UNDERGRADUATE 2024

Auckland Park Kingsway Campus

Faculty of Science

UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

AUCKLAND PARK KINGSWAY CAMPUS (APK)

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMMES

2024

IMPORTANT NOTICE

Always compare the information contained in this copy of the Rules and Regulations book with the copy on the Internet. The electronic copy is updated regularly.
www.uj.ac.za/science

Updated December 2023

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GENERAL INFORMATION

UJ Website: www.uj.ac.za
Faculty website: www.uj.ac.za/science

STUDENT FINANCE

In respect of fees payable please refer to the Brochure: **Student Fees**

If you are not in possession of this brochure and you need information urgently, please contact STUDENT FINANCES: (011) 559-3935/4339/3910/3277/4303.

DIVISION FOR INTERNATIONALISATION

Auckland Park Kingsway Campus
Next to the Library
011 559 4517

Doornfontein Campus
Student Enrolment Centre
Ground floor, Admin Building
011 559 6510

PART 1

SC.1 ADMISSION CRITERIA

SC.1.1 THE FACULTY OF SCIENCE OFFERS THE FOLLOWING PROGRAMMES AT THE AUCKLAND PARK KINGSWAY CAMPUS (APK)

- Bachelor of Science (BSc) in each of the following programme groups:
  - Information Technology
  - Life and Environmental Sciences
  - Mathematical Sciences
  - Physical Sciences
- Bachelor of Science Honours (BSc Hons)
- Master of Science (MSc)
- Master of Philosophy (MPhil)
- Doctor of Philosophy (DPhil)
- Philosophiae Doctor (PhD)

For information on Postgraduate studies kindly refer to the Faculty of Science Postgraduate yearbook.

SC.1.2 ADMISSION REQUIREMENTS TO THE FACULTY OF SCIENCE

UNDERGRADUATE PROGRAMMES (APK)

The Faculty offers BSc degrees (three year) as stipulated below. Furthermore, the faculty offers BSc degrees (four years) as an extended qualification. Students enter the four-year degree of which the first two years are planned support and an extended curriculum. The foundational provision renders guidance and structured academic support to ensure that students are assisted to adapt to higher education and graduate within minimum time.

Note:
- The University and the Faculty reserves the right to change the requirements for admission to the Faculty. A restricted number of students are accepted in certain fields of study. The Faculty offers various programmes to students who do not comply with the necessary admission requirements.
- Please note that the requirements given are the minimum requirements and that meeting them does not guarantee acceptance into the Faculty.

Please note:
In addition to the formal entry requirements:
1. There are constraints in certain programmes that may limit the numbers that may be accepted into that programme, and
2. It may be required from prospective students to write a placement test

A THE MINIMUM ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WHO MATRICULATED IN 2008 AND ONWARDS, IS A NATIONAL SENIOR CERTIFICATE (NSC) WITH ENDORSEMENT

The Admission Point Score (APS) is calculated as follows:

APS scale	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Percentage	80-100%	70-79%	60-69%	50-59%	40-49%	30-39%	0-29%

Note: Life Orientation is **NOT** counted in the calculation of the APS.

For Programme Specific admission requirements refer to the tables that follow.

ADMISSION REQUIREMENTS

NAME OF QUALIFICATION		Group A		Group B	Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Not specified**	
BACHELOR OF SCIENCE INFORMATION TECHNOLOGY DEGREE (3 years)					
B2I01Q	Information Technology	5	6	-	30
B2I02Q	Computer Science and Informatics	5	6	-	30
B2I04Q	Computer Science and Informatics with AI	5	7	-	34

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics ***	**Physical Science ****	**Life Science ^**	
BACHELOR OF SCIENCE LIFE AND ENVIRONMENTAL SCIENCES DEGREE (3 years)						
B2L10Q	Biochemistry and Botany	5	5/6*	4/5**	4 ^	30
B2L11Q	Botany and Chemistry	5	6	4/5**	4 ^	30
B2L12Q	Botany and Zoology	5	5/6*	4/5**	4 ^	30
B2L13Q	Biochemistry and Zoology	5	5/6*	4/5**	4 ^	30
B2L14Q	Chemistry and Zoology	5	6	4/5**	4 ^	30
B2L15Q	Environmental Management and Zoology	5	5	4**	4 ^	30
B2L16Q	Geography and Zoology	5	5/6*	4/5**	4 ^	30
B2L17Q	Physiology and Zoology	5	5/6*	4/5**	4 ^	30
B2L18Q	Physiology and Biochemistry	5	5/6*	4/5**	4 ^	30
B2L19Q	Physiology and Psychology	5	5/6*	4/5**	4 ^	30
B2L20Q	Geography and Environmental Management	5	5	4**	4 ^	30
B2L21Q	Geology and Environmental Management *(phasing out)*	5	5	4**	4	30
B2L24Q	Geology and Environmental Management	5	5	5	4	30
B2L25Q	Geology and Geography	5	5	5	4 ^	30

* A minimum rating of **6** for Mathematics if Mathematics 1A is included in the programme
A minimum rating of **5** for Mathematics if Mathematics 1C is included in the programme

** A minimum rating of **5** for Physical Science if Chemistry 1A and/or Physics 1A/S1 is included in the programme
A minimum rating of **4** for Physical Science if Chemistry 1C and/or Physics G1/L1 and/or Biology are included in the programme

^ A minimum rating of **4** for Life Science if Biology is included in the programme

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Physical Science ****	**Not Specified**	
BACHELOR OF SCIENCE MATHEMATICAL SCIENCES DEGREE (3 years)						
B2M40Q	Applied Mathematics and Computer Science	5	6	4/5**	-	31
B2M41Q	Applied Mathematics and Mathematical Statistics	5	6	4/5**	-	31
B2M42Q	Applied Mathematics and Mathematics	5	6	4/5**	-	31
B2M43Q	Computational Science	6	7	5**	-	33
B2M44Q	Mathematical Statistics and Computer Science	5	6	4**	-	31
B2M45Q	Mathematics and Computer Science	5	6	4**	-	31
B2M46Q	Mathematics and Informatics	5	6	4**	-	31
B2M47Q	Mathematics and Mathematical Statistics	5	6	4**	-	31
B2M48Q	Mathematics and Psychology	5	6	4**	-	31
B2M49Q	Mathematics and Mathematical Statistics (with financial orientation)	5	6	4**	-	33
B2M50Q	Mathematical Statistics and Economics (with financial orientation)	5	6	4**	-	33
B2M51Q	Mathematics and Economics (with financial orientation)	5	6	4**	-	33
B2M52Q	Actuarial Science	5	7	5	-	33
** A minimum rating of **5** for Physical Science if Chemistry 1A and/or Physics 1A is included in the programme A minimum rating of **4** for Physical Science if Chemistry 1C is included in the programme						

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Physical Science ****	**Life Science ^**	
BACHELOR OF SCIENCE PHYSICAL SCIENCES DEGREE (3 years)						
B2P70Q	Biochemistry and Chemistry	5	6	5**	4 ^	31
B2P71Q	Chemistry and Mathematics	5	6	5**	4	31
B2P72Q	Chemistry and Physics	5	6	5**	4	31
B2P77Q	Physics and Applied Mathematics	5	6	5*	4	31
B2P78Q	Physics and Mathematics	5	6	5*	4	31
B2P81Q	Geology and Chemistry	5	6	5*	4 ^	31
B2P82Q	Geology and Mathematics	5	6	5*	4	31
B2P83Q	Geology and Physics	5	6	5*	4	31
* A minimum rating of **6** for Mathematics if Mathematics 1A is included in the programme A minimum rating of **5** for Mathematics if Mathematics 1C is included in the programme						

NAME OF QUALIFICATION	Group A		Group B		Minimum APS
	Language of Teaching and Learning **English**	**Mathematics**	**Physical Science ****	**Life Science ^**	

** A minimum rating of **5** for Physical Science if Chemistry 1A and/or Physics 1A/S1 is included in the programme
A minimum rating of **4** for Physical Science if Chemistry 1C and/or Physics G1 and/or Biology are included in the programme
^ A minimum rating of **4** for Life Science if Biology is included in the programme

ADMISSION REQUIREMENTS FOR 4-YEAR DEGREE QUALIFICATIONS

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Physical Science ****	**Life Science ^**	
BACHELOR OF SCIENCE INFORMATION TECHNOLOGY DEGREE (4 years)						
B2E01Q	Computer Science and Informatics	4	5	4**	4	26
BACHELOR OF SCIENCE LIFE AND ENVIRONMENTAL SCIENCES (4 years)						
B2E10Q	Biochemistry and Botany	4	5	4**	4 ^	26
B2E11Q	Botany and Chemistry	4	5	4**	4 ^	26
B2E12Q	Botany and Zoology	4	5	4**	4 ^	26
B2E13Q	Geography and Environmental Management	4	5	4**	4 ^	26
B2E14Q	Physiology and Biochemistry	4	5	4**	4 ^	26
B2E15Q	Physiology and Psychology	4	5	4**	4 ^	26
B2E17Q	Zoology and Biochemistry	4	5	4**	4 ^	26
B2E18Q	Zoology and Chemistry	4	5	4**	4 ^	26
B2E19Q	Zoology and Environmental Management	4	5	4**	4 ^	26
B2E20Q	Zoology and Geography	4	5	4**	4 ^	26
B2E21Q	Zoology and Physiology	4	5	4**	4 ^	26

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Physical Science ****	**Life Science ^**	
BACHELOR OF SCIENCE MATHEMATICAL SCIENCES (4 years)						
B2E40Q	Applied Mathematics and Computer Science	4	5	4**	4	26
B2E41Q	Applied Mathematics and Mathematical Statistics	4	5	4**	4	26
B2E42Q	Applied Mathematics and Mathematics	4	5	4**	4	26
B2E43Q	Mathematical Statistics and Computer Science	4	5	4**	4	26
B2E44Q	Mathematics and Computer Science	4	5	4**	4	26
B2E45Q	Mathematics and Informatics	4	5	4**	4	26
B2E46Q	Mathematics and Mathematical Statistics	4	5	4**	4	26
B2E47Q	Mathematics and Psychology	4	5	4**	4	26
BACHELOR OF SCIENCE PHYSICAL SCIENCES (4 years)						
B2E70Q	Biochemistry and Chemistry	4	5	4**	4 ^	26
B2E71Q	Chemistry and Mathematics	4	5	4**	4	26
B2E72Q	Chemistry and Physics	4	5	4**	4	26
B2E73Q	Physics and Applied Mathematics	4	5	4**	4	26
B2E74Q	Physics and Mathematics	4	5	4**	4	26
** A minimum rating of **4** for Physical Science is required if Chemistry and/or Physics are included in the programme. ^ A minimum rating of **4** for Life Science if Biology is included in the programme						

B ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WITH A NATIONAL CERTIFICATE (VOCATIONAL)

For admission to a **BSc degree (4 years)** the applicant must have:

- An NCV (level 4) issued by the Council for General and Further Education and Training
- Achieved a minimum of 70% for 5 of the 7 subjects – fundamental and vocational categories
- Passed English as Language of Teaching and Learning/First Additional Language as fundamental component with a minimum of 70%
- Passed Mathematics and Physical Sciences as Fundamental Components with a minimum score of 70%.

Applicants have to complete the NBT prior to admission. The result of the NBT will inform decisions taken on placement of the applicant.

C ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WITH A TECHNICAL SUBJECTS

- **Technical Mathematics**
  The DoE together with Umalusi have indicated that Technical Mathematics is equal to Mathematics. Therefore, programmes requiring a Mathematics score of 5 (60%), will equally require a Technical Mathematics score of 5 (60%).

- **Technical Science**
  The DoE together with Umalusi have indicated that Technical Sciences is NOT EQUAL to Physical Sciences, since it does not include Chemistry.
  The Faculty of Science will therefore not accept Technical Science for admission.

SC.1.3 REGULATIONS

SC.1.3.1 Regulations (General)
Each BSc programme must consist of 18 semester modules (or their equivalent modules), selected from the subject disciplines indicated in 1.3.6 below. Any curriculum containing more than 18 semester modules (or their equivalent modules), or which exceeds the specified maximum number per year, must be approved by the Executive Dean in consultation with the programme representative.

SC.1.3.2 Regulations (Economic and Management sciences)
A BSc curriculum which contains more than 2 semester modules from Economic and/or Management sciences must contain at least 19 semester modules or their equivalents. The following relative weighting applies: 1 semester module from the Economic and/or Management sciences carries the equivalent weight of 1 semester module from Science; 2 the weight of 2; 3 of 2; 4 of 3 and 5 of 4.

SC.1.3.3 Regulations (Financial Orientation)
The BSc programme with financial orientation consists of at least 18 approved semester modules (or their equivalent modules) from existing BSc degree modules with at least 6 additional modules, or their equivalent, mainly from the College of Business and Economics.

Prerequisite and compulsory ancillary modules from Economic and Management sciences are set out in full in the Regulations of the College of Business and Economics.

SC.1.3.4 BSc Regulations
A primary major for a bachelor's degree consists of at least 6 semester modules, or their equivalent, of which at least two must be taken in each year of study (or an alternative module from a higher year). An approved two-year primary major consists of four semester modules of which two are taken at second-year level and two at third-year level.

In the second and third year a student may take a maximum of three semester modules in a primary major module per year.

A BSc curriculum includes two primary majors unless specifically approved otherwise.

SC.1.3.5 Maximum number of modules
The maximum number of modules that may be taken in the first year of study by a full-time student is four modules per semester, unless specifically approved otherwise by the Executive Dean. In the second year of study it is four modules per semester and three per semester in the third year of study.

SC.1.3.6 A BACCALAUREUS SCIENTIAE DEGREE (BSc) CONSISTS OF MODULES FROM THE FOLLOWING SUBJECT DISCIPLINES:

Modules and outcomes are given in alphabetic sequence from Regulation SC.5 onwards (The module code for each module is provided in brackets)

Actuarial Science	(ACS)
Analytical Techniques	(ATE)
Applied Geology	(APG)
Applied Mathematics	(APM)
Biochemistry	(BIC)
Botany	(BOT)

Chemistry	(CEM)
Computer Science	(CSC)
Environmental Management	(ENM)
Geography and Environmental Management	(GGR)
Geology	(GLG)
Informatics	(IFM)
Mathematics	(MAT)
Microbiology	(MCB)
Physics	(PHY)
Physiology	(PHS)
Statistics	(STA)
Statistical Methods	(SMT)
Zoology	(ZOO)

Please note:
The remainder of the code indicates the year level and semester of presentation, for example MAT01A1 is a first-year module (1) in Mathematics (MAT) that will be presented in the first semester (A).

Approved BSc curricula with financial orientation, include modules from the College of Business and Economics.

Most of the modules listed above include practical work. Modules at first year level have one practical lecture of 3½ hours per week while second- and third-year modules may have more than one lecture per week or may be longer than 3½ hours.

SC.1.3.7 The modules with prerequisites are listed under Part 2 of this book.

SC.1.3.8 Students' attention is specifically drawn to the stipulations of regulations regarding requirements for promotion.

SC.1.3.9 AFRICAN INSIGHTS

African Insights (AFINSA1) is **compulsory** for all first-year undergraduate students of the University of Johannesburg. Upon completing the module, a student's academic record will reflect the successful completion of the module. These credits do not count towards the completion of their chosen qualifications. *African Insights* is a fully online module that is offered over thirteen weeks. All student support will take place online. Students **need to complete** African Insights **before they graduate**.

PART 2

SC.2 LIST OF MODULES WITH PREREQUISITES

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
ACTUARIAL SCIENCE			
Statistics	ACS02A2	Actuarial Science 2A	Mathematics Grade 12 – APS 7 (80%) at least 70% average for MAT01A1 and MAT01B1 **and** STA01A1 and STA01B1
Statistics	ACS02B2	Actuarial Science 2B	ACS02A2
Statistics	ACS03A3	Actuarial Science 3A	ACS02A2, ACS02B2 **and** STA02A2, STA02B2
Statistics	ACS03B3	Actuarial Science 3B	ACS03A3 **and** ACS02A2, ACS02B2 and STA02A2, STA02B2
ANALYTICAL TECHNIQUES			
Statistics	ATE01A1	Descriptive statistics	Mathematics Grade 12 – APS 4
Statistics	ATE01B1	Statistical inference	ATE01A1
Statistics	ATEACP2	Analytical Techniques 1A (online module)	Mathematics Grade 12 – APS 4
APPLIED MATHEMATICS			
Applied Maths	APM1EB1	Applied Mathematics 1A1E	Mathematics Grade 12 – APS 5
Applied Maths	APM2EA1	Applied Mathematics 1A2E	APM1EB1, MAT1EA1
Applied Maths	APM01A1	Introduction to Statics	Mathematics Grade 12 – APS 6 (BSc) Mathematics Grade 12 – APS 5 (Engineering)
Applied Maths	APM01B1	Introduction to Dynamics	APM01A1 **or** APM2EA1 **and** MAT01A1 **or** ASMA1A1 **or** ASME1A1 **or** MAT3EA1 **or** MATENA1
Applied Maths	APM02A2	Introduction to Differential equations	MAT01A1 **or** ASMA1A1 **or** MAT3EA1 **or** MATENA1 **or** ASME1A1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1 **and** APM01B1 or APMA1B1
Applied Maths	APM02B2	Introduction to Numerical Analysis	MAT01A1 **or** ASMA1A1 **or** MAT3EA1 **or** MATENA1 **or** ASME1A1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1 **and** APM01B1 or APMA1B1
Applied Maths	APM03A3	Mathematical Optimisation	APM01A1, APM01B1, APM02A2, APM02B2 **and** MAT01A1, MAT01B1, MAT01A2, MAT02A2, MAT01B2 and MAT02B2 (or equivalent alternative semester module offerings)
Applied Maths	APM03B3	Multi-linear Algebra	APM01B1, APM02A2, APM02B2 **and** MAT01A2, MAT02A2, MAT01B2 and MAT02B2 (or equivlanet alternative semester module offerings)
ALTERNATIVE SEMESTER APPLIED MATHEMATICS			
Applied Maths	APMA1A1	Introduction to Statics	Mathematics Grade 12 – APS 6 (BSc) Mathematics Grade 12 – APS 5 (Engineering)
Applied Maths	APMA1B1	Introduction to Dynamics	APM01A1 **or** APMA1A1 **and** MAT01A1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1
Applied Maths	APMA2A2	Introduction to Differential Equations	APM01B1 or APMA1B1 and MAT01A1 or MAT3EA1 or ASMA1A1 or MATENA1 and MAT01B1 or ASMA1B1 or MATENB1
Applied Maths	APMA2B2	Introduction to Numerical Analysis	APM01B1 or APMA1B1 and MAT01A1 or MAT3EA1 or ASMA1A1 or MATENA1 and MAT01B1 or ASMA1B1 or MATENB1
BIOCHEMISTRY			
Biochemistry	CEM01A1 **or** CEM1AC1 (60%) **or** CEM2EC1 and CEM3EC1 (average 65%) **and** CEM01B1 are compulsory modules for Biochemistry as major.		
Biochemistry	BIC01B1	Principles of Biochemistry	BIO10A1 **or** BIO2EA1
Biochemistry	BIC02A2	Biochemical Techniques and Enzymology	BIO10A1 **or** BIO2EA1 **and** BIC01B1, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 (60%) **or** CEM2EC1 **and** CEM3EC1 (Ave 65%) **and** CEM01B1 **and** MAT01A1

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
			or MAT2EB1 **and** MAT3EA1 **or** MAT1CA1 **or** MAT2EC1 **and** MAT3EC1 **or** ASMA1A1
Biochemistry	BIC02B2	Integrated Metabolism and Control	BIC02A2
Biochemistry	BIC03A3	Molecular Biology	BIC02A2, BIC02B2
Biochemistry	BIC03B3	Molecular Physiology	BIC02A2, BIC02B2
BOTANY			
Botany	CEM01A1 **or** CEM1AC1 **or** CEM2EC1, CEM3EC1 **and** CEM01B1 **or** CEM1DB1 are compulsory modules for Botany as a major.		
Botany	BIO1EB1	Biology 1A1E	Life Science Grade 12 – APS 4
Botany	BIO2EA1	Biology 1A2E	BIO1EB1
Botany	BIO10A1	Biology 1A	Life Science Grade 12 – APS 4
Botany	BOT01B1	Plant Diversity	BIO10A1 **or** BIO2EA1
Botany	BOT02A2	Plant Anatomy and Cytology	BIO10A1 **or** BIO2EA1, BOT01B1, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM01B1 **or** CEM1DB1
Botany	BOT02B2	Plant Physiology	BIO10A1 **or** BIO2EA1, BOT01B1, BOT02A2, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 **and** CEM3EC1 **and** CEM01B1 **or** CEM1DB1
Botany	BOT03A3	Biotechnology	BIO10A1 **or** BIO2EA1, BOT01B1, BOT02A2, BOT02B2, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM01B1 **or** CEM1DB1
Botany	BOT03B3	Plant Taxonomy	BIO10A1 **or** BIO2EA1, BOT01B1, BOT02A2, BOT02B2, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM01B1 **or** CEM1DB1
CHEMISTRY			
Chemical Sci	CEM1EA1	Chemistry 1A1E	Physical Science Grade 12 – APS 4
Chemical Sci	CEM2EB1	Chemistry 1A2E	CEM1EA1
Chemical Sci	CEM3EA1	Chemistry 1A3E	CEM2EB1
Chemical Sci	CEM01A1	Introduction to General Chemistry	Physical Science Grade 12 – APS 5
Chemical Sci	CEM01B1	Introduction to Physical and Organic Chemistry	CEM01A1 **or** CEM1EA1, 12EB1 and 3EA1 **or** a final mark of at least 60% in CEM1C **or** Average final mark of at least 65% for CEM2EC1 and CEM3EC1
Chemical Sci	CEM2EC1	Chemistry 1C2E	CEM1EA1
Chemical Sci	CEM3EC1	Chemistry 1C3E	CEM2EC1
Chemical Sci	CEM1AC1	Introduction to General Chemistry for Biological and Earth Sciences	Physical Science Grade 12 – APS 4
Chemical Sci	CEM1DB1	Environmental Chemistry: Atmosphere, Hydrosphere and Soil	CEM1AC1 **or** CEM2EC1 and CEM3EC1
Chemical Sci	CEM01A2	Structural Inorganic Chemistry	CEM01A1 **or** CEM3EA1 **or** at least 60% in CEM1AC1 **or** average 65% for CEM2EC1 **and** CEM3EC1 **and** CEM01B1, MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Chemical Sci	CEM02A2	Intermediate Physical Chemistry	CEM01A1 **or** CEM3EA1 **or** at least 60% in CEM1AC1 **or** average 65% for CEM2EC1 **and** CEM3EC1 **and** CEM01B1, MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Chemical Sci	CEM01B2	Intermediate Organic Chemistry	CEM01A1 **or** CEM3EA1 **or** at least 60% in CEM1AC1 **or** average 65% for CEM2EC1 **and** CEM3EC1 **and** CEM01B1, MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Chemical Sci	CEM02B2	Principles of Analytical Chemistry	CEM01A1 **or** CEM3EA1 **or** at least 60% in CEM1AC1 **or** average 65% for CEM2EC1 **and** CEM3EC1 **and** CEM01B1, MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Chemical Sci	CEM01A3	Advanced Physical Chemistry	CEM01A2, CEM02A2, CEM01B2, CEM02B2
Chemical Sci	CEM02A3	Co-Ordination Chemistry	CEM01A2, CEM02A2, CEM01B2, CEM02B2

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
Chemical Sci	CEM01B3	Instrumental Chemical Analysis	CEM01A2, CEM02A2, CEM01B2, CEM02B2
Chemical Sci	CEM02B3	Advanced Organic Chemistry	CEM01A2, CEM02A2, CEM01B2, CEM02B2
COMPUTER SCIENCE			
ACSSE	CSC01A1	Introduction to algorithm development (C++)	Mathematics Grade 12 – APS 6 Mathematics Grade 12 – APS 7 (B2I04Q – AI)
ACSSE	CSC01B1	Introduction to data structures (C++)	CSC01A1
ACSSE	CSC02A2	Object oriented programming	CSC01A1, CSC01B1
ACSSE	CSC02B2	Data communications	CSC02A2
ACSSE	CSC03A3	Advanced data structures and algorithms	CSC02A2 **and** CSC02B2 (**or** CSC02D2 (B2I04Q-AI))
ACSSE	CSC03B3	Computer system architectures	CSC02A2, CSC02B2
ACSSE	CSC02D2	Introduction to Artificial Intelligence	CSC02A2 **and** a minimum pass mark of 65% for CSC01B1 to continue with CSC02D2 (B2I04Q – AI) *(Students will be changed to B2I02Q degree where the pre-requisite was not met)*
ACSSE	CSC03D3	Artificial Intelligence Techniques	CSC03A3, CSC02D2
ACSSE	CSC03P3	Artificial Intelligence Project	MALEEA3
ENVIRONMENTAL MANAGEMENT			
Geography	ENM02A2	Environmental problems and sustainable development	GGR1EB1 **and** GGR2EA1 **or** GGR01A1 **and** GGR01B1
Geography	ENM03A3	Environmental ethics, economics, and administration	ENM02A2 **and** GGR02B2
Geography	ENM03B3	Environmental assessment, monitoring and mitigation	ENM02A2 **and** ENM03A3
GEOGRAPHY			
Geography	GGR1EB1	Geography 1A1E	Physical Science Grade 12 – APS 4
Geography	GGR2EA1	Geography 1A2E	GGR1EB1
Geography	GGR01A1	Introduction to Human Geography	Physical Science Grade 12 – APS 4
Geography	GGR01B1	Climatology and Geomorphology	GGR1EB1 **and** GGR2EA1 **or** GGR01A1
Geography	GGR02A2	Pedology and Biogeography	GGR1EB1 **and** GGR2EA1 **or** GGR01A1 **and** GGR01B1
Geography	GGR02B2	Economic and Population Geography	GGR1EB1 **and** GGR2EA1 **or** GGR01A1 **and** GGR01B1
Geography	GGR03A3	Geo-Informatics	GGR02A2 **and** GGR02B2
Geography	GGR03B3	Urban Geography and the SA City	GGR03A3
GEOLOGY			
Geology	GLG00A1	Geology 1 Field Techniques	GLG01A1
Geology	GLG01A1	Minerals, rocks and earth dynamics	Physical Science Grade 12 – APS 5
Geology	GLG01B1	Optical and Analytical Mineralogy	GLG01A1
Geology	GLG00A2	Geology 2 Field Techniques	GLG01B1
Geology	GLG22A2	Geology 2A	GLG01A1 **and** GLG01B1
Geology	GLG02B2	Structural geology and plate tectonics	GLG01A1, GLG01B1, **and** GLG22A2
Geology	GLG00A3	Geology 3 Field Mapping	GLG02B2
Geology	GLG10A3	Geology 3A Igneous Rocks	GLG01A1, GLG01B1, GLG22A2 **and** GLG02B2
Geology	GLG20A3	Geology 3A Metamorphic Rocks	GLG01A1, GLG01B1, GLG22A2 **and** GLG02B2
Geology	GLG03B3	Historical and Economic Geology 3	GLG01A1, GLG01B1, GLG22A2, GLG02B2, **and** GLG10A3, GLG20A3
Geology	APG02A2	Applied Geological Maps and Geospatial Techniques	GLG01A1 recommended
Geology	APG02B2	Applied Engineering and Environmental Geology	GLG01A1, GLG01B1

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
INFORMATICS			
ACSSE	IFM100	Informatics 100	Mathematics Grade 12 – APS 5
ACSSE	IFM01A1	Introduction to algorithm development (VB)	Mathematics Grade 12 – APS 6 Mathematics Grade 12 – APS 7 (B2I04Q – AI)
ACSSE	IFM01B1	Introduction to data structures (VB)	IFM01A1
ACSSE	IFM02A2	Database design	IFM01A1, IFM01B1
ACSSE	IFM02B2	Internet electronic commerce	IFM02A2
ACSSE	IFM03A3	Introduction to software engineering	IFM02A2, IFM02B2
ACSSE	IFM03B3	Advanced software engineering	IFM03A3
MATHEMATICS			
Mathematics	MAT1EA1	Pre-calculus	Mathematics Grade 12 – APS 5
Mathematics	MAT2EB1	Calculus of one-variable functions part 1	MAT1EA1
Mathematics	MAT3EA1	Calculus of one-variable functions part 2	MAT2EB1
Mathematics	MAT01A1	Calculus on One-variable functions	Mathematics Grade 12 - APS 6
Mathematics	MAT01B1	Applications of Calculus	MAT01A1 **or** ASMA1A1 **or** MAT3EA1 **or** MATENA1 **or** ASME1A1
Mathematics	MAT2EC1	Mathematics 1C2E	MAT1EA1
Mathematics	MAT3EC1	Mathematics 1C3E	MAT2EC1
Mathematics	MAT1CA1	Bio and Enviro Math & Stats	Mathematics Grade 12 - APS 5
Mathematics	MAT1DB1	Advanced Bio & Enviro Math Stats	MAT1CA1 **or** MAT3EC1
Mathematics	MAT01A2	Sequences, Series and Vector Calculus 2A1	MAT01A1 **or** MATENA1 **or** MAT3EA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1
Mathematics	MAT02A2	Linear Algebra A	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1)
Mathematics	MAT04A2	Discrete Mathematics – IT	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Mathematics	MAT01B2	Multivariable and Vector Calculus 2B1	MAT01A1 **or** MATENA1 **or** MAT3EA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1 **and** MAT01A2 **or** ASMA2A1
Mathematics	MAT02B2	Linear Algebra B	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1) **and** (MAT02A2 **or** ASMA2A2)
Mathematics	MAT04B2	Introductory Abstract Algebra - IT	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **and** MAT01B1 **or** ASMA1B1 **and** MAT02A2 **or** ASMA2A2 **and** MAT04A2 **or** ASMA2A4
Mathematics	MAT01A3	Real Analysis	MAT01A2 **or** ASMA2A1
Mathematics	MAT02A3	Discrete Mathematics	MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Mathematics	MAT01B3	Complex Analysis	MAT01B2 **or** ASMA2B1
Mathematics	MAT02B3	Introductory Abstract Algebra	MAT02A2 **or** ASMA2A2
For Faculty of Engineering and the Built Environment			
Mathematics	MATENA1	Calculus on One-variable functions for Engineers	Mathematics Grade 12 – APS 5
Mathematics	MATENB1	Applications of Calculus for Engineers	MATENA1 **or** ASME1A1 **or** MAT01A1 **or** ASMA1A1 **or** MAT3EA1
Mathematics	MATEAA2	Engineering Mathematics 2A2	(MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1)
Mathematics	MATEAB2	Engineering Mathematics 2B2	(MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1) **and** (MAT02A2 **or** ASMA2A2 **or** MATEAA2 **or** ASME2A2)

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
Mathematics	MATECA2	Engineering Sequences, Series and Vector Calculus 2A1	MAT01A1 **or** MATENA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1
Mathematics	MATECB2	Engineering Multivariable and Vector Calculus 2B1	MAT01A1 **or** MATENA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1 **and** MAT01B2 **or** MATECA2 **or** ASMA2A1 **or** ASME2A1
For College of Business and Economics			
Mathematics	MAA00A1	Introductory Mathematical Analysis A	Mathematics Grade 12 – APS 4
Mathematics	MAA00B1	Mathematical Analysis B	MAA00A1
Mathematics	MATDCA1	Mathematics: Finance and Business 1A	Mathematics Grade 12 – APS 3 **or** Mathematical Literacy Grade 12 – APS 5
Mathematics	MATDCB1	Mathematics: Finance and Business 1B	MATDCA1
Mathematics	MAT100	Business Mathematics 100	Mathematics Grade 12 – APS 5
Mathematics	MAEB0A1	Basic Mathematics and Applications in Economics and Business A *(Couplet)*	Mathematics Grade 12 – APS 3 **or** Mathematical Literacy Grade 12 – APS 6
Mathematics	MAEB0B1	Basic Mathematics and Applications in Economics and Business B *(Couplet)*	MAEB0A1 with 40%
ALTERNATIVE SEMESTER MATHEMATICS			
Mathematics	ASMA1A1	Calculus on One-variable functions	(Equivalent to MAT01A1) Maths Grade 12 - APS 6
Mathematics	ASMA1B1	Applications of Calculus	(MAT01B1) ASMA1A1
Mathematics	ASMA2A1	Sequences, Series and Vector Calculus 2A1	(MAT01A2) ASMA1A1, ASMA1B1
Mathematics	ASMA2B1	Multivariable and Vector Calculus 2B1	(MAT01B2) ASMA1A1, ASMA1B1, ASMA2A1
Mathematics	ASMA2A2	Linear Algebra A	(MAT02A2) ASMA1A1, ASMA1B1
Mathematics	ASMA2B2	Linear Algebra B	(MAT02B2) ASMA1A1, ASMA1B1, ASMA2A2
ALTERNATIVE SEMESTER MATHEMATICS FOR CBE			
Mathematics	ASMAAA1	Introductory Mathematical Analysis A	(MAA00A1) Mathematics Grade 12 – APS 4
ALTERNATIVE SEMESTER MATHEMATICS FOR ENGINEERING			
Mathematics	ASME1A1	Calculus on One-variable functions for Engineers	(MATENA1) Mathematics Grade 12 – APS 5
Mathematics	ASME1B1	Applications of Calculus for Engineers	(MATENB1) ASME1B1
Mathematics	ASME2A1	Engineering Sequences, Series and Vector Calculus 2A1	(MATECA2) ASME1A1, ASME1B1
Mathematics	ASME2B1	Engineering Multivariable and Vector Calculus 2B1	(MATECB2) ASME1A1, ASME1B1, ASME2A1
Mathematics	ASME2A2	Engineering Mathematics 2A2	(MATEAA2) ASME1A1, ASME1B1
Mathematics	ASME2B2	Engineering Mathematics 2B2	(MATEAB2) ASME1A1, ASME1B1, ASME2A2
MATHEMATICAL STATISTICS			
Statistics	STA1EB1	Statistics 1A1E	Mathematics Grade 12 – APS 5
Statistics	STA2EA1	Statistics 1A2E	STA1EB1
Statistics	STA01A1	Distribution Theory	Mathematics Grade 12 – APS 6
Statistics	STA01B1	Statistical Inference	STA01A1 **or** STA2EA1
Statistics	STA02A2	Probability Theory	STA01B1 **and** MAT01B1 **or** ASMA1B1
Statistics	STA02B2	Statistical inference and Distribution Theory	STA02A2
Statistics	STA03A3	Linear Models	STA02B2 **and** MAT01A2 **or** ASMA2A1 **and** MAT02B2 **or** ASMA2B2
Statistics	STA03B3	Stochastic Processes	STA02B2 **and** MAT01A2 **or** ASMA2A1
Statistics	STAE0A3	Statistics for Engineers	MATENB1 **or** ASME1B1

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
MICROBIOLOGY			
Botany	MCB02A2	Bacteriology and Virology	BIO10A1 **or** BIO2EA1, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM01B1 **or** CEM1DB1
Botany	MCB02B2	Microbial diversity and Plant pathology	BIO10A1 **or** BIO2EA1, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM01B1 **or** CEM1DB1
PHYSICS			
Physics	PHY1EA1	Physics 1A1E	Physical Science Grade 12 – APS 4
Physics	PHY2EB1	Physics 1A2E	PHY1EA1
Physics	PHY3EA1	Physics 1A3E	PHY2EB1
Physics	PHE2LB1	Physics L02E	PHY1EA1
Physics	PHE3LA1	Physics L03E	PHE2LB1
Physics	PHYL1A1	Physics for Life Sciences 1A	Physical Science Grade 12 – APS 4
Physics	PHYG1A1	General Physics for Earth Sciences	Physical Science Grade 12 – APS 4
Physics	PHYG1B1	Physics of the Earth and its Natural Environment	PHYG1A1
Physics	PHYS1A1	Physics S1A	Mathematics Grade 12 – APS 5
Physics	PHYS1B1	Physics S1B	PHYS1A1 **or** PHY3EA1
Physics	PHY00A2	Classical Mechanics and Special Relativity	PHYS1B1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Physics	PHY00B2	Static and Dynamic Electromagnetism	PHYS1B1 **and** MAT01A2 **or** ASMA2A1 **and** MAT02A2 **or** ASMA2A2 **or** APM02A2
Physics	PHY00Y2	Thermal Physics, Optics and Waves	PHYS1B1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Physics	PHY00A3	Quantum Mechanics and Modern Physics	PHY00A2, PHY00B2 **and** MAT01B2 **or** ASMA2B1 **and** MAT02B2 **or** ASMA2B2 **or** APM02B2
Physics	PHY00B3	Mathematical, Statistical and Solid-State Physics	PHY00A3
Physics for Faculty of Engineering and the Built Environment			
Physics	PHYE0A1	Engineering Physics 1A	Mathematics Grade 12 – APS 5
Physics	PHYE0B1	Engineering Physics 1B	PHYE0A1
Physics	PHYE2A2	Engineering Physics 2A	PHYE0B1 **and** MATENB1 **or** ASME1B1 **or** MAT01B1 **or** ASMA1B1
PHYSIOLOGY			
Zoology	PHS02A2	Basic Physiological concepts and Movement	-
Zoology	PHS02B2	Control Systems	PHS02A2
Zoology	PHS03A3	Visceral Organ Systems	PHS02B2
Zoology	PHS03B3	Advanced Integration	PHS03A3
STATISTICAL METHODS			
Statistics	SMT01A1	Statistical Methods 1A	Mathematics Grade 12 – APS 5
ZOOLOGY			
Zoology	ZOO11B1	Animal diversity	BIO10A1 **or** BIO1EB1, BIO2EA1
Zoology	ZOO22A2	General Parasitology	ZOO11B1
Zoology	ZOO22B2	Vertebrate anatomy, function and evolution	ZOO11B1
Zoology	ZOO33A3	Ecology	-
Zoology	ZOO33B3	Comparative Animal Physiology	BIO10A1 **or** BIO1EB1, BIO2EA1 **and** CEM01A1 **and** CEM01B1 **or** CEM1AC1 **or** CEM2EC1 and CEM3EC1 **and** CEM1DB1

ALPHABETICAL LIST OF BEd MODULES WITH PRE-REQUISITES

DEPT	CODE	NAMES OF MODULES	PRE-REQUISITES
Geography	GR1AFET	Geography 1A for FET	Grade 12 Physical Science (APS 3) **or** Life Science (APS 3) **or** Mathematics (APS 4) **or** Mathematical Literacy (APS 6) **and** Geography (APS 3)
Geography	GR1BFET	Geography 1B for FET	Grade 12 Physical Science (APS 3) **or** Life Science (APS 3) **or** Mathematics (APS 4) **or** Mathematical Literacy (APS 6) **and** Geography (APS 3)
Geography	GR2AFET	Geography 2A for FET	GR1AFET **and** GR1BFET
Geography	GR2BFET	Geography 2B for FET	GR1AFET **and** GR1BFET
Geography	GR3AFET	Geography 3A for FET	GR2AFET **and** GR2BFET
Geography	GR3BFET	Geography 3B for FET	GR2AFET **and** GR2BFET
Botany	LSFT0A1	Life Sciences 1A for FET	Grade 12 Mathematics (APS 4) **or** Mathematical Literacy (min. APS 6) **and** Physical Science **or** Life Science (min. APS 4)
Botany	LSFT0B1	Life Sciences 1B for FET	LSFT0A1
Botany	LSFT0A2	Life Sciences 2A for FET	LSFT0A1 **and** LSFT0B1
Botany	LSFT0B2	Life Sciences 2B for FET	LSFT0A2
Botany	LSFT0A3	Life Sciences 3A for FET	LSFT0A2 **and** LSFT0B2
Botany	LSFT0B3	Life Sciences 3B for FET	LSFT0A3
Mathematics	MAFT0A1	Mathematics 1A for FET	Grade 12 Mathematics (min. APS 4) **or** Grade 12 Mathematical Literacy (min. APS 6)
Mathematics	MAFT0B1	Mathematics 1B for FET	MAFT0A1
Mathematics	MAFT0A2	Mathematics 2A for FET	MAFT0A1
Mathematics	MAFT0B2	Mathematics 2B for FET	MAFT0B1
Mathematics	MAFT0A3	Mathematics 3A for FET	MAFT0B1 **and** MAFT0B2
Mathematics	MAFT0B3	Mathematics 3B for FET	MAFT0B1
Physics	PSFT0A1	Physical Sciences 1A for FET (Physics)	Grade 12 Physical Science **and** Mathematics (APS min. 4)
Chemical Sci	PSFT0B1	Physical Sciences 1B for FET (Chemistry)	Grade 12 Physical Science **and** Mathematics (APS min. 4)
Physics	PSFT0A2	Physical Sciences 2A for FET (Physics)	PSFT0A1
Chemical Sci	PSFT0B2	Physical Sciences 2B for FET (Chemistry)	PSFT0B1
Physics	PSFT0A3	Physical Sciences 3A for FET (Physics)	PSFT0A2
Chemical Sci	PSFT0B3	Physical Sciences 3B for FET (Chemistry)	PSFT0B2

PART 3

SC.3 ACADEMIC AND FACULTY SPECIFIC REGULATIONS

A selection of the Academic Regulations (AR) for the specific attention of students in the Faculty of Science is given below.

