

244 (16) Systems in Physiology (3L, 3P)

A comprehensive overview of the physiological systems of the human body, including the muscle and respiratory systems, acid/base balance, immunology, haematology, urinary, and reproductive systems.

Prerequisite module:

- *Physiology 214*

Corequisite module:

- *Biochemistry 244*

314 (16) Integrated Physiology (3L, 3P)

This module primarily focusses on integrated human physiology and explore a range of topics, including systems physiology and homeostasis, endocrinology and metabolism, as well as cardiovascular physiology and neurophysiology.

Prerequisite pass modules:

- *Physiology 214, 244*

Prerequisite modules:

- *Biochemistry 214, 244*

334 (16) Metabolic Physiology (3L, 3P)

In this module, students explore metabolic physiology including macronutrient digestion, absorption, and utilisation, inherited diseases of carbohydrate, protein and fat metabolism, and the glycaemic index.

Prerequisite pass modules:

- *Physiology 214, 244*

Prerequisite modules:

- *Biochemistry 214, 244*

344 (16) Cellular Physiology (3L, 3P)

This module primarily focusses on cellular physiology and explore various topics, including basic principles of human nutrition, membrane and cell communication, oxidative stress, as well as muscle satellite cells and stem cells.

Prerequisite modules:

- *Biochemistry 214, 244*
- *Physiology 314*

364 (16) Clinical Applied Physiology (3L, 3P)

This module will primarily focus on lifestyle-related diseases and wellness promotion. It will cover the physiological and cellular aspects of several chronic conditions, including cancer, diabetes, bone physiology and pathophysiology, atrophy, ageing and infectious 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).

5. Undergraduate subjects and modules offered by other faculties**Faculty of AgriSciences**

Please consult Part 7 (Faculty of AgriSciences) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below

Department of Genetics**11061 Biometry**

- 212 (8) Introductory Biometry
- 242 (8) Applications in Biometry

54410 Biotechnology

- 215 (16) Introductory Microbial Biotechnology
- 245 (16) Introductory Plant and Animal Biotechnology
- 315 (16) Advanced Biotechnology
- 345 (16) Economic and Legal Aspects of Biotechnology

13285 Genetics

- 214 (16) Introductory Genetics
- 244 (16) Introductory Molecular Biology
- 314 (16) Genomes and Genome Analysis
- 324 (16) Molecular Population Genetics
- 344 (16) Advanced Topics in Molecular Genetics
- 354 (16) Quantitative genetics

Department of Soil Science**14176 Soil Science**

- 214 (16) Introduction to Soil Science

Faculty of Arts and Social Sciences

Please consult Part 4 (Faculty of Arts and Social Sciences) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below.

Department of General Linguistics

10294 General Linguistics

- 178 (24) Introduction to Linguistics
- 278 (32) Language and the Human Mind
- 318 (24) Advanced Linguistics
- 348 (24) Advanced Linguistics

Department of Geography and Environmental Studies

64165 Geo-environmental Science

- 124 (16) Introduction to Human-Environmental Systems

56502 Geography and Environmental Studies

- 265 (16) Environmental Studies
- 334 (16) Environmental Processes and Hazards
- 358 (16) Environmental Studies

12923 Geographical Information Technology

- 141 (16) Nature of Geospatial Data
- 211 (16) Earth Observation
- 214 (16) Geographical Information Systems
- 241 (16) Spatial Data Management
- 242 (16) Digital Photogrammetry
- 311 (16) Spatial Data Acquisition
- 312 (16) Spatial Analysis
- 341 (16) Spatial Modelling
- 342 (16) Earth Observation

Department of Information Science

14689 Organisational Informatics

- 214 (16) Principles of Information Systems
- 244 (16) Introduction to Application Design
- 318 (24) Systems Analysis and Design
- 348 (24) Systems Development