*In the Academic Regulations of the University reference is made to Faculty-specific rules. The list below provides the **number and text of the Academic Regulation** together with the interpretation or application of the specific regulation in the Faculty of Science in italics. In cases where no faculty-specific interpretation is given, the Academic Regulation applies.*

2.3.22 **"Faculty-specific assessment"** means opportunities such as continuous assessments that are determined by academic departments and approved by the Faculty Board.

Module-specific assessment criteria as approved by the Faculty are set out in the relevant learning guides in accordance with Regulation 10.2.

2.3.33 **"Marks"** means the following in the defined context:

(a) **"Final mark"** means a mark calculated according to a prescribed ratio/proportion and/or weighting per programme of the final period or semester or year mark and the mark of the last summative assessment opportunity, determined by the Faculty Board.

Calculation of the final mark of a module, as approved by the Faculty, is set out in the relevant learning guides.

(b) "**Final period/semester/year mark"** means the mark obtained from summative assessment opportunities during the period of registration for the module. The final period or semester or year mark obtained from the summative assessment is calculated as determined by the Faculty Board.

The relative weighting applied to the various assessments in each module is set out in the relevant learning guides.

2.3.40 **"Module"** is a learning component (building block) within a programme of study towards a qualification and means the following in the defined context:

a) **"Compulsory module"** is a module that students must register for as part of a particular programme and whose outcomes must be achieved successfully before a qualification can be awarded.

b) **"Couplet module"** is a first-semester module followed by the second-semester module where the content of the second-semester module is dependent on the content of the first-semester module, subject to a minimum of 40% obtained for the first-semester module to progress to the second-semester module.

c) **"Elective module"** is any module that can be exchanged for another module as provided for in the programme.

d) **"Semester module"** is a module that extends over one semester (approximately 14 academic weeks) as reflected in the academic calendar approved by Senate.

g) **"Term module"** is a module that extends over one term (approximately 7 academic weeks) within a particular semester as reflected in the academic calendar as approved by Senate.

2.3.48 **"Plagiarism"** means passing off ideas, however expressed, including in the form of phrases, words, images, artefacts, sounds, or other intellectual or artistic outputs, as

one's own when they are not one's own; or such passing off, as an original contribution, of ideas that are one's own but have been expressed on a previous occasion for assessment by any academic institution or in any published form, without acknowledgement of the previous expression. Plagiarism is understood as one of several related forms of academic dishonesty, all of which are addressed in the Student Disciplinary Code and the UJ Policy on Academic Misconduct (once approved).

"**Actionable plagiarism**" means *Plagiarism* that:

(a) Vitiates the attempt fairly and meaningfully to assess and, where relevant, assign a mark, grade, or other outcome to the work in question; *and/or*

(b) Is such that an educational response (which may include capping or prescribing a mark) is inappropriate and that a formal academic response or a disciplinary response is appropriate, given the plagiarism history of the student, the nature and extent of the plagiarism, the level of the student, and all the other relevant circumstances of the case; *or*

(c) In the case of work that is not submitted for assessment (for example, work submitted by a graduate student to a supervisor or lecturer for comment), is deemed by the individual academic staff member in question to be actionable, having regard to the nature of the offence, the plagiarism history of the student, the possibility or probability of repeat offence, and all the other circumstances of the case.

2.3.52 **"Promotion"** means the advancement of students who meet the minimum requirements of a particular study level from that particular study level to the next (e.g. from the first-year level to the second-year level) as determined per programme by the academic department and the relevant Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.

The conditions for promotion as set out in Regulation 6 apply. Any deviations from these will be programme-specific and set out in the Faculty Rules and Regulations under the particular programme.

2.3.59 **"Service learning"** means a form of teaching and learning that is directed at specific community needs and integrated into a credit-bearing academic programme and curriculum in which students participate in contextualised, well-structured and organised service activities aimed at addressing identified service needs in a community and subsequently reflect on such experiences in order to gain a deeper understanding of the linkage between curriculum, content and community dynamics as well as to achieve personal growth and a sense of social and civic responsibility. The experience is assessed and takes place under the supervision and/or mentorship of a person/s representing the community. A collaborative partnership that enhances mutual reciprocal teaching and learning among all members of the partnership (lecturers and students, members of the communities or representatives of the service sector) is required. See also work integrated learning.

2.3.60 **"Special assessment opportunity"** means a further assessment opportunity equivalent to the original assessment opportunity aimed at accommodating students who were unable to be assessed in the original assessment opportunity.

2.3.64 **"Supplementary assessment opportunity"** means an assessment that supplements the original assessment granted to students. Admission to this assessment opportunity is based on the results of the original assessment opportunity.

2.3.70 **"Work integrated learning"** means the component of a learning programme that focuses on the application of learning in an authentic learning work-based context under the supervision and/or mentorship of a person/s representing the workplace. It addresses specific competencies identified for the acquisition of a qualification that make the student employable and assist in the development of related personal attributes. Workplace/service employees and professional bodies are involved in the assessment of the learning experience together with the University's academic employees. See also service learning.

4. ADMISSION

4.1 General minimum admission requirement principles for an undergraduate programme

4.1.1 Admission requirements and compliance with the legal endorsement for undergraduate programmes for study at the University are as follows:

(a) A National Senior Certificate (NSC) with higher certificate endorsement is a legal requirement for admission into a higher certificate.

(b) A NSC with diploma endorsement is a legal requirement for admission into an undergraduate diploma.

(c) A NSC with bachelor's degree endorsement is a legal requirement for admission into an undergraduate bachelor's degree.

(d) A SC(A) with relevant endorsement, with a pass of three subjects at 40%, one of which must be an official language at Home Language Level or pass subjects at 30%, one of which must be an official language at First Additional or Home Language Level or obtained a subminimum of 20% in the sixth subject.

(e) A NASCA is awarded at certification of 120 credits with at least four subjects passed, carrying 30 credits each.

(f) An applicant who has successfully completed a Higher Certificate at an accredited Higher Education Institution (HEI) may be admitted into an appropriate Advanced Certificate.

(g) An applicant who has successfully completed a Higher Certificate at an accredited HEI and has accumulated relevant credits may be admitted to a related undergraduate diploma programme, subject to the candidate being granted a NSC with diploma endorsement by Universities South Africa (USAf) after the successful completion of the Higher Certificate (refer to AR 6 for credit requirements).

(h) An applicant who has successfully completed an undergraduate diploma, may be admitted into an undergraduate bachelor's degree programme, subject to the candidate being granted an NSC with bachelor's degree endorsement by USAf (refer to AR 6 for credit requirements).

(i) Other progression and/or articulation requirements, as reflected in the Higher Education Qualifications Sub Framework (HEQSF), are applicable.

(j) Applicants who have completed their (NSC) or (SC) must comply with the minimum Admission Point Score (APS).

(k) All applicants must comply with the language requirements, faculty and qualification or module requirements for admission into each programme as outlined by the relevant faculty.

(l) International applicants wishing to register for undergraduate or postgraduate fully online qualifications will be required to demonstrate equivalence with the above admission requirements, with certification of equivalence by SAQA or USAf where required.

(n) Other additional admission requirements may be:
  (i) Admission and placement tests as approved by Senate;
  (ii) Interviews in person or online;
  (iii) Portfolios of evidence;
  (iv) Recognition of Prior Learning (RPL) process;
  (v) SAQA or USAf certification of equivalents;
  (vi) Language proficiency tests;
  (vii) Senate discretionary admission.

The specific requirements for admission to the Faculty of Science are set out in regulation SC.1 in the Faculty Rules and Regulations.

4.2 Table used for calculating the Admission Point Score (APS)

APS	NATIONAL			INTERNATIONAL										
	NSC/IEB/SACAI	SC HG (M-SCORE)	SC SG (M-SCORE)	HIGCSE/NSSC (HL)	IGCSE/NSSC (OL)	AS LEVELS	A LEVELS	IB (HL)	IB (SL)	WAEC	KCSE	Diplome/Exam D' Etat	CHL/EM	Baccalaureate
10							A	7						
9							B	6						
8							C	5						
7	7 (80-100%)	A		1		A	D	4	7		A			
6	6 (70-79%)	B	A	2		B	E	3	6		B			
5	5 (60-69%)	C	B	3	A	C		2	5	A	C	80-100%	16-20	16-20
4	4 (50-59%)	D	C	4	B	D		1	4	B	D	70-79%	14-15	14-15
3	3 (40-49%)	E	D		C	E			3	C	E	50-69%	10-13	10-13
2	2 (30-39%)	F	E		D/E				2	D/E	F	30-49%	8-9	8-9
1	1 (0-29%)	G	F		F/G				1	F/G	G	0-29%	0-7	0-7

4.4 Admission requirements for applicants who obtained the National Senior Certificate (NSC) in 2008 or later

(a) Life Orientation is not counted in the calculation of the total APS nor is it considered as an individual compulsory subject.

(b) In total six **subjects** are used for the calculation of the APS. The total APS of an applicant is the sum of the achievement ratings of the programme compulsory subjects and the remaining NSC subjects of that applicant.

(c) If applicants completed more than the minimum number of subjects in their NSC, the compulsory subjects and the best three remaining subjects will be used to calculate the total APS.

(d) Refer to the UJ Prospectus/Website for the requirements per qualification and Faculty.

4.9 Minimum admission requirements applicable to Bachelor programmes

a) Senior Certificate (SC) with complete or conditional exemption.

b) National Senior Certificate (NSC) with admission to a bachelor's degree endorsement,
or
Senate discretionary admission may be considered for candidates with an NSC endorsed with admission to a diploma, who have applied for admission to an undergraduate bachelor's degree at the University. Senate may consider such matter on recommendation by the relevant Executive Dean in accordance with the Regulations on Senate Discretionary Exemption.

c) Admission tests, as approved by Senate;

d) APS;

e) Language requirements;

f) Faculty and/or programme-specific requirements as determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.10 Alternative admission requirements

4.10.1 **Senate Discretionary Conditional Admission**

Senate Discretionary Conditional Admission for candidates who have successfully completed the National Senior Certificate or National Certificate or National Certificate

(Vocational) or ASC or NASCA and who have applied for admission to an undergraduate programme at the University may be considered by Senate on recommendation of the relevant Executive Dean, subject to successfully completing a PsyCaD assessment and the NBT and obtaining at least Higher Intermediate Level.

4.10.2 **School of Tomorrow applicants**

The Executive Dean, together with the Registrar, may approve admission of School of Tomorrow applicants via the Senate discretional admission process subject to Faculty Rules and Regulations, the applicant successfully completing a PsyCaD assessment and the NBT (obtaining at least Higher Intermediate level).
The request for Senate Discretionary Admission should serve at the first Senate meeting, following the conditional admission for final Approval by Senate.

4.10.3 **Recognition of prior learning (RPL)**

The University may, on the grounds of RPL, and subject to Senate-approved special admission rules, admit students who do not comply with the minimum admission requirements.

The Faculty of Science Policy on RPL will be followed. A student who has obtained entry to any level based on RPL is not entitled to the award of the qualification which normally determines entry to the study, even if the study is not completed.

4.11 Application for admission to study at the University

4.11.1 Prospective students must apply for admission to programmes not later than the determined programme specific closing dates as stipulated on the official UJ website. An annually determined application fee is payable for paper applications. Online applications are free.

4.11.2 Admission is subject to selection in accordance with programme-specific admission requirements determined by the Faculty Board, as well as minimum requirements set for transfer students, approved by Senate and contained in the relevant Faculty Rules and Regulations.

The Faculty of Science does not have specific regulations applicable to transferring students.

4.11.5 Admission is also subject to:

a) the University's Enrolment Management Plan approved by the DHET, the Senate and Faculty Boards;
b) caps for elective modules as approved;
c) professional regulatory requirements where programmes are regulated by external regulatory boards/councils;
d) requirements related to the student equity profile;
e) Senate approved selection, placement and admission tests.
f) caps on enrolment into fully online programmes as determined annually by the faculties.

4.12 Admission of International applicants

Refer to the Academic Regulations.
International applicants wishing to register for undergraduate or postgraduate qualifications will be required to demonstrate equivalence with the admission requirements, with certification of equivalence by SAQA or USAf where required.

5. REGISTRATION

5.1.18 Students may not register simultaneously for two programmes at the University, or for a programme or module at another university, concurrently with their registration at the University without prior written consent of the Executive Dean or his/her delegated authority of the relevant faculty in consultation with the Registrar and the relevant authority of the other university.

5.1.19 At least 50% of all the required modules (including all exit-level modules) that a student must successfully complete for an undergraduate qualification to be awarded or conferred must be completed at the University to obtain the qualification certification.

5.1.20 Only in exceptional cases may the Executive Dean or his/her delegated authority in consultation with the Registrar grant permission to complete an exit-level module at another higher education institution.

5.1.22 A student may not register for more than the prescribed number of modules per academic year/semester as:

a) approved by Faculty Board and Senate;
b) reflected in Faculty rules and regulations and curriculum;
c) specified per year level.

The Executive Dean of the Faculty may approve a maximum of two additional semester modules or one year-module per academic year.

5.1.23 Faculty Boards may determine the maximum number of students who may register for a programme or module in accordance with the University's Enrolment Management Plan or in order to ensure quality teaching.

Unless approved by the Executive Dean:

- *No student will be permitted to register for two or more modules in the same semester of any year if any lecture, tutorial or practical session of the relevant modules are allocated the same timetable period.*
- *The module on the lower academic level will have to be completed before registration for the other module/s will be permitted.*

5.1.27 Registration and re-registration or renewal of registration for any programme is subject to satisfactory academic performance and other rules of the University. A student may be deregistered and refused permission to re-register on the ground of unsatisfactory academic performance and behaviour disqualifying the student to be issued with a Statement of Good Conduct by the University. The standards of academic performance required from students to permit them to re-register appear in the Academic Regulations and Faculty Rules and Regulations. The University is not required to issue warnings to students to improve their academic performance before deregistering them or refusing them permission to re-register on the ground of poor unsatisfactory academic performance, but if such warnings are issued, students can thereafter be deregistered or refused permission to re-register if they fail to meet the conditions attached to the warning. Persons, who are prevented from re-registering on the ground of unsatisfactory academic performance and may appeal their academic exclusion in terms of the Academic Regulations, may only exercise that right once.

5.2 Documents to be submitted upon registration

At registration, prospective students who register for the first time at the University may be required to submit, together with their registration documents, certified copies of the documents specified below.

5.2.1 First-year students

a) SA identity document, international identity document, passport or permanent residence permit, where applicable.
b) Senior Certificate or National Senior Certificate or equivalent qualification only when specifically requested by faculties.

5.2.2 Transfer students from other higher education institutions

a) SA identity document, international identity document, passport or permanent residence permit where applicable.
b) Senior Certificate or National Senior Certificate or equivalent qualification only when specifically requested by faculties.
c) Certified copies of academic record from the previous higher education institution(s)
d) Certified copies of certificate of conduct if not included on the academic record.

e) Additional faculty programme requirements determined by the relevant Faculty Boards.

The decision to accept or reject modules passed at the previous higher education institution is vested in the Head of the relevant department.

Confirmation by the Head of Department that the student has been accepted is required. (This also applies to B Tech degree/Advanced Diploma registrations).

5.2.3 International students

a) Passport
b) Study permit
c) Postgraduates: SAQA evaluation of previous qualification
d) Undergraduates: USAf evaluation of the school-leaving certificate
e) English proficiency test certificate or proof of English passed at school-leaving level or at a level determined by the relevant faculty.
f) Proof of South African medical insurance cover.

5.7 Programme and module changes

5.7.1 After the official registration period and within the appointed time, students may change their registration only with the permission of the HFA of the faculty.

5.7.2 Application for module or programme changes must be made according to the University and Faculty rules. These changes are subject to approval according to the Academic Regulations.

5.8 Cancellation of studies

5.8.1 Students cancel their studies in a particular programme or module by official notification on a prescribed form and in accordance with the prescribed procedure thereof before the date determined by the University. This form is submitted to the relevant faculty officer for processing.

5.8.3 Cancellation of semester or year module(s) should be done 21-calendar days before the start of the final assessment period. Cancellation of continuously evaluated year modules should be done 42-calendar days before the commencement of assessment opportunities. After this deadline, semester, or year modules (including continuously evaluated modules) will be regarded as failed if the student did not participate in the assessments. Refer to 5.8.1 for procedure.

5.9 Service or work integrated learning

5.9.1 If service (SL) or work integrated (WIL) learning forms an integral part of a programme, this period is included in the programme as part of the study period.

5.9.2 The University supports students to obtain relevant SL or WIL placement opportunities.

5.10 Registration and assessment

5.10.1 Students may not attend lectures or any contact sessions in a module, receive study material or supervision, or have access to any electronic study material or sources or be assessed in a module if they are not registered students at the University for the relevant module for the relevant academic year.

5.10.2 No assessment result obtained by a student is official if the student was not registered for the relevant module when the result concerned was obtained.

5.11 Class attendance

5.11.1 Students have the responsibility to attend all classes unless they have a legitimate reason, and where appropriate, the necessary evidence thereof, for being absent.

5.11.2 Students might be required at any time to account for their irregular class attendance, either by personal explanation to their lecturer or by a written statement from a guardian or another authority.

5.11.3 In borderline academic result cases, information on class attendance is taken into account by faculties.

5.11.4 Students are expected to attend a minimum of 80% of tutorials that are indicated as compulsory tutorials.

5.11.5 Faculties might have rules regarding the compulsory attendance of practical, laboratory and clinical classes as contained in the Faculty Rules and Regulations.

6. CREDIT AND PROMOTION REQUIREMENTS FOR UNDERGRADUATE PROGRAMMES

6.1 Students may receive credit once only for an interchangeable module in any one programme at the equivalent NQF level.

6.3 Students retain credit for a module passed for a period of seven years, provided that there have been no material changes to the curriculum. This provision also applies when modules are presented for credit/exemption or renewal or registration purposes. For credit/exemption purposes, the NQF level of the completed module presented for credit/exemption must be at the same NQF level of the module offered in the qualification for which the credit/exemption is being requested. Exceptions from any of the aforesaid may only be permitted by the Executive Dean in consultation with the Head of Department and the Registrar.

Any deviations from this regulation will be department-specific, apply ad hominem and will be subject to approval by the Executive Dean.

6.4 Faculty specific promotion requirements and deregistration rules are contained in the Faculty Rules and Regulations and are applied in addition to the other regulations in this section.

These regulations refer to students who are rated as E1/E2 or F7/BF
*An **E1** global result is applied by the Faculty Office at the end of the FIRST semester and requires that all the modules for which the student is registered in the SECOND semester have to be passed.*

*An **E2** global result is applied by the Faculty Office at the end of the SECOND semester and requires that all the modules for which the student is registered in the FIRST semester of the following year have to be passed.*

*An **E1/E2** global result is applied when:*
a) *fewer than 60% of the modules for which the student was registered in a given semester have been passed, **AND***
b) *the student is able to continue with at least 50% of the modules prescribed for the relevant qualification.*

The continued registration of such a student is conditional and permission to continue in the faculty must be obtained from the Faculty Office.

*A student is rated **F7/BF** when his/her success rate is extremely poor. It will be applied to a student who:*
a) *has already had one or more previous E1/E2 ratings, OR*
b) *has failed all the modules in a semester, OR*
c) *cannot continue to the next semester, irrespective of whether in the same or the following year of study.*

*Students with an **F7/BF** global result will not be permitted to continue with their studies in the faculty.*

6.5 Students who have temporarily discontinued their studies and who have passed a module whose content has in the meantime undergone substantial changes may be refused admission to a module for which this module is a prerequisite.

6.6 Students who have failed a module twice will not be allowed to continue their studies in the same module at the University, except with the permission of the Executive Dean or his/her delegated authority on recommendation of the relevant HOD after consultation with the lecturer, or on recommendation of the faculty's examination or

assessment committee. When a module is failed, a student must repeat the module at the first opportunity when it is offered again.

This regulation includes any modules failed previously at another higher education institution.

6.7 To be admitted to any module in the second, third or fourth academic year of study, and progress to the following year of study, students must have passed at least 60% of the modules registered for in the previous academic year of study for contact programmes.

To be admitted to any module in the second academic year of study, a student must have passed at least 60% of the modules prescribed for the relevant qualification in the previous year of study.

To be admitted to any module in the third/final academic year of study, a student must have passed:

a) *ALL the modules of the first academic year of study, AND*
b) *At least 60% of the modules prescribed for the relevant qualification in the previous year of study.*

6.8 Students who have not been promoted to the following year of study for any two years of study will not be permitted to continue with that programme and will academically be excluded except with the special permission of the Executive Dean or his/her delegated authority. The Executive Dean or his/her delegated authority may stipulate conditions for students to continue with their studies.

6.9 If students have been granted special permission to continue with studies as determined in AR 6.6 and AR 6.8, the Executive Dean or his/her delegated authority may refuse continuation of studies if their progress in the first semester is unsatisfactory. Students may also be refused further admission if they continue to perform unsatisfactorily at the end of the relevant academic year and will be academically excluded.

The Executive Dean will determine what constitutes unsatisfactory performance.

6.10 The formal time during which students were registered for a particular programme at another higher education institution, as well as their results at such institution, may be considered in applying AR 6.6, AR 6.8 and AR 6.9.

7. APPEALS AGAINST ACADEMIC EXCLUSION

Applicants who want to appeal must follow the prescribed procedure by submitting their motivation and supporting documents online via the UJ website (uLink) during the prescribed submission period according to faculty guidelines and in accordance with UJ policies. Failure to do so within the prescribed submission period may result in the opportunity lapsing.

In cases where students have been academically excluded and granted a supplementary assessment opportunity, the student will be required to write the supplementary examination and submit an application to appeal the academic exclusion. A student who wrote the supplementary examination should have no expectation that the academic exclusion will be lifted if the examination is passed.

(a) The Faculty Appeals Committee will consider the appeals and may refuse or allow re-admission.
(b) The students will be notified in writing of the outcome of the appeal.
(c) The decision of the Faculty Appeals Committee is final subject to AR 7(f).
(d) Students who omitted to provide information or documentation material to an appeal cannot provide it at a later stage if the appeal was unsuccessful.
(e) Students who transfer to another faculty retain their academic history related to their previous registration for any other programme(s).
(f) When a Faculty Appeals Committee allows re-admission under circumstances where a student had submitted incorrect, incomplete or fraudulent information/ documentation that is material to an appeal, the Faculty Appeals Committee may

reverse its decision and the registration of the student may be cancelled and the exclusion reinstated.

8. EXEMPTION AND RECOGNITION REQUIREMENTS

8.1 A Head of Department may, in consultation with the Executive Dean or his/her delegated authority in accordance with a list of exemptions approved by the Executive Dean, grant exemption from and award a credit for a module, of which the content of the module was at least 80% the same, to students on the grounds that they have passed a relevant module at the University or at another accredited higher education institution.

8.2 Exemption from modules and awarding of credit, as stipulated in A-Regulation 8.1, may not be granted for more than half the number of modules required in an undergraduate programme in which exemption and recognition are requested. A faculty may determine rules and regulations in this regard congruent with the existing Faculty Rules and Regulations, and subject to approval by Senate. At least half the number of semester modules, including the exit level modules where appropriate, should be passed at the University in order for the University to award the diploma or confer the degree. The Executive Dean concerned, in consultation with the Registrar, may give permission to the student (for legitimate reasons) to complete such exit level module(s) at another HEI in South Africa, or abroad in accordance with the academic record concerned. For the purposes of this sub-regulation, a year module counts as two semester modules, and one term module counts as half a semester module.

8.3 Only in exceptional circumstances may the Executive Dean or his/her delegated authority grant exemption from an exit level or semester core module that has been passed at another institution or in another programme.

The Executive Dean will determine whether exceptional circumstances apply.

8.4 Exemption from or credit for a module may only be granted for one further programme in addition to the programme in which the module was originally completed.

10. DURATION OF PROGRAMME

These are guiding principles regarding the duration of programmes unless specified differently in the Faculty Rules and Regulations.

10.1 The minimum duration of a programme is in accordance with the HEQSF and HEMIS requirements.

10.2 The maximum duration of a **full-time** contact programme is as indicated in Table 3 Duration of Programmes.

10.3 For any contact programme offered **part time**, one additional year may be added to the maximum duration of that contact programme, i.e. one year may be added to the duration as in Column C.

10.4 The maximum duration of the distance (fully online) programmes offered by UJ is as stipulated in Column D. The maximum duration of an online programme allows for one additional year (12 months where applicable) in comparison to the maximum period of the contact programme.

10.5 Apart from master's and doctoral programmes, the duration of contact programmes is inclusive of any interruption of studies unless approval is granted prior to the interruption by the faculty.

(a) For all qualifications up to NQF Level 8 the maximum period is inclusive of interruption of studies.

(b) For master's and doctoral qualifications, the maximum period excludes an interruption of studies. A request for an interruption of study will only be granted in exceptional circumstances and must be approved prior to interruption of studies as stipulated in the Higher Degrees Policy.

10.6 Students who fail to complete the programme within the maximum period will be allowed to continue with the programme only if granted special permission by the Executive Dean on recommendation of the relevant HOD or the faculty's Examination or Assessment Committee.

10.7 Maximum duration of study for distance education programmes (carousel model and non-carousel):
While the carousel model is designed to allow students to interrupt their studies for one or more modules, thus providing the student with flexibility, it is important to bear in mind that each programme has a maximum duration of study, as indicated in Table 3 Duration of Programmes.

10.8 For the purposes of calculating the duration taken to complete a distance (fully online) programme or a master's by research, the number of months will be utilised where applicable.

10.9 Table 3 stipulates the maximum periods of enrolment for full-time and part-time study. For distance (fully online) master's and doctoral programmes, the maximum periods are calculated in terms of the months a student is registered. The month in which a student registers or completes the studies will count as a full month. Should re-registration be required due to resubmission of a minor dissertation or dissertation or thesis, this extended period will be included in the calculation of the registration period.

Table 3. Duration of Programmes

Qualification	**Minimum Credits** **A**	**Minimum Duration** **B**	**Maximum Duration** **C**	**Maximum Duration for Distance (fully online) Programmes** **D**
Higher Certificate	120	1 year	2 years	
Advanced Certificate	120	1 year	2 years	
Diploma	240	2 years	3 years	48 months*
UG Diploma	360	3 years	5 years	72 months*
UG Extended Diploma	360	4 years	6 years	
Advanced Diploma	120	1 year	2 years	36 months*
UG Degree	360	3 years	5 years	72 months*
UG Extended Degree	360	4 years	6 years	
UG Professional Degree	480	4 years	6 years	
PG Diploma	120	1 year	2 years	
Honours Degree	120	1 year	2 years	36 months*
Master's Degree (Coursework)	180	1 year	24 months	36 months
Master's Degree (Research)	180	1 year	24 months	36 months
Doctoral Degree	360	2 years	48 months	60 months

*** Please note that the number of months will be utilised as an indicator to determine whether a student has obtained a qualification with distinction.**

10.10 Students must comply with the minimum duration of a particular programme, even in the event where credit(s) have been granted towards the programme as stipulated in Table 3 Duration of Programmes (page 46).

The UJ Academic Regulations do allow for exceptions to this rule: Students who fail to complete the programme within the maximum period will be allowed to continue with the programme only if granted special permission by the Executive Dean on recommendation of the relevant HOD or the faculty's Examination or Assessment Committee.

11. TEACHING, LEARNING AND ASSESSMENT

11.1.1 Teaching, learning and assessment take place in accordance with the University's Teaching and Learning Policy, Assessment Policy, and the Online Policy Framework.

11.1.2 Registered students have a right to tuition in accordance with the Senate-approved academic timetable or Senate-approved Online Policy Framework.

11.1.3 The University does not permit student behaviour that disrupts formal teaching and learning activities.

11.1.4 Any form of dishonesty, including plagiarism, in relation to any assessment event in any programme, will be dealt with in accordance with the University's disciplinary code and/or criminal law.

11.1.5 Programme-specific assessments and regulations are determined by the Faculty Board and Senate.

11.2 Assessment opportunities

11.2.5 Every summative assessment opportunity carries a predetermined weight that takes the integration of the outcomes into account. A number of smaller summative assessments may count as one assessment opportunity in a module.

A student who does not participate in all assessment opportunities in a module and has not been excused from participation by the relevant lecturer, will only be permitted to pass in exceptional circumstances, and after submission of a written motivation from the relevant Head of Department to, and approved by, the Executive Dean, irrespective of the weighted average of the marks obtained by the student.

11.2.6 When a summative assessment opportunity is used as a last (comprehensive) assessment opportunity, a minimum final period/semester or year mark of 40% is required for admission to the summative assessment opportunity concerned.

Attendance of practicals, where applicable, are required for admission.

11.2.8 Assessments should include opportunities to give students timeous, meaningful and constructive feedback.

11.3 Assessment results

11.3.5 When a traditional examination is used as a last assessment opportunity, the module is deemed a pass if the following marks have been obtained:

(a) a last summative assessment mark (examination mark) of at least 40%; **and**

(b) a final mark of at least 50%. (This means that if a student obtains a final mark of 50% but has not met the 40% requirement for the examination mark, the student will qualify for a supplementary examination).

11.3.6 When a final assessment opportunity is used for continuous assessment, programme-specific requirements, as approved by the Faculty Board and contained in the Faculty Rules and Regulations will be adhered to. The number, type, weight and date of assessments, replacement and/or supplementary assessments are pre-set and agreed upon by the assessor and moderator before the beginning of the unit/module or programme. Summative assessments are not limited to written assessments and may include a variety of assessment methods and/or instruments or portfolios as indicated in the Faculty Learning Guides.

11.3.7 Students pass a continuous assessment module if they obtain a weighted final mark of at least 50% (or more if stipulated by a professional/regulating body).

11.3.9 A couplet module consists of two modules in the academic year concerned whereby the second module builds on the first module. A final period/semester mark, examination mark and a final mark of at least 40% each in the first semester are required for admission to the second semester module. To pass the couplet, a combined final mark of at least 50% must be obtained in the same year.

11.3.10 If a couplet module is not passed on the combined final marks, the module(s) in which the final mark is less than 50% must be repeated.

11.4 Appeals

11.4.1 After the final mark for a module has been published, students may apply to the lecturer responsible for the allocation of the final summative assessment opportunity for an explanation of the mark awarded in the cases where:

a) the student has failed the module with a final mark of at least 45%; or

b) the last summative assessment (examination) mark is at least 15% lower than their module mark; or

c) a module was passed without distinction, but either the module mark (i.e. semester or year mark) or last summative assessment (examination) mark was a distinction mark

11.4.2 Requests for the explanation of the award of final marks in the final summative assessment opportunity as indicated in AR 11.4.1 must be made within 10 days after classes have commenced for the second semester for first semester assessments. In the case of a second semester assessment opportunity, requests must be made at least three days prior to the commencement of the academic programme in the following year. No assessment material (for example, answer scripts or portfolios) or copies of it may be provided to students after such explanatory discussion, if such material would not otherwise have been returned to the student.

11.4.3 If, after the explanation has been provided as described in AR 11.4.2, students are still dissatisfied with the award of marks, they may appeal to the Executive Dean or his/her delegated authority who may, at their own discretion, decide to appoint an external arbiter to re-assess the final and/or last summative assessment. A fee, as determined by the University, is payable for the assessment by arbitration.

11.5 Special summative assessment and supplementary summative assessment opportunities

11.5.1 Special summative assessment opportunities are considered by the faculty in which the programme/qualification resides, for students who, in the event of illness, for compassionate reasons, on religious grounds or for similar legitimate reasons, were prevented from attending a summative assessment opportunity. Students may be granted a special summative assessment opportunity if they apply for it within seven calendar days after the original date of the relevant summative assessment opportunity. The Executive Dean or his/her delegated authority, in consultation with the relevant HOD, considers all applications and decides whether to grant the special summative assessment opportunity

The Faculty Board determines the procedure for and manner of such application in accordance with University procedure. The application procedure must be contained in the relevant programme-specific information or learning guide.

11.5.2 The Assessment Committee or a senior administrative officer of a faculty in which the module resides may grant a student a supplementary last summative assessment opportunity if

(a) the student failed a module but obtained a final mark of at least 40%;
or
(b) the student failed a module but obtained a final period/semester/year mark of at least 60%;

11.5.3 The Assessment Committee or the Executive Dean or his/her delegated authority of a faculty in which the qualification resides may grant a student a supplementary last summative assessment opportunity, if the student requires not more than the equivalent of two semester modules or one-year module for the completion of the relevant qualification, provided that the student:

(a) was registered for the relevant module in the current academic year; and
(b) was admitted to, and participated in the last assessment opportunity in the relevant module; and
(c) has complied with all the experiential or practical requirements prescribed for the qualification (where applicable), excluding work-integrated modules.

The Executive Dean or his/her delegated authority of the faculty in which the qualification resides may, in exceptional circumstances and in consultation with the Executive Dean of the faculty, in which the particular modules reside, waive one or more of the conditions specified in (c).

11.5.4 In all other circumstances, students may not be granted another supplementary summative assessment opportunity if they have used and failed a previous one, except if the Executive Dean of the faculty in which the qualification resides has waived the requirement.

11.5.5 Supplementary summative assessment for continuous assessment modules are scheduled as part of the assessment plan for a particular module. The following applies:

(a) To be granted a supplementary assessment opportunity for a particular component in the continuous assessment portfolio, a minimum of 40% must have been obtained for that particular component.
(b) Supplementary assessments are according to each faculty's internal assessment policy..
(c) A maximum of no more than a pass mark is awarded for the supplementary assessment of the particular component in the continuous assessment portfolio..

11.5.6 Special summative assessment and supplementary assessment opportunities should be equivalent to the original assessment regarding the scope, standard and duration.

11.5.7 The weight of the summative assessment opportunity granted must retain its original weighting.

11.5.8 Students are personally responsible for ascertaining whether they qualify for a special assessment or a supplementary assessment opportunity and for acquainting themselves with the details of the timetable and the venue.

11.5.9 Students' entitlement to a special or supplementary summative assessment opportunity lapses if they fail to use the opportunity.

11.5.10 In the case of a supplementary of the last summative assessment, for example, the examination – the final mark of the module is capped at 50%. This rule does not apply to continuous assessment modules (Refer to AR 11.5.5).

11.5.11 No capping of a final mark is applicable in the case of a special summative assessment opportunity.

11.6 Obtaining a qualification

11.6.1 Students obtain a qualification if they have passed every module prescribed for a programme and have successfully completed service or work integrated learning where applicable. It is the student's responsibility to ensure all prescribed modules, service or work integrated learning are completed.

11.6.2 A qualification is awarded or conferred with distinction if the requirements below are met:

(a) Duration:
  (i) Students must complete an undergraduate programme in the minimum period of study specified for the programme, unless the Executive Dean has approved a longer period of study for legitimate reasons.
  (ii) Students must complete an advanced diploma, postgraduate diploma or an honours qualification within one year if registered full-time and within two years if registered part-time.
  (iii) Students must complete a master's qualification within the maximum period allowed for the master's programme.

(b) Average final mark for the qualification:
  (i) Students must achieve a weighted and/or proportional calculated average final mark for an undergraduate qualification of at least 75% as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.
  (ii) Students must achieve an average final mark for an advanced diploma, postgraduate diploma or an honours qualification of at least 75% calculated by weighting the final marks for all the modules comprising the qualification in accordance with the NQF credit values allocated to the modules.
  (iii) Students for a master's qualification by dissertation must achieve a final mark of at least 75% for the dissertation.
  (iv) Students for a master's qualification by coursework must achieve an average final mark for the qualification of at least 75% calculated by weighting the average final marks for all the coursework modules and the final mark for the minor dissertation in accordance with the credit values allocated to all the coursework modules and the minor dissertation respectively (for example, if the credit value of the minor dissertation represents 40% of the total credit value of the qualification, the average final mark for the qualification will be weighted in the proportion of 40 for the minor dissertation and 60 for all the coursework modules).
  (v) Decimal marks may be rounded upwards or downwards in accordance with the decision taken by the Faculty Assessment Committee concerned.

(c) A student must never have failed a module as a first attempt in the relevant programme.
(d) A student must have obtained a minimum mark of 65% in every prescribed module at NQF level 6 for Diplomas, NQF 7 for Advanced Diplomas/BTech and Degrees, NQF level 8 for Professional Bachelor Degrees, Postgraduate Diplomas and Honours Degrees and NQF level 9 for Master's Degrees and, in the case of a master's qualification by coursework, in the minor dissertation as well.
(e) Students must have been registered for the full curriculum as prescribed for each academic year on a full-time or part-time basis, as the case may be.
(f) If students are transferred from another Higher Education Institution in the same qualification to UJ the same requirements as stated shall apply.
(g) If students change programmes within the UJ, only the modules related to the new programme will be taken into consideration in calculating whether the qualification is obtained with distinction.

In addition to the requirements set out above, the following applies:

- *Modules at first year level have a weight of 1, at second year level a weight of 2 and at third year level a weight of 3, irrespective of the year of study during which the module is passed.*

- *Students registered for the Extended Degree or Extended Diploma have to fulfil the following requirements:*
  Modules at first year level (offered over a two-year period) have a weight of 1
  at second year level (in the third year) have a weight of 2, and
  at third year level (in the fourth year) a weight of 3, irrespective of the year of study during which the module is passed.

11.7 Students with disabilities

11.7.1 Students wishing to submit an application for special assessment conditions, based on the grounds of a disability, must do so in accordance with the procedure prescribed in the University's Policy on People with Disabilities.

11.7.2 Students should submit the application, together with reports supporting the request, from a Registered Health Professional to the Disability Unit at the beginning of every semester/year. The request should clearly specify the needs and concessions requested, including concession recommendations from a Registered Health Professional. These applications will be submitted to the UJ Concessions Committee (Charter: UJ Concessions Committee). After consideration, the Disability Unit will refer the request, together with a recommendation to the respective student who will discuss it with his/her lecturer to support the concession.

11.7.3 The confidential nature of information regarding a disability will always be honoured. The information will only be revealed with students' written consent or, where applicable, that of their parents or guardians

11.8 Access control during assessments

11.8.1 Students may not enter a summative assessment venue later than 30 minutes after the official starting time of the summative assessment opportunity to take part in the assessment opportunity, and neither may they leave the assessment venue during the first 30 minutes of an assessment opportunity or during the last 15 minutes of the allocated assessment time.

11.8.2 Students must identify themselves as required for admission to an assessment venue.

During an assessment event the access card must be placed on the student's desk where it is to be in plain view for the duration of the assessment event.

A student who is not in possession of an access card (for whatever reason) must place another form of identification on the desk. The alternative form of identification must be a formal document that shows the student's name, photograph and National Identity number or other reference number (a driver's licence or passport, for example).

A student who is not in possession of any of the above forms of identification will be required to provide his/her National Identity number in addition to the student number on the attendance slip and assessment script.

The assessment script and attendance slip of any student without an access card will be prominently marked by the invigilator as an indication to the assessor that the student was unidentified and possibly suspect.

11.9 Transgressions during any assessment opportunity

11.9.1 Students commit a transgression when

(a) they commit plagiarism;
(b) during a formal assessment opportunity, the student is in possession of any book, cell phone, electronic devices that has not been switched off, memorandum, notes in whatsoever form, or any papers, documents or database equipment, except for access to such answer books or other books, papers or documents that the invigilator has supplied or access to such other sources that the invigilator authorised as per instructions of the examiner;
(c) students help or attempt to help other students, or obtain help or attempt to obtain help from other students, or obtain help or attempt to obtain help from any source of information, with the exception of explicitly approved sources as permitted by the assessor;
(d) students help other students to commit an offence (also considering that students are under an obligation to take all reasonable measures to ensure that other students do not have access to their work);
(e) students have unauthorised information stored on a pocket calculator, cell phone or any other device brought into the assessment venue, whether or not they have had the opportunity to access such information;
(f) students cause a disturbance in the proximity of, or inside the assessment venue, or conduct themselves in an improper or unbecoming manner;
(g) students disregard the instructions of invigilators or assessors;
(h) students pose as other students.

11.9.2 Persons who are not registered for a relevant module and are present in an assessment venue with the intention of taking part in the assessment are guilty of fraud and may face disciplinary procedures or legal action.

11.9.3 Executive Deans of Faculties can initiate disciplinary procedures in certain cases. They may implement disciplinary procedures with regard to alleged transgressions in class assessments, assignments, tasks and essays as well as undisciplined behaviour towards academic or administrative staff.

11.10 Irregularities during participation in summative assessment and practical opportunities

11.10.1 Students who, in the opinion of the invigilator, commit an irregularity during an assessment or practical opportunity will have their assessment script, product or any other material or equipment that, in the opinion of the invigilator pertains to the irregularity, confiscated immediately with the time recorded on it. Students will be issued immediately with a new assessment script or any other relevant material or equipment and the time of issue will be written on the front cover of the script.

11.10.5 If the suspected offence involves an electronic device, the invigilator will consult the assessor before responding to the offence as described in AR11.10.1.

Before commencement of the assessment event students are advised that all cell phones and any other unauthorized electronic devices have to be switched off and remain so for the duration of the assessment event. They must remove these devices from their persons and place them on the floor under their seats or in their bags.

Any cell phone or other unauthorized electronic device that is seen to be held in the hand or operated in any way for whatever reason once the assessment has formally

begun, will be confiscated by the invigilator. Any scripts will be dealt with in accordance with Regulation 11.10.1.

Confiscated phones will be left on the invigilators' table in full view to protect the invigilator from accusations of tampering.
Any student who refuses to hand the cell phone to the invigilator or argues will be deemed to have disqualified him/herself from the assessment event, will have his/her script/s removed and will be required to leave the venue immediately (or once the first half hour of the assessment period has lapsed (refer to Regulation 11.8).

All details pertaining to any such incidents will be reported in writing to the Head of Department and the Executive Dean by the staff member/s involved.

REGISTRATION WITH THE SOUTH AFRICAN COUNCIL FOR NATURAL SCIENTIFIC PROFESSIONS (SACNASP)

Students who anticipate registering with the SACNASP after completion of their studies are advised to note that their curricula must comply with the following requirements (among others) set by the SACNASP:

Programme content

1. The degree or diploma held by a graduate applying for registration shall be composed of subjects or modules of which **at least 50% of the total credits can be classified as natural science subjects or modules;**
2. Such qualification shall include at least **one subject from the generic fields of practice listed in Schedule 1 of the Act, must be studied in increasing depth and breadth of FOUR years and must be based on at least two of the appropriate level-1 basic natural science subjects of physics, chemistry, mathematics and /or biology;**
3. In cases where the appropriate natural science requirements are not met, an additional period of study shall be required to achieve the appropriate natural science content.

It is important to note that not all degrees will necessarily meet the qualification requirements. Students are, therefore, advised to consult departmental staff members should they have any queries regarding registration with the SACNASP.

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PART 4

SC.4 CURRICULA FOR UNDERGRADUATE PROGRAMMES

SC.4.1 BACHELOR OF SCIENCE – INFORMATION TECHNOLOGY – LEVEL 7

Purpose and characteristics of the programme

This qualification is primarily designed to provide a well-rounded, broad education that equips graduates with the knowledge base, theory and methodology of information technology. The purpose of the BSc Information Technology programme is to develop qualified scientists who can identify, evaluate and solve problems associated with information technology and be able to assume and demonstrate initiative and responsibility in related academic and professional contexts in South Africa as well as in the international world. With the focus of the programme being on the principles, theory and practice of information technology, the students acquire the appropriate competence and research ability that serves as a basis for entry into the labour market and a range of professional training, practice as well as postgraduate studies opportunities associated with information technology.

Exit-level outcomes

Students should be able to:

- Identify, interpret, analyse and solve routine as well as unfamiliar problems and issues using enquiry and theory-driven arguments
- Demonstrate effectiveness in working with others in a team by taking responsibility for their own work and showing regard for the work of others
- Identify, evaluate and address their own task-specific learning needs
- Develop good information retrieval as well as quantitative and/or qualitative data analysis, synthesis and evaluation skills, including the appropriate use of ICT
- Demonstrate a well-grounded, systematic and integrated knowledge, theory and practice of information technology
- Monitor and evaluate their own academic development and progress based on commonly applied information technology applicable criteria
- Present and communicate information and ideas and opinions in well-structured arguments, adhering to appropriate academic/ professional discourse
- Use science and technology reliably in variable and unfamiliar contexts and adhere to recognised professional and/or ethical standards, seeking guidance where appropriate
- Identify, distinguish, effectively select and apply procedures, processes, methods/ techniques of enquiry and research applicable to information technology related contexts.

COMBINATION OF MAJORS	SC. NO	CODE
Computer Science and Informatics (4 Years)	4.1.1	B2E01Q
Information Technology (3 Years)	4.1.2	B2I01Q
Computer Science and Informatics (3 Years)	4.1.3	B2I02Q
Computer Science and Informatics with Artificial Intelligence (3 Years)	4.1.4	B2I04Q

Refer to Part 1 for General Rules of Admission

CURRICULA

4.1.1	Bachelor of Science in Computer Science and Informatics	B2E01Q

FIRST YEAR

First Semester	**Second Semester**
Informatics 1A	Informatics 1B
Mathematics 1A1E	Mathematics 1A2E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B

Choose one set of elective semester modules:

Business Management 1A	Electrotechnics 1B
Geography 1A	Geography 1B
Information Technology Management 1A	Information Technology Management 1B

THIRD YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Informatics 2A	Informatics 2B

Choose one set of elective modules: One semester module or its equivalent, per semester chosen from the elective modules listed below, provided the appropriate prerequisites have been met:

Electrotechnics 2A*	Electrotechnics 2B*
Geography 2A	Geography 2B
Information Technology Management 2A	Information Technology Management 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Mathematics 2A2, 2A4	Mathematics 2B2, 2B4

Any other combination of four second year Mathematics modules that may be approved ***ad hoc***, provided there are no timetable clashes, and the necessary prerequisites are adhered to.

FOURTH YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Informatics 3A	Informatics 3B

* Electrotechnics 2 may be taken if Business Management 1 and Electrotechnics 1 were taken in the first year

4.1.2	Bachelor of Science in Information Technology	B2I01Q

FIRST YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Informatics 1A	Informatics 1B
Mathematics 1A	Mathematics 1B
Business Management 1A	Electrotechnics 1B **or** Information Management 2B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B0
Informatics 2A	Informatics 2B
Mathematics 2A1, 2A2 **or** Mathematics 2A2, 2A4	Mathematics 2B1, 2B2 **or** Mathematics 2B2, 2B4

Any other combination of four second year Mathematics modules that may be approved ***ad hoc***, provided there are no timetable clashes, and the necessary prerequisites are adhered to.

THIRD YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Informatics 3A	Informatics 3B

4.1.3	Bachelor of Science in Computer Science and Informatics	B2I02Q

FIRST YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Informatics 1A	Informatics 1B
Mathematics 1A	Mathematics 1B

Choose one set of elective modules
One semester module or its equivalent, per semester chosen from the elective modules listed below:

Applied Mathematics 1A	Applied Mathematics 1B
Business Management 1A	Electrotechnics 1B
Geography 1A	Geography 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Informatics 2A	Informatics 2B

Choose one set of elective modules
One semester module or its equivalent, per semester chosen from the elective modules listed below provided the appropriate prerequisites have been met:

Applied Mathematics 2A	Applied Mathematics 2B
Electrotechnics 2A*	Electrotechnics 2B*
Geography 2A	Geography 2B
Mathematics 2A1, 2A2 **or**	Mathematics 2B1, 2B2 **or**
Mathematics 2A2, 2A4	Mathematics 2B2, 2B4
Statistics 2A	Statistics 2B

Any other combination of four second year Mathematics modules that may be approved ***ad hoc*** provided there are no timetable clashes, and the necessary prerequisites are adhered to.

THIRD YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Informatics 3A	Informatics 3B

* Electrotechnics 2 may be taken if the Business Management and Electrotechnics 1 were taken in the first year

4.1.4	Bachelor of Science in Computer Science and Informatics with Artificial Intelligence	B2I04Q

FIRST YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Informatics 1A	Informatics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2D
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2

Choose one set of elective modules

One semester module or its equivalent, per semester chosen from the elective modules listed below provided the appropriate prerequisites have been met:

Information Management 2A	Information Management 2B
Statistics 2A	Statistics 2B

Any other combination of four second year Mathematics modules that may be approved ***ad hoc*** provided there are no timetable clashes, and the necessary prerequisites are adhered to.

THIRD YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3D
Machine Learning 3A	AI Project

SC.4.2 BACHELOR OF SCIENCE - LIFE AND ENVIRONMENTAL SCIENCES - LEVEL 7

Purpose and characteristics of the programme

This qualification is primarily designed to provide a well-rounded, broad education that equips graduates with the knowledge base, theory and methodology of life and environmental sciences. The purpose of the BSc Life and Environmental Sciences is to develop qualified scientists who can identify, evaluate and solve problems associated with life, earth and environmental sciences and be able to assume and demonstrate initiative and responsibility in related academic and professional contexts in South Africa as well as in the international world. With the focus of the programme being on the principles and theory of the life and environmental sciences with the possible applications thereof, the students acquire the appropriate competence and research ability that serves as a basis for entry into the labour market and a range of professional training and practice as well as postgraduate studies opportunities.

Exit level outcomes

Students should be able to:

- Identify, interpret, analyse and solve routine as well as unfamiliar problems and issues using enquiry and theory-driven arguments
- Demonstrate effectiveness in working with others in a team by taking responsibility for their own work and showing regard for the work of others
- Identify, evaluate and address their own task-specific learning needs
- Develop good information retrieval as well as quantitative and/or qualitative data analysis, synthesis and evaluation skills, including the appropriate use of ICT
- Demonstrate a well-grounded, systematic and integrated knowledge and theory of the life and environmental sciences
- Monitor and evaluate their own academic development and progress based on a commonly applied life and environmental sciences related criteria
- Present and communicate information and ideas and opinions in well-structured arguments, adhering to appropriate academic/ professional discourse
- Use science and technology reliably in variable and unfamiliar contexts and adhere to recognised professional and/or ethical standards, seeking guidance where appropriate
- Identify, distinguish, effectively select and apply procedures, processes, methods/ techniques of enquiry and research applicable to the life and environmental sciences related context.

COMBINATION OF MAJORS	SC. NO	CODE
BACHELOR OF SCIENCE LIFE AND ENVIRONMENTAL SCIENCE (4 years)		
Botany and Biochemistry	4.2.1	B2E10Q
Botany and Chemistry	4.2.2	B2E11Q
Botany and Zoology	4.2.3	B2E12Q
Geography and Environmental Management	4.2.4	B2E13Q
Biochemistry and Physiology	4.2.5	B2E14Q
Physiology and Psychology	4.2.6	B2E15Q
Biochemistry and Zoology	4.2.7	B2E17Q
Chemistry and Zoology	4.2.8	B2E18Q
Environmental Management and Zoology	4.2.9	B2E19Q
Geography and Zoology	4.2.10	B2E20Q
Physiology and Zoology	4.2.11	B2E21Q
BACHELOR OF SCIENCE LIFE AND ENVIRONMENTAL SCIENCE (3 years)		
Botany and Biochemistry	4.2.12	B2L10Q
Botany and Chemistry	4.2.13	B2L11Q
Botany and Zoology	4.2.14	B2L12Q
Biochemistry and Zoology	4.2.15	B2L13Q
Chemistry and Zoology	4.2.16	B2L14Q

Environmental Management and Zoology	4.2.17	B2L15Q
Geography and Zoology	4.2.18	B2L16Q
Physiology and Zoology	4.2.19	B2L17Q
Physiology and Biochemistry	4.2.20	B2L18Q
Physiology and Psychology	4.2.21	B2L19Q
Geography and Environmental Management	4.2.22	B2L20Q
Geology and Environmental Management	4.2.23	B2L24Q
Geology and Geography	4.2.24	B2L25Q

Refer to Part 1 for General Rules of Admission

CURRICULA

4.2.1	Bachelor of Science in Life and Environmental Sciences in Biochemistry and Botany	B2E10Q

FIRST YEAR

First Semester
Computer Competence 1
Chemistry 1A1E
Mathematics 1A1E
Physics 1A1E
anguage for Science

Second Semester
Biology 1A1E
Chemistry 1A2E **or** 1C2E*
Mathematics 1A2E** **or** 1C2E
Physics L02E
Language for Science

SECOND YEAR

First Semester
Biology 1A2E
Chemistry 1A3E **or** 1C3E*
Mathematics 1A3E** **or** 1C3E
Physics L03E

Second Semester
Biochemistry 1B
Botany 1B
Chemistry 1B

Choose one elective module
Mathematics 1B ** **or** 1D
Zoology 1B

THIRD YEAR

First Semester
Biochemistry 2A*
Botany 2A

Second Semester
Biochemistry 2B*
Botany 2B

Choose one set of electives
Chemistry 2A1, 2A2**
Microbiology 2A
Zoology 2A

Chemistry 2B1, 2B2**
Microbiology 2B
Zoology 2B

FOURTH YEAR

First Semester
Biochemistry 3A
Botany 3A

Second Semester
Biochemistry 3B
Botany 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are pre-requisites for Chemistry 2.**

4.2.2	Bachelor of Science in Life and Environmental Sciences in Botany and Chemistry	B2E11Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Biology 1A1E
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Mathematics 1A1E	Mathematics 1A2E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Botany 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B
Mathematics 1A3E	Mathematics 1B
Physics L03E	
	Choose one elective module
	Biochemistry 1B
	Zoology 1B

THIRD YEAR

First Semester	**Second Semester**
Botany 2A	Botany 2B
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2**
Choose one set of elective modules	
Biochemistry 2A*	Biochemistry 2B*
Microbiology 2A	Microbiology 2B
Zoology 2A	Zoology 2B

FOURTH YEAR

First Semester	**Second Semester**
Botany 3A	Botany 3B
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Chemistry 2 and Biochemistry 2.**

4.2.3	Bachelor of Science in Life and Environmental Sciences in Botany and Zoology	B2E12Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Biology 1A1E
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Mathematics 1A1E	Mathematics 1C2E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Botany 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B **or** 1D**
Mathematics 1C3E	Zoology 1B
Physics L03E	
	Choose one elective module
	Biochemistry 1B
	Mathematics 1D

THIRD YEAR

First Semester	**Second Semester**
Botany 2A	Botany 2B
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Biochemistry 2A*	Biochemistry 2B*
Microbiology 2A	Microbiology 2B

FOURTH YEAR

First Semester	**Second Semester**
Botany 3A	Botany 3B
Zoology 3A	Zoology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Biochemistry 2.**

**** Chemistry 1D does not allow access to Biochemistry 2**

4.2.4	Bachelor of Science Life and Environmental Sciences in Geography and Environmental Management	B2E13Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Biology 1A1E
Chemistry 1A1E	Chemistry 1C2E
Mathematics 1A1E	Geography 1A1E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Botany 1B
Chemistry 1C3E	Chemistry 1D
Geography 1A2E	Geography 1B
Anthropology 1A **or** Sociology 2A	Zoology 1B

THIRD YEAR

First Semester	**Second Semester**
Geography 2A	Geography 2B
Environmental Management 2A	Project Management 3B
Choose one set of elective modules	
Botany 2A	Botany 2B
Zoology 2A	Zoology 2B

FOURTH YEAR

First Semester	**Second Semester**
Geography 3A	Geography 3B
Environmental Management 3A	Environmental Management 3B

4.2.5	Bachelor of Science in Life and Environmental Sciences in Biochemistry and Physiology	B2E14Q

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Computer Competence 1	Biology 1A1E
Mathematics 1A1E*	Mathematics 1A2E** **or** 1C2E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Biochemistry 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B
Mathematics 1A3E** **or** 1C3E	Zoology 1B
Physics L03E	
	Choose one elective module
	Mathematics 1B ** **or**
	Mathematics 1D

THIRD YEAR

First Semester	**Second Semester**
Biochemistry 2A*	Biochemistry 2B*
Physiology 2A	Physiology 2B
Choose one set of elective modules	
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2**
Microbiology 2A	Microbiology 2B

FOURTH YEAR

First Semester	**Second Semester**
Biochemistry 3A	Biochemistry 3B
Physiology 3A	Physiology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are pre-requisites for Chemistry 2.**

4.2.6	Bachelor of Science in Life and Environmental Sciences in Physiology and Psychology	B2E15Q

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Computer Competence 1	Biology 1A1E
Mathematics 1A1E	Mathematics 1C2E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Chemistry 1A3E **or** 1C3E*	Chemistry 1B **or** 1D
Psychology 1A	Psychology 1B
Biology 1A2E	Zoology 1B
Mathematics 1C3E	Mathematics 1D

THIRD YEAR

First Semester	**Second Semester**
Physiology 2A	Physiology 2B
Developmental Psychology 2A **or**	Social Psychology 2C **or**
Personality Psychology 2H	Positive Psychology 2D **or**
	Contemporary Psychology 2F

Choose one set of elective modules

Microbiology 2A	Microbiology 2B
Zoology 2A	Zoology 2B

FOURTH YEAR

First Semester	**Second Semester**
Physiology 3A	Physiology 3B
Research Psychology 3A **or**	Psychopathology 3D **or**
Community Psychology 3E **or**	Psychotherapy 3F
Cognitive Psychology 3G	

PLEASE NOTE: If a student is planning to register for Honours in Psychology, then Psychology 3A must be selected

4.2.7	Bachelor of Science in Life and Environmental Sciences in Biochemistry and Zoology	B2E17Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Biology 1A1E
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Mathematics 1A1E*	Mathematics 1A2E** **or** 1C2E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Biochemistry 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B
Mathematics 1A3E** **or** 1C3E	Zoology 1B
Physics L03E	
	Choose one elective module
	Botany 1B
	Mathematics 1B** **or**
	Mathematics 1D

THIRD YEAR

First Semester	**Second Semester**
Biochemistry 2A*	Biochemistry 2B*
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Botany 2A	Botany 2B
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2**
Microbiology 2A	Microbiology 2B

FOURTH YEAR

First Semester	**Second Semester**
Biochemistry 3A	Biochemistry 3B
Zoology 3A	Zoology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are pre-requisites for Chemistry 2.**

4.2.8	Bachelor of Science in Life and Environmental Sciences in Chemistry and Zoology	B2E18Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Biology 1A1E
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Mathematics 1A1E	Mathematics 1A2E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Zoology 1B
Mathematics 1A3E	Mathematics 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B
Physics L03E	
	Choose one elective module
	Biochemistry 1B
	Botany 1B

THIRD YEAR

First Semester	**Second Semester**
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2**
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Biochemistry 2A*	Biochemistry 2B*
Botany 2A	Botany 2B
Microbiology 2A	Microbiology 2B

FOURTH YEAR

First Semester	**Second Semester**
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2
Zoology 3A	Zoology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are pre-requisites for Chemistry 2.**

4.2.9	Bachelor of Science in Life and Environmental Sciences in Environmental Management and Zoology	B2E19Q

FIRST YEAR

First Semester

Chemistry 1A1E
Computer Competence 1
Mathematics 1A1E
Language for Science

Second Semester

Biology 1A1E
Chemistry 1C2E
Geography 1A1E
Mathematics 1C2E
Language for Science

SECOND YEAR

First Semester

Biology 1A2E
Geography 1A2E
Chemistry 1C3E
Mathematics 1C3E

Second Semester

Zoology 1B
Geography 1B
Chemistry 1D

Choose one elective module

Botany 1B
Mathematics 1D

THIRD YEAR

First Semester

Environmental Management 2A
Microbiology 2A
Zoology 2A

Second Semester

Geography 2B
Project Management 3B
Zoology 2B

FOURTH YEAR

First Semester

Environmental Management 3A
Zoology 3A

Second Semester

Environmental Management 3B
Zoology 3B

4.2.10	Bachelor of Science in Life and Environmental Sciences in Geography and Zoology	B2E20Q

FIRST YEAR

First Semester	**Second Semester**
	Biology 1A1E
Chemistry 1A1E	Chemistry 1A2E **or** 1C2E*
Computer Competence 1	Geography 1A1E
Physics 1A1E	Physics L02E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Biology 1A2E	Zoology 1B
Chemistry 1A3E **or** 1C3E*	Chemistry 1B
Geography 1A2E	Geography 1B
Physics L03E	
	Choose one elective module
	Biochemistry 1B
	Botany 1B

THIRD YEAR

First Semester	**Second Semester**
Geography 2A	Geography 2B
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Biochemistry 2A*	Biochemistry 2B*
Botany 2A	Botany 2B
Microbiology 2A	Microbiology 2B

FOURTH YEAR

First Semester	**Second Semester**
Geography 3A	Geography 3B
Zoology 3A	Zoology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Biochemistry 2.**

4.2.11	Bachelor of Science in Life and Environmental Sciences in Zoology and Physiology	B2E21Q

FIRST YEAR

First Semester
Computer Competence 1
Chemistry 1A1E
Mathematics 1A1E
Language for Science

Second Semester
Biology 1A1E
Chemistry 1A2E **or** 1C2E*
Mathematics 1C2E
Language for Science

SECOND YEAR

First Semester
Biology 1A2E
Chemistry 1A3E **or** 1C3E*
Mathematics 1C3E
~~Human Anatomy 1A~~

Second Semester
Zoology 1B
Chemistry 1B **or** 1D

Choose two elective modules
Biochemistry 1B
~~Human Anatomy 1B~~
Mathematics 1D

THIRD YEAR

First Semester
Physiology 2A
Zoology 2A

Second Semester
Physiology 2B
Zoology 2B

Choose one set of elective modules
Biochemistry 2A*
Microbiology 2A

Biochemistry 2B*
Microbiology 2B

FOURTH YEAR

First Semester
Physiology 3A
Zoology 3A

Second Semester
Physiology 3B
Zoology 3B

*** An average final mark of 65% in Chemistry 1C2E and 1C3E offers entrance to Chemistry 1B which is a pre-requisite for Biochemistry 2.**

4.2.12	**Bachelor of Science in Life and Environmental Sciences in Biochemistry and Botany**	**B2L10Q**

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A **or** 1C*
Mathematics 1A** **or** 1C
Physics for Life Sciences L1A

Second Semester
Botany 1B
Chemistry 1B
Biochemistry 1B

Choose one elective module
Mathematics 1B ** **or** 1D
Zoology 1B

SECOND YEAR

First Semester
Biochemistry 2A*
Botany 2A

Choose one set of electives
Chemistry 2A1, 2A2**
Microbiology 2A
Zoology 2A

Second Semester
Biochemistry 2B*
Botany 2B

Chemistry 2B1, 2B2**
Microbiology 2B
Zoology 2B

THIRD YEAR

First Semester
Biochemistry 3A
Botany 3A

Second Semester
Biochemistry 3B
Botany 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are prerequisites for Chemistry 2.**

4.2.13	Bachelor of Science in Life and Environmental Sciences in Botany and Chemistry	B2L11Q

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A **or** 1C*
Mathematics 1A
Physics for Life Sciences L1A

Second Semester
Botany 1B
Chemistry 1B
Mathematics 1B

Choose one elective module
Biochemistry 1B
Zoology 1B

SECOND YEAR

First Semester
Botany 2A
Chemistry 2A1, 2A2**

Choose one set of elective modules
Biochemistry 2A*
Microbiology 2A
Zoology 2A

Second Semester
Botany 2B
Chemistry 2B1, 2B2

Biochemistry 2B*
Microbiology 2B
Zoology 2B

THIRD YEAR

First Semester
Botany 3A
Chemistry 3A1, 3A2

Second Semester
Botany 3B
Chemistry 3B1, 3B2

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are prerequisites for Chemistry 2.**

4.2.14	**Bachelor of Science in Life and Environmental Sciences in Botany and Zoology**	**B2L12Q**

FIRST YEAR

First Semester	**Second Semester**
Biology 1A	Botany 1B
Chemistry 1A **or** 1C*	Chemistry 1B **or** 1D**
Mathematics 1A **or** 1C	Zoology 1B
Physics for Life Sciences L1A	
	Choose one elective module
	Biochemistry 1B
	Mathematics 1B **or** 1D

SECOND YEAR

First Semester	**Second Semester**
Botany 2A	Botany 2B
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Biochemistry 2A*	Biochemistry 2B*
Microbiology 2A	Microbiology 2B

THIRD YEAR

First Semester	**Second Semester**
Botany 3A	Botany 3B
Zoology 3A	Zoology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Biochemistry 2.**

**** Chemistry 1D does not allow access to Biochemistry 2**

4.2.15	**Bachelor of Science in Life and Environmental Sciences in Biochemistry and Zoology**	**B2L13Q**

FIRST YEAR

First Semester	**Second Semester**
Biology 1A	Biochemistry 1B
Chemistry 1A **or** 1C*	Chemistry 1B
Mathematics 1A** **or** 1C	Zoology 1B
Physics for Life Sciences L1A	
	Choose one elective module
	Botany 1B
	Mathematics 1B ** **or** 1D

SECOND YEAR

First Semester	**Second Semester**
Biochemistry 2A*	Biochemistry 2B*
Zoology 2A	Zoology 2B
Choose one set of elective modules	
Botany 2A	Botany 2B
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2
Microbiology 2A	Microbiology 2B

THIRD YEAR

First Semester	**Second Semester**
Biochemistry 3A	Biochemistry 3B
Zoology 3A	Zoology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Chemistry 2 and Biochemistry 2**.

**** Mathematics 1A and 1B are prerequisites for Chemistry 2.**

4.2.16	Bachelor of Science in Life and Environmental Sciences in Chemistry and Zoology	B2L14Q

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A **or** 1C
Mathematics 1A
Physics 1A01 **or**
Physics for Life Sciences L1A

Second Semester
Zoology 1B
Chemistry 1B
Mathematics 1B

Choose one elective module
Biochemistry 1B
Botany 1B
Physics 1B01***

SECOND YEAR

First Semester
Chemistry 2A1, 2A2**
Zoology 2A

Second Semester
Chemistry 2B1, 2B2**
Zoology 2B

Choose one set of elective modules
Biochemistry 2A*
Botany 2A
Microbiology 2A

Biochemistry 2B*
Botany 2B
Microbiology 2B

THIRD YEAR

First Semester
Chemistry 3A1, 3A2
Zoology 3A

Second Semester
Chemistry 3B1, 3B2
Zoology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Chemistry 2 and Biochemistry 2.**
**** Mathematics 1A and 1B are prerequisites for Chemistry 2.**
***** Physics 1B01 may not be chosen if Physics L1A is taken.**

4.2.17	Bachelor of Science in Life and Environmental Sciences in Environmental Management and Zoology	B2L15Q

FIRST YEAR

First Semester
Biology 1A
Chemistry 1C
Geography 1A
Mathematics 1C

Second Semester
Zoology 1B
Chemistry 1D
Geography 1B

Choose one set of elective modules
Botany 1B
Mathematics 1D

SECOND YEAR

First Semester
Environmental Management 2A
Microbiology 2A
Zoology 2A

Second Semester
Geography 2B
Project Management 3B
Zoology 2B

THIRD YEAR

First Semester
Environmental Management 3A
Zoology 3A

Second Semester
Environmental Management 3B
Zoology 3B

4.2.18	Bachelor of Science in Life and Environmental Sciences in Geography and Zoology	B2L16Q

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A **or** 1C*
Geography 1A
Physics for Earth Sciences G1A **or**
Physics for Life Sciences L1A

Second Semester
Zoology 1B
Chemistry 1B **or** 1D
Geography 1B

Choose one elective module
Botany 1B
Biochemistry 1B
Physics for Earth Sciences G1B**

SECOND YEAR

First Semester
Geography 2A
Zoology 2A

Second Semester
Geography 2B
Zoology 2B

Choose one set of elective modules
Biochemistry 2A*
Botany 2A
Microbiology 2A

Biochemistry 2B*
Botany 2B
Microbiology 2B

THIRD YEAR

First Semester
Geography 3A
Zoology 3A

Second Semester
Geography 3B
Zoology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Biochemistry 2.**

**** Physics G1B may not be chosen if Physics L1A is taken.**

4.2.19	Bachelor of Science in Life and Environmental Sciences in Physiology and Zoology	B2L17Q

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A **or** 1C*
Mathematics 1A **or** 1C
Physics for Life Sciences L1A

Second Semester
Zoology 1B
Chemistry 1B **or** 1D

Choose two elective modules
Biochemistry 1B
Mathematics 1B **or** 1D

SECOND YEAR

First Semester
Physiology 2A
Zoology 2A

Second Semester
Physiology 2B
Zoology 2B

Choose one set of elective modules
Biochemistry 2A*
Microbiology 2A

Biochemistry 2B*
Microbiology 2B

THIRD YEAR

First Semester
Physiology 3A
Zoology 3A

Second Semester
Physiology 3B
Zoology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Biochemistry 2.**

**** Students will attend Human Anatomy lectures at the Doornfontein campus.**

4.2.20	Bachelor of Science in Life and Environmental Sciences in Biochemistry and Physiology	B2L18Q

FIRST YEAR

First Semester	**Second Semester**
Biology 1A	Biochemistry 1B
Chemistry 1A **or** 1C*	Chemistry 1B
Mathematics 1A** **or** 1C	Mathematics 1B ** **or** 1D
Physics for Life Sciences L1A	Zoology 1B

SECOND YEAR

First Semester	**Second Semester**
Biochemistry 2A*	Biochemistry 2B*
Physiology 2A	Physiology 2B
Choose one set of elective modules	
Chemistry 2A1, 2A2**	Chemistry 2B1, 2B2
Microbiology 2A	Microbiology 2B

THIRD YEAR

First Semester	**Second Semester**
Biochemistry 3A	Biochemistry 3B
Physiology 3A	Physiology 3B

*** A final mark of 60% in Chemistry 1C offers entrance to Chemistry 1B which is a prerequisite for Chemistry 2 and Biochemistry 2.**

**** Mathematics 1A and 1B are prerequisites for Chemistry 2.**

4.2.21	Bachelor of Science in Life and Environmental Sciences in Physiology and Psychology	B2L19Q

FIRST YEAR

First Semester	**Second Semester**
Biology 1A	
Chemistry 1A **or** 1C	Chemistry 1B **or** 1D
Mathematics 1A **or** 1C*	Mathematics 1B **or** 1D
Psychology 1A	Psychology 1B
	Zoology 1B

SECOND YEAR

First Semester	**Second Semester**
Physiology 2A	Physiology 2B
Psychology 2A **or**	Social Psychology 2C **or**
Personality Psychology 2H	Positive Psychology 2D **or**
	Contemporary Psychology 2F

Choose one set of elective modules

Microbiology 2A	Microbiology 2B
Zoology 2A	Zoology 2B

THIRD YEAR

First Semester	**Second Semester**
Physiology 3A	Physiology 3B
Research Psychology 3A **or**	Psychopathology 3D **or**
Community Psychology 3C **or**	Psychotherapy 3F
Cognitive Psychology 3G	

PLEASE NOTE: If a student is planning to register for Honours in Psychology, then Psychology 3A must be selected

4.2.22	Bachelor of Science in Life and Environmental Sciences in Geography and Environmental Management	B2L20Q

FIRST YEAR

First Semester	**Second Semester**
Biology 1A	Botany 1B
Geography 1A	Geography 1B
Anthropology 1A **or** Sociology 2A	Zoology 1B
Choose one set of elective modules	
Chemistry 1C	Chemistry 1D
Physics for Earth Sciences G1A	Physics for Earth Sciences G1B

SECOND YEAR

First Semester	**Second Semester**
Geography 2A	Geography 2B
Environmental Management 2A	Project Management 3B
Choose one set of elective modules	
Botany 2A	Botany 2B
Zoology 2A	Zoology 2B

THIRD YEAR

First Semester	**Second Semester**
Geography 3A	Geography 3B
Environmental Management 3A	Environmental Management 3B

4.2.23	Bachelor of Science in Life and Environmental Sciences in Geology and Environmental Management	B2L24Q

FIRST YEAR

First Semester	**Second Semester**
Geography 1A	Geography 1B
Geology 1A	Geology 1B
Geology 1 Field Techniques	
Choose two sets of elective modules	
Chemistry 1C	Chemistry 1D
Mathematics 1C	Mathematics 1D
Physics for Earth Sciences G1A	Physics for Earth Sciences G1B

SECOND YEAR

First Semester	**Second Semester**
Applied Geology 2A	Applied Geology 2B
Environmental Management 2A	Geography 2B
Geology 2A	Geology 2B
Geology 2 Field Techniques	

THIRD YEAR

First Semester	**Second Semester**
Geology 3A01, 3A02	Geology 3B
Geology 3 Field Mapping	
Environmental Management 3A	Environmental Management 3B

4.2.24	Bachelor of Science in Life and Environmental Sciences in Geography and Geology	B2L25Q

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A **or** 1C	Chemistry 1B **or** 1D
Geography 1A	Geography 1B
Geology 1A	Geology 1B
Geology 1 Field Techniques	

Choose one set of elective modules

Biology 1A	Botany 1B
Mathematics 1C*	Mathematics 1D*
Physics for Earth Sciences G1A	Physics for Earth Sciences G1B
	Zoology 1B

PLEASE NOTE: * If a student is planning to register for Geology Honours, then Mathematics 1C and 1D must be selected

SECOND YEAR

First Semester	**Second Semester**
Geography 2A	Geography 2B
Geology 2A	Geology 2B
Geology 2 Field Techniques	

Choose one set of elective modules

Applied Geology 2A	Applied Geology 2B
Botany 2A	Botany 2B
Zoology 2A	Zoology 2B

THIRD YEAR

First Semester	**Second Semester**
Geography 3A	Geography 3B
Geology 3A01, 3A02	Geology 3B
Geology 3 Field Mapping	

SC.4.3 BACHELOR OF SCIENCE - MATHEMATICAL SCIENCES – LEVEL 7

Purpose and characteristics of the programme

This qualification is primarily designed to provide a well-rounded, broad education that equips graduates with the knowledge base, theory and methodology of the mathematical sciences. The purpose of the BSc Mathematical Sciences is to develop qualified scientists who can identify, evaluate and solve problems associated with mathematical sciences and be able to assume and demonstrate initiative and responsibility in related academic and professional contexts in South Africa as well as in the international world. With the focus of the programme being on the principles and theory of the mathematical sciences with the possible applications thereof, the students acquire the appropriate competence and research ability that serves as a basis for entry into the labour market and a range of professional training and practice as well as postgraduate studies opportunities associated with the mathematical sciences.