58173 Socio-informatics

- 214 (16) Interaction Design
- 348 (24) Computational Social Science

Department of Music

50652 Music Technology

- 112 (6) Music Technology
- 142 (6) Music Technology
- 222 (8) Music Technology
- 252 (8) Music Technology
- 379 (48) Music Technology

Department of Psychology

18414 Psychology

- 114 (12) Psychology as a Science
- 144 (12) Psychology in Context
- 213 (8) Approaches to Psychological Theories of the Person
- 223 (8) Human Development in Context 243 (8) Research Design in Psychology
- 243 (8) Research Design in Psychology
- 314 (12) Psychopathology

- 324 (12) Social Psychology
- 348 (24) Psychological Interventions

Faculty of Economic and Management Sciences

Please consult Part 10 (Faculty of Economic and Management Sciences) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below.

Department of Business Management

48550 Business Management

- 113 (12) Business Management

Department of Economics

12084 Economics

- 114 (12) Economics
- 144 (12) Economics
- 217 (16) Economics
- 248 (16) Economics
- 318 (24) Economics
- 348 (24) Economics

Department of Logistics

55336 Operations Research

- 214 (16) Network Optimisation
- 244 (16) Linear Programming
- 314 (16) Combinatorial Optimisation
- 322 (16) Stochastic Methods of Operations Research
- 344 (16) Optimisation
- 352 (16) Decision Modelling

Department of Statistics and Actuarial Science

43214 Actuarial Science

- 112 (8) Theory of Interest

56820 Probability Theory and Statistics

- 144 (16) Probability Theory and Statistics

14026 Data Science

- 141 (16) Data Science
- 241 (16) Data Science
- 316 (16) Data Science
- 346 (16) Data Science

22853 Mathematical Statistics

- 214 (16) Distribution Theory and Introduction to Statistical Inference
- 245 (8) Statistical Inference
- 246 (8) Linear Models in Statistics
- 312 (16) Statistical Inference and Probability Theory
- 316 (16) Regression and Predictive Modelling
- 344 (16) Stochastic Processes and Statistical Learning
- 364 (16) Time Series

19658 Statistics

- 318 (24) Linear and Econometric Models
- 348 (24) Statistical Practice

14223 Statistics and Data Science

- 188 (18) Statistics and Data Science

14289 Introduction to Statistical Learning

- 441 (12) Introduction to Statistical Learning

65250 Stochastic Simulation

- 441 (12) Stochastic Simulation

14309 Time Series Analysis

- 441 (12) Time Series Analysis

Faculty of Engineering

Please consult Part 11 (Faculty of Engineering) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below.

Department of Electrical and Electronic Engineering**11576 Chemical Engineering**

- 224 (15) Principles and Processes of Chemical Engineering
- 254 (15) Mass and Energy Balances
- 264 (15) Fluid Mechanics for Chemical Engineers

36153 Computer Systems

- 214 (15) Introduction to Computer Systems
- 245 (15) Microprocessors

14019 Data Engineering

- 245 (12) Big Data Platforms
- 314 (15) Data Engineering

46833 Design (E)

- 314 (15) Digital Design

12599 Electrotechnique

- 143 (15) Introduction to Circuit Theory

46779 Systems and Signals

- 214 (15) Introduction to Systems and Signals
- 244 (15) Frequency Domain Techniques

33863 Thermodynamics A

- 224 (15) Applied Chemical Thermodynamics A

Faculty of Law

Please consult Part 8 (Faculty of Law) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below.

Department of Mercantile Law**14879 Introduction to Intellectual property Law**

- 314 (8) Introduction to Intellectual Property Law
- 344 (8) Introduction to Intellectual Property Law

Faculty of Medicine and Health Sciences

Please consult Part 12 (Faculty of Medicine and Health Sciences) of the Yearbook for module content, teaching loads, and prerequisites of subject modules listed below.