Exit-level outcomes

Students should be able to:

- Identify, interpret, analyse and solve routine as well as unfamiliar problems and issues using enquiry and theory-driven arguments
- Demonstrate effectiveness in working with others in a team by taking responsibility for their own work and showing regard for the work of others
- Identify, evaluate and address their own task-specific learning needs
- Develop good information retrieval as well as quantitative and/or qualitative data analysis, synthesis and evaluation skills, including the appropriate use of ICT
- Demonstrate a well-grounded, systematic and integrated knowledge and theory of the Mathematical Sciences
- Monitor and evaluate their own academic development and progress based on a commonly applied mathematical sciences related criteria
- Present and communicate information and ideas and opinions in well-structured arguments, adhering to appropriate academic/ professional discourse
- Use science and technology reliably in variable and unfamiliar contexts and adhere to recognised professional and/or ethical standards, seeking guidance, where appropriate
- Identify, distinguish, effectively select and apply procedures, processes, methods/ techniques of enquiry and research applicable to the mathematical sciences related contexts.

MATHEMATICS ALTERNATIVE SEMESTER MODULES - An alternative presentation of certain first and all second year Mathematics modules

Alternative Semester Courses are presented by the Department of Pure and Applied Mathematics, eg. MAT01A1 is offered in the first semester, while the alternative ASMA1A1 is offered in the subsequent (second) semester. This presentation is intended to provide students who had failed the original course, with the opportunity to repeat the same module in the following/alternative semester. Students do not have to wait a whole semester before repeating the module. This opportunity is available for the following modules:

MAT01A1, MAT01B1 (as ASMA1A1, ASMA1B1 respectively)
MAT01A2, MAT01B2 (as ASMA2A1, ASMA2B1 respectively)
MAT02A2, MAT02B2 (as ASMA2A2, ASMA2B2 respectively)
MAT04A2, MAT04B2 (as ASMA2A4, ASMA2B4 respectively)
APM01A1, APM01B1 (as APMA1A1, APMA1B1 respectively)
APM02A2, APM02B2 (as APMA2A2, APMA2B2 respectively)

Entrance Requirements: Please refer to Part 1
Pass requirements: At least 50%

For further information contact the Department of Pure and Applied Mathematics:
Tel: (011) 559-2848 (office hours)
Fax: (011) 559-2874

COMBINATION OF MAJORS	SC. NO	CODE
BACHELOR OF SCIENCE IN MATHEMATICAL SCIENCES (4 YEARS)		
Applied Mathematics and Computer Science	4.3.1	B2E40Q
Applied Mathematics and Mathematical Statistics	4.3.2	B2E41Q
Applied Mathematics and Mathematics	4.3.3	B2E42Q
Mathematical Statistics and Computer Science	4.3.4	B2E43Q
Mathematics and Computer Science	4.3.5	B2E44Q
Mathematics and Informatics	4.3.6	B2E45Q
Mathematics and Mathematical Statistics	4.3.7	B2E46Q
Mathematics and Psychology	4.3.8	B2E47Q
BACHELOR OF SCIENCE IN MATHEMATICAL SCIENCES (3 YEARS)		
Applied Mathematics and Computer Science	4.3.9	B2M40Q
Applied Mathematics and Mathematical Statistics	4.3.10	B2M41Q
Applied Mathematics and Mathematics	4.3.11	B2M42Q
Computational Science	4.3.12	B2M43Q
Mathematical Statistics and Computer Science	4.3.13	B2M44Q
Mathematics and Computer Science	4.3.14	B2M45Q
Mathematics and Informatics	4.3.15	B2M46Q
Mathematics and Mathematical Statistics	4.3.16	B2M47Q
Mathematics and Psychology	4.3.17	B2M48Q
Mathematics and Mathematical Statistics with Financial Orientation	4.3.18	B2M49Q
Mathematical Statistics and Economics with Financial Orientation	4.3.19	B2M50Q
Mathematics and Economics With Financial Orientation	4.3.20	B2M51Q
Actuarial Science	4.3.21	B2M52Q

Refer to Part 1 for General Rules of Admission

CURRICULA

4.3.1	Bachelor of Science in Mathematical Sciences in Applied Mathematics and Computer Science	B2E40Q

FIRST YEAR

First Semester
Computer Competence 1
Mathematics 1A1E
Physics 1A1E
Language for Science

Second Semester
Applied Mathematics 1A1E
Mathematics 1A2E
Physics 1A2E
Language for Science
Statistics 1A1E

SECOND YEAR

First Semester
Applied Mathematics 1A2E
Computer Science 1A
Mathematics 1A3E
Physics 1A3E
Statistics 1A2E

Second Semester
Applied Mathematics 1B
Computer Science 1B
Mathematics 1B
Physics S1B
Statistics 1B

THIRD YEAR

First Semester
Applied Mathematics 2A
Computer Science 2A
Mathematics 2A1, 2A2

Second Semester
Applied Mathematics 2B
Computer Science 2B
Mathematics 2B1, 2B2

FOURTH YEAR

First Semester
Applied Mathematics 3A
Computer Science 3A

Second Semester
Applied Mathematics 3B
Computer Science 3B

4.3.2	Bachelor of Science in Mathematical Sciences in Applied Mathematics and Mathematical Statistics	B2E41Q

FIRST YEAR

First Semester
Computer Competence 1
Informatics 1A
Mathematics 1A1E
Language for Science

Second Semester
Applied Mathematics 1A1E
Informatics 1B
Mathematics 1A2E
Language for Science
Statistics 1A1E

SECOND YEAR

First Semester
Applied Mathematics 1A2E
Mathematics 1A3E
Statistics 1A2E

Second Semester
Applied Mathematics 1B
Mathematics 1B
Statistics 1B

THIRD YEAR

First Semester
Applied Mathematics 2A
Mathematics 2A1, 2A2
Statistics 2A

Second Semester
Applied Mathematics 2B
Mathematics 2B1, 2B2
Statistics 2B

FOURTH YEAR

First Semester
Applied Mathematics 3A
Statistics 3A

Second Semester
Applied Mathematics 3B
Statistics 3B

4.3.3	Bachelor of Science in Mathematical Sciences in Applied Mathematics and Mathematics	B2E42Q

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Applied Mathematics 1A1E
Mathematics 1A1E	Mathematics 1A2E
Language for Science	Language for Science
Physics 1A1E	
	Choose one elective module
	Statistics 1A1E
	Physics 1A2E

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 1A2E	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B
Choose one set of elective modules	
Statistics 1A2E	Statistics 1B
Physics 1A3E	Physics S1B

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Computer Science 2A	Computer Science 2B
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Statistics 2A	Statistics 2B

FOURTH YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.4	**Bachelor of Science in Mathematical Sciences in Mathematical Statistics and Computer Science**	**B2E43Q**

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Applied Mathematics 1A1E
Mathematics 1A1E	Mathematics 1A2E
Language for Science	Language for Science
	Statistics 1A1E

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 1A2E	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B
Statistics 1A2E	Statistics 1B

THIRD YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

FOURTH YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Statistics 3A	Statistics 3B

4.3.5	**Bachelor of Science in Mathematical Sciences in Mathematics and Computer Science**	**B2E44Q**

FIRST YEAR

First Semester	**Second Semester**
Computer Competence 1	Applied Mathematics 1A1E
Mathematics 1A1E	Mathematics 1A2E
Language for Science	Language for Science
	Statistics 1A1E

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 1A2E	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B
Statistics 1A2E	Statistics 1B

THIRD YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Statistics 2A	Statistics 2B

FOURTH YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.6	**Bachelor of Science in Mathematical Sciences in Mathematics and Informatics**	**B2E45Q**

FIRST YEAR

First Semester
Informatics 1A
Mathematics 1A1E
Language for Science

Second Semester
Informatics 1B
Mathematics 1A2E
Language for Science

Choose one elective module
Applied Mathematics 1A1E
Statistics 1A1E

SECOND YEAR

First Semester
Computer Science 1A
Mathematics 1A3E

Second Semester
Computer Science 1B
Mathematics 1B

Choose one set of elective modules
Applied Mathematics 1A2E
Statistics 1A2E

Applied Mathematics 1B
Statistics 1B

THIRD YEAR

First Semester
Computer Science 2A
Informatics 2A
Mathematics 2A1, 2A2

Second Semester
Computer Science 2B
Informatics 2B
Mathematics 2B1, 2B2

FOURTH YEAR

First Semester
Informatics 3A
Mathematics 3A1, 3A2

Second Semester
Informatics 3B
Mathematics 3B1, 3B2

4.3.7	**Bachelor of Science in Mathematical Sciences in Mathematics and Mathematical Statistics**	**B2E46Q**

FIRST YEAR

First Semester
Computer Competence 1
Mathematics 1A1E
Language for Science

Second Semester
Applied Mathematics 1A1E
Mathematics 1A2E
Language for Science
Statistics 1A1E

SECOND YEAR

First Semester
Applied Mathematics 1A2E
Computer Science 1A
Mathematics 1A3E
Statistics 1A2E

Second Semester
Applied Mathematics 1B
Computer Science 1B
Mathematics 1B
Statistics 1B

THIRD YEAR

First Semester
Mathematics 2A1, 2A2
Statistics 2A

Second Semester
Mathematics 2B1, 2B2
Statistics 2B

Choose one set of elective modules
Applied Mathematics 2A
Computer Science 2A

Applied Mathematics 2B
Computer Science 2B

FOURTH YEAR

First Semester
Mathematics 3A1, 3A2
Statistics 3A

Second Semester
Mathematics 3B1, 3B2
Statistics 3B

4.3.8	**Bachelor of Science in Mathematical Sciences in Mathematics and Psychology**	**B2E47Q**

FIRST YEAR

First Semester	**Second Semester**
Mathematics 1A1E	Mathematics 1A2E
Informatics 1A	Informatics 1B
Language for Science	Language for Science
	Statistics 1A1E

SECOND YEAR

First Semester	**Second Semester**
Mathematics 1A3E	Mathematics 1B
Psychology 1A	Psychology 1B
Statistics 1A2E	Statistics 1B

THIRD YEAR

First Semester	**Second Semester**
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B
Psychology 2A **or** 2C	Positive Psychology 2D **or**
	Contemporary Psychology 2F **or**
	Personality Psychology 2H **or**
	Sport Psychology 2B

FOURTH YEAR

First Semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Psychology 3A **or** 3E **or** 3G	Psychology 3D **or** 3F

PLEASE NOTE: If a student is planning to register for Honours in Psychology, then Psychology 3A must be selected

4.3.9	**Bachelor of Science in Mathematical Sciences in Applied Mathematics and Computer Science**	**B2M40Q**

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A	Mathematics 1B
Choose one set of elective modules	
Physics S1A	Physics S1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Computer Science 2A	Computer Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Computer Science 3A	Computer Science 3B

4.3.10	Bachelor of Science in Mathematical Sciences in Applied Mathematics and Mathematical Statistics	B2M41Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B
Choose one set of elective modules	
Computer Science 1A	Computer Science 1B
Physics S1A	Physics S1B

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Statistics 3A	Statistics 3B

4.3.11	Bachelor of Science in Mathematical Sciences in Applied Mathematics and Mathematics	B2M42Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Mathematics 1A	Mathematics 1B
Choose two sets of elective modules	
Computer Science 1A	Computer Science 1B
Physics S1A	Physics S1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Computer Science 2A	Computer Science 2B
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.12	Bachelor of Science in Mathematical Sciences in Computational Science	B2M43Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B
Physics S1A	Physics S1B
	Electrotechnics1B21

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Electrotechnics 2A	Electrotechnics 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Computer Science 2A	Computer Science 2B
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Signals and Systems 3A	Signal Processing 3B
Choose one set of elective modules	
Computer Science 3A	Computer Science 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Physics 3A	Physics 3B
Statistics 3A	Statistics 3B

4.3.13	Bachelor of Science in Mathematical Sciences in Mathematical Statistics and Computer Science	B2M44Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Statistics 3A	Statistics 3B

4.3.14	Bachelor of Science in Mathematical Sciences in Mathematics and Computer Science	B2M45Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2

Choose one set of elective modules

Applied Mathematics 2A	Applied Mathematics 2B
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Computer Science 3A	Computer Science 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.15	Bachelor of Science in Mathematical Sciences in Mathematics and Informatics	B2M46Q

FIRST YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Informatics 1A	Informatics 1B
Mathematics 1A	Mathematics 1B

Choose one set of elective modules

Applied Mathematics 1A	Applied Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Computer Science 2A	Computer Science 2B
Informatics 2A	Informatics 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2

THIRD YEAR

First Semester	**Second Semester**
Informatics 3A	Informatics 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.16	Bachelor of Science in Mathematical Sciences in Mathematics and Mathematical Statistics	B2M47Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Computer Science 2A	Computer Science 2B

THIRD YEAR

First Semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Statistics 3A	Statistics 3B

4.3.17	Bachelor of Science in Mathematical Sciences in Mathematics and Psychology	B2M48Q

FIRST YEAR

First Semester	**Second Semester**
Mathematics 1A	Mathematics 1B
Psychology 1A	Psychology 1B
Statistics 1A	Statistics 1B
Choose one set of elective modules	
Applied Mathematics 1A	Applied Mathematics 1B
Computer Science 1A	Computer Science 1B
Informatics 1A	Informatics 1B

SECOND YEAR

First semester	**Second Semester**
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Psychology 2A **or** 2C	Positive Psychology 2D **or** Contemporary Psychology 2F **or** Personality Psychology 2H **or** Sport Psychology 2B
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Computer Science 2A	Computer Science 2B
Statistics 2A	Statistics 2B

THIRD YEAR

First semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Psychology 3A **or** 3E **or** 3G	Psychology 3D **or** 3F

PLEASE NOTE: If a student is planning to register for Honours in Psychology, then Psychology 3A must be selected

4.3.18	**Bachelor of Science in Mathematical Sciences in Mathematics and Mathematical Statistics with financial orientation**	**B2M49Q**

FIRST YEAR

First Semester	**Second Semester**
Accounting A **or** Accounting 1A	Financial Management 1B **or** Accounting 1B
Computer Science 1A	Computer Science 1B
Economics 1A	Economics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Economics 2A	Economics 2B
Investment Management 2A	Investment Management 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Statistics 3A	Statistics 3B

Choose one set of elective modules

Economics 3A	Economics 3B
Investment Management 3A	Investment Management 3B

4.3.19	**Bachelor of Science in Mathematical Sciences in Mathematical Statistics and Economics with financial orientation**	**B2M50Q**

FIRST YEAR

First Semester	**Second Semester**
Accounting A **or** Accounting 1A	Financial Management 1B **or** Accounting 1B
Computer Science 1A	Computer Science 1B
Economics 1A	Economics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Economics 2A	Economics 2B
Investment Management 2A	Investment Management 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Economics 3A	Economics 3B
Investment Management 3A	Investment Management 3B
Statistics 3A	Statistics 3B

4.3.20	**Bachelor of Science in Mathematical Sciences in Mathematics and Economics with financial orientation**	**B2M51Q**

FIRST YEAR

First Semester	**Second Semester**
Accounting A **or** Accounting 1A	Financial Management 1B **or** Accounting 1B
Computer Science 1A	Computer Science 1B
Economics 1A	Economics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Economics 2A	Economics 2B
Investment Management 2A	Investment Management 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Economics 3A	Economics 3B
Investment Management 3A	Investment Management 3B
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.3.21	**Bachelor of Science in Mathematical Sciences in Actuarial Science**	**B2M52Q**

FIRST YEAR

First Semester	**Second Semester**
Accounting 1A	Accounting 1B
Computer Science 1A	Computer Science 1B
Economics 1A	Economics 1B
Mathematics 1A	Mathematics 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Actuarial Science 2A	Actuarial Science 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Actuarial Science 3A	Actuarial Science 3B
Statistics 3A	Statistics 3B

SC.4.4 BACHELOR OF SCIENCE – PHYSICAL SCIENCES – LEVEL 7

Purpose and characteristics of the programme

This qualification is primarily designed to provide a well-rounded, broad education that equips graduates with the knowledge base, theory and methodology of the physical sciences. The purpose of the BSc Physical Sciences is to develop qualified scientists who can identify, evaluate and solve problems associated with physical sciences and be able to assume and demonstrate initiative and responsibility in related academic and professional contexts in South Africa as well as in the international world. With the focus of the programme being on the principles and theory of the physical sciences and the possible applications thereof, the students acquire the appropriate competence and research ability that serves as a basis for entry into the labour market and a range of professional training and practice as well as postgraduate studies opportunities associated with the physical sciences.

Exit level outcomes

Students should be able to:

- Identify, interpret, analyse and solve routine as well as unfamiliar problems and issues using enquiry and theory-driven arguments
- Demonstrate effectiveness in working with others in a team by taking responsibility for their own work and showing regard for the work of others
- Identify, evaluate and address their own task-specific learning needs
- Develop good information retrieval as well as quantitative and/or qualitative data analysis, synthesis and evaluation skills, including the appropriate use of ICT
- Demonstrate a well-grounded, systematic and integrated knowledge and theory of the physical sciences
- Monitor and evaluate their own academic development and progress based on a commonly applied physical sciences related criteria
- Present and communicate information and ideas and opinions in well-structured arguments, adhering to appropriate academic/ professional discourse
- Use science and technology reliably in variable and unfamiliar contexts and adhere to recognised professional and/or ethical standards, seeking guidance where appropriate
- Identify, distinguish, effectively select and apply procedures, processes, methods/ techniques of enquiry and research applicable to the physical sciences related contexts.

CURRICULA

4.4.1	Bachelor of Science in Physical Sciences in Biochemistry and Chemistry	B2E70Q

FIRST YEAR

First Semester
Chemistry 1A1E
Computer Competence 1
Mathematics 1A1E
Physics 1A1E
Language for Science

Second Semester
Chemistry 1A2E
Biology 1A1E
Mathematics 1A2E
Physics 1A2E
Language for Science

SECOND YEAR

First Semester
Biology 1A2E
Chemistry 1A3E
Mathematics 1A3E
Physics 1A3E

Second Semester
Biochemistry 1B
Chemistry 1B
Mathematics 1B

Choose one elective module
Botany 1B
Physics S1B
Zoology 1B

THIRD YEAR

First Semester
Biochemistry 2A
Chemistry 2A1, 2A2

Second Semester
Biochemistry 2B
Chemistry 2B1, 2B2

Choose one set of elective modules

Botany 2A
Mathematics 2A1, 2A2
Microbiology 2A
Zoology 2A

Botany 2B
Mathematics 2B1, 2B2
Microbiology 2B
Zoology 2B

FOURTH YEAR

First Semester
Biochemistry 3A
Chemistry 3A1, 3A2

Second Semester
Biochemistry 3B
Chemistry 3B1, 3B2

4.4.2	**Bachelor of Science in Physical Sciences in Chemistry and Mathematics**	**B2E71Q**

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A1E	Chemistry 1A2E
Mathematics 1A1E	Mathematics 1A2E
Physics 1A1E	Physics 1A2E
Language for Science	Language for Science
Computer Competence 1	

SECOND YEAR

First Semester	**Second Semester**
Chemistry 1A3E	Chemistry 1B
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B
Physics 1A3E	Physics S1B

THIRD YEAR

First Semester	**Second Semester**
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Computer Science 2A	Computer Science 2B
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y

FOURTH YEAR

First Semester	**Second Semester**
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.4.3	**Bachelor of Science in Physical Sciences in Chemistry and Physics**	**B2E72Q**

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A1E	Chemistry 1A2E
Computer Competence 1	Applied Mathematics 1A1E
Mathematics 1A1E	Mathematics 1A2E
Physics 1A1E	Physics 1A2E
Language for Science	Language for Science

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 1A2E	Applied Mathematics 1B
Chemistry 1A3E	Chemistry 1B
Mathematics 1A3E	Mathematics 1B
Physics 1A3E	Physics S1B

THIRD YEAR

First Semester	**Second Semester**
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y

FOURTH YEAR

First Semester	**Second Semester**
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2
Physics 3A	Physics 3B

4.4.4	Bachelor of Science in Physical Sciences in Physics and Applied Mathematics	B2E73Q

FIRST YEAR

First Semester
Computer Competence 1
Mathematics 1A1E
Physics 1A1E
Language for Science

Second Semester
Applied Mathematics 1A1E
Mathematics 1A2E
Physics 1A2E
Language for Science

SECOND YEAR

First Semester
Applied Mathematics 1A2E
Computer Science 1A
Mathematics 1A3E
Physics 1A3E

Second Semester
Applied Mathematics 1B
Computer Science 1B
Mathematics 1B
Physics S1B

THIRD YEAR

First Semester
Applied Mathematics 2A
Mathematics 2A1, 2A2
Physics 2A **and**
Physics 2Y

Second Semester
Applied Mathematics 2B
Mathematics 2B1, 2B2
Physics 2B **and**
Physics 2Y

FOURTH YEAR

First Semester
Applied Mathematics 3A
Physics 3A

Second Semester
Applied Mathematics 3B
Physics 3B

4.4.5	**Bachelor of Science in Physical Sciences in Physics and Mathematics**	**B2E74Q**

FIRST YEAR

First Semester	**Second Semester**
Mathematics 1A1E	Mathematics 1A2E
Physics 1A1E	Physics 1A2E
Language for Science	Language for Science
Computer Competence 1	
Elective module	**Choose one elective module**
Chemistry 1A1E	Chemistry 1A2E
	Applied Mathematics 1A1E

Please Note:
Elective Modules: A student may take Chemistry 1A1E and 1A2E **or** Applied Mathematics 1A1E and then take the corresponding elective in second year.

SECOND YEAR

First Semester	**Second Semester**
Computer Science 1A	Computer Science 1B
Mathematics 1A3E	Mathematics 1B
Physics 1A3E	Physics S1B
Choose one set of elective modules	
Applied Mathematics 1A2E	Applied Mathematics 1B
Chemistry 1A3E	Chemistry 1B

THIRD YEAR

First Semester	**Second Semester**
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Computer Science 2A	Computer Science 2B

FOURTH YEAR

First Semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Physics 3A	Physics 3B

4.4.6	**Bachelor of Science in Physical Sciences in Biochemistry and Chemistry**	**B2P70Q**

FIRST YEAR

First Semester
Biology 1A
Chemistry 1A
Mathematics 1A
Physics S1A

Second Semester
Biochemistry 1B
Chemistry 1B
Mathematics 1B

Choose one elective module
Botany 1B
Physics S1B
Zoology 1B

SECOND YEAR

First Semester
Biochemistry 2A
Chemistry 2A1, 2A2

Second Semester
Biochemistry 2B
Chemistry 2B1, 2B2

Choose one set of elective modules

Botany 2A
Mathematics 2A1, 2A2
Microbiology 2A
Physics 2A **and**
Physics 2Y
Zoology 2A

Botany 2B
Mathematics 2B1, 2B2
Microbiology 2B
Physics 2B **and**
Physics 2Y
Zoology 2B

THIRD YEAR

First Semester
Biochemistry 3A
Chemistry 3A1, 3A2

Second Semester
Biochemistry 3B
Chemistry 3B1, 3B2

4.4.7	**Bachelor of Science in Physical Sciences in Chemistry and Mathematics**	**B2P71Q**

FIRST YEAR

First Semester
Chemistry 1A
Mathematics 1A
Physics S1A

Second Semester
Chemistry 1B
Mathematics 1B
Physics S1B

Choose one set of elective modules

Applied Mathematics 1A
Computer Science 1A

Applied Mathematics 1B
Computer Science 1B

SECOND YEAR

First Semester
Chemistry 2A1, 2A2
Mathematics 2A1, 2A2

Second Semester
Chemistry 2B1, 2B2
Mathematics 2B1, 2B2

Choose one set of elective modules

Applied Mathematics 2A
Computer Science 2A
Physics 2A **and**
Physics 2Y

Applied Mathematics 2B
Computer Science 2B
Physics 2B **and**
Physics 2Y

THIRD YEAR

First Semester
Chemistry 3A1, 3A2
Mathematics 3A1, 3A2

Second Semester
Chemistry 3B1, 3B2
Mathematics 3B1, 3B2

4.4.8	Bachelor of Science in Physical Sciences in Chemistry and Physics	B2P72Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Chemistry 1A	Chemistry 1B
Mathematics 1A	Mathematics 1B
Physics S1A	Physics S1B

SECOND YEAR

First Semester	**Second Semester**
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y

THIRD YEAR

First Semester	**Second Semester**
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2
Physics 3A	Physics 3B

4.4.9	Bachelor of Science in Physical Sciences in Physics and Applied Mathematics	B2P77Q

FIRST YEAR

First Semester	**Second Semester**
Applied Mathematics 1A	Applied Mathematics 1B
Mathematics 1A	Mathematics 1B
Physics S1A	Physics S1B

Choose one set of elective modules

Chemistry 1A	Chemistry 1B
Computer Science 1A	Computer Science 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Applied Mathematics 2A	Applied Mathematics 2B
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2

THIRD YEAR

First Semester	**Second Semester**
Applied Mathematics 3A	Applied Mathematics 3B
Physics 3A	Physics 3B

4.4.10	Bachelor of Science in Physical Sciences in Physics and Mathematics	B2P78Q

FIRST YEAR

First Semester	**Second Semester**
Mathematics 1A	Mathematics 1B
Physics S1A	Physics S1B
Choose two sets of elective modules	
Applied Mathematics 1A	Applied Mathematics 1B
Chemistry 1A	Chemistry 1B
Computer Science 1A	Computer Science 1B
Statistics 1A	Statistics 1B

SECOND YEAR

First Semester	**Second Semester**
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y
Choose one set of elective modules	
Applied Mathematics 2A	Applied Mathematics 2B
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Computer Science 2A	Computer Science 2B
Statistics 2A	Statistics 2B

THIRD YEAR

First Semester	**Second Semester**
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2
Physics 3A	Physics 3B

4.4.11	Bachelor of Science in Physical Sciences in Geology and Chemistry	B2P81Q

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A	Chemistry 1B
Geology 1A	Geology 1B
Geology 1 Field Techniques	
Mathematics 1A	Mathematics 1B
Choose one set of elective modules	
Physics S1A	Physics S1B
Physics for Earth Sciences G1A	Physics for Earth Sciences G1B
Biology 1A	Biochemistry 1B **or**
	Botany 1B **or**
	Chemistry 1D* **or**
	Zoology 1B

SECOND YEAR

First Semester	**Second Semester**
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Geology 2A	Geology 2B
Geology 2 Field Techniques	
Choose one set of elective modules	
Applied Geology 2A	Applied Geology 2B
Botany 2A	Botany 2B
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Zoology 2A	Zoology 2B

THIRD YEAR

First Semester	**Second Semester**
Chemistry 3A1, 3A2	Chemistry 3B1, 3B2
Geology 3A01,3A02	Geology 3B
Geology 3 Field Mapping	

PLEASE NOTE: * Chemistry 1D may only be taken in the second year of studies due to a timetable clash

4.4.12	**Bachelor of Science in Physical Sciences in Geology and Mathematics**	**B2P82Q**

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A	Chemistry 1B
Geology 1A	Geology 1B
Geology 1 Field Techniques	
Mathematics 1A	Mathematics 1B
Physics S1A **or** G1A	Physics S1B **or** G1B

SECOND YEAR

First Semester	**Second Semester**
Geology 2A	Geology 2B
Geology 2 Field Techniques	
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Choose one set of elective modules	
Chemistry 2A1, 2A2	Chemistry 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y

THIRD YEAR

First Semester	**Second Semester**
Geology 3A01, 3A02	Geology 3B
Geology 3 Field Mapping	
Mathematics 3A1, 3A2	Mathematics 3B1, 3B2

4.4.13	**Bachelor of Science in Physical Sciences in Geology and Physics**	**B2P83Q**

FIRST YEAR

First Semester	**Second Semester**
Chemistry 1A **or** 1C*	Chemistry 1B **or** 1D
Geology 1A	Geology 1B
Geology 1 Field Techniques	
Mathematics 1A	Mathematics 1B
Physics S1A	Physics S1B

SECOND YEAR

First Semester	**Second Semester**
Geology 2A	Geology 2B
Geology 2 Field Techniques	
Mathematics 2A1, 2A2	Mathematics 2B1, 2B2
Physics 2A **and**	Physics 2B **and**
Physics 2Y	Physics 2Y

THIRD YEAR

First Semester	**Second Semester**
Geology 3A01, 3A02	Geology 3B
Geology 3 Field Mapping	
Physics 3A	Physics 3B

PART 5

SC.5 LEARNING OUTCOMES OF UNDERGRADUATE MODULES

SC.5.1 ACTUARIAL SCIENCE	
MODULE CODE	**SC NR**
ACS02A2	5.1.1
ACS02B2	5.1.2
ACS03A3	5.1.3
ACS03B3	5.1.4
SC.5.2 ANALYTICAL TECHNIQUES	
MODULE CODE	**SC NR**
ATE01A1	5.2.1
ATE01B1	5.2.2
ATEACP2	5.2.3
SC.5.3 APPLIED MATHEMATICS	
MODULE CODE	**SC NR**
APM1EB1	5.3.1
APM2EA1	5.3.2
APM01A1	5.3.3
APM01B1	5.3.4
APM02A2	5.3.5
APM02B2	5.3.6
APM03A3	5.3.7
APM03B3	5.3.8
SC.5.4 BIOCHEMISTRY	
MODULE CODE	**SC NR**
BIC01B1	5.4.1
BIC02A2	5.4.2
BIC02B2	5.4.3
BIC03A3	5.4.4
BIC03B3	5.4.5
SC.5.5 BIOLOGY	
MODULE CODE	**SC NR**
BIO1EB1	5.5.1
BIO2EA1	5.5.2
BIO10A1	5.5.3
SC.5.6 BOTANY	
MODULE CODE	**SC NR**
BOT01B1	5.6.1
BOT02A2	5.6.2
BOT02B2	5.2.3
BOT03A3	5.6.4
BOT03B3	5.6.5
SC.5.7 CHEMISTRY	
MODULE CODE	**SC NR**
CEM1EA1	5.7.1
CEM2EB1	5.7.2
CEM3EA1	5.7.3
CEM01A1	5.7.4
CEM2EC1	5.7.5
CEM3EC1	5.7.6
CEM1AC1	5.7.7
CEM1DB1	5.7.8
CEM01B1	5.7.9
CEM01A2	5.7.10
CEM02A2	5.7.11
CEM01B2	5.7.12
CEM02B2	5.7.13
CEM01A3	5.7.14
CEM02A3	5.7.15
CEM01B3	5.7.16
CEM02B3	5.7.17

SC.5.8 COMPUTER SCIENCE	
MODULE CODE	**SC NR**
CSC01A1	5.8.1
CSC01B1	5.8.2
CSC02A2	5.8.3
CSC02B2	5.8.4
CSC02D2	5.8.5
CSC03A3	5.8.6
CSC03B3	5.8.7
CSC03D3	5.8.8
CSC03P3	5.8.9
SC.5.9 ENVIRONMENTAL MANAGEMENT	
MODULE CODE	**SC NR**
ENM02A2	5.9.1
ENM03A3	5.9.2
ENM03B3	5.9.3
SC.5.10 GEOGRAPHY	
MODULE CODE	**SC NR**
GGR1EB1	5.10.1
GGR2EA1	5.10.2
GGR01A1	5.10.3
GGR01B1	5.10.4
GGR02A2	5.10.5
GGR02B2	5.10.6
GGR03A3	5.10.7
GGR03B3	5.10.8
SC.5.11 GEOLOGY	
MODULE CODE	**SC NR**
GLG01A1	5.11.1
GLG00A1	5.11.2
GLG01B1	5.11.3
GLG22A2	5.11.4
GLG00A2	5.11.6
GLG02B2	5.11.7
GLG10A3	5.11.8
GLG20A3	5.11.9
GLG00A3	5.11.10
GLG03B3	5.11.11
APG02A2	5.11.12
APG02B2	5.11.13
SC.5.12 INFORMATICS	
MODULE CODE	**SC NR**
IFM100	5.12.1
IFM1A10	5.12.2
IFM1B10	5.12.3
IFM2A10	5.12.4
IFM2B10	5.12.5
IFM3A10	5.12.6
IFM3B10	5.12.7

SC.5.13 MATHEMATICS	
MODULE CODE	**SC NR**
MAA00A1	5.13.1
MAA00B1	5.13.2
MATDCA1	5.13.3
MATDCB1	5.13.4
MT1ACP1	5.13.5
MAT1EA1	5.13.6
MAT2EB1	5.13.7
MAT3EA1	5.13.8
MAT1CE2	5.13.9
MAT1CE3	5.13.10
MAT1CA1	5.13.11
MAT1DB1	5.13.12
MAT01A1	5.13.13
MAT01B1	5.13.14
MATENA1	5.13.15
MATENB1	5.13.16
MAT01A2	5.13.17
MAT02A2	5.13.18
MAT04A2	5.13.19
MAT01B2	5.13.20
MAT02B2	5.13.21
MAT04B2	5.13.22
MATEAA2	5.13.23
MATEAB2	5.13.24
MATECA2	5.13.25
MATECB2	5.13.26
MAT01A3	5.13.27
MAT02A3	5.13.28
MAT01B3	5.13.29
MAT02B3	5.13.30
ADIA004	5.13.31
MAEB0A1	5.13.32
MAEB0B1	5.13.33
MAT100	5.13.34
SC.5.14 MATHEMATICAL STATISTICS	
MODULE CODE	**SC NR**
STA1EB1	5.14.1
STA2EA1	5.14.2
STA01A1	5.14.3
STA01B1	5.14.4
STA02A2	5.14.5
STA02B2	5.14.6
STA03A3	5.14.7
STA03B3	5.14.8
STAE0A3	5.14.9
SC.5.15 MICROBIOLOGY	
MODULE CODE	**SC NR**
MCB02A2	5.15.1
MCB02B2	5.15.2

SC.5.16	PHYSICS
MODULE CODE	**SC NR**
PHY1EA1	5.16.1
PHY2EB1	5.16.2
PHY3EA1	5.16.3
PHYG1A1	5.16.4
PHYG1B1	5.16.5
PHE2LB1	5.16.6
PHE3LA1	5.16.7
PHYL1A1	5.16.8
PHYS1A1	5.16.9
PHYS1B1	5.16.10
PHY00A2	5.16.11
PHY00B2	5.16.12
PHY00Y2	5.16.13
PHY00A3	5.16.14
PHY00B3	5.16.15
PHYE0A1	5.16.16
PHYE0A2	5.16.17
PHYE2A2	5.16.18
SC.5.17	**PHYSIOLOGY**
MODULE CODE	**SC NR**
PHS02A2	5.17.1
PHS02B2	5.17.2
PHS03A3	5.17.3
PHS03B3	5.17.4
SC.5.18	**STATISTICAL METHODS**
MODULE CODE	**SC NR**
SMT01A1	5.18.1
SC.5.19	**ZOOLOGY**
MODULE CODE	**SC NR**
ZOO11B1	5.19.1
ZOO22A2	5.19.2
ZOO22B2	5.19.3
ZOO33A3	5.19.4
ZOO33B3	5.19.5

SC.5.1	ACTUARIAL SCIENCE	ASC

SC.5.1.1 ACTUARIAL SCIENCE LEVEL 6 (Second Year)

Module ACS02A2	Actuarial Science 2A
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisite	Mathematics Grade 12 – APS 7 (80%) At least 70% average for MAT01A1 and MAT01B1 **and** STA01A1 and STA01B1
Purpose	The aim of the module is to provide grounding in financial mathematics and its simple applications.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe how to use a generalised cash flow model to describe financial transactions.
- Describe how to take into account the time value of money using the concepts of compound interest and discounting.
- Demonstrate a knowledge and understanding of real and money interest rates.
- Define and use the more important compound interest functions including annuities certain.
- Describe how a loan may be repaid by regular instalments of interest and capital.
- Show how discounted cash flow techniques can be used in investment project appraisal.
- Describe the investment and risk characteristics of the following types of asset available for investment purposes: fixed interest government borrowings; fixed interest borrowing by other bodies; index-linked government borrowings; shares and other equity-type finance; derivatives
- Analyse elementary compound interest problems.
- Calculate the delivery price and the value of a forward contract using arbitrage free pricing methods.
- Show an understanding of the term structure of interest rates.
- Show an understanding of simple stochastic models for investment returns.

SC.5.1.2 ACTUARIAL SCIENCE LEVEL 6 (Second Year)

Module ACS02B2	Actuarial Science 2B
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisite	ACS02A2
Purpose	The aim of this introduction to life assurance mathematics is to provide a preparation for life contingencies, which form part of Actuarial Science 3B.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Life tables and their use in the deterministic determination of survival and death probabilities.
- Provide analytic formulae for the expectation of life.
- Understand the complexities of multiple decrements.
- Describe what is meant by stationary populations.
- Develop commutation functions for variable life annuities, premiums and reserves.
- Develop commutation functions for insurance payable at the moment of death, varying insurance, and the calculation of premiums and reserves.
- Show an understanding of basic pension applications.

SC.5.1.3 ACTUARIAL SCIENCE LEVEL 7 (Third Year)

Module ACS03A3	Actuarial Science 3A
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisite	ACS02A2, ACS02B2, STA02A2, STA02B2
Purpose	The aim of this course is to provide a grounding in mathematical and statistical modelling techniques that are of particular relevance to actuarial work, including stochastic processes and survival models and their applications.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use statistical distributions for risk modelling. This includes use of compound distributions, expressing association between variables explicitly using copulas and extreme value distributions to model the distribution of severity of loss
- Describe and apply the main concepts underlying the analysis of time series models. Applications include random walk, autoregressive and cointegrated models as applied to security prices and other economic variables.
- Describe and apply Markov chains and processes. Using this knowledge, the student will analyse the random process by which a life passes from one state (alive) to another (dead).
- Describe and apply techniques of survival analysis. This includes deriving many results that are the building blocks of actuarial work relating to human mortality, describing methods of graduating mortality data and describing approaches to forecasting of future mortality rates
- Describe and apply basic principles of machine learning.

SC.5.1.4 ACTUARIAL SCIENCE LEVEL 7 (Third Year)

Module ACS03B3	Actuarial Science 3B
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisite	ACS03A3 **and** ACS02A2, ACS02B2, STA02A2, STA02B2
Purpose	The aim of this subject is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value cashflows that are dependent on death, survival, or other uncertain risks.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe, interpret and discuss mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks
- Define various assurance and annuity contracts
- Develop formulae for the means and variances of the payments under various assurance and annuity contracts
- Define and use assurance and annuity contracts involving two lives
- Describe and illustrate methods of valuing cash flows that are contingent upon multiple transition events
- Describe and use methods of projecting and valuing expected cash flows that are contingent upon multiple decrement events
- Define the gross future loss under an insurance contract, and state the principle of equivalence
- Describe and calculate gross premiums and reserves of assurance and annuity contracts
- Define and calculate, for a single policy or a portfolio of policies, the death strain at risk, expected death strain, actual death strain and mortality profit
- Project expected cash flows for whole life, endowment and term assurances, annuities, unit-linked contracts and conventional/unitised with profits contracts, incorporating multiple decrement models where appropriate.
- Show how, for unit-linked contracts, non-unit reserves can be set up to ‘zeroise’ future negative cash flows, using a profit test model.

SC.5.2	ANALYTICAL TECHNIQUES	ATE

SC.5.2.1 ANALYTICAL TECHNIQUES LEVEL 5 (First Year)

Module ATE01A1	Descriptive Statistics
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	A student credited with this module will have developed a basic ability to define terms commonly used in Statistics, to show how a set of data can be organised in a meaningful way and presented so as to reveal or enhance its fundamental properties. The student will also be able to measure and model the linear relationship between two variables. A student credited with this module will have developed a basic ability to analyse a time series, understand and implement the basic concepts of probability, probability distributions, sampling distributions and elementary matrix operations.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate the ability to use statistical terminology in the appropriate way and distinguish between different measurement scales.
- Show how the raw data can be tabulated and presented graphically.
- Calculate and interpret measures of central tendency and spread for a set of data and perform elementary probability calculations
- Identify different methods used to gather sample data and understand the basic concepts of sampling distributions and statistical inference.
- Show how to analyse a time series and forecast values for future time periods.
- Determine and use least squares regression lines and the coefficients of correlation.

SC.5.2.2 ANALYTICAL TECHNIQUES LEVEL 5 (First Year)

Module ATE01B1	Statistical Inference
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	Descriptive Statistics (ATE01A1)
Purpose	To develop a basic understanding of inferential statistics and the ability to apply the methodology to a variety of business-oriented problems. This module is also intended to equip students with mathematical skills involving the differential and integral calculus and the optimisation of functions subject to constraints and to apply these to understand modern theories about the functioning of the economy.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply various inferential methods to data.
- Apply the rudiments of the differential and integral calculus to business applications.
- Find the maximum or minimum of a multivariable function subject to linear constraints on the variables.

SC.5.2.3 ANALYTICAL TECHNIQUES LEVEL 5 (First Year)

Module ATEACP2	Analytical Techniques 1A (online module)
Qualification	Online Bachelor of Human Resource Management (B34HRP)
NQF Level	5
Credits	15
Presentation	Online Semester module
Assessment	Continuous Evaluation

Purpose	A student credited with this module will have developed a basic ability to define terms commonly used in Statistics, to show how a set of data can be organised in a meaningful way and presented so as to reveal or enhance its fundamental properties. The student will also be able to measure and model the linear relationship between two variables. A student credited with this module will have developed a basic ability to analyse a time series, understand and implement the basic concepts of probability, probability distributions, sampling distributions and elementary matrix operations.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate the ability to use statistical terminology in the appropriate way and distinguish between different measurement scales.
- Show how the raw data can be tabulated and presented graphically.
- Calculate and interpret measures of central tendency and spread for a set of data and perform elementary probability calculations.
- Identify different methods used to gather sample data and understand the basic concepts of sampling distributions and statistical inference.
- Show how to analyse a time series and forecast values for future time periods.
- Determine and use least squares regression lines and the coefficients of correlation.

SC.5.3 APPLIED MATHEMATICS APM

APPLIED MATHEMATICS ALTERNATIVE SEMESTER MODULES - An alternative presentation of first year Applied Mathematics

Alternative Semester Courses are presented by the Department of Mathematics and Applied Mathematics, eg. APM01A1 is offered in the first semester, while the alternative ASMA1A1 is offered in the subsequent (second) semester. This presentation is intended to provide students who had failed the original course, with the opportunity to repeat the same module in the following/alternative semester. Students do not have to wait a whole semester before repeating the module. This opportunity is available for the following modules:

APM01A1, APM01B1 (as APMA1A1, APMA1B1 respectively)
APM02A2, APM02B2 (as APMA2A2 and APMA2B2 respectively)

Entrance Requirements: Please refer to Part 1
Pass requirements: At least 50%

For further information contact the Department of Mathematics and Applied Mathematics:
Tel: (011) 559-2831/2661 (office hours)
Fax: (011) 559-2874

ASSESSMENT AND WEIGHTING

ASSESSMENT
Attendance of both semester tests is compulsory. Exemptions will only be granted in cases where a student submits a medical certificate (from a registered medical practitioner) certifying that the student was not able to take the test or in cases where a student experiences an urgent personal crisis (such as a death in the immediate family). If an exemption is granted, the lecturer will make arrangements for a supplementary assessment.

Note that the regulations of the UJ require a medical certificate to be handed in within 7 calendar days of the scheduled test.

At the end of each semester a semester mark (SM) is calculated for each student. This mark is derived from the student's marks in the *two* semester tests as well as tutorial assignments. If a student is admitted to the examination, he/she will earn an examination mark (EM). The SM and EM will then be combined to yield a final mark (FM).

SC.5.3.1 APPLIED MATHEMATICS LEVEL 5

Module APM1EB1	Applied Mathematics 1A1E Geometry and Vector Algebra
NQF Level	5
Credits	12
Presentation	Semester 2
Prerequisite	Mathematics Grade 12 – APS 5
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. The purpose of this module is to reinforce concepts from Geometry and Analytical Geometry and introduce the concepts and techniques of Vector Algebra.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the postulates of Euclidean Geometry and how these postulates are applied to solve problems;
- Understand the various methods of proof used to solve geometric problems;
- Be able to solve geometric problems using Geometry and Analytical Geometry;
- Know and define what a scalar and a vector is;
- Be able to calculate the direction and magnitude of a vector using Analytical Geometry techniques;
- Know which algebraic operations are applicable to vectors and the properties of these vector algebraic operations;
- Define the scalar product and its properties and use it to solve abstract problems;
- Define the vector product and its properties and use it to solve abstract problems;
- Define the triple products and their properties and use them to solve abstract problems.

SC.5.3.2 APPLIED MATHEMATICS LEVEL 5

Module APM2EA1	Applied Mathematics 1A2E Introduction to Mathematical Modelling
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisites	APM1EB1 and MAT1EA1
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. The purpose of this module is to master the concepts and techniques of Vector Algebra and apply these concepts and techniques to real world problems.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify the parameters and variables relevant to a real-world problem;
- Construct a mathematical model of the real-world problem using vector algebra;
- Utilize the appropriate vector algebraic operations to solve the mathematical model;
- Interpret the solution and its relation to the real-world problem.

SC.5.3.3 APPLIED MATHEMATICS LEVEL 5 (First Year)

Module APM01A1	Introduction to Mathematical Modelling 1A
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisite	Grade 12 Mathematics – APS 6 (BSc) Grade 12 Mathematics – APS 5 (Engineering)

Purpose	The central theme in Applied Mathematics is that of mathematical modelling. This course introduces the student to the methodology of this approach, where a mathematical model is derived for a real-life system, the solution(s) to the mathematical problem is found and the results are interpreted in order to solve the real-life problem.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify the variables and parameters relevant to a real-life problem.
- Construct a mathematical model which relates these variables.
- Utilize the appropriate mathematical techniques in order to solve the resulting model.
- Interpret the results and relate these to the real-life problem.

SC.5.3.4 APPLIED MATHEMATICS LEVEL 5 (First Year)

Module APM01B1	Introduction to Analytical Dynamics 1B
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	APM01A1 **or** APMA1A1 **and** MAT01A1 **or** MAT3EA1 **or** MATENA1 **or** ASMA1A1
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. In this course, the motion of bodies are rigorously studied using analytical methods.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify all dynamical variables in a given mechanical system.
- Formulate the equations of motion in a given mechanical system.
- Solve these equations by analytical means.

SC.5.3.5 APPLIED MATHEMATICS LEVEL 6 (Second Year)

Module APM02A2	Introduction to Differential Equations
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	APM01B1 **or** APMA1B1 **and** MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. Continuous phenomena are often modelled via differential equations. The purpose of this module is to teach analytical and formal methods of solution for a variety of differential equations, predominantly linear.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand and apply basic concepts concerning ODEs.
- Solve first-order Differential Equations (ODEs) and systems of ODEs at an appropriate level.
- Use transformation of variables.
- Study systems of differential equations using qualitative techniques.
- Understand and apply the basic concepts of mathematical modelling, using differential equations, to a wide variety of fields at an appropriate level.
- Master the philosophy and language of the field.

SC.5.3.6 APPLIED MATHEMATICS LEVEL 6 (Second Year)

Module APM02B2	Introduction to Numerical Analysis
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	APM01B1 **or** APMA1B1 **and** MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1

Purpose	The central theme in Applied Mathematics is that of mathematical modelling. Often these models can only be solved by numerical (rather than analytical) methods. The purpose of this module is to introduce various concepts in the vast field of Numerical Analysis: methods of solution of linear and non-linear equations, approximation theory, numerical differentiation and integration and techniques for solving ordinary differential equations (ODEs).

Module learning outcomes: On completion of this learning event, the student should be able to:

- Appreciate the mathematical origin of the method of Numerical Analysis.
- Apply these methods in order to find numerical solutions for various mathematically formulated problems.
- Understand that these methods are approximations and that errors are associated with solutions found by using these methods.
- Understand the derivation of error formulas to use these formulas to find solutions of required accuracy.

SC.5.3.7 APPLIED MATHEMATICS LEVEL 7 (Third Year)

Module APM03A3	Mathematical Optimisation
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	APM01A1, APM01B1, APM02A2, APM02B2 **and** MAT01A1, MAT01B1, MAT01A2, MAT02A2, MAT01B2 and MAT02B2 (or equivalent alternative semester module offerings).
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. The purpose of this module is to introduce students to the theory and applications of Mathematical Optimisation and the methodology to solve mathematical models which require optimal solutions.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Classify and model various optimisation problems based on real-world examples, by identifying objective functions, decision variables and constraints, and represent these concepts with the correct mathematical language.
- Understand the derivation of the optimality conditions.
- Differentiate between first- and second-order necessary and sufficient optimality conditions.
- Apply the optimality conditions to solve optimisation problems.
- Solve unconstrained optimisation problems using suitable mathematical methods.
- Solve constrained optimisation problems using the Lagrange multiplier method and Karush-Kuhn-Tucker conditions.
- Solve nonlinear optimisation problems using suitable numerical method.

SC.5.3.8 APPLIED MATHEMATICS LEVEL 7 (Third Year)

Module APM03B3	Multi-linear Algebra
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	APM01B1/APMA1B1 or APM2EA1 and APM02A2/APMA2A2, APM02B2/APMA2B2 and MAT01A2/ASMA2A1 and MAT02A2/ASMA2A2 and MAT01B1/ASMA2B1 and MAT02B2/ ASMA2B2
Purpose	The central theme in Applied Mathematics is that of mathematical modelling. The purpose of this module is to give a comprehensive introduction to multi-linear algebra. This will enable the student to study mathematical models relevant to problems in physics and engineering.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the concept of multi-linear algebra and product spaces.
- Use multi-linear algebra and the Kronecker product in physics and quantum groups.
- Apply software packages to problems in science.

SC.5.4 BIOCHEMISTRY BIC

The following Chemistry modules: Introduction of General Chemistry (CEM01A1), Introduction of Physical and Organic Chemistry (CEM01B1) are compulsory modules for Biochemistry as a major and are prerequisites for Biochemistry 2 and 3. CEM1AC1 or CEM2EC1 and CEM3EC1 include aspects of general chemistry relevant to the biological sciences and can be taken as an equivalent to CEM01A1.

A student may register for CEM01B1 if a pass of at least 60% is achieved in CEM1AC1.
A student may register for CEM01B1 if a pass of at least 65% is achieved in CEM2EC1 and CEM3EC1.

- The combination of CEM1AC1 (>60%) and CEM01B1 gives access to Biochemistry 2
- The combination of CEM2EC1 and CEM3EC1 (>65%) and CEM01B1 gives access to Biochemistry 2
- The combination of CEM1AC1 and CEM1DB1 does not allow access to Biochemistry 2
- Mathematics 1C (Bio and Enviro Math & Stats) OR Mathematics 1A are prerequisites for Biochemistry 2A

Practicals

BIC01B1	=	1 x 3 hour per week
BIC02A2	=	1 x 6 hour per week
BIC02B2	=	1 x 6 hour per week
BIC03A3	=	1 x 6 hour per week
BIC03B3	=	1 x 6 hour per week

Practicals form an integral part of the theory discussed during lectures. A sub-minimum of **50%** for practicals is required for admission to semester examinations in Biochemistry. A student repeating a module will only be given practical exemption for that module if a minimum of 50% for the practical work was obtained in the previous year.

The Biochemistry department has formal minimum requirements that have to be met to allow entry to final summative assessments. Unsatisfactory attendance of lectures or (where applicable) participation in an electronic learning environment and practicals is taken into consideration when unsatisfactory progress in a student's studies is determined.

Practicals

- All practicals have to be attended and practical assignments/reports have to be submitted on or before the indicated dates. Practical classes form an integral part of the module and NO student will be excused from practical classes.
- Practical classes are compulsory and count towards the semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 3 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated. The absence from any practical without reason will result in a semester mark of "incomplete". A maximum of 1 practical session may be missed with valid reasons. If more than 1 practical session is missed, even with valid reasons, the student will be given an "incomplete" mark which will result in no exam entrance.
- Absence from a practical session must be motivated by a doctor's certificate with a valid medical condition. This only excuses the student from the practical session; a report must still be handed in when returning to university - before starting the next practical session. The class test (if there is one) for the missed practical/tutorial class must also be written.
- In addition to weekly practical reports, a practical exam is written at the end of each module. The combined mark for the practical reports and the practical exam must be at least 50% to gain admission to the final theory assessment opportunity.
- The practical mark contributes 50% of the module mark. The calculation of the module mark and the contribution of the practical component thereto, are explained in the respective study guides. If a student fails the final assessment exam, he/she can obtain exemption from repeating the practical component of a module if the combined final mark for the practical reports and practical exam was greater than 50%.

Theory

- Class attendance is very important to master the theory component of all Biochemistry modules. Tests and tutorials are compulsory and all formal formative assessment marks count towards the module mark.
- Tests and tutorials are compulsory and count towards the module/semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 3 days after the missed test. Failure to do so will result in a mark of zero being allocated.
- In the determination of the module/semester mark, the mark attained in the theoretical assessment is given a weight of 50% and the practical mark a weighting of 50%. The calculation of the module mark and the contribution/ weighting of the theory and practical components thereto, are explained in the respective study guides.

SC.5.4.1 BIOCHEMISTRY LEVEL 5 (First Year)

Module BIC01B1	Principles of Biochemistry
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	Biology (BIO10A1 or BIO2EA1)
Purpose	This module - Principles of Biochemistry - forms an integral part of the BSc Life and Environmental Sciences and BSc Physical Sciences qualification and lays the foundation for Biochemistry as the language and central core of the Life Sciences. It provides students with a fundamental, general knowledge of basic principles and techniques in Biochemistry that would equip them for further undergraduate studies in Biochemistry in following years. It also serves as a service module for students who do not wish to major in Biochemistry, but who require an introductory module as part of study in the Life Sciences.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Recognize, determine and demonstrate the working and calculation of buffers.
- Define, memorize, explain and show the working of proteins.
- Indicate, classify and recognize different biomolecules and understand their actions in membrane function.
- Describe basic molecular techniques, employ and solve biotechnological problems and their use in new developments.

SC.5.4.2 BIOCHEMISTRY LEVEL 6 (Second Year)

Module BIC02A2	Biochemical Techniques and Enzymology
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	BIO10A1 **or** BIO2EA1 **and** BIC01B1, CEM01A1 **or** CEM3EA1 **or** CEM1AC1 (60%) **or** CEM2EC1 **and** CEM3EC1 (Ave 65%) **and** CEM01B1 **and** MAT01A1 **or** MAT2EB1 **and** MAT3EA1 **or** MAT1CA1 **or** MAT2EC1 **and** MAT3EC1 **or** ASMA1A1

Purpose	The primary purpose of this course, as an integral part of the degree BSc Life and Environmental Sciences and BSc Physical Sciences, is to educate the student in the theory and practice of Biochemical Techniques for isolation, separation, analysis and quantification of bio-molecules and to develop the students laboratory skills and practical knowledge in the application of isolation, separation and characterization techniques for bio-molecules. The second section will provide students with a general knowledge of basic principles in Enzymology (Enzymes, Enzyme Mechanisms and Enzyme Kinetics) that would equip them for a more in-depth study of Biochemistry in following years (e.g. Metabolism and Molecular Biology) as well as professional training, practice and postgraduate studies. This will serve as a basis for entry into the Biochemistry modules on second and third year level.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Recognize, determine and demonstrate the working and calculation of buffers.
- Name and recognize monomers and polymers of biomolecules.
- Explain the principle involved in biochemical separation and analytical techniques.
- Demonstrate the ability to design and develop simple protocols for biomolecule isolation, purification and characterization.
- Describe, classify and recognize different enzymes, their functioning and application.
- Define and describe the working of enzymes.
- Acquire, analyse and interpret enzymological data.
- Understand the biochemical basis of enzyme regulation.

SC.5.4.3 BIOCHEMISTRY LEVEL 6 (Second Year)

Module BIC02B2	Integrated Metabolism and Control
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	BIC02A2
Purpose	The primary purpose of this module as an integral part of the degree BSc Life and Environmental Sciences and BSc Physical Sciences is to develop the student's understanding of scientific principles and methods related to the field of Metabolism (the sum total of enzyme-catalysed chemical reactions inside living cells, anabolism, catabolism and energy generation) and the integration thereof; as well as the laboratory skills and practical knowledge related to Metabolism, that is required as a basis for entry into the third year of study. The module would also equip the student for postgraduate studies, professional training and practice.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Have knowledge of and comprehend the principles and theories governing carbohydrate, lipid, protein and nucleic acid metabolism.
- Interpret the related mechanisms of regulation and be able to compare the different ways on metabolic control.
- Grasp the overall concept of metabolism and indicate how it is integrated in terms of energy metabolism.
- Apply their knowledge to relevant applicable situations, e.g. how metabolism is influenced by nutrition and exercise.

SC.5.4.4 BIOCHEMISTRY LEVEL 7 (Third Year)

Module BIC03A3	Molecular Biology
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	BIC02A2 and BIC02B2
Purpose	The primary purpose of this module as an integral part of the BSc Life and Environmental Sciences and BSc Physical Sciences degree is to provide students with a well-rounded and broad education concerning Biological Information Flow. The module will equip them with the scientific knowledge base, theory and methodology of Molecular Genetics which is the study of genes and their activities at the molecular level. This module strongly emphasizes the techniques and methodology leading to molecular processes that will enable students to understand the applications of molecular biology which forms a fundamental part of the knowledge base in Life and Environmental Sciences. The module also equips the student for entry into the labour market, professional training and practice or postgraduate studies.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Name and define different Mendelian principles and biological information flow.
- Differentiate between and select appropriate techniques that can be employed in Molecular Biology and Biotechnology.
- Relate, compare and discriminate between components of prokaryotic biological information flow.
- Relate, compare and discriminate between components of eukaryotic biological information flow.

SC.5.4.5 BIOCHEMISTRY LEVEL 7 (Third Year)

Module BIC03B3	Molecular Physiology
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	BIC02A2 and BIC02B2
Purpose	The purpose of this module (Molecular Physiology, concerned with the biochemistry of specialized physiological processes) as an integral part of the BSc Life and Environmental Sciences and BSc Physical Sciences qualification with Biochemistry as major; is to integrate the knowledge obtained in the second and third years of study. It provides students with an understanding of the theory, the scientific principles and methods related to the field of molecular and cellular communication and extracellular biochemistry. In addition, laboratory skills and practical knowledge about procedures to investigate and solve biochemical problems are learned as well as the necessary skills in data collection, statistical analysis and presentation of results that would equip the student for entry into professional training, practice and postgraduate studies.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Comment on the composition, role and classification of different membranes, and bacterial cell walls.
- Organize the endocrine system and related hormones in terms of origin (organs or tissue), structure, transduction mechanisms and effects.
- Evaluate the different mechanisms involved in host-pathogen interaction, including apoptosis.
- Formulate an overview of muscle structure and function as well as the cytoskeleton.
- Organize blood cells as red and white based on origin, composition and function and explain haemostasis and thrombosis.
- Formulate the collection of plasma proteins and immunoglobulins found in the plasma.
- Criticise various immunological techniques and formulate their appropriate use.
- Prepare a critique on the human genome project and the management thereof.
- Comment on HIV/AIDS in the context of Southern Africa.

SC.5.5	BIOLOGY	BIO

Practicals form an integral part of the theory discussed during lectures. A sub-minimum of 50% for practicals is required for admission to semester examinations in Biology. A student repeating a module will only be given practical exemption for that module if a minimum of 50% for the practical work was obtained in the previous year. The Biochemistry department has formal minimum requirements that have to be met to allow entry to final summative assessments. Unsatisfactory attendance of lectures or (where applicable) participation in an electronic learning environment and practicals is taken into consideration when unsatisfactory progress in a student's studies is determined.

Practicals

- All practicals have to be attended and practical assignments/reports have to be submitted on or before the indicated dates. Practical classes form an integral part of the module and NO student will be excused from practical classes.
- Practical classes are compulsory and count towards the semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 3 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated. The absence from any practical without reason will result in a semester mark of "incomplete". A maximum of 2 practical sessions may be missed with valid reasons. If more than 2 practical sessions are missed, even with valid reasons, the student will be given an "incomplete" mark which will result in no exam entrance.
- Absence from a practical session must be motivated by a doctor's certificate with a valid medical condition. This only excuses the student from the practical session; a report must still be handed in when returning to university - before starting the next practical session. The class test (if there is one) for the missed practical/tutorial class must also be written.
- In addition to weekly practical reports, a practical exam is written quarterly. The combined mark for the practical reports and the practical exams must be at least 50% to gain admission to the final theory assessment opportunity.
- The practical mark contributes 40% of the module mark. The calculation of the module mark and the contribution of the practical component thereto, are explained in the respective study guides. If a student fails the final assessment exam, he/she can obtain exemption from repeating the practical component of a module if the combined final mark for the practical reports and practical exam was greater than 50%.

Theory

Class attendance is very important to master the theory component of the Biology module. Tests and tutorials are compulsory and all formal formative assessment marks count towards the module mark.

- Tests and tutorials are compulsory and count towards the module/semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 3 days after the missed test. Failure to do so will result in a mark of zero being allocated.
- In the determination of the module/semester mark, the mark attained in the theoretical assessment is given a weight of 60% and the practical mark a weight of 40%. The calculation of the module mark and the contribution/weighting of the theory and practical components thereto, are explained in the respective study guides.

SC.5.5.1 BIOLOGY LEVEL 5 (First Year)

Module BIO1EB1	Biology 1A1E
NQF Level	5
Credits	12
Presentation	Semester 2
Purpose	To provide the students with the basic knowledge and understanding of the principles of biology that is applicable to Biochemistry, Botany and Zoology. The content and activities of the module serve to give students the relevant understanding of matters that are fundamental to the later modules in Life and Environmental Science.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the different themes that unify the study of life and demonstrate the methodology of the scientific inquiry.
- Understand the basic principles of chemistry as it relates to inorganic and organic molecules and relate the molecular structure of biomolecules to their respective molecular function.
- Justify why the cell can be considered the basic unit of life, distinguish between pro- and eukaryotic cells and relate the molecular structure of cellular organelles and the biological membrane to their function.
- Consider cellular metabolic concepts such as central role of ATP and the central role of aerobic cellular respiration and photosynthesis to life.
- Examine cellular reproduction (meiosis), the fundamental principles of inheritance as well as the flow of genetic information from DNA to RNA to proteins in the cell (replication, transcription, translation).
- Understand the origin of the Protista and examine the phylum's characteristics and life cycles.
- Compare the developmental differences between protostomes and deuterostomes in relation to the classification of the different phyla of the Kingdom Animalia.
- Understand the basic stages of animal development (fertilization, cleavage and gastrulation) and relate this to the germ layers that form as well as structures these layers eventually give rise to.
- Understand the adaptation of vascular plants to life on land and distinguish between angiosperms and gymnosperms, and monocots and eudicots.
- Explore resource acquisition and transport in vascular system of plants.
- Understand the relationship between soil-composition, -bacteria and -fungi with plant nutrition.
- Consider the role of flowers and fruits in the angiosperm life cycle and describe sexual reproduction in flowering plants.
- Discuss how food crops can be modified using techniques of breeding and genetic engineering.
- Develop the general skills (e.g., observation, problem solving, hypothesis generation and testing) used in science and familiarize themselves with various laboratory techniques.

SC.5.5.2 BIOLOGY LEVEL 5 (First Year)

Module BIO2EA1	Biology 1A2E
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisite	BIO1A1E
Purpose	To provide the students with the basic knowledge and understanding of the principles of biology that is applicable to Biochemistry, Botany and Zoology. The content and activities of the module serve to give students the relevant understanding of matters that are fundamental to the later modules in Life and Environmental Science.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the different themes that unify the study of life and demonstrate the methodology of the scientific inquiry.
- Understand the basic principles of chemistry as it relates to inorganic and organic molecules and relate the molecular structure of bio-molecules to their respective molecular function.
- Justify why the cell can be considered the basic unit of life, distinguish between pro- and eukaryotic cells and relate the molecular structure of cellular organelles and the biological membrane to their function.

- Consider cellular metabolic concepts such as central role of ATP and the central role of aerobic cellular respiration and photosynthesis to life.
- Examine cellular reproduction (meiosis), the fundamental principles of inheritance as well as the flow of genetic information from DNA to RNA to proteins in the cell (replication, transcription, translation).
- Develop the general skills (e.g., observation, problem solving, hypothesis generation and testing) used in science and familiarize themselves with various laboratory techniques.

SC.5.5.3 BIOLOGY LEVEL 5 (First Year)

Module BIO10A1	Biology 1A
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	To provide the students with the basic knowledge and understanding of the principles of biology, that is applicable to Biochemistry, Botany and Zoology. The content and activities of the module serve to give students the relevant understanding of matters that are fundamental to the later modules in Life and Environmental Sciences.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the different themes that unify the study of life and demonstrate the methodology of the scientific inquiry.
- Understand the basic principles of chemistry as it relates to inorganic and organic molecules and relate the molecular structure of biomolecules to their respective molecular function.
- Justify why the cell can be considered the basic unit of life, distinguish between pro- and eukaryotic cells and relate the molecular structure of cellular organelles and the biological membrane to their function.
- Consider cellular metabolic concepts such as central role of ATP and the central role of aerobic cellular respiration and photosynthesis to life.
- Examine cellular reproduction (meiosis), the fundamental principles of inheritance as well as the flow of genetic information from DNA to RNA to proteins in the cell (replication, transcription, translation).
- Understand the origin of the Protista and examine the phylum's characteristics and life cycles.
- Compare the developmental differences between protostomes and deuterostomes in relation to the classification of the different phyla of the Kingdom Animalia
- Understand the basic stages of animal development (fertilization, cleavage and gastrulation) and relate this to the germ layers that form as well as structures these layers eventually give rise to.
- Understand the adaptation of vascular plants to life on land and distinguish between angiosperms and gymnosperms, and monocots and eudicots.
- Explore resource acquisition and transport in vascular system of plants.
- Understand the relationship between soil-composition, -bacteria and -fungi with plant nutrition.
- Consider the role of flowers and fruits in the angiosperm life cycle and describe sexual reproduction in flowering plants.
- Discuss how food crops can be modified using techniques of breeding and genetic engineering.
- Develop the general skills (e.g., observation, problem solving, hypothesis generation and testing) used in science and familiarize themselves with various laboratory techniques.

SC.5.6 BOTANY AND PLANT BIOTECHNOLOGY BOT

Chemistry 1A **or** 1C **and** Chemistry 1B **or** CEM1D are compulsory modules for Botany as a major subject. Botany 2B is normally a prerequisite for admission to Botany 3A but exemption from this requirement may be granted in exceptional cases by the Head of Department.

Excursions:
Participation in one extended excursion is compulsory for all students in Botany 3B.
Botany 2B and 3B may only be taken in the same year with the approval of the Head of Department.

Practicals:
BOT01B1 = 1 x 3 hour per week
BOT02A2 = 1 x 7 hour per week
BOT02B2 = 1 x 7 hour per week
BOT03A3 = 1 x 7 hour per week
BOT03B3 = 1 x 7 hour per week

The relative weightings for determining the module mark applied to theory and practical assessments are: (Theory : Practical)

BOT01B1 70:30
BOT02A2 no separate mark for theory and practicals
BOT02B2 60:40
BOT03A3 60/30/10 (last 10% for the assignment)
BOT03B3 50:50

Attendance at practical classes is compulsory. Absence from a practical class will only be condoned on presentation of a very good reason substantiated by a certificate from an acceptable source, this certificate to be submitted to the department within 5 working days. Any student absent from a practical class without permission will not be permitted entry to the final assessment opportunity.

SC.5.6.1 BOTANY LEVEL 5 (First Year)

Module BOT01B1	Plant Diversity
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	BIO10A1 or BIO 1A1E and BIO2EA1
Purpose	The primary purpose of this module is to provide students with a well-rounded and broad education that equips them with knowledge to identify, name and classify plants, study vegetative features and use appropriate terminology useful in the identification of (flowering) plants and have a basic understanding of the major groups of vascular and non-vascular plants and basic ecological concepts.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Name and classify plants.
- Describe the vegetative and reproductive features and demonstrate the use of appropriate terminology that is useful in the identification of flowering plants.
- Show a basic understanding of the major groups of vascular and non-vascular plants throughout the world.
- Demonstrate knowledge of the major families of vascular plants, as well as the collection and identification of local vascular plants.
- Define, explain and explore fundamental concepts of ecology and population and community ecology.

SC.5.6.2 BOTANY LEVEL 6 (Second Year)

Module BOT02A2	Plant Anatomy and Cytology
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	BIO10A1 or BIO2EA1 and BOT01B1 and CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1
Purpose	The primary purpose of this module is to provide students with a basic knowledge of the structure and function of plant cells, tissues and organs, and to become familiar with basic light microscopic techniques applicable to investigations of plant material especially for identification purposes. This will equip students with knowledge of anatomy and cytology fundamental to all botanical studies.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe, as well as compare and contrast, the structure of eukaryotic and prokaryotic cells, and point out and explain the relationship between structure and function of the various cell components.
- Prepare temporary, semi-permanent and permanent microscope mounts of fresh material by means of epidermal peels and hand sections and simple staining techniques, as well as construct scale bars and calculate magnifications.
- Examine microscope slides, diagrams, micrographs and ultra-micrographs, and identify, describe, draw and interpret the various plant organs, tissues, cells and cell components.
- Explain why plant anatomy is studied and describe how it can be used for identification and related purposes, and be able to use and apply appropriate tests and procedures in order to investigate material microscopically for these purposes.
- Describe, explain, compare, classify, record and distinguish between the various simple and complex plant tissues, as well as primary and secondary tissues, and the various cell types within these categories, describe how they are structurally suited to perform their functions and how this relates to their commercial value.
- Describe, explain and compare the basic anatomy of roots, stems and leaves (of monocotyledons and dicotyledons) as well as of flowers, to identify these organs from sections, recognize and explain adaptations to different environmental conditions and draw line diagrams to show the distribution of tissues.
- Plan and carry out a logical, comprehensive anatomical investigation of a selected plant which includes producing suitable slides, illustrations and working with units using an estimation technique.

SC.5.6.3 BOTANY LEVEL 6 (Second Year)

Module BOT02B2	Plant Physiology
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	BIO10A1 or BIO2EA1 and BOT01B1 and CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1
Purpose	The purpose of this module as an integral part of the Life and Environmental Science programme is to provide the student with a well-rounded and broad education that equips them with a theoretical and practical knowledge base in plant physiology that could serve as a basis for entry into postgraduate studies in plant physiology.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe the sub-cellular components and their functions.
- Describe the properties of water, discuss plant water relations, explain the process of transpiration, specify the different mineral elements essential to plant growth and give details about their functions, deficiency symptoms, uptake and transport from cell to cell and demonstrate the application of mineral nutrition in agriculture.
- Categorize enzymes and describe and explain their composition and functioning.
- Expound on the process of respiration, lipid metabolism and photosynthesis and their roles in the control of plant growth and development.
- Explain the translocation of solutes in the plant.
- Illustrate how plant hormones orchestrate the different processes involved in plant growth and development and examine plant growth and development in terms of movement, photomorphogenesis, photoperiodism, vernalisation, dormancy and seed germination.
- Describe the different groups of secondary plant products and some of their uses.
- Conduct practical work and experiments that illustrate the processes, principles and applications of plant growth and development; design, construct and conduct experiments that will illustrate specific aspects of growth and development; and to write reports that appraise the results of these experiments.

SC.5.6.4 BOTANY LEVEL 7 (Third Year)

Module BOT03A3	Biotechnology
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	BIO10A1 or BIO 1A1E and BIO2EA1, BOT01B1, BOT02A2, BOT02B2 and CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1
Purpose	The primary purpose of this module as an integral part of the BSc qualification is to provide students with a well-rounded and broad education that equips them with the scientific knowledge base, theory and methodology of Plant Biotechnology that could serve as a basis for entry into postgraduate studies or as a research scientist in the field of biology and the life sciences.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Explain the concept of biotechnology and concepts related to the field.
- Describe the composition of plant genomes and genes and their relevance to plant genetic engineering.
- Describe, understand and elaborate on the biotechnological aspects of plant manipulation and cultivation.
- Describe and apply several techniques in the field of plant recombinant DNA technology.
- Conduct practical work and experiments that illustrate and exemplify the techniques and applications of recombinant DNA technology and plant tissue culture.
- Write an appropriate scientific essay and report.
- Give appropriate presentations on assignments given.

SC.5.6.5 BOTANY LEVEL 7 (Third Year)

Module BOT03B3	Plant Taxonomy
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	BIO10A1 or BIO 1A1E and BIO2EA1, BOT01B1, BOT02A2, BOT02B2, CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1
Purpose	Purpose of module: The primary purpose of this module as an integral part of Life and Environmental Sciences is to provide students with a well-rounded and broad education that equips them with the necessary taxonomic, nomenclatural and floristic knowledge base, theory and methodology.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Distinguish and identify any indigenous seed plant to the level of family and genus, using appropriate identification keys and microscope techniques.
- Distinguish between selected representatives of all the major plant families, the dominant and characteristic plant species of all the biomes and selected vegetation types of South Africa and well-known indigenous and exotic plants of commercial and horticultural importance.
- Describe and explain the history, principles and methods of plant classification (both phenetic and cladistic approaches), and generate phenograms and cladograms using small data sets.
- Explain the principles, methods and application of plant nomenclature (scientific naming of plants).
- Categorize the various types of taxonomic evidence used in plant classification, including the correct use of descriptive terminology.
- Compare and explain the basic methodologies used in plant classification and plant survey work, including plant collecting, botanical survey work and the role of various types of herbaria and botanical gardens and how they function.
- Assess and contrast the biomes and major vegetation types of South Africa in terms of environmental parameters, structure, function and dominant species, based on a sound knowledge of the basic principles of plant ecology, including the behaviour and ecological role of fire in grasslands, savannah and fynbos.

SC.5.7 CHEMISTRY CEM

Prerequisites
A pass of at least 60% in CEM1AC1 for CEM01B1 and 65% in CEM2EC1, CEM13CE for CEM01B1
Chemistry 1A **and** 1B01 for all second and third year modules
CEM01A2, CEM02A2, CEM01B2 and CEM02B2 for CEM02A3, CEM01A3, CEM02B3 and CEM01B3

Practicals
Practicals are compulsory for all modules in Chemistry.