Department of Biomedical Sciences, Division of Anatomy and Histology**12558 Anatomy**

- 214 (16) Basic Anatomy of the Human Body
- 244 (16) Basic Anatomy of the Human Body
- 314 (16) Advanced Anatomy of the Human Body
- 324 (16) Applied Anatomy
- 344 (16) Advanced Anatomy of the Human Body
- 364 (16) Clinical Anatomy

Department of Exercise, Sport and Lifestyle Medicine

54429 Applied Kinesiology

- 313 (12) Coaching Strategies
- 314 (12) Scientific Base of the Fitness Industry
- 324 (12) Principles of Adapted Movement
- 344 (12) Sport and Recreation for Persons with Disabilities
- 352 (12) Exercise and Fitness Training
- 353 (12) Scientific Base of Sport Coaching

19305 Kinesiology

- 162 (8) Anatomy
- 182 (8) The Sport Experience
- 312 (8) Sport Injuries
- 332 (8) Peak Performance
- 342 (8) Sociological and Psychological Aspects of Sport Performance
- 352 (8) Tests and Measurement
- 372 (8) Values and Ethics in Professional Applications

44229 Movement Education, Sport and Recreation

- 212 (8) Teaching and Programme Development
- 222 (8) Adapted movement programmes
- 242 (8) Sport and Recreation Management
- 282 (8) Structure of Physical Activities

54607 Sport Science

- 222 (8) Motor Learning
- 232 (8) Exercise Physiology
- 252 (8) Sport Physiology
- 262 (8) Applied Biomechanics
- 382 (6) Professional Applications

Division for Learning and Teaching Enhancement

SU Language Centre

(In consultation with the 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 curriculum 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.

146 (6) Scientific Communication Skills (3L)

For BSc students in the BSc (extended curriculum 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.

6. Undergraduate module contents of modules offered for other faculties

52078 Applied Chemistry

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 Science) programme.

Prerequisite modules:

- Chemistry 214, 264

48321 Chemistry C

152 (6) Chemistry Laboratory Practicals (3P)

Development of laboratory skills by performing introductory chemistry experiments.

Project.

Prerequisite module:

- Engineering Chemistry 123 or 143
-

224 (15) Industrial Chemistry I (4L, 2P)

Eight 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, basic nomenclature, stereochemistry.

Prerequisite pass modules:

- Engineering Chemistry 123 or 143
- Chemistry C 152

254 (15) Industrial Chemistry II (4L, 2P)

Eight practicals per semester

Organic chemistry: 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.

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 science focal areas of physiotherapy and dietetics. It comprises atomic structure and bonding; stoichiometry; gas laws; properties of solutions; chemical kinetics and equilibria; organic chemistry and biomolecules.

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 or must have successfully completed the first year of a suitable extended curriculum programme.

Mathematical induction and the binomial theorem; functions; limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of simple functions.

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.

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.

Prerequisite pass module:

- *Mathematics 114 or Engineering Mathematics 115 or Mathematics 144 or Engineering Mathematics 145*

Prerequisite module:

- *Mathematics 144 or 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.

Prerequisite pass module:

- *Mathematics 144 or Engineering Mathematics 145 or 214*

Prerequisite module:

- *Engineering Mathematics 214*

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.

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.

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.

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.

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.

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.

Prerequisite module:

- *Engineering Mathematics 214*

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.

Prerequisite pass module:

- *Computer Programming 143*

Prerequisite modules:

- *Engineering Mathematics 115, 145*

414 (15) Machine Learning (3L, 3T)

This module is identical to Machine Learning A 742.

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.

Prerequisite modules:

- *Computer Science E 214 or Computer Science 144*
- *Mathematics 214 or Applied Mathematics 214 or Engineering Mathematics 214*
- *Mathematical Statistics 245 and 246; or Systems and Signals 344*

50040 Computer Skills

136 (4) Computer skills and digital literacies (1L)

This module fosters essential digital literacies, equipping students with the critical understanding and practical skills necessary to navigate and utilise technology effectively. Beyond basic computer skills, we delve into the core principles of digital citizenship, emphasizing ethical and values-based practices and ensuring your safety and responsible behaviour in the online world. You will learn to leverage the digital systems provided by Stellenbosch University to enhance your learning journey, mastering the tools necessary to manage your digital learning environment with confidence. This includes developing proficiency in word processing, spreadsheet analysis and creating compelling presentations, all while adhering to the standards of scientific reporting and data management. The module emphasises the importance of professional communication and collaboration in digital spaces, preparing you to effectively contribute to and engage within online learning communities. Ultimately, this module aims to cultivate digitally literate, responsible and proficient scholars who can confidently utilise technology to support their academic success and future professional endeavours.

146 (4) Computer skills and digital literacies (1L)

Only students who have failed Computer Skills 136 will be allowed to enrol for this module. Students should enrol for 146 in the same academic year that they failed 136.

This module fosters essential digital literacies, equipping students with the critical understanding and practical skills necessary to navigate and utilise technology effectively. Beyond basic computer skills, we delve into the core principles of digital citizenship, emphasizing ethical and values-based practices and ensuring your safety and responsible behaviour in the online world. You will learn to leverage the digital systems provided by Stellenbosch University to enhance your learning journey, mastering the tools

necessary to manage your digital learning environment with confidence. This includes developing proficiency in word processing, spreadsheet analysis and creating compelling presentations, all while adhering to the standards of scientific reporting and data management. The module emphasises the importance of professional communication and collaboration in digital spaces, preparing you to effectively contribute to and engage within online learning communities. Ultimately, this module aims to cultivate digitally literate, responsible and proficient scholars who can confidently utilise technology to support their academic success and future professional endeavours.

19267 Special Physics

111 (8) Physics for Health Sciences (2L, 1T)

Structure of matter, kinematics, statics, dynamics, heat, temperature, wave motion and electricity.

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, polarisation; introduction to nuclear physics.

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.

Prerequisite module:

- *Engineering Physics 113*

7. Postgraduate module contents of specific postgraduate degree programmes

Centre for Bioinformatics and Computational Biology

BScHons in Bioinformatics and Computational Biology

14241 – 711 (10) Scientific Computing in Bioinformatics

Introduction to Linux, programming in Python, variables and data structures, conditional execution, program flow, reading and writing from/to disc, functions, exception handling, classes and object-oriented code, regular expressions, using Python libraries.

14242 – 712 (10) Cell Biology in Bioinformatics

Origin of life and evolution, cell biology, cell respiration, inheritance of genetic material and gene expression.

14234 – 713 (5) Current Topics in Bioinformatics

Current and classic research publications are presented and discussed in a group context.

14235 – 714 (40) Advanced Bioinformatics

Introduction to biostatistics, databases, next-generation sequencing technologies, genomics and functional genomics, sequence analysis, biological databases and ontologies, evolution and phylogenetics, population genetics and GWAS, structural bioinformatics, proteomics, metabolomics, networks and pathways, and HPC use.

14236 – 715 (5) Bioinformatics Seminar

A seminar is prepared and presented in which a project is proposed, including a review of the relevant literature, identification of the aim, and presentation of a feasible workplan to achieve the aim.

14237 – 716 (5) Algorithms in Bioinformatics

Algorithms with special applications in bioinformatics will be reviewed and the applications thereof studied. This will include algorithms used in sequence-similarity searches, suffix tree construction, genome alignment, database searches, phylogenetic reconstructions, genome rearrangements, motif finding and peptide sequencing.

14238 – 717 (5) Machine Learning in Bioinformatics

Linear and logistic regression, regularization, neural networks, system design, support vector machines, unsupervised learning, dimensionality reduction, applications.

14240 – 721 (50) Project in Bioinformatics

A research project performed under supervision.