1 x 3 hours per week:	CEM01A1, 1B, 1C, 1D
1 x 6 hours per week:	CEM01A2, 2A2, 2B1, 2B2 CEM01A3, 3A2, 3B1, 3B2

Practicals form an integral part of the theory discussed in the modules.
A sub-minimum of 50% for practicals is required for admission to semester examinations in Chemistry.

Examination
Apart from the sub-minimum of 50% for practical work, the candidate must have a final semester mark (practical work + theoretical tests) of at least 40% for admission to the semester examination. The final mark is the average of the semester mark and the examination mark. The final pass mark for a module is 50%. A sub-minimum of 40% must be achieved in the examination (irrespective of the semester mark) to pass the module.

Tests, Tutorials and Practicals
1. Tests, tutorials and practicals are compulsory and count towards the semester mark. If an assessment opportunity of any kind is missed due to illness, an original medical certificate for a valid medical condition **plus** the Application for Deferred test/final assessment MUST be completed by a reputable general practitioner and must be handed in not later than 3 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated. In case of other reasons for not attending an assessment opportunity an appropriate certificate or affidavit must accompany the Application for a deferred test. The Department may reject the application on grounds of insufficient justification.
2. A sub-minimum of 50% for practical assessments is required for admission to the exams in all Chemistry Department modules.
3. A student will only be allowed to miss one practical per module with valid documentation as set out in (1) above. If more than one practical is missed, the student will get a “Practical Incomplete” grading and will not be allowed entrance to the examination.
4. A student repeating a module will only be given exemption for the practical component of that module if 50% for the practical work was obtained in the previous year.
5. In the determination of the module semester mark the mark attained in the theoretical assessment is given a weight of approximately 75% and the practical mark a weight of approximately 25%. There may, however, be deviations from this in individual modules. Please consult study guides for individual modules for the percentages pertaining to each module.

SC.5.7.1 CHEMISTRY LEVEL 5 (First Year)

Module CEM1EA1	Chemical Principles
NQF Level	5
Credits	4
Presentation	Semester 1
Purpose	To develop the student’s knowledge and comprehension of introductory chemical principles and techniques.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Make use of a calculator for scientific notation calculations
- Solve problems relating to rounding of figures and the use of significant figures

- Convert between different units of mass, length, time, volume and temperature
- Describe the structure of atoms, ions, anions, cations and simple molecules
- Distinguish between molar mass, atomic mass and formula mass and do calculations related to these concepts
- Distinguish between different type of chemical reactions (combustion, combination, single displacement, dissolving of salts and acids in water) and write the corresponding chemical equations.
- Identify a limiting reactant through mole-ratios, calculate percentage yield in chemical reactions and perform stoichiometric calculations.
- Describe and do basic calculations on the behaviour of gases with changes in pressure, volume, temperature and amount.
- Do basic stoichiometric calculations involving solutions.
- Compare different acid-base models and do simple calculations relating to acid-base chemistry.

SC.5.7.2 CHEMISTRY LEVEL 5 (First Year)

Module CEM2EB1	Introduction to General Chemistry
NQF Level	5
Credits	10
Presentation	Semester 2
Purpose	To develop the students' knowledge and comprehension of chemical principles and techniques. Additionally, the module aims to develop the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use chemical vocabulary
- Perform chemical calculations
- Identify a limiting reactant through mole ratios, calculate percentage yield in chemical reactions and perform stoichiometric calculations
- Distinguish between the different types of chemical reactions (precipitation, complex formation, acid-base and redox reactions)
- Apply the solubility rules in precipitation reactions
- Define oxidation and reduction and determine oxidation numbers
- Identify redox reactions and balance these using half reactions
- Explain and apply the concepts of modern atomic theory
- Explain the causes and consequences of periodicity
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report.

SC.5.7.3 CHEMISTRY LEVEL 5 (First Year)

Module CEM3EA1	General Chemistry
NQF Level	5
Credits	10
Presentation	Semester 1
Purpose	To introduce students to more advanced concepts and techniques in within general chemistry. Additionally, the module aims to develop the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes
- Describe the concept of dynamic equilibrium and write equilibrium constants equations
- Predict the effect of stresses applied to systems in equilibrium
- Discuss different acid-base theories and differentiate between weak and strong acids and bases

- Perform quantitative calculations involving acid-base reactions (pH, pOH, $[H_3O^+]$, $[OH^-]$, K_w, buffers)
- Recognise simple organic functional groups
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report.

SC.5.7.4 CHEMISTRY LEVEL 5 (First Year)

Module CEM01A1	Introduction to General Chemistry
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	To develop the students' knowledge and comprehension of chemical principles and techniques within general chemistry which will serve as a fundamental basis for further studies in the physical and biological sciences and in engineering. Additionally, the module aims to develop the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use chemical vocabulary
- Perform chemical calculations
- Distinguish between the different types of chemical reactions (precipitation, complex formation, acid-base and redox reactions)
- Identify a limiting reactant through mole ratios, calculate percentage yield in chemical reactions and perform stoichiometric calculations
- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes
- Describe the concept of dynamic equilibrium and write equilibrium constants equations
- Predict the effect of stresses applied to systems in equilibrium
- Discuss different acid-base theories and differentiate between weak and strong acids and bases.
- Perform quantitative calculations involving acid-base reactions (pH, pOH, $[H_3O^+]$, $[OH^-]$, K_w, buffers).
- Define and apply the five gas laws for ideal gases; derive the density and molecular mass of gases from these laws and then apply stoichiometry to problems involving gas laws.
- Provide a qualitative description of the gas laws based on the kinetic theory and then distinguish between an ideal and a real gas and apply this with the use of the Van der Waal's equation.
- Explain and differentiate between effusion and diffusion
- Recognise simple organic functional groups and reaction mechanisms.
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report.

SC.5.7.5 CHEMISTRY LEVEL 5 (First Year)

Module CEM2EC1	Chemistry 1C2E
NQF Level	5
Credits	12
Presentation	Semester 2
Purpose	To introduce and develop the students' knowledge and comprehension of chemical principles and techniques.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use chemical vocabulary.
- Perform chemical calculations and do appropriate conversions.
- Distinguish between the different types of matter and their properties.
- Understand the Periodic Table of the elements
- Perform stoichiometric calculations.
- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes.

SC.5.7.6 CHEMISTRY LEVEL 5 (First Year)

Module CEM3EC1	Chemistry 1C3E
NQF Level	5
Credits	12
Presentation	Semester 1
Purpose	Building on CEM2EC1, to further develop the students' knowledge and comprehension of chemical principles and techniques within general chemistry which will serve as a fundamental basis for further studies in physical and biological sciences. Additionally, the module aims to develop the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe the behaviour of gases.
- Describe various kinds of solutions.
- Describe the concept of dynamic equilibrium and write equilibrium constant equations.
- Predict the effect of stresses applied to systems in equilibrium.
- Discuss the different acid-base theories and differentiate between weak and strong acids and bases.
- Correlate the terms endothermic and exothermic with the heat flow between a system and its surroundings and interpret enthalpy, entropy and free energy and know its implications.
- Interpret nuclide symbols.
- Write balanced equations for nuclear processes and perform half-life calculations.
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report

SC.5.7.7 CHEMISTRY LEVEL 5 (First Year)

Module CEM1AC1	Introduction to General Chemistry for Biological & Earth Science
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	To develop the students' knowledge and comprehension of chemical principles and techniques within general chemistry which will serve as a fundamental basis for further studies in the physical and biological sciences and in engineering. Additionally, the module aims to develop the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use chemical vocabulary.
- Perform chemical calculations and do appropriate conversions.
- Distinguish between the different types of matter and their properties.
- Understand the Periodic Table of the elements.
- Perform stoichiometric calculations.
- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes.
- Describe the behaviour of gases.
- Describe various kinds of solutions.
- Describe the concept of dynamic equilibrium and write equilibrium constant equations.
- Predict the effect of stresses applied to systems in equilibrium.
- Discuss the different acid-base theories and differentiate between weak and strong acids and bases.
- Correlate the terms endothermic and exothermic with the heat flow between a system and its surroundings and interpret enthalpy, entropy and free energy and know its implications.
- Interpret nuclide symbols.
- Write balanced equations for nuclear processes and perform half-life calculations.
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report.

ARTICULATION TO CHEMISTRY ON SECOND YEAR LEVEL

Students achieving **at least 60%** in CEM1C may register for CEM01B1 instead of CEM1DB1. Once the combination of CEM1AC1 and CEM01B1 is passed, a student may register for Chemistry at Second Year Level. The combination of CEM1AC1 and CEM1DB1 does not allow a student to register for Second Year Chemistry modules.
Modules CEM2EC1 and CEM3EC1 together constitute CEM1AC1. However, students who register for these modules must demonstrate more exceptional performance and require an average mark of **at least 65%** in the two modules in order to register for CEM01B1.

SC.5.7.8 CHEMISTRY LEVEL 5 (First Year)

Module CEM1DB1	Environmental Chemistry: Atmosphere, Hydrosphere and Soil
NQF Level	5
Credits	15
Presentation	Semester 2
Pre-requisite	CEM1AC1
Purpose	To develop the students basic understanding of atmospheric chemistry with special reference to modern energy supply and the implications thereof for the for the earth's atmosphere. To develop the students understanding of scientific principles relating to the hydrosphere and lithosphere that forms the basis for environmental modules.

Only students who do not wish to continue with Chemistry or Biochemistry on second year level may register for CEM1AC1 and CEM1DB1.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Explain the factors involved in energy production, including conversion of energy and the efficiency of energy conversion.
- Discuss the formation and composition of fossil fuels and to apply this knowledge to the identification of possible environmental implications.
- Differentiate between renewable and non-renewable energy sources and identify the advantages and disadvantages of each.
- Identify the layers of the atmosphere and explain the composition thereof.
- Explain stratospheric chemistry, including the formation, chemistry and destruction of the ozone layer.
- Identify types and sources of air pollutants and their impact on the environment, including phenomena like acid rain, photochemical smog, particulates and organic contaminants.
- Explain the causes and effects of global warming and the greenhouse effect.
- Demonstrate understanding of the composition of natural waters, including the role of O_2, CO_2, carbonates, nitrates, phosphides, natural buffer systems and solubility.
- Discuss the processes involved in water treatment and purification
- Apply knowledge of the composition and chemistry of water to problem solving regarding toxic metal pollution in the environment.
- Identify simple organic compounds and classify them by functional groups, predict products of simple organic reactions.
- Assess the factors that contribute to the nature of different soils including chemical composition, crystals, rock-forming minerals and their role as adsorbents for pollutants.
- Demonstrate the ability to perform laboratory experiments, interpret the results and write a report.

ARTICULATION TO CHEMISTRY ON SECOND YEAR LEVEL
Students achieving at least 60% in CEM1AC1 can register for CEM01B1 instead of CEM1DB1. Once the combination of CEM1AC1 + CEM01B1 was passed a student may register for Chemistry on second year level. The combination 1C and 1D does not allow a student to register for Chemistry 2 modules.

SC.5.7.9 CHEMISTRY LEVEL 5 (First Year)

Module CEM01B1	Introduction to Physical and Organic Chemistry
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	CEM01A1 **or** CEM1EA1, 1EA2 and 1EA3 **or** a final mark of at least 60% for CEM1AC1.
Purpose	To introduce students to the concepts of thermochemistry, thermodynamics, basic kinetics (zero and first order reactions), solution chemistry and electrochemistry in relation to technological advancement. To develop the students' understanding of foundational organic chemistry, introducing the student to synthesis and the importance of organic compounds in living systems. The student acquires an appreciation of functional group transformations and stereochemistry. Introductory laboratory skills are imparted to the student via experiments involving some synthesis and comparative techniques.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and apply principles and definitions of thermochemistry.
- Apply stoichiometry to and differentiate between heat capacity and specific heat obtained from calorimetric data.
- Apply Hess's Law of heat summation.
- Define and apply the state functions and standard reference form used in the first (internal energy, enthalpy), second (entropy), and third laws of thermodynamics.
- Relate and apply Gibbs free-energy concepts to equilibrium constant expressions.
- Explain the solution process as well as define and explain the factors that affect solubility.
- Identify and apply colligative properties of solutions as well as define and explain colloidal systems.
- Explain the factors that affect reaction rates.
- Apply and link the concepts of stoichiometry and reaction rates (limited to zero and first order reactions only).
- Integrate and apply concepts of concentration, temperature and time to reaction rates (limited to zero and first order reactions only).
- Explain and apply the principles of electrochemical cells.
- Integrate and apply concepts in electrochemistry and thermodynamics related to electrochemical changes.
- Demonstrate the required laboratory skills to perform practical work and describe the results obtained from the data.
- Recognise and identify various functional groups in natural products as well as in synthetic materials
- Transpose a structure into an IUPAC name and vice versa
- Analyse, compare and differentiate between organic compounds, based on their stereochemistry and analysis of their conformations
- Explain or suggest acceptable reaction mechanisms
- Combine aspects of the above to propose viable products, starting materials and reagents for selected transformations
- Predict reaction outcomes
- Execute the synthesis and analysis of simple organic compounds in the laboratory
- Write a complete and accurate report on all experiments

SC.5.7.10 CHEMISTRY LEVEL 6 (Second Year)

Module CEM01A2	Structural Inorganic Chemistry
NQF Level	6
Credits	10
Presentation	Semester 1
Prerequisites	CEM01A1 or 60% for CEM1AC1, CEM01B1, MAT01A1 (or ASMA1A1 or MAT3EA1), MAT01B1 (or ASMA1B1).
Purpose	Introduce students to the concepts involved in atomic-, molecular, and ionic structure, and to correlate these concepts with the reactivity and properties of inorganic compounds. The s-, p- and d-block metals are examined with regard to occurrence and recovery, and representative examples are introduced. To develop laboratory and practical skills in the application of physical methods to solve problems in inorganic chemistry.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply principles of atomic and molecular structures.
- Demonstrate and apply the concepts of symmetry and group theory to molecular orbital theory.
- Demonstrate and apply the concepts of covalent and ionic bonding to the stability and reactivity of inorganic compounds.
- Distinguish, explain and apply valence-bond (VB) theory and molecular orbital (MO) theory.
- Recognise and explain different ionic solids.
- Explain the trends in chemical and physical properties of the main group elements and the d-block metals and correlate them with their inorganic structures.
- Demonstrate the required laboratory skills to perform practical work and describe the results obtained from the data.

SC.5.7.11 CHEMISTRY LEVEL 6 (Second Year)

Module CEM02A2	Intermediate Physical Chemistry
NQF Level	6
Credits	10
Presentation	Semester 1
Prerequisites	CEM01A1 or 60% for CEM1AC1, CEM01B1, MAT01A1 (or ASMA1A1 or MAT3EA1, MAT01B1 (or ASMA1B1).
Purpose	The purpose of the module is to develop an understanding of scientific principles and methods as applied to chemical thermodynamics, kinetics and fundamental quantum mechanics to develop laboratory and practical skills in the application of physical methods to solve problems in physical chemistry.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply the principles of chemical thermodynamics in problems related to heat capacity, energy, enthalpy, entropy and Gibbs energy.
- Apply the principles of reaction kinetics to determine rate laws and rate constants, to predict variation in rate with temperature change, and to design simple reaction mechanisms.
- Apply the laws of quantum mechanics to translational, vibrational and rotational motion.
- Demonstrate practical skills in the application of physical methods to solve chemical problems.

SC.5.7.12 CHEMISTRY LEVEL 6 (Second Year)

Module CEM01B2	Intermediate Organic Chemistry
NQF Level	6
Credits	10
Presentation	Semester 2
Prerequisites	CEM01A1 or 60% in CEM1AC1, CEM01B1, MAT01A1 (or ASMA1A1 or MAT3EA1), MAT01B1 (or ASMA1B1).

Purpose	To develop the student's knowledge and understanding of mono-functional organic compounds, their reactivity, reaction mechanisms and how this information is relevant to the pharmaceutical, mining, petrochemical and related industries, as well as to living systems. Additionally, the module aims to enhance the technical abilities of the student through practical experience in the laboratory.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Explain the reaction mechanisms of mono-functional organic compounds, including alkenes, alkynes, alkyl halides, alcohols and selected carbonyl compounds
- Predict and compare the chemical reactivity of mono-functional organic compounds
- Propose syntheses for mono-functional organic materials
- Predict the products of given organic reactions
- Demonstrate the ability to carry out the synthesis and analysis of some organic compounds in the laboratory

SC.5.7.13 CHEMISTRY LEVEL 6 (Second Year)

Module CEM02B2	Principles of Analytical Chemistry
NQF Level	6
Credits	10
Presentation	Semester 2
Prerequisites	CEM01A1 or 60% CEM1AC1, CEM01B1, MAT01A1 (or ASMA1A1 or MAT3EA1), MAT01B1 (or ASMA1B1).
Purpose	To develop an understanding of the principles and practice of analytical chemistry, in particular basic wet chemical techniques. To develop laboratory skills and practical knowledge in the application of volumetric and gravimetric, sample preparation techniques to solve problems related to chemical equilibrium.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Explain the underlying principles and theory of wet chemical analysis.
- Demonstrate proficiency in the application of wet chemical (gravimetric and volumetric) techniques in qualitative and quantitative chemical analysis.
- Apply selected statistical procedures in analytical data processing.
- Explain the principles underlying the interaction of species in ionic solutions.
- Characterise simple and complex equilibrium systems using theoretical calculations based on thermodynamic principles.
- Calculate concentrations and equilibrium constants for equilibrium reactions.

SC.5.7.14 CHEMISTRY LEVEL 7 (Third Year)

Module CEM01A3	Advanced Physical Chemistry
NQF Level	7
Credits	7.5
Presentation	Semester 1
Prerequisites	CEM01A1 or 60% in CEM1AC1 and CEM01B1, CEM01A2, CEM02A2, CEM01B2, CEM02B2, MAT01A1/ASMA1A1/ MAT3EA1 and MAT01B1/ ASMA1B1.
Purpose	The purpose of the module is to develop an understanding of scientific principles and methods as applied to chemical kinetics and equilibrium and quantum mechanical principles. To introduce surface chemistry and photochemistry and to develop laboratory and practical skills in the application of physical methods to solve problems in physical chemistry.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Evaluate the order and molecularity of reactions based on principles and/or numerical examples.
- Discuss the kinetics of multistep reactions based on molecular dynamics.
- Hypothesise collision theory and transition state theory with respect to catalysis.
- Compare the translational, vibrational and rotational motion of a particle.

- Understand principles of surface chemistry and explain the difference between adsorption and absorption
- Explain various physical and chemical events related to absorption of light and apply the theory to solving problems relating to photochemical reactions.
- Integrate practical skills in the application of physical methods to solve chemical problems.

SC.5.7.15 CHEMISTRY LEVEL 7 (Third Year)

Module CEM02A3	Co-ordination Chemistry
NQF Level	7
Credits	7.5
Presentation	Semester 1
Prerequisites	CEM01A1 or 60% in CEM1AC1 and CEM01B1, MAT01A1/ ASMA1A1/MAT3EA1, MAT01B1/ASMA1B1, CEM01A2, CEM01A2, CEM02A2, CEM01B2 and CEM02B2.
Purpose	The purpose of the module is to introduce students to bonding and reaction mechanisms in inorganic complexes. Knowledge of how these principles are applied to in industry is an integral part of this of the module. Practical that support the theory are carried out to equip students with laboratory skills; and report writing is a strong component of the practicals.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Apply the concepts of acids and bases in predicting the outcomes of reactions.
- Demonstrate the ability to apply concepts of bonding and to use these bonding concepts to predict and/or explain the properties of metal complexes.
- Apply basic knowledge of organometallic chemistry to predict and/or explain metal carbonyl chemistry.
- Demonstrate laboratory skills in performing practicals in support of theory and to compile and interpret data obtained in experiments into a formal report.

SC.5.7.16 CHEMISTRY LEVEL 7 (Third Year)

Module CEM01B3	Instrumental Chemical Analysis
NQF Level	7
Credits	7.5
Presentation	Semester 2
Prerequisites	CEM01A1 **or** 60% in CEM1AC1 and CEM01B1, CEM01A2, CEM02A2, CEM01B2, CEM02B2, MAT01A1/ASMA1A1/MAT3EA1 and MAT01B1/ ASMA1B1.
Purpose	To develop an understanding of the principles and practice analytical chemistry, in particular instrumental analysis. To develop laboratory skills and practical knowledge in the application of electrochemical, chromatographic and spectroscopic techniques to solve chemical problems.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Explain the underlying principles and theory of electrochemical analysis in relation to potentiometry, electrogravimetry, coulometry and chromatographic techniques with emphasis on HPLC and ion chromatography.
- Explain the origins of atomic and molecular spectra and the processes of atomic and molecular absorption, emission and fluorescence.
- Identify the different instrumental components in ultraviolet-visible, flame atomic absorption (FAAS), flame atomic emission (FAES), and fluoresce spectrometers (FS).
- Compare and contrast sample introduction techniques in UV-VIS, FAAS, FAES, and FS.
- Understand strategies for correcting sample matrix effects in atomic spectroscopic measurements.
- Utilize UV-VIS, FAAS, FEAS, and FS in qualitative and quantitative chemical analysis.
- Demonstrate proficiency in the laboratory application of chromatographic separations, electrochemical and spectroscopic techniques to solve problems in trace analysis.

SC.5.7.17 CHEMISTRY LEVEL 7 (Third Year)

Module CEM02B3	Advanced Organic Chemistry
NQF Level	7
Credits	7.5
Presentation	Semester 2
Prerequisites	CEM01A1 **or** 60% in CEM1AC1 and CEM01B1, CEM01A2, CEM02A2, CEM01B2, CEM02B2, MAT01A1/ASMA1A1/MAT3EA1 and MAT01B1/ASMA1B1.
Purpose	To develop the students' understanding of multifunctional compounds, their synthesis and their reactivity. In addition, the student is introduced to aromatic chemistry, NMR spectroscopy of organic compounds and to pericyclic reactions. The module is designed to further develop the practical skills of the student through laboratory work.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate an understanding of chemical reactivity and reaction mechanisms of aromatic compounds, and account for the unusual stability of aromatic compounds in comparison with aliphatic analogues. Various approaches to the synthesis of aromatic compounds should be able to be compared with the view to designing a viable synthesis of multifunctional aromatic products.
- Show an understanding of the reactions and reaction mechanisms of carbonyl compounds. This understanding should be used to evaluate a synthetic protocol to be applied to the synthesis of carbonyl compounds and to propose methods of preparing such materials.
- Identify some organic materials on the basis of NMR spectroscopy.
- Predict the outcomes of some pericyclic reactions based on FMO theory.
- Show competence in the synthesis and characterisation of some organic compounds in the laboratory and to write a report on the outcomes of the experiments.

SC.5.8 COMPUTER SCIENCE CSC

Lectures, Tutorials, Practicals and Assessment Criteria

1. Tests, tutorials and practical classes are compulsory and count towards the semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 7 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated.

2. Practical classes form an integral part of the module and NO student will be excused from practical classes. Absence from a practical session must be motivated by a doctor's certificate with a valid medical condition (see above). The procedure pertaining to absence from practical sessions will be detailed in each module's study guide respectively.

3. With the exception of Informatics 3B NO exemption from practical classes is applicable for modules that are repeated. A student repeating Informatics 3B will only be given exemption for the practical component of that module if a pass percentage was obtained for the group project in the previous year. If a pass percentage was not obtained in the group project the student will be required to complete a mini-project.

4. In the determination of the module semester mark the mark attained in the theoretical assessment and the practical mark is taken into account. This weighting is provided in the study guide of each module.

5. A sub-minimum of 50% for practicals is required for admission to semester examinations in Computer Science and Informatics.

6. A student needs a semester mark of 40% to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.8.1 COMPUTER SCIENCE LEVEL 5 (First Year)

Module CSC01A1	Introduction to algorithm development (C++)
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisite	Mathematics Grade 12 – APS 6
Purpose	The primary purpose of this module as an integral part of the BSc Information Technology program is to provide information technology professionals who can identify, evaluate and solve problems associated with the Information Technology discipline in South Africa and internationally. This module prepares student to analyse, design and develop algorithms into programs demonstrating correctness using a visual computer language.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Analyse, Design and interpret an algorithm
- Program algorithms in an object oriented language such as C++.
- Use a computer to solve programming problems.
- Demonstrate computer programs in C++.

SC.5.8.2 COMPUTER SCIENCE LEVEL 5 (First Year)

Module CSC01B1	Introduction to data structures (C++)
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	Computer Science 1A (CSC01A1)
Purpose	The primary purpose of this module as an integral part of the BSc Information Technology programme is to provide IT professionals who can identify, evaluate and solve problems associated with the information technology discipline in South Africa and abroad. The module prepares the student to analyse, design and develop object oriented programming solutions demonstrating correctness using a visual computer language. Students are introduced to fundamental data structures in preparation for a more rigorous theoretical treatment of the subject matter in their final year. In addition students are introduced to external data structures and data abstraction by way of the stream metaphor forming the foundation for network computing in second year.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Explain the meaning of abstract data types.
- Implement internal data structures such as linked lists.
- Explain internal data structures such as stacks and queues.
- Apply external data types such as sequential and direct files.
- Compare the object oriented programming paradigm and the component approach to program development.
- Develop object oriented programs in a computer language such as C++.

SC.5.8.3 COMPUTER SCIENCE LEVEL 6 (Second Year)

Module CSC02A2	Object-Oriented Programming
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	Computer Science 1A (CSC01A1) and Computer Science 1B (CSC01B1)
Purpose	The primary purpose of this module as an integral part of the BSc (IT) programme is to provide IT professionals who can identify, evaluate and solve problems associated with the IT discipline in South-Africa as well as in the International context. The module further ensures that students have sufficient theoretical and practical knowledge to apply object-oriented principles. The student is also introduced to concurrent processing, executable content over the Internet and portable software.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Distinguish between classes and objects.
- Explain object-oriented principles.
- Apply object-oriented principles during the development of programs.
- Explain the role of graphic interfaces, events, processes and threads.
- Develop programs that implement graphic user interfaces, events, processes and threads.
- Explain the principles of distributed processing.

SC.5.8.4 COMPUTER SCIENCE LEVEL 6 (Second Year)

Module CSC02B2	Data Communications
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	Computer Science 2A (CSC02A2)
Purpose	The primary purpose of this module, as integral part of the BSc IT programme, is to provide IT professionals who can identify, evaluate and solve problems associated with the IT discipline in South Africa, as well as internationally. The module provides students with a thorough grounding in network oriented programming in an object oriented programming language such as Java or C++ along with both a theoretical and practical understanding of the associated protocols, topologies and technologies.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Describe ISO and Internet protocols.
- Evaluate ISO and Internet protocols against each other.
- Use protocol specifications to establish the design and functioning of protocols not discussed in the lectures.
- Apply principles of network protocol design
- Explain how data, voice and video signals are transmitted over a computer network.
- Describe components of computer networks.
- Analyse various types of computer network topologies.
- Develop object-oriented Java programs to transmit messages between workstations on a computer network

SC.5.8.5 COMPUTER SCIENCE LEVEL 6 (Second Year)

Module CSC02D2	Introduction to Artificial Intelligence
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	Computer Science 2A (CSC02A2) **and** a minimum pass mark of 65% for CSC01B1 to continue with CSC02D2 (B2I04Q – AI) *(Students will be changed to B2I02Q degree if pre-requisite was not met).*

Purpose	The primary purpose of this module as an integrated part of the BSc (Computer Science) with AI specialisation programme is to provide a solid foundation for the skills required in Artificial Intelligence as a key enabler of the Fourth Industrial Revolution. The module introduces agent-oriented and multi-agent systems development both as a mechanism for concurrency control and as a framework for the development of intelligent systems. Furthermore, the student is introduced to selected approaches covering a variety of learning systems.

Module learning outcomes: On completion of this learning event students should be able to:

- Distinguish between agent-oriented and conventional paradigms
- Explain agent-oriented principles
- Apply agent-oriented and multi-agent principles during software development
- Distinguish between a selection of artificial intelligence learning problems
- Explain selected approaches for intelligent systems development
- Develop intelligent systems using selected approaches

SC.5.8.6 COMPUTER SCIENCE LEVEL 7 (Third Year)

Module CSC03A3	Advanced data structures and algorithms
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	Computer Science 2A (CSC02A2) and Computer Science 2B (CSC02B2) (or CSC02D2 (for B2I04Q – AI))
Purpose	The primary purpose of this module, as an integral part of the BSc Information Technology program, is to provide the student in IT with advanced data structure knowledge. After completing this module the student should be able to explain the meaning of data structures and data structure algorithms and to develop data structure programs in an object-oriented language such as Java or C++ and to do a critical evaluation of these programs.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Explain in detail the theoretical aspects of data structures.
- Develop short programs in an object oriented language that applies these data structures.
- The implementation of a practical project, of an appropriate scope, that demonstrates the student's proficiency with Abstract Data Structures.
- Comment on the efficiency of the different data structures in a range of applications.
- Estimate the performance of algorithms with respect to execution times and memory usage.

SC.5.8.7 COMPUTER SCIENCE LEVEL 7 (Third Year)

Module CSC03B3	Computer system architectures
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	Computer Science 2A (CSC02A2) and Computer Science 2B (CSC02B2)
Purpose	The primary purpose of this module as an integral part of the BSc Information Technology program is to provide IT professionals with knowledge of system software and related hardware. After completion the student will have the knowledge to evaluate the design of computer hardware and system software. The student will also obtain practical experience in the design of programs to illustrate applicable aspects of system software.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Explain the functioning of the hardware of a computer system such as the central processor, memory, and other components of the execution cycle correctly.

- Explain important aspects of system software such as operating systems, compilers and interpreters accurately.
- Evaluate the design of system software, and system software components logically.
- Develop short programs in a suitable language that illustrate important aspects of a computer system.

SC.5.8.8 COMPUTER SCIENCE LEVEL 7 (Third Year)

Module CSC03D3	Artificial Intelligence Techniques
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	Computer Science 3A (CSC03A3) and Computer Science Introduction to Artificial Intelligence (CSC02D2)
Purpose	The primary purpose of this module as an integrated part of the BSc (Computer Science) with AI specialisation programme is to provide the further advanced skills required in Artificial Intelligence as a key enabler of the fourth industrial revolution. These skills depend on data structures covered in Computer Science 3A. These artificial intelligence techniques are explored in the context of problem domains such as Big Data, Computer Vision, and Robotics.

Module learning outcomes: On completion of this learning event students should be able to:

- Discuss Advanced Artificial Intelligence Techniques such as selected approaches from Biologically Inspired Artificial Intelligence, Pattern Recognition, and Dimensionality Reduction
- Distinguish between AI related problem domains as appropriate in contrast to conventional software development
- Address issues of scalability in general and within the context of the selected problem domain.
- Apply selected Advanced Artificial Intelligence Techniques in the development of software systems within the selected problem domain

SC.5.8.9 COMPUTER SCIENCE LEVEL 7 (Third Year)

Module CSC03P3	AI Project
NQF Level	7
Credits	34
Presentation	Semester 2
Prerequisites	Machine Learning module (offered by Faculty of Engineering and the Built Environment)
Purpose	The primary purpose of this module as an integrated part of the BSc (Computer Science) with AI specialisation programme is to serve as a capstone individual project in the field of either Artificial Intelligence or Machine Learning. Projects will be supervised by either the Academy of Computer Science or the Faculty of Engineering and the Built Environment according to the specifics of each project.

Module learning outcomes: On completion of this learning event students should be able to:

- Identify a project in an appropriate Artificial Intelligence or Machine Learning Problem domain.
- Extract the functional and non-functional requirements for such a project
- Research any additional techniques and technologies required to address the identified problem
- Implement a solution to the identified problem creating (as opposed to merely utilising) appropriate software and hardware components as agreed upon by the project supervisor.

SC.5.9 ENVIRONMENTAL MANAGEMENT ENM

Assessment criteria
A student needs a semester mark of 40% (theory and practical) to gain entrance to the final assessment opportunity. A subminimum of 50% is required for practicals to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

Practicals
The practical component of this course contributes 20% to the semester mark and is based on practical application of concepts discussed in the Theory lectures. These activities range from Field trips to completion of relevant online certificates to enhance the students understanding of Environmental problems.

SC.5.9.1 ENVIRONMENTAL MANAGEMENT LEVEL 6 (Second year)

Module ENM02A2	Environmental Management 2A
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	GGR1EB1 **and** GGR2EA1 **or** GR01A1 **and** GGR01B1
Purpose	This module examines environmental problems and sustainable development. During the module students develop an understanding of the physical environment and ecosystems, and a detailed knowledge of the major environmental problems and their impacts. It also examines how sustainable development can assist in managing the environment in a sustainable way. In particular the course focusses on environmental problems associated with the earth's atmosphere, biodiversity and human activities such as agriculture and mining. It is vital that students are aware of the environmental problems that exist and ways to manage reduce and mitigate it. The practicals proposed for the course

Module learning outcomes: On completion of this learning event, the students should be able to:

- Examine and explain the causes of the present-day environmental crisis.
- Define and explain essential terminology related to sustainability and environmental management.
- Explain how ecosystems have a structure and functions according to certain basic environmental laws.
- Critically assess the meaning and principles of sustainable development.
- Discuss and explain how environmental degradation is caused by both natural and anthropogenically-induced factors.
- Examine and explain environmental problems in the context of different types of land use.
- Discuss the meaning and principles of sustainable development.
- Explain the causes, impacts and strategies to ameliorate global climate change.
- Account for the loss of biodiversity on a global scale, as well as within South Africa and examine various solutions to this environmental issue.
- Explain the environmental impacts of different types of mining and discuss ways to manage these more appropriately.
- Explain the impacts of agriculture on the environment, both in general and in South Africa more specifically.
- Apply specific research methods to environmental data and to the local environment.

SC.5.9.2 ENVIRONMENTAL MANAGEMENT LEVEL 7 (Third year)

Module ENM03A3	Environmental Management 3A
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	ENM02A2 **and** GGR02B2
Purpose	The law and administration module allows students to develop an understanding of the Environmental legislation in South Africa and the application thereof. Students are taught the history and background of the different laws applicable to Environmental Management Globally, and are trained on how to apply the laws through exploring relevant and applicable case studies.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Explain the role played by economics in environmental management.
- Identify and explain suitable economic instruments for environmental management.
- Have an understanding of ethics as pertaining to the environment, and using many case studies, assess how ethical projects are for people and the environment.
- Debate environmental issues regarding the impact of the environment, economics and humans.
- Describe the manner in which statutory environmental law has evolved in South Africa with specific reference to the post-apartheid period.
- Assess the role played by international and regional environmental law in shaping South African environmental law.
- Differentiate between compliance and enforcement
- Critically assess the effectiveness and implementation of South African environmental law, with specific reference to the Constitution, and other relevant framework laws.
- Participate in practical sessions, which may comprise of various site visits, case studies, physical activities, data collection and processing, attending public participation events and the like.

SC.5.9.3 ENVIRONMENTAL MANAGEMENT LEVEL 7 (Third year)

Module ENM03B3	Environmental Management 3B
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	ENM02A2 **and** ENM03A3
Purpose	This module examines environmental ethics and law and their relationship to environmental management. It is a core module. Students are expected to understand the perspectives, factors and elements embedded in human social systems that then influence environmental economics, environmental management and the use of natural resources. This enables critical understanding of how environmental problems develop, how humans impact on the natural environmental and how natural resources are degraded. The evolution of environmental law, as well as the challenges surrounding its implementation and administration will then be clarified. The challenges of managing compliance and enforcing adherence to the law will be articulated, primarily through case studies. This module aims to capacitate students of environmental management for work in the field of environmental management.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Identify why environmental resource management is an ethical and moral issue.
- Define and interpret key concepts associated with environmental assessment, monitoring, mitigation and rehabilitation and to know and apply the logical sequence to be followed when undertaking a successful environmental management programme.
- Describe Integrated Environmental Management (IEM) in South Africa.

- Demonstrate how Environmental Management in South Africa is determined by environmental policy and associated environmental legislation.
- Discuss the environmental decision making process in terms of an Environmental Impact Assessment (EIA) (as well as other related tools) in South Africa, and through the use of case studies.
- Provide a brief overview of the principles and methods of Social Impact Assessment (SIA) in South Africa.
- Explain why, how and when environmental monitoring, mitigation and rehabilitation should take place, through the use of case studies.
- Describe different processes involved in Specialist Studies within an EIA (eg: Air quality monitoring, Soil assessment, Water quality assessment, Health impact assessment, Heritage assessment and Climate Risk analysis)

SC.5.10 GEOGRAPHY GGR

Assessment
A student needs a semester mark of 40% in theory and 50% in practical to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped at 50%.

Excursions
The official Geography excursion during the spring recess forms an integral part of third-year modules and is compulsory for all third-year students.

Practical work
All undergraduate programmes have a 1 x 3-hour practical session per week. An average of 50% is required for practical work, to obtain admission to a particular semester examination. Candidates repeating a module must apply to be exempted from practicals if a mark of more than 50% was obtained during the previous registration.

SC.5.10.1 GEOGRAPHY LEVEL 5 (First Year)

Module GGR1EB1	Geography 1A1E
NQF Level	5
Credits	12
Presentation	Semester 2
Purpose	To develop the students' understanding of Human Geography by investigating population and cultural geography.

Module learning outcomes: On completion of this learning event, the students should be able to:
- Explain and evaluate Geography as a science.
- Discuss and explain the basic terms, concepts, facts, principles, rules and theories of population.
- Formulate approprioate responses to critical or problematic issues in these field of Human Geography.
- Employ appropriate cartographic methods to display geographic and statistical information visually, using maps, diagrams and graphs (bar, line, pie, proportion and scatter).
- Interpret and infer meaning from maps, diagrams and graphs and employ appropriate methods to manipulate data and graphs to interpret and infer meaning.
- Construct a logical, coherent argumentative academic essay, which follows the rules and standards of geographical academic discourse, and displays evidence of comprehension, analysis and synthesis.