MSc in Bioinformatics of Infectious Diseases and Pathogen Genomics

12555 – 811 (35) Bioinformatics

The following topics will be reviewed: concepts in statistics for bioinformatics, next-generation sequencing technologies, introduction to Linux and high-performance computing, genomics, functional genomics, sequence analysis, biological databases and ontologies, evolution and phylogenetics, population genetics, structural bioinformatics, proteomics, and microbiome analysis.

71030 – 845 (25) Bioinformatics of Infectious Diseases

Tuberculosis (TB) host genetics, genetic epidemiology and population genetics of TB susceptibility, extreme phenotypes of TB susceptibility and resistance, TB pharmacogenetics, immunology of TB, TB diagnostics, animal models in TB, introduction to mycobacteriology, the *Mycobacterium tuberculosis* genome and transcriptome, molecular tools for mycobacteriology, mycobacterial secretion systems, molecular diagnosis, TB drugs, drug resistance mechanisms, mycobacterial metabolism, *M. tuberculosis* in the macrophage, TB latency/persisters, veterinary TB, TB microbiome.

71031 – 846 (25) Pathogen Genomics

Model pathogens, including viruses, bacteria, archaea, fungi, and eukaryotes, pathogen genomes, proteins and functions, genome replication, technologies for sequencing pathogen genomes, Sanger and next-generation sequencing, genome assembly, mutational analysis, evolution, and phylogenetics.

71025 – 813 (10) Python for Bioinformatics

Brief introduction to and overview of the Python programming language applied to topics in bioinformatics.

Introduction to the Biopython module and application of SeqRecord and Sequence classes. Reading, writing and interconversion of sequences. Review of programmatic access to NCBI databases and multiple alignments. Retrieval of PDB files and manipulating three-dimensional structures. Sequence-motif analysis using Bio.motifs and cluster analysis. Inheriting from Biopython classes and extending functionality. Application of Biopython classes to public datasets.

71026 – 814 (10) R language for Bioinformatics

Brief introduction and overview of R, data types and R programming, package development and robust scripting. Emphasis on using R and Rmarkdown to annotate analyses. Using R and Bioconductor for bioinformatic data analysis, with emphasis on the Bioconductor data structures (complex data types) and classes, including S4 classes and accessor functions, how abstraction facilitates good programming principles and the types of analysis models that can use the Bioconductor data structures. In addition, use of Bioconductor packages to download public data sets.

71024 – 812 (10) Algorithms and Machine Learning in Bioinformatics

Algorithms with special applications in bioinformatics will be reviewed and the applications thereof studied. This will include algorithms used in sequence similarity searches, suffix tree construction, genome alignment, database searches, phylogenetic reconstructions, genome rearrangements, motif finding and peptide sequencing.

The following topics in machine learning will be reviewed: linear and logistic regression, regularization, over- and under-fitting, bias and variance, neural networks, system design, support vector machines, unsupervised learning, dimensionality reduction, applications.

71042 – 871 (90) Bioinformatics Research project in the Natural Sciences

A thesis reporting the results of a research project in Bioinformatics.

Department of Biochemistry

BScHons in Biochemistry

11412 – 711 (10) Practical Protein Biochemistry

Advanced protein purification and analytical techniques

This practical module focusses on training in the following techniques: plasmid DNA preparation, restriction enzyme digestion, polymerase chain reaction, preparation of competent cells, transformation and heterologous protein expression, desalting, protein concentration determination, SDS-PAGE and Western blot, and various enzyme activity determinations. The module includes the theory and applications of protein purification techniques, as well as experimental data analysis.

11413 – 712 (10) Steroid Hormones

Research approaches to investigate the biosynthesis and 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. Abnormalities in steroid hormone biosynthesis or signalling are involved in the aetiology of disease states ranging from type 2 diabetes to hormone dependent cancers. 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 biosynthesis of steroid hormones and their transcriptional control of gene expression by steroid receptors in eukaryotes. Integration between the theory and techniques will facilitate greater understanding of both, as well as illustrating how theory and method are employed together to answer questions in science.

14046 – 713 (10) Soft Skills

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 and evaluate research results in selected fields within 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), x-ray crystallography, cryo-electron microscopy, isothermal titration calorimetry (ITC) and surface plasmon resonance spectroscopy (SPR), method development and validation, as well as data analysis and interpretation.

11418 – 717 (10) Specialised Topics

Specialised topic by a research expert

A research expert 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. These tools can also be used for drug discovery and development. 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.

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

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

Take note: The expected background for modules in this programme is a major in Computer Science, as well as additional quantitative modules on at least second-year level. For more information, please consult the specific admission requirements for this programme in the chapter "Postgraduate programmes" of this Yearbook part.

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

Advanced topics in formal languages and automata theory, including various models of computation and descriptive complexity.

Prerequisite pass module:

- *Computer Science 345 or Automata Theory and Applications 711*

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 optimisation, 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.

14530 – 711 (16) Computer Networks 1

Introduction to networks in general and the internet in particular. Architecture and protocols. Allocation of resources and congestion control. Network security, Network applications. Network research technique.

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.

65013 – 744 (16) Concurrent Programming 2

This module continues from Computer Science 714. The focus is much narrower and one or two selected topics are covered in depth. Possible topics include implementation of model checkers, concurrency in operating systems, formal methods, the use of a specific tool for concurrency and case studies.

65021 – 745 (16) Software Construction

One of a range of possible topics centred on software construction. Examples include aspect-oriented software development, object-oriented software development, agile methods, XP (extreme programming), as well as specialised application areas such as game programming and compiler construction.

65048 – 746 (16) Advanced Topics in Computer Science 2

Selected topics of current interest presented by lecturers or visiting researchers.

14232 – 791 (16) Artificial Intelligence

Introduction to a selection of topics in artificial intelligence and optimisation

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.

62847 – 792 (16) Computer Vision

Module at honours level presented by the Department of Mathematical Sciences, Division: Applied Mathematics.

64572 – 793 (16) Digital Image Processing

Module at honours level presented by the Department of Mathematical Sciences, Division: Applied

Mathematics.

13945 – 794 (16) Search and Planning

This module studies a selection of search and planning algorithms.

13944 – 795 (16) Functional Programming

This module gives an introduction to the functional programming paradigm.

14065 – 796 (16) Software Verification and Analysis

Introduction to various techniques for software quality management.

14066 – 791 (16) Space Science Algorithms

Algorithms and techniques in Space Science, with applications.

63444 – 771 (32) Honours Project in Computer Science

The Honours project consists of the independent development of a larger computer application. The project must illustrate the student's expertise with regards to all aspects of software engineering, including formal specification, prototype development, testing and documentation.

14531 – 771 (16) Principles of Data Science

The data science pipeline. Data retrieval and cleaning. Information retrieval. Data analysis. Data visualisation. Presentation and communication of data analysis results. Best practices in big data. Data ethics.

14533 – 771 (16) Computing and Society

Theory, domains and critique of topics relating to Computing and Society, such as human-centred computing; social development theories, critical analysis of case studies; methods and ethics; and challenges of sustainable community engagement.

14888 – 743 (16) Machine Learning and Artificial Intelligence I

This module thoroughly covers some key areas in Artificial Intelligence (AI), focusing on logic, knowledge representation, probabilistic reasoning, automated planning, and reinforcement learning. Core concepts in logic-based agents are covered. The student will learn logic programming for representing problem domains and for implementing deterministic classical planning algorithms. The module progresses to probabilistic techniques, covering some probabilistic graphical models for reasoning over time, and Markov Decision Processes (MDPs) for probabilistic planning. Boolean and Arithmetic Circuits are covered - these are used for compact representation and tractable reasoning with Boolean and arithmetic/probabilistic knowledge. Students will learn a probabilistic logic programming language and will be expected to implement programs for solving complex problems involving uncertainty. The module concludes with reinforcement learning (RL) by building on MDP theory, covering fundamental RL algorithms for decision-making in stochastic environments. The module aims to equip students with advanced AI skills, enabling them to analyse and design intelligent agents effectively, contributing to the evolving field of AI."