SC.5.10.2 GEOGRAPHY LEVEL 5 (First Year)

Module GGR2EA1	Geography 1A2E
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisite	GGR1EB1
Purpose	To develop the students' understanding of Human Geography by investigating political, economic, development and settlement geography.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Discuss and explain the basic terms, concepts, facts, principles, rules and theories of political, economic, development and settlement geography.
- Formulate appropriate responses to critical or problematic issues in these fields of Human Geopgraphy.
- Construct a logical, coherent argumentative academic essay, which follows the rules and standards of geographical academic discourse, and displays evidence of comprehension, analysis and synthesis.
- Conduct research and write a research report following the rules, standards and conventions of scientific report writing in the subject of Geography.

SC.5.10.3 GEOGRAPHY LEVEL 5 (First Year)

Module GGR01A1	Introduction to Human Geography
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	To develop the students' understanding of Human Geography (Population dynamics, development of rural and urban settlements, urbanisation, agriculture and the provision of food, rural land use, sources of energy and economic impacts).

Module learning outcomes: On completion of this learning event, the students should be able to:

- Describe the basic phenomena and theories concerning population, rural and urban settlements, as well as rural and economic activities;
- Solve problems and gather and analyse data with regard to the topics mentioned above.
- Interpret topographic maps and orthophotos, diagrams and graphs.
- Plan, construct and present a well drafted and edited essay that demonstrates academic literacy and referencing.
- Describe the basic terms, concepts, facts, principles, rules and theories of population studies, cultural studies, human settlements and economic activities and formulate appropriate responses to critical or problematic issues (both familiar and new) in these fields.
- Critically engage with the evolution of theoretical ideas within the fields of population studies, human settlements and economic activities.
- Employ appropriate cartographic methods to display geographic information.
- Interpret and infer meaning from maps, diagrams and graphs.
- Construct a logical, coherent argumentative academic essay, which follows the rules and standards of geographical academic discourse, and displays evidence of comprehension, analysis and synthesis.
- Articulate the norms and standards of professional and ethical conduct within the field of geography.

SC.5.10.4 GEOGRAPHY LEVEL 5 (First Year)

Module GGR01B1	Climatology and Geomorphology
NQF Level	5
Credits	15
Presentation	Semester 2

Prerequisite	GGR1EB1 and GGR2EA1 or GGR01A1
Purpose	This module is a key module for Geography. It examines the basic concepts and principles in climatology and geomorphology in order to understand the physical processes that produce weather and climate, and shape the Earth. Students need a clear understanding of climatology and geomorphology as it determines and influences the human and natural environment. It is vital that the students are aware of the complex relationship between man and the physical environment, as it influences human activities and visa-versa.

Module learning outcomes: On completion of this learning event, the students should be able to:

Climatology:

- Define and explain the composition and structure of the atmosphere and adiabatic processes.
- Apply adiabatic processes in order to explain cloud formation and associated precipitation.
- Apply adiabatic processes in order to explain atmospheric heat transfer.
- Apply adiabatic processes in order to explain horizontal and vertical air motion and winds.
- Apply adiabatic processes in order to explain cumulus convection.

Geomorphology:

- Define and explain tectonic and orogenic processes and gravitational, fluvial, coastal and aeolian erosional and depositional processes.
- Elaborate on possible future Ice Ages and Global Warming, and the implication thereof for utilisation of the land.

Practicals: Topographic maps and Orthophoto Maps

- Read and analyse Topographic maps and Orthophoto maps
- Work out the gradient of slopes, area of different features on the maps.
- Determine the exact location on the maps as well as direction from one feature to another.
- Interpret relationships between features on the map.

SC.5.10.5 GEOGRAPHY LEVEL 6 (Second Year)

Module GGR02A2	Pedology and Biogeography
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	GGR1EB1 **and** GGR2EA1 **or** GGR01A1 **and** GGR01B1
Purpose	To develop the students' understanding of Soil and Plant geography and how these sub-disciplines relate to each other and to humans' activities on Earth. Pedology studies soil forming factors, physical and chemical soil formation processes, soil types and classifications, the worldwide distribution of soil (and in South Africa) as well as soil management principles, including applications of soil science theory to improve agricultural soil. Biogeography instructs the student in the distribution pattern of plants and animals on the surface of the earth, time-space variability patterns and the processes that produce these patterns, as well as the structure and functioning of ecosystems.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Define and explain soil forming factors and physical and chemical soil-forming processes.
- Identify and scientifically describe soil textural and structural types and soil colour.
- Elaborate on soil types found in South Africa.
- Explain how a plant system functions and describe the structure and functioning of an ecosystem.
- Explain the main differences that exist between terrestrial and marine ecosystems.
- Discuss and know the main biome types of South Africa as well as their main characteristics.
- Explain the influence and impact of humans on the various ecosystems and the necessity for the conservation thereof.

SC.5.10.6 GEOGRAPHY LEVEL 6 (Second Year)

Module GGR02B2	Economic and Population Geography
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	GGR02A2
Purpose	To develop the students' understanding of Economic and Population Geography and how these two sub-disciplines impact on each other and man's activities on planet earth. *Economic Geography* explains and study the spatial organisation of humanity's economic activities and how the globalisation process influences location considerations of human activities, especially that of agriculture and industries. *Population Geography* develops the students understanding of the uneven population distributions and densities, as well as differential population trends by means of a spatial study of human population; to show how this information will lead to a better insight into their spatial impacts on and change of the natural and cultural environments.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Demonstrate a detailed knowledge of the differences, numbers and distribution patterns of the world's population as well as how mortality, fertility and migration will change it.
- Understand the impact of economic activities on the world's population as well as the environment and natural resources.
- Understand the historical development of economic processes and population changes.
- Able to do basic statistics to depict and analyse population and economic data. and statistical information visually, using maps, diagrams and graphs (bar, line, pie, proportion and scatter).
- Employ appropriate statistical methods to manipulate statistical data and graphs in order to interpret and infer meaning.
- Work as a member of a team to successfully complete tasks in the practicals.
- Draft and edit an essay that demonstrates academic literacy and referencing.

SC.5.10.7 GEOGRAPHY LEVEL 7 (Third Year)

Module GGR03A3	Geo-Informatics
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	GGR02A2 and GGR02B2
Purpose	This module develops students understanding of the concepts, basic principles and components of Geographic Information Systems (GIS) as a tool for spatial analyses. GIS is a useful tool and information system to store, retrieve at will, transform and display spatial data from the real world for a particular set of purposes. It is vital that students are aware of various methodologies that can be used to analyse and solve human and environmental problems. During the course of the module they will also develop their ability to use GIS as a tool for spatial analyses.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Define Geographic Information Systems.
- Explain, discuss and describe the basic concepts, principles and components of GIS.
- Demonstrate their understanding of the basic concepts, principles and components of GIS and apply them to relevant GIS software.
- Apply GIS as a spatial problem-solving tool.
- Generate GIS products.

SC.5.10.8 GEOGRAPHY LEVEL 7 (Third Year)

Module GGR03B3	Urban Geography and the S.A. City
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	GGR03A3
Purpose	To outline the origins of urban life and explore the relationship between colonization and globalisation that characterizes the emergence of different urban forms around the world. Analyse how contemporary cities can be interpreted as economic and social spaces. Case studies from the global South and Africa in particular will be drawn on to illustrate this urban narrative. The South African city will focus on the origins of segregation and Apartheid planning and control, decentralization and the post-Apartheid era. A range of topics related to contemporary Johannesburg such as urban renewal initiatives, urban tourism and development issues are also interrogated.

Module learning outcomes: On completion of this learning event, the students should be able to:

- The ability to examine the key contemporary social, economic and political debates within urban geography.
- To understand the relationship of historical, economic, political and social processes shaping contemporary urban life.
- Analyse a range of different patterns of urbanisation in the world.
- Understand the roots of segregation the ethos behind Apartheid city planning and how it has impacted and shaped the socio-economic development of South African cities.
- Understand the various factors that led to the decentralization of Johannesburg.
- Ability to analyse, discuss and contextualize urban issues in contemporary Johannesburg

SC.5.11 GEOLOGY GLG

The Department of Geology presents undergraduate and postgraduate (Honours, Masters and Doctoral) programmes in Geology and supporting modules. Students require at least an Honours Degree in Geology to be able to register as a professional geologist. The programme as a whole is designed such that the qualified geologist or earth scientist would be able to choose from a large variety of career possibilities.

Undergraduate and Honours programmes are subdivided into the following modules:

The undergraduate programme in Geology (with supporting modules) is presented in the form of independent semester modules.

Modules are grouped into *core modules*, which we consider essential for students who would like to become professional geologists and require an Honours Degree in Geology, and *supporting* designed specifically to enhance the earth science degree programme.

In addition to the above, the Department of Geology offers special 1 to 2 week-long *practical field modules* in techniques of geological field observation, data acquisition and mapping. These field modules are compulsory for undergraduate students who intend to major in Geology, in addition to the six core modules of Geology 1, 2 and 3, and for all students registered for the Geology Honours programme.

All theoretical modules are designed so as to train Geology and Earth Science students in a global context. Modules are all subdivided into three components,

1. An introduction to the subject terminology and the most important processes of earth dynamics and rock formation;
2. Modelling of earth and geological phenomena.
3. The application of models and observations towards development and management of geological resources and the environment.

Ad hoc compulsory weekend and one-day field excursions form part of some of the theoretical core modules. These excursions carry extra costs not covered by the module fee.

Geology Department Practicals

Tests, tutorials and practicals are compulsory and count towards the semester mark. If an assessment opportunity is missed due to illness, an original medical certificate for a valid medical condition **plus** the Application for Deferred Test/Final assessment MUST be completed by a reputable general practitioner and must be handed in not later than 5 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated. A sub-minimum of 40% for practical assessments is required for admission to the exams in all Geology Department modules. A student will only be allowed to miss one practical per module with valid documentation as set out above. If more than one practical is missed, the student will get a "Practical Incomplete" grading and will not be allowed entrance to the examination.

There is no uniform, departmental policy for the way in which each geology module semester mark is calculated as each lecturer has different weightings for practical tests, reports and theory assessments used to finalize the semester mark.

GLG01A1

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

The semester mark is compiled as follows:
Practical 40%
Theory 60%

GLG01B1

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

GLG22A2

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

Semester mark compiled as follows:

Written theory assessments	60%
Practical assessments	40%

GLG02B2

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

Semester mark compiled as follows:

Written theory assessments	50%
Practical assessments	50%

GLG10A3 and GLG20A3

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

Semester mark compiled as follows:

Assessments in practical studies (laboratory)	20%
2 written theory semester tests	60%
1 week-end excursion report	20%

Note: In the event that the week-end field excursion does not take place, the semester mark is then weighted as 30% practicals and 70% theory.

GLG03B3

Final mark weighting	= Semester mark	:	Exam mark
	= 50	:	**50**

Credit for Repeat Students

If a student fails a module, but passes the practical component, they will only be allowed to retain credit for the practicals, and hence not repeat them, if their average for the entire semester's practicals is at least 65%.

SC.5.11.1 GEOLOGY LEVEL 5 (First Year)

Module GLG01A1	Minerals, Rocks and Earth Dynamics
NQF Level	5
Credits	12
Presentation	Semester 1
Purpose	The main purpose is to familiarise the students with general geological concepts and principals as these are not taught at high schools. The purpose of the module is to ensure that the student obtains an overall understanding of the earth and how it functions. Special attention is given to the nature, composition and classification of materials constituting earth and the importance of time in earth processes. This module is considered essential for all subsequent modules in Geology and also for students in Environmental and other Earth Sciences. It is also a required module for students in Civil Engineering.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate a knowledge of and ability to identify common minerals and rocks.
- Demonstrate a proficiency of the basic processes affecting the earth and how they are inter-related through the paradigm of plate tectonics.
- Demonstrate an understanding of geological time and both the changes (including evolution of life forms) that have occurred over the 4.5 billion years of the existence of the earth and its future fate.
- Demonstrate an understanding of basic concepts about the formation of various types of mineral deposits and natural organic carbon fuel resources.
- Demonstrate an understanding of the general geological structure and stratigraphy of southern Africa.
- Demonstrate an appreciation of the importance of geological parameters in applied science like civil engineering and environmental sciences.

SC.5.11.2 GEOLOGY LEVEL 5 (First Year)

Module GLG00A1	Geology 1 Field Techniques
NQF Level	5
Credits	3
Presentation	1 week, usually offered during the first week of the winter break.
Prerequisites	GLG01A1
Purpose	This purpose of this module is vital in the programme because it provides students the opportunity to undertake field work, make field observations and visit working mines. None of these learning outcomes are possible in the lecture room or during practical sessions held on campus.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify and describe rocks in the field.
- Appreciate the value of field work.
- Classify the rocks observed into their lithostratigraphic groupings.
- Make geological observations and record them in a coherent way in their field note book.
- Use geological field equipment.
- Make notes about the relationship between geological features and the environment.

SC.5.11.3 GEOLOGY LEVEL 5 (First Year)

Module GLG01B1	Optical and Analytical Mineralogy
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	GLG01A1

Purpose	Mineral science is the fundamental building block of the geosciences, and a good understanding of the physical and chemical structure of minerals is therefore indispensable. The purpose of this module as part of the BSc qualification is to enable students to understand the fundamentals of crystallography, and the physical and optical properties of minerals.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Predict chemical and structural properties of minerals based on crystal chemistry.
- Evaluate minerals using crystallographic principles.
- Analyse common minerals with a fundamental understanding of systematic mineralogy.
- Demonstrate an understanding of the optical properties of transparent minerals.
- Use the correct terminology in describing the optical properties of a mineral.
- Use the petrographic microscope for the identification of the optical properties of minerals.

SC.5.11.4 GEOLOGY LEVEL 6 (Second Year)

Module GLG22A2	Sedimentology and Stratigraphy
NQF Level	6
Credits	16
Presentation	Semester 1
Prerequisites	GLG01A1 and GLG01B1
Purpose	The purpose of the module is to enable students to appreciate the importance of sedimentary rocks in geology and in the role of understanding the origin and formation of sedimentary rocks in unravelling the origin and evolution of the Earth. At the end of the module students will be able to identify and describe sedimentary rocks and interpret the sedimentary environments in which they form.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate an understanding of the fundamental components of clastic, chemical and biogenic sedimentary rocks and classify as well identify their origins
- Identify and contrast the various bedforms and primary and secondary sedimentary structures associated with sedimentary rocks and understand their formation
- Understand the processes by which rocks weather physically and chemically
- Describe and interpret the composition of clastic and chemical sediments
- Examine ancient sedimentary rock sequences in the field, measure sedimentary profiles in the field, examine and record various aspects of sedimentary rocks (grain size, sedimentary structures) in the field.
- Understand the basic principles of facies analysis and how facies analysis is used to identify and interpret modern and ancient sedimentary environments
- Understand the origin and evolution of some sedimentary deposits of southern Africa and its mineral deposits.

SC.5.11.5 GEOLOGY LEVEL 6 (Second Year)

Module GLG00A2	Geology 2 Field Techniques
NQF Level	6
Credits	4
Presentation	1 week, usually offered during the first week of the winter break
Prerequisites	GLG01A1 and GLG01B1
Purpose	To familiarise students with geological field work. The students will learn how make, evaluate, interpret geological observations, and how to indicate geological observations on a geological map.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Observe different geological features.
- Evaluate and interpret geological observations

SC.5.11.6 GEOLOGY LEVEL 6 (Second Year)

Module GLG02B2	Structural Geology and Plate Tectonics
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	GLG01A1, GLG01A2 and GLG02A2
Purpose	Due to its dynamic basis Structural Geology forms an integral part of most other sub disciplines in Geology such as Sedimentary basin analyses etc. It is therefore of cardinal importance that all geology students be well educated in this subject. The main purpose of the module is therefore to enable students to comprehend the link between structural geological processes and Plate Tectonics.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Comprehend the mutual relationship between stress, strain and rheological behaviour of deformed rocks
- Identify the characteristic features in fault rock that relate to brittle and ductile rock behaviour formations.
- Make and interpret structural measurements using geological maps and stereographic projections
- Understand the mutual relationship between deformation, metamorphism and time in the evolution of deformed terrains
- Understand the relationship between geodynamic processes and the evolution of modern day plate boundaries.

SC.5.11.7 GEOLOGY LEVEL 6 (Third Year)

Module GLG10A3	Igneous Rocks
NQF Level	7
Credits	12.5
Presentation	Semester 1 (First Quarter)
Prerequisites	GLG01A1, GLG01B1 and GLG22A2, GLG02B2
Purpose	The primary purpose of this module as an integral part of the BSc qualification is to provide the students with a focused education on the fundamental concepts of igneous rocks. Students will develop theoretical and practical knowledge in identifying igneous rocks that will serve as a fundamental basis for their further development in geology.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Recognize, categorize and interpret the origin of the most common types of igneous rocks.
- Use the petrographic microscope to the study of igneous rocks.
- Use geochemistry to the study of igneous rocks.
- Identify the origin and evolution of South Africa's igneous rocks.
- Identify the significance of igneous rocks in a plate tectonic context.

SC.5.11.8 GEOLOGY LEVEL 7 (Third Year)

Module GLG20A3	Metamorphic Rocks
NQF Level	7
Credits	12.5
Presentation	Semester 1 (Second Quarter)
Prerequisites	GLG01A1, GLG01B1 and GLG22A2, GLG02B2
Purpose	The primary purpose of this module as an integral part of the BSc qualification is to provide the students with a focused education on the fundamental concepts of metamorphic rocks. Students will develop theoretical and practical knowledge in identifying metamorphic rocks that will serve as a fundamental basis for their further development in geology.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Recognize, categorize and interpret the origin of the most common types of metamorphic rocks.

- Use the petrographic microscope to the study of metamorphic rocks.
- Use pressure-temperature to understand the formation conditions of metamorphic rocks
- Identify the origin and evolution of South Africa's metamorphic rocks.
- Identify the significance of metamorphic rocks in the global-plate tectonic context.

SC.5.11.9 GEOLOGY LEVEL 7 (Third Year)

Module GLG00A3	Geology 3 Field Mapping
NQF Level	7
Credits	5
Presentation	Ten (10) days usually offered during the last week of the winter break
Prerequisites	GLG01A1 and GLG02B2
Purpose	To expose students to field mapping techniques. In this module the student will learn how to practically integrate sedimentary, structural, igneous and metamorphic geological principles.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Use the geological compass for geological measurements.
- Map geological phenomena on various scales.
- Produce a geological map, including cross sections and a stratigraphic column.
- Write a concise report on the results.

SC.5.11.10 GEOLOGY LEVEL 7 (Third Year)

Module GLG03B3	Historical and Economic Geology 3B
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	GLG01A1 and GLG22A2
Purpose	The primary purpose of this module is to make students aware of the geological evolution of Earth and of petrological processes that may lead to the formation of economic mineral deposits. Special emphasis is given to examples from southern Africa. Students will learn how to describe the lithostratigraphy, biostratigraphy and event stratigraphy from the Archaean to the Cenozoic and to understand the changes that have occurred throughout the ca. 4.55 billion years of Earth History. Students will also learn how important mineral deposits formed through time, providing them with the necessary skills to explore for mineral resources (metal commodities, gem stones such as diamond, industrial minerals and rocks) and evaluate those for mining feasibility.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Appreciate the origin and evolution of the Earth and the concept of plate tectonics through time.
- Understand evolutionary changes in life forms over time.
- Understand the occurrences and major changes in Earth processes, such as ice ages, origin of life, and origin of oxygen in the atmosphere.
- Recognise and understand the major lithostratigraphic sequences in southern Africa.
- Understand the dynamics (event stratigraphy) of how the sedimentary, igneous and metamorphic rock sequences originated and changed during 3.5 billion years of Earth History as preserved in southern Africa .
- Recognize important ore minerals and interpret their textures both in hand samples / drillcores and by using the petrographic microscope with reflected light.
- Understand the primary processes of ore formation.
- Understand the theory of the principle types of geochemical surveys.
- Understand and apply the primary data-handling techniques of ore body evaluation.
- Understand the economic aspects of South Africa's economic deposits

SC.5.11.11 GEOLOGY LEVEL 6 (First Year)

Module APG02A2	Applied Geological Maps and Geospatial Techniques
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	GLG01A1 and GLG01B1
Purpose	A good understanding of geological maps and geospatial techniques is indispensable in the geosciences. To be able to create and understand geological maps knowledge of navigation techniques as well as the use of a geological compass is indispensable. The purpose of this module as part of the BSc qualification is to enable students to create, read, understand, and interpret geological maps and geospatial data and to effectively use a geological compass to gather data that needs to be presented on a geological map.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand the function of a geological compass and how to use if effectively.
- Use the correct terminology in describing the geological structure indicated on a geological map.
- To interpret geological maps in terms of stratigraphy and structural geology.
- Create a geological map from limited information given.
- Understand basic navigational techniques
- Explain the fundamental theory and applications of coordinate reference systems, map projections, and the global positioning system (GPS).
- Formulate geological applications of geographic information systems (GIS) using technical methods.
- Formulate geological applications of remote sensing (RS) using technical methods.

SC.5.11.12 GEOLOGY LEVEL 6 (First Year)

Module APG02B2	Applied Engineering and Environmental Geology
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	GLG01A1 is highly recommended
Purpose	The purpose of the module is to show the relationship between geology, environmental issues and engineering concepts of rocks. This module compliments the core geology modules because it examines the applied aspects of geology, not only the classic, theoretical aspects.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate an understanding of how the South African geology is an integral part of environmental studies.
- Demonstrate an understanding of the fundamentals of aquatic chemistry.
- Demonstrate an understanding of the environmental implications of mining activities.
- Demonstrate an understanding of lithological variation in rock sequences and how variation in rheological properties under varying physical conditions can influence the stability of target areas.
- Demonstrate an understanding of basic geological structures and how these influence engineering aspects of the rocks.
- Give a basic evaluation of engineering sites based on geological observations made
- Gain an understanding of the stratigraphy of South Africa.
- Give examples of different kinds of weathering in rocks.
- Demonstrate an understanding of the positive and negative engineering aspects of common rocks.

SC.5.12 INFORMATICS IFM

Lectures, Tutorials, Practicals and Assessment Criteria

1. Tests, tutorials and practical classes are compulsory and count towards the semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of this guide) **MUST** be completed by a reputable general practitioner or a death certificate must be handed in not later than 7 days after the missed practical or test. Failure to do so will result in a mark of zero being allocated.

2. Practical classes form an integral part of the module and **NO** student will be excused from practical classes. Absence from a practical session must be motivated by a doctor's certificate with a valid medical condition (see above). The procedure pertaining to absence from practical sessions will be detailed in each module's study guide respectively.

3. With the exception of Informatics 3B **NO** exemption from practical classes is applicable for modules that are repeated. A student repeating Informatics 3B will only be given exemption for the practical component of that module if a pass percentage was obtained for the group project in the previous year. If a pass percentage was not obtained in the group project the student will be required to complete a mini-project.

4. In the determination of the module semester mark the mark attained in the theoretical assessment and the practical mark is taken into account. This weighting is provided in the study guide of each module.

5. A sub-minimum of 50% for practicals is required for admission to semester examinations in Informatics and Computer Science.

6. A student needs a semester mark of 40% to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

7. For the modules **Informatics 100 (IFM100)** and **Informatics 1A (IFM01A1, IFM1A10) -** Students who obtain a semester mark of 70% or higher will be exempted from writing the final assessment (examination) (applicable as from 2018).

SC.5.12.1 INFORMATICS LEVEL 5 (First Year)

Module IFM100	Informatics 100
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisites	o Matriculation endorsement certificate o Grade 12 Mathematics with a minimum of a 5 o Minimum APS: 35 points
Purpose	The primary purpose of this module is to provide Accountancy professionals with basic knowledge of the analysis, design and development of algorithms into programs demonstrating correctness using a visual computer language such as Visual Basic

Module learning outcomes: On completion of the learning event, the student should be able to:

- Solve programming problems using a computer.
- Analyse, design and program algorithms.
- Use control structures in algorithms and computer programs.
- Demonstrate the use of arrays and records in computer programs.
- Demonstrate computer programs.

SC.5.12.2 INFORMATICS LEVEL 5 (First Year)

Module IFM01A1	Introduction to algorithm development (VB)
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisites	Informatics 1A requires that students wishing to register for the module obtain the following: o Matriculation endorsement certificate o If Mathematics 1 is included in the qualification, the minimum APS of 6 for Mathematics is required. o If Mathematics 1 is not included the minimum APS of 4 for Mathematics is required.
Purpose	The primary purpose of this module as an integral part of the BSc Information Technology programme is to provide Information Technology professionals who can analyse, design and develop algorithms into programs demonstrating correctness using a visual computer language such as Visual Basic.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Solve programming problems using a computer.
- Analyse, design and program algorithms.
- Use control structures in algorithms and computer programs.
- Demonstrate the use of arrays and records in computer programs.
- Demonstrate computer programs.

SC.5.12.3 INFORMATICS LEVEL 5 (First Year)

Module IFM01B1	Introduction to data structures (VB)
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	Informatics 1A (IFM01A1)
Purpose	The module aims to enable the student to represent data in the memory of a computer, enable the student to develop object-oriented and component-based computer programs in a computer language such as Visual Basic and to introduce the student to introductory concepts of social and professional issues with relevance to Information Technology.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Describe abstract data and internal data types.
- Explain external data types.
- Explain and compare the object-oriented programming paradigm and the component approach to program development.
- Describe object-oriented program components and their existing relationships with other components.
- Develop object-oriented programs in a computer language such as Visual Basic to design and implement internal and external data types.
- Explain introductory concepts concerning social and professional issues in Information Technology.
- Discuss select applications in Informatics.

SC.5.12.4 INFORMATICS LEVEL 6 (Second Year)

Module IFM02A2	Database Design
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	Informatics 1A (IFM01A1) and Informatics 1B (IFM01B1) (For Information Technology (Electrical Engineering): Computer Science 1A (CSC01A1) and Computer Science 1B (CSC01B1)).
Purpose	The module prepares the student to develop and implement computer systems for the solution of business problems. To obtain, on a practical level, experience as an individual; to identify, analyse and implement a complete database system. The Database design module aims to facilitate the development of competent database developers for the ever-growing IT industry.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Discuss and use database concepts.
- Discuss and implement design concepts.
- Discuss and implement advanced design and Implementation concepts.
- Discuss and implement new developments.

SC.5.12.5 INFORMATICS LEVEL 6 (Second Year)

Module IFM02B2	Internet electronic commerce
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	Informatics 2A (IFM02A2)
Purpose	The module ensures that a student will have knowledge on the architecture and functioning of the Internet; will be able to explain how the Internet can be used in applications such as the WWW, e-commerce and e-mail and explain the role of network security in the protection of information and to introduce the student to ethical and professional issues with relevance to Information Technology.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Describe key features of electronic commerce.
- Evaluate the role of the Internet in applications.
- Define electronic commerce business models and strategies.
- Identify appropriate technologies to meet different electronic commerce objectives.
- Critically evaluate security measures in electronic commerce over the Internet.
- Explain ethical and professional considerations for Information Technology.
- Design a simple three-tier client/server system.

SC.5.12.6 INFORMATICS LEVEL 7 (Third Year)

Module IFM03A3	Introduction to software engineering
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	Informatics 2A (IFM02A2) & Informatics 2B (IFM02B2)
Purpose	The Software Engineering module specifically aims to facilitate the development of competent software developers and engineers for the ever-growing IT industry. The purpose of this module in Software Engineering is to enable students to develop professional skills, knowledge and attitudes that are necessary to become highly competent as software developers and engineers. Specifically, students develop and implement computer systems for the solution of business problems and obtain, on a practical level, experience in a team relationship; to identify, analyse and implement a prototype of a business system.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Explain the accepted theoretical principles of software engineering.
- Indicate and recognize the steps involved in the development of an IT business system.
- Develop an object-orientated model for a client/server system for the Internet.
- Analyse and design a prototype of a business system in a team relationship.

SC.5.12.7 INFORMATICS LEVEL 7 (Third Year)

Module IFM03B3	Advanced Software Engineering
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	Informatics 3A (IFM03A3)
Purpose	The primary purpose of this module as an integral part of the BSc Information Technology programme is to facilitate the development of competent software developers and software engineers for the ever-growing IT industry. The module prepares the student to develop and implement computer systems for the solution of business problems. To obtain, on a practical level, experience in a team relationship; to identify, analyse and implement a prototype of a business system.

Module learning outcomes: On completion of the learning event, the student should be able to:

- Discuss and use Development concepts.
- Discuss and implement Verification and Validation concepts.
- Discuss and implement Management concepts.
- Discuss and use Emerging Technologies.
- Identify and discuss legal aspects of IT.
- Completion of a practical IT business system in a group project.

SC.5.13 MATHEMATICS MAT

MATHEMATICS ALTERNATIVE SEMESTER MODULES - An alternative presentation of first and certain second year Mathematics

Alternative Semester Courses are presented by the Department of Mathematics and Applied Mathematics, eg. MAT01A1 is offered in the first semester, while the alternative ASMA1A1 is offered in the subsequent (second) semester. This presentation is intended to provide students who had failed the original course, with the opportunity to repeat the same module in the following/alternative semester. Students do not have to wait a whole semester before repeating the module. This opportunity is available for the following modules:

MAT01A1, MAT01B1 (as ASMA1A1, ASMA1B1 respectively)
MAT01A2, MAT01B2 (as ASMA2A1, ASMA2B1 respectively)
MAT02A2, MAT02B2 (as AMA2A2, ASMA2B2 respectively)
MAT04A2, MAT04B2 (as ASMA2A4, ASMA2B4 respectively) *(not currently available)*

MATENA1, MATENB1 (as ASME1A1, ASME1B1 respectively) (Engineering)
MATEAA2, MATEAB2 (as ASME2A2, ASME2B2 respectively) (Engineering)
MATECA2, MATECB2 (as ASME2A1, ASME2B1 respectively) (Engineering)

MAA00A1 (as ASMAAA1) (CBE)

Entrance Requirements: Please refer to Part 1
Pass requirements: At least 50%

For further information contact the Department of Mathematics and Applied Mathematics:
Tel: (011) 559-2831/2661 (office hours)
Fax: (011) 559-2874

SC.5.13.1 MATHEMATICS LEVEL 5 (First Year)

Module MAA00A1	Introductory Mathematical Analysis A
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisites	Mathematics Grade 12 – APS 4
Purpose	The purpose of this module is to give students a proper foundation in important Mathematical skills needed to pursue further studies in Accounting, Business, Finance and Economics. Students are taught various topics in fundamental Algebra, Graphs, Financial Mathematics, Statistics and Calculus with direct applications in the relevant fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- define and apply fundamental concepts of algebra;
- determine and apply fundamental concepts of domains and functions;
- display relevant skills in the areas of graphs and systems;
- solve exponential and logarithmic equations;
- solve elementary financial mathematical problems;
- solve problems around basic linear programming and linear equations geometrically;
- discuss and determine various probability and statistical techniques and apply fundamental concepts of calculus.

SC.5.13.2 MATHEMATICS LEVEL 5 (First Year)

Module MAA00B1	Mathematical Analysis B
NQF Level	5
Credits	12
Presentation	Semester 2
Prerequisites	MAA00A1 (or ASMAAA1)
Purpose	The purpose of this module is to teach students more advanced Mathematical skills needed to pursue future studies in Economics and Econometrics. Students are taught many topics in Calculus and Matrix Algebra with direct applications in Economics and Econometrics.

Module learning outcomes: On completion of this learning event, the student should be able to:

- calculate arithmetic and geometric sequences, convert sums into summation notation and evaluate sums;
- apply symmetry to curve-sketching, be familiar with the shapes of the graphs of six basic functions and to consider translation, reflection, and vertical stretching or shrinking of the graph of a function and to discuss functions of several variables and to compute function values;
- define and analyse the fundamentals of matrix algebra;

- apply limits and basic continuity;
- apply differentiation theoretically and practically;
- graphically display knowledge of curve-sketching; and
- apply integration

SC.5.13.3 MATHEMATICS LEVEL 5 (First Year)

Module MATDCA1	Mathematics for Finance and Business 1A
NQF Level	5
Credits	12
Presentation	Semester 1
Prerequisites	Mathematics Grade 12 – APS 3 or Mathematical Literacy Grade 12 – APS 5
Purpose	The purpose of this module is to give students a proper foundation in important Mathematical skills needed to pursue studies in Accounting, Business, Finance and Economics. Students are taught various topics in fundamental Algebra and Graphs with direct applications in the relevant fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- accurately perform basic calculations in algebra;
- correctly apply the algebraic techniques learned to problem solving;
- apply consistently the features of a straight line to selected problems;
- solve and discuss economic and financial based problems by means of graphs, lines, functions and inequalities;
- apply methodically non-linear functions to selected areas in the economic sciences;
- calculate and apply exponential and logarithmic functions to selected problems;
- apply concepts of percentage, rates and ratio;
- logically reason problems using the skills that they have learned; and
- reproduce formulas and apply techniques in order to solve economic and financial science related problems.

SC.5.13.4 MATHEMATICS LEVEL 5 (First Year)

Module MATDCB1	Mathematics for Finance and Business 1B
NQF Level	5
Credits	12
Presentation	Semester 2
Prerequisites	MATDCA1
Purpose	The purpose of this module is to teach students more intermediate Mathematical skills needed to pursue studies in Accounting, Business, Finance and Economics. Students are taught various topics in Algebra, Financial Mathematics, Statistics and Calculus with direct applications in the relevant fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- accurately perform time value of money calculations;
- correctly apply time value of money to problem solving;
- solve methodically, simultaneous equations and apply them to selected problems in the economic sciences;
- determine by means of linear programming solutions to constrained problems;
- perform and interpret descriptive statistics calculations;
- determine and discuss probability related problems;
- apply the rules of differentiation logically to selected areas in the financial and economic sciences;
- logically reason problems using the skills that they have learned; and
- reproduce formulas and apply techniques in order to solve economic and financial science related problems.

SC.5.13.5 MATHEMATICS LEVEL 5 (First Year)

Module MT1ACP1	Mathematics for Finance and Business 1A (online)
Qualification	Online Bachelor of Human Resource Management (B34HRP)
NQF Level	5
Credits	12
Presentation	Online Semester module
Prerequisites	Mathematics Grade 12 – APS 3 or Mathematical Literacy Grade 12 – APS 5
Assessment	Continuous Evaluation
Purpose	The purpose of this module is to give students a proper foundation in important Mathematical skills needed to pursue studies in Accounting, Business, Finance and Economics. Students are taught various topics in fundamental Algebra and Graphs with direct applications in the relevant fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- accurately perform basic calculations in algebra;
- correctly apply the algebraic techniques learned to problem solving;
- apply consistently the features of a straight line to selected problems;
- solve and discuss economic and financial based problems by means of graphs, lines, functions and inequalities;
- apply methodically non-linear functions to selected areas in the economic sciences;
- calculate and apply exponential and logarithmic functions to selected problems;
- apply concepts of percentage, rates and ratio;
- logically reason problems using the skills that they have learned; and
- reproduce formulas and apply techniques in order to solve economic and financial science related problems.

SC.5.13.6 MATHEMATICS LEVEL 5 (First Year)

Module MAT1EA1	Pre-calculus
NQF Level	5
Credits	4
Presentation	Semester 1
Prerequisites	Grade 12 Mathematics APS 5
Purpose	The purpose of this module is to prepare students for first-year Calculus by providing a solid foundation in algebra, trigonometry and one-variable functions.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Master the algebra of real numbers including exponential and rational expressions.
- Solve equalities and inequalities including those involving absolute values and polynomial and rational expressions.
- Analyse, manipulate and sketch various functions, including inverse functions.
- Develop a comprehensive understanding of polynomial and rational functions.
- Demonstrate a thorough grasp of exponential and logarithmic functions.
- Study the fundamentals of trigonometry and trigonometric functions, including radian measure.

SC.5.13.7 MATHEMATICS LEVEL 5 (First Year)

Module MAT2EB1	Calculus of one-variable functions Part 1
NQF Level	5
Credits	10
Presentation	Semester 2
Prerequisites	MAT1EA1
Purpose	The purpose of this module is to develop an understanding of basic mathematical logic, as well as limits and derivatives of one-variable functions.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define complex numbers and perform basic operations on complex numbers.
- Understand and apply the basic ideas of mathematical logic.

- Identify different proof techniques and apply them correctly to prove mathematical statements.
- Define limits and use limit laws to evaluate basic limits.
- Express the basic theoretic concepts underlying differentiation.
- Master fundamental differentiation techniques..

SC.5.13.8 MATHEMATICS LEVEL 5 (First Year)

Module MAT3EA1	Calculus of one-variable functions Part 2
NQF Level	5
Credits	10
Presentation	Semester 1
Prerequisites	MAT2EB1
Purpose	Develop an understanding of advanced differentiation techniques of one-variable functions, as well as the fundamental theory of integration.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Use sigma notation.
- Evaluate limits of indeterminate form.
- Master advanced differentiation techniques including implicit and logarithmic differentiation.
- Integrate basic one variable function.

SC.5.13.9 MATHEMATICS LEVEL 5 (First Year)

Module MAT2EC1	Mathematics 1C2E (Bio & Enviro Math & Stats A)
NQF Level	5
Credits	10
Presentation	Semester 2
Prerequisites	MAT1EA1
Purpose	To provide the students with the basic knowledge and understanding of the principles of Mathematics and Statistics that are applicable to Botany, Zoology, Biochemistry and Microbiology and provide the necessary support to deal with calculations and the handling of data encountered in the curricula.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Manipulate algebraic expressions and equations.
- Determine limits, and understand the properties of limits.
- Apply trigonometric rules and assumptions to solve problems.
- Demonstrate an understanding of the basic tools and terminology of statistics.
- Use the definition, properties and rules of probability and counting.