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.

14396 – 813 (15) Foundations of Deep Learning

A recap of machine learning fundamentals, followed by topics specific to neural networks: multilayer perceptrons, deep feedforward neural networks, gradient-based training and backpropagation, convolutional neural networks, recurrent neural networks, attention mechanisms, auto-encoders, and deep generative models.

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.

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.

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

Convolution 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.

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.

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.

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.

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.

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.

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.

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.

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

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

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)

Diffraction by crystals and the reciprocal lattice. Periodic crystal potentials, the tight-binding model, semi-conductors. Magnetism: para-, dia-, ferro- and antiferromagnetism. Superconductivity.

10586 – 714 (16) Quantum Mechanics B (Advanced Formalism and Applications) (3L, 3P)

Bra-ket notation, the axioms of quantum mechanics, basis transformations and unitary operators, position and momentum representations, Schrödinger and Heisenberg images, spin, formal theory of angular momentum, time-dependent perturbation theory, scattering theory, identical particles.

10390 – 716 (8) Atomic Physics (1.5L, 1.5P)

Multi-electron atoms, exclusion principle, electrostatic interaction and exchange degeneracy, Hartree model, angular momentum coupling: L-S and j-j coupling, transition probability and selection rules.

10708 – 718 (8) Radiation Interaction (1.5L, 1.5P)

Radiation sources, the process of radioactive decay as source of radiation, interaction of photons and neutrons 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)

Relativistic dispersion relations and quantum mechanics. Klein Gordon equation, Klein paradox. Dirac equation and spin. Covariance of the Dirac wave-function, chirality. Minimal coupling. Non-relativistic limit and Pauli equation. Relativistic treatment of the hydrogen atom. Maxwell equation as gauge theory. Radiation gauge.

10702 – 721 (16) Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems) (3L, 3P)

Phase transitions and critical phenomena, phenomenological theories (Landau-Ginsburg, scaling hypothesis), simple model systems, approximation methods (mean field theory, self-consistent approach). Statistical physics of liquid crystals and polymers. Simulation methods. Dynamic correlation and response functions, Langevin theory, stochastic differential equations (Fokker-Planck equations).

63274 – 741 (32) Physics Project (6L, 6P)

Independent work on a topic that forms part of Physics, chosen in consultation with lecturers in the Department of Physics. The project should form part of the research activities of the Physics Department under supervision of a suitable supervisor. The project must be approved by the research committee of the

Physics Department. A written report has to be submitted and an oral presentation must be given. Each student must also complete an oral examination.

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)

Optical spectroscopic diagnostic instrumentation and techniques. Laser spectroscopy techniques for atoms, molecules and plasmas. High-frequency and time-resolved spectroscopy and related diagnostic instrumentation and methods. Examples of applications of spectroscopic techniques.

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.

Laser media: solid state, gas and dye lasers. Excitation techniques. Resonator types and designs. Q-switching, gain switching, mode locking, single-mode operation, wavelength tuning. Current laser systems. Applications: Scientific, industrial, communications, medical, military.

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)

Quantum mechanics of rotational and vibrational degrees of freedom of molecules. Electronic spectra of molecules. The use of symmetries in molecular physics. The interaction of light with molecules. Kinetics and dynamics of elementary molecular reactions.

10563 – 748 (8) Nuclear Reactions and Nuclear Structure (1.5L, 1.5P)

Nuclear reactions: Scattering kinematics basic concepts. Elastic scattering, the optical model. The study of reaction mechanisms, e.g. compound nucleus formation, direct reactions, pre-equilibrium processes. Reactions with light projectiles, e.g. inelastic scattering, transfer reactions, knockout reactions. Heavy ion reactions, fragmentation. Electron scattering and high-energy nuclear reactions.

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.

Physics of Radiology: The X-ray machine, Conventional radiography, Fluoroscopy, Mammography, Computed Tomography, Ultrasound, Magnetic Resonance Imaging.

10465 – 751 (8) Physics of Nuclear Medicine (1.5L, 1.5P)

Radiation detectors, the gamma camera, quality control of the gamma camera, computers in nuclear medicine, principles of SPECT, principles of PET, statistics of counting, basic principles of tracer studies, whole body counters.

10466 – 752 (8) Physics of Radiotherapy (1.5L, 1.5P)

Dosimetry of teletherapy, filters, treatment planning, geometry of the beam, teletherapy units, quality

assurance, electron therapy, brachytherapy, unsealed sources and beta irradiators.

10706 – 753 (8) Radiation Protection (1.5L, 1.5P)

Radiological protection, the shielding of neutrons and gamma rays.

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.

Lagrange formalism in field theory and Noether currents. Covariant quantisation of Klein-Gordon and Dirac fields. Particle interpretation, spin and statistics. Functional calculus, Grassmann variables, functional integral quantisations of gauge theories. Perturbation theory and Feynman rules. Cross-sections and decay widths in particle physics. Effective Potentials. Regularisation and renormalisation. Asymptotic freedom in gauge theories.

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.

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)

Principles of non-linear optics. Non-linear polarisation, non-linear optical coefficients, harmonic generation and phase matching.

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 will be undertaken, using the body as unit model. Both molecular pathways and 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.

Faculty of Arts and Social Sciences

Department of Geography and Environmental Studies

For information on module contents of honours programmes in GeoInformatics; and Geography and Environmental Studies, please consult Part 4 (Faculty of Arts and Social Sciences) of the Yearbook

BScHons in GeoInformatics

49611 – 713 (30) Geographical Information Systems

12187 – 716 (30) Spatial Modelling and Geographical Communication

63363 – 742 (30) Environmental Geography Research Application

63398 – 712 (30) Advanced Remote Sensing

BScHons in Geography and Environmental Sciences

63371 – 711 (30) Environmental Analysis and Synthesis

63363 – 742 (30) Environmental Geography Research Application

14259 – 771 (30) Applications in Geomorphology

Research centres, bureaus and institutes

In this chapter the research and service bodies that reside at the Faculty of Science are presented.

1. 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 (focal area Bioinformatics and Computational Biology), and administers the BScHons, MSc and PhD degrees in bioinformatics and computational biology. The SBBB also offers a structured MSc in Bioinformatics of Infectious Diseases and Pathogen Genomics as a multi-disciplinary programme between the Faculties of Science, Medicine and Health Sciences, and AgriSciences.

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, contact Prof Hugh Patterton at hpatterton@sun.ac.za or 021 808 2774.

2. Stellenbosch Photonics Institute

History

The Stellenbosch Photonics Institute (SPI), established in 2020 (previously known as the Laser Research Institute), resides in the Physics Department. It strives to be a centre of excellence in photonics-related research and development in South Africa. The Institute boasts state-of-the-art laser and photonics facilities and is involved in world-class research projects. There is a vibrant research atmosphere: Students, teachers and 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 includes modules specific to the field of photonics, as well as a practical project.

The Institute's excellence is due to the research conducted by MSc and PhD students, as well as post-doctoral fellows making use of the excellent facilities under the supervision of dedicated staff members. Projects range from basic research funded by the National Research Foundation and the CSIR Photonics Centre, to applied research funded by private sector companies.

Contact details

For more information, contact Prof Pieter Neethling at pietern@sun.ac.za or 021 808 3365.

3. 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, contact Prof Wesaal Khan at wesaal@sun.ac.za or 021 808 5804.

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