SC.5.13.10 MATHEMATICS LEVEL 5 (First Year)

Module MAT3EC1	Mathematics 1C3E (Bio & Enviro Math & Stats B)
NQF Level	5
Credits	10
Presentation	Semester 1
Prerequisites	MAT2EC1
Purpose	To provide the students with the basic knowledge and understanding of the principles of Mathematics and Statistics that are applicable to Botany, Zoology, Biochemistry and Microbiology and provide the necessary support to deal with calculations and the handling of data encountered in the curricula.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply differentiation and integration to solve problems and/or address practical situations.
- Determine and apply the sample distribution of the mean, proportions and differences between sample means for small and large samples.
- Define, differentiate and apply regression and correlation statistical tools to situations/ relationships.

SC.5.13.11 MATHEMATICS LEVEL 5 (First Year)

Module MAT1CA1	Bio & Enviro Math & Stats
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisites	Mathematics Grade 12 APS 5
Purpose	To provide the students with the basic knowledge and understanding of the principles of Mathematics and Statistics that are applicable to Botany, Zoology, Biochemistry and Microbiology and provide the necessary support to deal with calculations and the handling of data encountered in the curricula.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Manipulate algebraic expressions and equations.
- Apply trigonometric rules and assumptions to solve problems.
- Apply differentiation and integration to solve problems and/or address practical situations.
- Demonstrate an understanding of the basic tools and terminology of statistics.
- Use the definition, properties and rules of probability and counting.
- Determine and apply the sample distribution of the mean, proportions and differences between sample means for small and large samples.
- Define, differentiate and apply regression and correlation statistical tools to situations/ relationships.

SC.5.13.12 MATHEMATICS LEVEL 5 (First Year)

Module MAT1DB1	Advanced Bio & Enviro Math & Stats
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	MAT1CA1 or MAT3EC1
Purpose	To provide the students with the basic knowledge and understanding of the principles of Mathematics and Statistics that are applicable to Botany, Zoology, Biochemistry and Microbiology and provide the necessary support to deal with calculations and the handling of data encountered in the curricula.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and use the standard techniques of calculus, both differential and integral, and utilize them to solve selected applied problems.
- Recognize exact and nearly exact differential forms and solve related differential equations.
- Construct and evaluate hypotheses tests.

SC.5.13.13 MATHEMATICS LEVEL 5 (First Year)

Module MAT01A1	Calculus of one variable functions
NQF Level	5
Credits	15
Presentation	Semester 1 (Semester 2 for ASMA1A1)
Prerequisites	Grade 12 Mathematics APS 6
Purpose	The purpose of this module is to develop an understanding of basic mathematical logic, set theory and the theory of differentiation and integration of one variable functions by means of first principles and otherwise, and to include an understanding of the key terms, concepts, facts, principles, rules and theories.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand and apply the basics concepts and operations of set theory.
- Define absolute values and solve equations containing absolute values.
- Identify different proof techniques and apply them correctly to prove mathematical statements.
- Understand and apply the basic ideas of logic.
- Define complex numbers and use their properties to perform operations on equations containing complex numbers.

- Define limits and use limit laws to evaluate basic limits as well as limits of indeterminate form.
- Express the basic theoretical concepts underlying differentiation and integration.
- Differentiate and integrate basic exponential, logarithmic, trigonometric and hyperbolic functions.

SC.5.13.14 MATHEMATICS LEVEL 5 (First Year)

Module MAT01B1	Applications of Calculus
NQF Level	5
Credits	15
Presentation	Semester 2 (Semester 1 for ASMA1B1)
Prerequisites	MAT01A1 **or** ASMA1A1 **or** MAT3EA1 **or** MATENA1 **or** ASME1A1
Purpose	The purpose of this module is to develop an understanding of the applications of differentiation and integration of one variable functions, and to include an understanding of the key terms, concepts, facts, principles, rules and theories.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply different integration techniques to integrate exponential, logarithmic, trigonometric and rational functions and evaluate improper integrals.
- Sketch calculus functions using methods of graph sketching.
- Apply the concepts of differentiation in solving calculus-related word problems.
- Determine areas under curves and volumes of solids of revolution by applying techniques of integration.
- Solve first-order differential equations.
- Employ polar coordinates to parameterise curves.
- Represent systems of linear equations using matrices and solve such systems using Gaussian elimination.
- Comprehend the binomial theorem and use it to expand binomial expressions

SC.5.13.15 MATHEMATICS LEVEL 7 (First Year)

Module MATENA1	Calculus of one variable functions for Engineers
NQF Level	7
Credits	15
Presentation	Semester 1 (Semester 2 for ASME1A1)
Prerequisites	Grade 12 Mathematics APS 5
Purpose	The purpose of this module is to develop an understanding of the main concepts of differentiation and integration of one variable functions by means of first principles and otherwise, and to include an understanding of the key terms, concepts, facts, principles and rules.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Solve equations containing absolute values.
- Identify different proof techniques and apply them correctly to prove mathematical statements.
- Understand and apply the basic ideas of logic.
- Use the properties of complex numbers to perform operations on equations containing complex numbers.
- Use limit laws to evaluate basic limits as well as limits of indeterminate form.
- Understand the concepts underlying differentiation and integration.
- Differentiate and integrate basic exponential, logarithmic, trigonometric and hyperbolic functions.

SC.5.13.16 MATHEMATICS LEVEL 7 (First Year)

Module MATENB1	Applications of Calculus for Engineers
NQF Level	7
Credits	15
Presentation	Semester 2 (Semester 1 for ASME1B1)
Prerequisites	MATENA1 **or** ASME1A1 **or** MAT01A1 **or** ASMA1A1 **or** MAT3EA1
Purpose	The purpose of this module is to develop an understanding of the applications of differentiation and integration of one variable functions, and to include an understanding of the key terms, concepts, facts, principles and rules.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply different integration techniques to integrate exponential, logarithmic, trigonometric and rational functions and evaluate improper integrals.
- Sketch calculus functions using methods of graph sketching.
- Apply the concepts of differentiation in solving calculus-related word problems.
- Determine areas under curves and volumes of solids of revolution by applying techniques of integration.
- Solve first-order differential equations.
- Employ polar coordinates to parameterise curves.
- Represent systems of linear equations using matrices and solve such systems using Gaussian elimination.
- Comprehend the binomial theorem and use it to expand binomial expressions.

SC.5.13.17 MATHEMATICS LEVEL 7 (Second Year)

Module MAT01A2	Sequences, Series and Vector Calculus 2A1
NQF Level	7
Credits	10
Presentation	Semester 1 (Semester 2 for ASMA2A1)
Prerequisites	MAT01A1 **or** MATENA1 **or** MAT3EA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1
Purpose	The main purpose of this module is to enable students to develop proficiency, in dealing with aspects of sequences and series. Furthermore, the purpose extends to exposing the student to a wide variety of series estimation techniques which are essential in applied science, to improve the problem solving skills of students and to form a basis of knowledge that would be necessary for further studies in Mathematics.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and apply basic concepts and theory underlying the convergence of sequences and series, and apply the precise definition of convergence where necessary.
- Describe and apply basic concepts and theory underlying the Taylor and Maclaurin series of functions, as well as approximate functions by polynomials.
- Extend and apply the calculus of single-variable functions to vector-valued functions.

SC.5.13.18 MATHEMATICS LEVEL 7 (Second Year)

Module MAT02A2	Linear Algebra 2A2
NQF Level	7
Credits	10
Presentation	Semester 1 (Semester 2 for ASMA2A2)
Prerequisites	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1)

Purpose	The primary purpose of this module as an integral part of the BSc and BSc Information Technology qualifications is to: o Provide the students with a well-rounded and broad education that equips them with the mathematical knowledge base, theory and methodology of disciplines that could serve as a basis for entry into the mathematically orientated labour market, professional training and practice and postgraduate studies. o Enable the students to demonstrate initiative and responsibility in mathematics related careers.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and comprehend the basic theoretical concepts underlying Linear Algebra.
- Comprehend the geometry and the algebra of vectors.
- Solve linear systems.
- Comprehend the algebra of Matrices.
- Apply matrices and linear transformation to solve mathematically related problems.
- Comprehend concepts relating to generalised vector spaces and subspaces.
- State and prove theorems in Linear Algebra.

SC.5.13.19 MATHEMATICS LEVEL 7 (Second Year)

Module MAT04A2	Discrete Mathematics - IT (Mathematics 2A4)
NQF Level	7
Credits	10
Presentation	Semester 1 (Semester 2 for ASMA2A4)
Prerequisites	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Purpose	To equip students with a detailed knowledge of three areas within discrete mathematics, namely mathematical logic, number theory and combinatorics - including an understanding of and an ability to apply the main concepts, techniques, methods, and results from these three areas. In doing so, contributing to a knowledge base for application in other disciplines, especially computer science and information technology.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate an integrated knowledge of the core concepts, theory, and techniques relating to the syntax and semantics of propositional and predicate logic and to selected deductive systems for these languages.
- Construct correct and appropriate combinatorial strategies for the efficient solution of counting problems.
- Apply the theory and techniques of basic number theory to solve problems relating to properties of divisibility and modular arithmetic, and to construct and use RSA cryptographic terms.

SC.5.13.20 MATHEMATICS LEVEL 7 (Second Year)

Module MAT01B2	Multivariable and Vector Calculus 2B1
NQF Level	7
Credits	10
Presentation	Semester 2 (Semester 1 for ASMA2B1)
Prerequisites	MAT01A1 **or** MATENA1 **or** MAT3EA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1 **and** MAT01A2 **or** ASMA2A1
Purpose	The main purpose of this module is to extended concepts such as limits and continuity, mostly studied in first year calculus, to functions of several variables. Furthermore, the purpose extends to broaden the student's function optimization and integration techniques, to improve the problem solving skills of students and to form a basis of knowledge that would be necessary for further studies in Mathematics.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Investigate continuity of several variable functions, using the precise definition of a limit, where necessary.

- Determine limits, gradients, partial derivatives and directional derivatives and apply these concepts to problem solving.
- Apply optimization theory to problems.
- Determine and evaluate multiple integrals and extend use of double and triple integrals to the physical sciences.
- Extend and apply multiple integration techniques to vector-valued functions.

SC.5.13.21 MATHEMATICS LEVEL 7 (Second Year)

Module MAT02B2	Linear Algebra 2B2
NQF Level	7
Credits	10
Presentation	Semester 2 (Semester 1 for ASMA2B2)
Prerequisites	(MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and** AT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1 **and** MAT02A2 **or** ASMA2A2
Purpose	The primary purpose of this module as an integral part of the BSc and BSc Information Technology qualifications is to: o Provide the students with a well-rounded and broad education that equips them with the mathematical knowledge base, theory and methodology of disciplines that could serve as a basis for entry into the mathematically orientated labour market, professional training and practice and postgraduate studies. o Enable the students to demonstrate initiative and responsibility in mathematics related careers.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Define and comprehend the basic theoretical concepts underlying Linear Algebra.
- State and prove theorems in Linear Algebra.
- Comprehend the concept of orthogonality.
- Define concepts on vector spaces and subspaces.
- Determine eigenvalues and eigenvectors of a given matrix.
- Comprehend the concepts and the theory of linear transformations.
- Comprehend the concepts and the theory of inner product spaces.
- Apply the theory of vector spaces and inner product spaces to solve related problems.

SC.5.13.22 MATHEMATICS LEVEL 7 (Second Year)

Module MAT04B2	Introductory Abstract Algebra – IT (Mathematics 2B4)
NQF Level	7
Credits	10
Presentation	Semester 2 (Semester 1 for ASMA2B4)
Prerequisites	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **and** MAT01B1 **or** ASMA1B1 **and** MAT02A2 **or** ASMA2A2 **and** MAT04A2 **or** ASMA2A4
Purpose	The primary purpose of this module is to equip students with a detailed knowledge of groups in abstract algebra and of combinatorial graphs, including an understanding of and an ability to apply the main concepts, techniques and results of this field. In doing so, contributing to a knowledge base for application in other disciplines.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Define and explain groups and recognize elementary properties of groups.
- Determine subgroups as well as cyclic subgroups and generators.
- Distinguish between isomorphisms, homomorphisms and automorphisms.
- Formulate theorems and proofs related to group theory.
- Demonstrate a thorough understanding of cosets, normal subgroups and external direct products.
- Correctly use and apply the basic terminology and concepts relating to combinatorial graphs.
- Apply path algorithms and tree traversal algorithms to problems involving graphs.
- Solve real world problems via graph theoretic modelling, e.g. solve scheduling problems by modelling as graph colouring problems.

SC.5.13.23 MATHEMATICS LEVEL 7 (Second Year)

Module MATEAA2	Engineering Linear Algebra 2A2
NQF Level	7
Credits	7.5
Presentation	Semester 1 (Semester 2 for ASME2A2)
Prerequisites	(MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1)
Purpose	The primary purpose of this module as an integral part of the Engineering qualification is to: o Provide the students with a well-rounded and broad education that equips them with the mathematical knowledge base, theory and methodology of disciplines that could serve as a basis for the Engineering qualification and entry into the mathematically orientated labour market. o Enable the students to demonstrate initiative and responsibility in mathematics related careers.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Utilize the basic concepts underlying Linear Algebra.
- Utilize the geometry and the algebra of vectors.
- Solve linear systems.
- Apply the algebra of Matrices.
- Apply matrices and linear transformation to solve mathematically related problems.
- Utilize concepts relating to generalised vector spaces and subspaces.
- Apply the knowledge-base to relevant applications.

SC.5.13.24 MATHEMATICS LEVEL 7 (Second Year)

Module MATEAB2	Engineering Linear Algebra 2B2
NQF Level	7
Credits	7.5
Presentation	Semester 2 (Semester 1 for ASME2B2)
Prerequisites	MAT01A1 **or** MAT3EA1 **or** ASMA1A1 **or** MATENA1 **or** ASME1A1) **and (**MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1) **and** (MAT02A2 **or** ASMA2A2 **or** MATEAA2 **or** ASME2A2)
Purpose	The primary purpose of this module as an integral part of the BSc qualification, Engineering qualification and Information Technology qualification is to: o Provide the students with a well-rounded and broad education that equips them with the mathematical knowledge base, theory and methodology of disciplines that could serve as a basis for entry into the mathematically orientated labour market, professional training and practice and postgraduate studies. o Enable the students to demonstrate initiative and responsibility in mathematics related careers.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Utilize the basic theoretical concepts underlying Linear Algebra.
- Utilize the concepts of orthogonality.
- Apply concepts on vector spaces and subspaces.
- Determine eigenvalues and eigenvectors of a given matrix.
- Utilize the theory of linear transformations.
- Utilize the theory of inner product spaces.
- Apply the theory of vector spaces and inner product spaces to solve related problems.

SC.5.13.25 MATHEMATICS LEVEL 7 (Second Year)

Module MATECA2	Engineering Sequences, Series and Vector Calculus 2A1
NQF Level	7
Credits	7.5
Presentation	Semester 1 (Semester 2 for ASME2A1)
Prerequisites	MAT01A1 **or** MATENA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1
Purpose	The main purpose of this module is to enable students to develop proficiency, in dealing with aspects of sequences and series. Furthermore, the purpose extends to exposing the student to a wide variety of series estimation techniques which are essential in applied science, to improve the problem solving skills of students and to form a basis of knowledge that would be necessary for completion of their degree.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply basic concepts and theory underlying the convergence of sequences and series.
- Apply basic concepts and theory underlying the Taylor and Maclaurin series of functions.
- Apply the calculus of single-variable functions to vector-valued functions.

SC.5.13.26 MATHEMATICS LEVEL 7 (Second Year)

Module MATECB2	Engineering Multivariable and Vector Calculus 2B1
NQF Level	7
Credits	7.5
Presentation	Semester 2 (Semester 1 for ASME2B1)
Prerequisites	MAT01A1 **or** MATENA1 **or** ASMA1A1 **or** ASME1A1 **and** MAT01B1 **or** MATENB1 **or** ASMA1B1 **or** ASME1B1 **and** MAT01B2 **or** MATECA2 **or** ASMA2A1 **or** ASME2A1
Purpose	The main purpose of this module is to extended concepts such as limits and continuity, mostly studied in first year calculus, to functions of several variables. Furthermore, the purpose extends to broaden the student's function optimization and integration techniques, to improve the problem solving skills of students and to form a basis of knowledge that would be necessary for completion of their degree.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Investigate continuity of several variable functions.
- Determine limits, gradients, partial derivatives and directional derivatives and apply these concepts to problem solving.
- Apply optimization theory to problems.
- Determine and evaluate multiple integrals and extend use of double and triple integrals to the physical sciences.
- Apply multiple integration techniques to vector-valued functions.

SC.5.13.27 MATHEMATICS LEVEL 7 (Third Year)

Module MAT01A3	Real Analysis (Mathematics 3A1)
NQF Level	7
Credits	15
Presentation	Semester 1
Prerequisites	MAT01A2 or ASMA2A1
Purpose	To equip students with a rigorous treatment of concepts, theory and properties of the real numbers and continuous functions.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and explain the Completeness Property of the real numbers.
- Describe the theory and properties of sequences and continuous functions.
- Demonstrate a thorough understanding of the theory of the Riemann Integral.
- Solve problems related to the abovementioned topics.

SC.5.13.28 MATHEMATICS LEVEL 7 (Third Year)

Module MAT02A3	Discrete Mathematics (Mathematics 3A2)
NQF Level	7
Credits	15
Presentation	Semester 1
Prerequisites	MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Purpose	To equip students with an integrated knowledge of the main concepts, techniques, methods and results from four areas within discrete mathematics, namely set theory, propositional logic, graph theory and combinatorics, thus contributing to a knowledge base for further studies in mathematics and for application in other disciplines.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Demonstrate a mastery of the basic theory involving sets, relations and order and be able to solve problems, related to these topics.
- Demonstrate an integrated knowledge of the core concepts, theory, and techniques relating to the syntax and semantics of propositional logic and to selected deductive systems for this language.
- Construct correct and appropriate combinatorial strategies for the efficient solution of counting problems.
- Apply the core theory and techniques of basic graph theory to prove propositions and solve problems.

SC.5.13.29 MATHEMATICS LEVEL 7 (Third Year)

Module MAT01B3	Complex Analysis (Mathematics 3B1)
NQF Level	7
Credits	15
Presentation	Semester 2
Prerequisites	MAT01B2 or ASMA2B1
Purpose	To introduce students to the theory of complex functions which is considered a classical discipline in pure mathematics with applications in various fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Check for analyticity of a given complex function by using the Cauchy-Riemann equations.
- Graphically represent the images of regions under various conformal mappings.
- Calculate integrals from first principles.
- Calculate integrals using Cauchy's integral formulas as well as by using the Residue method.
- Calculate the Laurent series of a given complex function centred at a given point.
- Calculate difficult real integrals by using methods from complex analysis.

SC.5.13.30 MATHEMATICS LEVEL 7 (Third Year)

Module MAT02B3	Introductory Abstract Algebra (Mathematics 3B2)
NQF Level	7
Credits	15
Presentation	Semester 2
Prerequisites	MAT02A2 or ASMA2A2
Purpose	A study of concepts, theory and applications of groups and rings that equips students with an integrated knowledge base for further studies in mathematics (i.e an honours in mathematics) and for application in other disciplines.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define the basic concepts and theory of integers, groups and rings: prime factorization divisibility, equivalence relations, groups, subgroups, normal subgroups, quotient groups, homomorphisms, isomorphisms and introductory concepts to rings and fields.
- Formulate and proof the basic theorems of integers, groups and rings: prime factorization divisibility, equivalence relations, groups, subgroups, normal subgroups, quotient groups, homomorphisms, isomorphisms and introductory concepts to rings and fields.
- Solve problems by first analysing it and then applying integrated knowledge in the above-mentioned topics using the theory of abstract algebra.

SC.5.13.31 MATHEMATICS LEVEL 6 (First Year)

Module MAEB0A1	Basic Mathematics and Applications in Economics & Business A
NQF Level	6
Credits	16
Presentation	Semester 1 *(Couplet with MAEB0B1)*
Prerequisites	Mathematics Grade 12 – APS 3 or Mathematical Literacy Grade 12 – APS 6
Purpose	This module is foundational in nature, specifically designed to cover selected applications in the economic sciences. It has as its primary purpose, the development of specific mathematical skills (relevant to the economic sciences) for students to cope with the mathematical demands of relevant regular modules in BCom degree programmes.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Perform basic algebraic operations accurately;
- Apply consistently, the features of a straight line to selected problems in the economic sciences;
- Solve methodically, simultaneous equations and apply them to selected problems in the economic sciences;
- Apply methodically non-linear functions to selected areas in the economic sciences;
- Apply the rules of differentiation logically to selected areas in the economic sciences.

SC.5.13.32 MATHEMATICS LEVEL 6 (First Year)

Module MAEB0B1	Basic Mathematics and Applications in Economics & Business B
NQF Level	6
Credits	16
Presentation	Semester 2
Prerequisites	MAEB0A1 with 40% *(Couplet)*
Purpose	This module is foundational in nature, specifically designed to cover selected applications in the economic sciences. It has as its primary purpose, the development of specific mathematical skills (relevant to the economic sciences) for students to cope with the mathematical demands of relevant regular modules in BCom degree programmes.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply consistently, the features of a straight line to selected problems in the economic sciences;
- Apply the rules of differentiation to selected areas in the economic sciences, logically;
- Determine, and interpret logically, selected variables/elements relating to finance;
- Interpret selected concepts relating to basic statistics clearly and undertake calculations involving such concepts.

SC.5.13.33 MATHEMATICS LEVEL 5 (First Year)

Module MAT100	Business Mathematics 100
NQF Level	5
Credits	14
Presentation	Semester 1
Prerequisites	Mathematics Grade 12 – APS 5
Purpose	The course consists of a basic introduction to Mathematical topics in the fields of Algebra, Calculus, Financial Mathematics, Discrete Mathematics and Statistics. A few applications of these Mathematic topics in Accounting, Economics and Finance are covered. This will allow students to observe and practice the practical applications of Mathematics to the relevant fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Accurately perform basic calculations in Algebra;
- Accurately determine limits, continuity intervals, derivatives and integrals using various techniques and rules;
- Accurately perform basic calculations in Financial Mathematics;
- Accurately perform basic calculations in Discrete Mathematics;
- Accurately perform basic calculations in Statistics; and
- Correctly apply all the skills that they have learnt in Accounting, Economics and Business.

SC.5.14 MATHEMATICAL STATISTICS STA

1. All modules (STA01A1, STA01B1, STA02A2, STA02B2, STA03A3 and STA03B3) have a practical component that makes up 30% of the semester mark.
2. Tutorials and practical classes are compulsory. These classes form an integral part of the module and no student will be excused from them. The procedure pertaining to absence from these sessions will be detailed in each module's study guide.
3. No exemption from tutorial and practical classes will be granted for modules that were failed and are repeated.
4. A student needs a semester mark of 40% to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.14.1 MATHEMATICAL STATISTICS LEVEL 6 (First Year)

Module STA1EB1	Statistics 1A1E
NQF Level	5
Credits	12
Presentation	Semester 2
Pre-requisite	Mathematics Grade 12 – APS 5
Purpose	To provide the student with the ability to define basic concepts and terms commonly used in statistics, to show how a set of data can be organised in a meaningful way and presented so as to reveal or enhance its fundamental properties. The student will also be provided with a basic perspective of probability and probability distributions, index numbers and time series and be able to apply them to solve problems in various fields of applications.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify different data collection methods and distinguish between different measurement scales.
- Calculate and interpret basic descriptive statistics from a set of data.
- Summarize data using suitable tables and graphs to portray discrete and continuous distributions.
- Define and apply the basic concepts of probability theory.
- Calculate and interpret probabilities from the binomial, Poisson and normal probability distributions.
- Calculate and interpret simple and composite index numbers.
- Describe and calculate basic components such as trend and seasonal effects of a time series.

SC.5.14.2 MATHEMATICAL STATISTICS LEVEL 6 (First Year)

Module STA2EA1	Statistical Inference
NQF Level	5
Credits	12
Presentation	Semester 1
Pre-requisite	STA1EB1
Purpose	To provide the student with a perspective of simple linear regression, the basics of hypothesis testing and to illustrate their application to the solution of practical problems so that students will be able to apply them to solve problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Measure and model linear relationships between two variables through simple linear regression and correlation analysis.
- Define what a sampling distribution is and distinguish between different sampling distributions.
- Perform hypothesis tests for a population mean, population proportion and population variance.
- Construct and interpret confidence intervals for a population mean, population proportion and population variance.

SC.5.14.3 MATHEMATICAL STATISTICS LEVEL 7 (First Year)

Module STA01A1	Distribution Theory
NQF Level	5
Credits	15
Presentation	Semester 1
Pre-requisite	Mathematics Grade 12 – APS 6
Purpose	To provide the student with a perspective of the basics of probability theory and to illustrate its application to the solution of practical problems. The student will also give a basic perspective of a variety of discrete probability distributions and will be able to apply them to solve problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and apply the basic concepts of probability theory.
- Define and apply random variables, their joint distributions and probability densities.

SC.5.14.4 MATHEMATICAL STATISTICS LEVEL 7 (First Year)

Module STA01B1	Statistical Inference
NQF Level	5
Credits	15
Presentation	Semester 2
Pre-requisite	STA01A1 **or** STA2EA1
Purpose	To provide the student with a perspective of the basics of probability theory and to illustrate its application to the solution of practical problems. The student will also give a basic perspective of a variety of continuous probability distributions and will be able to apply them to solve problems in various fields of application. The student will also have a fundamental perspective of statistical inference and be able to solve elementary inference problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and apply the basic concepts of probability theory.
- Define and apply continuous random variables, their joint distributions and probability densities.
- Explain the concepts of random sampling, statistical inference and sampling distributions, and state and use basic sampling distributions related to the normal distribution.

SC.5.14.5 MATHEMATICAL STATISTICS LEVEL 7 (Second Year)

Module STA02A2	Probability Theory
NQF Level	6
Credits	20
Presentation	Semester 1
Pre-requisites	STA01B1, MAT01B1 (or ASMA1B1) or MATENB1 (or ASME1B1)
Purpose	To provide the student with an advanced perspective of probability theory and to illustrate its application to the solution of practical problems. The student will also give an advanced perspective of a variety of probability distributions, their interrelationships their use in solving problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand and apply the general rules of probability theory
- Define the densities and derive the probability/moment generating functions of several types of commonly occurring discrete random variables.
- Understand and apply the elements of continuous distribution theory.

SC.5.14.6 MATHEMATICAL STATISTICS LEVEL 6 (Second Year)

Module STA02B2	Statistical Inference and Distribution Theory
NQF Level	6
Credits	20
Presentation	Semester 2
Pre-requisite	STA02A2
Purpose	To provide the student with an advanced perspective of continuous distribution theory and to illustrate its application to the solution of practical problems. The student will also be given an advanced perspective of a variety of statistical inference procedures and their use in solving problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Understand and apply the general rules of continuous distribution theory
- Define the densities and derive the moment/cumulant generating functions of several types of commonly occurring continuous random variables.
- Explain the concepts of random sampling, statistical inference and sampling distributions.
- Describe and apply the main methods of estimation and the main properties of estimators.

SC.5.14.7 MATHEMATICAL STATISTICS LEVEL 7 (Third Year)

Module STA03A3	Linear Models
NQF Level	7
Credits	30
Presentation	Semester 1
Pre-requisites	STA02B2, MAT01A2 (or ASMA2A1), MAT02B2 (or ASMA2B2)
Purpose	To provide the student with a knowledge of various linear and generalised linear models, how to find parameter estimates, how to deduce the distributions of suitable statistics and how to apply these to solve problems involving real world data.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define and apply the general linear model.
- Explain the concept of a generalised linear model and illustrate its use in problem solving.

SC.5.14.8 MATHEMATICAL STATISTICS LEVEL 7 (Third Year)

Module STA03B3	Stochastic Processes
NQF Level	7
Credits	30
Presentation	Semester 2
Pre-requisites	STA02B2, MAT01A2 (or ASMA2A1)
Purpose	To provide the student with a knowledge of a variety of stochastic processes and time series models and with the ability to apply them to solve problems in various substantive fields.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Define Markov processes and their classification into types. Define and derive transition probabilities and associated quantities.
- Define and apply the main concepts and general properties of stationary univariate time series models

SC.5.14.9 MATHEMATICAL STATISTICS LEVEL 7 (Third Year)

Module STAE0A3	Statistics for Engineers
NQF Level	6
Credits	20
Presentation	Semester 1
Pre-requisite	MATENB1 (or ASME1B1 or MAT01B1 or ASMA1B1)
Purpose	After completion of the module the learner will understand the basic elements of probability theory, random variables and processes, and statistical inference, and be able to apply this knowledge to solve problems.

Module learning outcomes: On completion of this learning event, the student should be able to:

- State and apply the basic axioms of probability theory in order to compute the probability of simple events
- State and apply the addition rules, conditional probability rules, Bayes' formula, multiplication rules and statistical independence.
- State the probability distribution and density functions of various discrete and continuous random variables, evaluate associated probabilities and determine the moments and other properties of these random variables
- Apply the joint distribution and probability mass function of discretely valued random variables to compute probabilities and expected values of functions of the random variables.
- Define a random process and apply it to model measurement noise and other random signals.
- Derive the expected value function and the autocorrelation function of a given random process.
- Apply pictorial and tabular techniques, such as empirical distributions, histograms, etc. for depicting statistical data.
- Compute statistical measures of location and variability, such as sample mean, sample variance, median, quantiles, percentiles, etc.
- State the Central Limit Theorem, and define the various sampling distributions (eg.t, chi-squared, F).
- Compute the confidence intervals and apply hypothesis testing for parameters of a population, for example, the population mean, the population variance, etc.
- Compute the reliability of parallel and series combinations of subsystems.

SC.5.15 MICROBIOLOGY MCB

Attendance at practical classes is compulsory. Absence from a practical class will only be condoned on presentation of a very good reason substantiated by a certificate from an acceptable source, this certificate to be submitted to the department within 5 working days. Any student absent from a practical class without permission will not be permitted entry to the final assessment opportunity.

The relative weightings for determining the module mark applied to theory and practical assessments are: (Theory: Practical)

MCB02A2 70:30
MCB02B2 70:30

SC.5.16.1 MICROBIOLOGY LEVEL 6 (Second Year)

Module MCB02A2	Bacteriology and Virology
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	BIO10A1 or BIO 1A1E and BIO2EA1, CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1

Purpose	The purpose of the Bacteriology component is to provide learners with a well-rounded and basic knowledge of prokaryotes such as bacteria. Upon completion of this module a learner will be able to discuss and explain the morphology, reproduction and overall importance of bacteria. The learners will have had experience in handling different types of bacteria in a safe manner and perform laboratory investigations without posing a risk to the environment or colleagues. The learner will also be able to explain the uses and roles of bacteria in industrial, medical and environmental contexts. The primary purpose of Virology is to provide learners with a basic knowledge of the viral group and its diseases. Upon completion of this module, a learner should be able to describe the fundamental principles of virology: taxonomy, classification & morphology of the viruses. The learners should also understand viral infection of plant, animal and bacterial tissue, as well as viral identification and cultivation techniques. The learner should be able to recognize certain diseases, its causal factor, symptoms, as well as the mode of transmission, incubation and infection of the host. Learners will be made to understand that viruses cause diseases but have advantages to their existence too (their use in cancer treatment & recombinant DNA technology).

Module learning outcomes: On completion of this learning event, the learner should be able to:

- Describe the significance of bacteria
- Summarise the discovery of bacteria and spontaneous generation
- Discuss the morphology & reproduction of the bacterium
- Discuss growth and cultivation of bacteria
- Explain sterility, sterilisation & conditions affecting the action of antimicrobial treatments
- Discuss water quality and the development of bacterial water borne diseases
- Discuss food preservation and the development of bacterial food borne diseases
- Debate the advantages & disadvantages of bacterial flora of the body
- Summarise the cause, symptoms and treatment of sexually transmitted diseases caused by bacteria
- Conduct practical work and experiments and demonstrate safe laboratory techniques
- Use a microscope correctly & present practical results by writing appropriate reports by correctly using appropriate terminology.
- Discuss the classification, morphology and replication of plant & animal viruses, and bacteriophages
- Explain the various isolation, identification and cultivation techniques used by virologists
- Discuss and explain viral disease development and how it influences/triggers the immune system
- Summarise the cause, symptoms, significance and treatment of certain viral diseases
- Demonstrate virtual HHMI ELISA and enzyme tests
- Complete answer sheets regarding prudently selected viral disease videos
- Present results correctly using appropriate terminology.

SC.5.15.2 MICROBIOLOGY LEVEL 7 (Second Year)

Module MCB02B2	Microbial Diversity and Plant Pathology
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	BIO10A1 or BIO 1A1E and BIO2EA1, CEM01A1 or CEM1AC1 and CEM01B1 or CEM1DB1

Purpose	The primary purpose of Microbial diversity is to provide learners with a basic knowledge of the various microbial groups (Archaea & Protists) in order for them to make sense of the diversity of organisms. Upon completion of this module, a learner should be able to organize groups into a classification system and describe the fundamental similarities and differences between the microorganisms, regarding structure, metabolism, habitat, reproduction and diseases. The primary purpose of the Plant Pathology component is to provide learners with a well-rounded and basic education of the Steps of an Outbreak Investigation and Development of plant diseases. Upon completion a learner will be able to describe the fundamental principles and importance of plant pathology and epidemiology. The learner will also be able to distinguish between healthy & "sick" plants. The learner will be able to list and discuss the steps in disease development and the control thereof. Certain plant diseases will be reviewed. The learner will be able to analyse and compare different types of fungi in a safe manner and perform laboratory investigations without posing a risk to the environment or colleagues.

Module learning outcomes: On completion of this learning event, the learner should be able to:

- Have a clear understanding of concepts used in the study of microbiology.
- List the differences between groups of prokaryotes and eukaryotes: morphology, metabolism, taxonomy, distribution and habitat.
- Be in a position to compare and contrast the general and diagnostic features of the following groups: Protozoans and Archaea.
- Identify the symptoms, cause, development and treatment of diseases caused by Protozoans and Archaea.
- Be in a position to identify, draw, annotate/label and classify giving reasons.
- Be able to integrate the theory and the practical work into one coherent unit.
- Explain the concept of plant pathology and categorize plant diseases.
- Recognize and describe the effect of the abiotic and biotic environment on the development of plant disease.
- Explain the influence of genetic interaction of a host.
- Define concepts in disease development and explain the steps involved in plant disease development.
- Discuss various plant diseases regarding symptoms and control.
- Demonstrate safe laboratory techniques and conduct practical experiments safely.
- Present practical results by writing appropriate reports using appropriate terminology.

SC.5.16 PHYSICS PHY

Practicals

Experimental courses in Physics consist of a Theory part and a Practical part, both of which run for the duration of the semester in which the course is offered. A semester mark is compiled from the Theory and Practical.

1. The Practical mark counts 30% of the semester mark for the particular course.

2. If a student is repeating a course, they may apply for exemption of the Practical provided he/she has previously obtained at least 50% for the relevant Practical. Should a student meet the criteria and exercise the option of exemption from a Practical, the formerly obtained Practical mark **will count 30%** towards the final semester mark. **A student repeating a module will only be given exemption from the practical component of that module if a mark of 50% for the practical work was obtained in the three years prior to the present academic year.**

3. A sub-minimum of 50% is required for the Practical mark, in conjunction with a sub-minimum of 40% for the Theory mark of a particular course in order to gain entrance to the exam for that specific module.

4. Attendance of all scheduled practicals is compulsory.

Times for practicals

First year	:	1 x 4 hours per week
Second year	:	1 x 4 hours per week
Third year	:	1 x 3.5 hours per week

Further Examination entrance requirements

1. If a student is found to have attended less than 70% of lectures during a semester in a particular course, such a student may be refused entrance to the exam for that course.
2. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.16.1 PHYSICS LEVEL 5 (First Year)

Module PHY1EA1	Physics 1A1E
NQF Level	5
Credits	4
Presentation	Semester 1
Purpose	To supply students with the conceptual foundation of the laws, principles and methods in elementary mechanics. Through the acquisition of appropriate skills, the student will discover the application of elementary mechanics with the emphasis on fundamental mathematical techniques involved in solving Physics problems. Several mechanics topics will be covered in these topics. Students will also be exposed to basics of simple harmonic motion including mechanical wave properties and the proper mathematical expressions of these concepts. A student who has completed Physics 1A1E will be in a position to proceed and undertake the next module, Physics 1A2E. and PHYL02E

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, basic principles and the basic laws of elementary mechanics, simple harmonic motion, and elasticity and waves and sounds.
- Derive equations, explain, interpret and evaluate elementary theoretical models in elementary mechanics, simple harmonic motion and elasticity, and waves and sounds.
- Integrate basic concepts and theories to solve problems of elementary mechanics.
- Recognize and explain aspects of the application of the topics covered in this module in everyday life.

SC.5.16.2 PHYSICS LEVEL 5 (First Year)

Module PHY2EB1	Physics 1A2E
NQF Level	5
Credits	10
Presentation	Semester 2
Pre-requisite	PHY1EA1
Purpose	To supply students with the conceptual foundation of the laws, principles and methods in elementary mechanics. Through the acquisition of appropriate skills, the student will discover the application of mechanics both in linear and rotational dimensions. Students will be able to reflect on the role of these concepts of physics, in our technological environment. A student who has completed Physics 1A2E will be in a position to proceed and undertake the next module, Physics 1A3E.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, basic principles and the basic laws of elementary mechanics in both dimensions, that is, linear and rotational.

- Derive equations, explain, interpret and evaluate elementary theoretical models in elementary mechanics.
- Integrate basic concepts and theories to solve problems of elementary mechanics.
- Recognize and explain aspects of the application of the topics covered in this module in everyday life.

SC.5.16.3 PHYSICS LEVEL 5 (Second Year)

Module PHY3EA1	Physics 1A3E
NQF Level	5
Credits	10
Presentation	Semester 1
Prerequisites	PHY2EB1
Purpose	To supply students with the conceptual foundation of the laws, principles and methods in mechanics, oscillations and mechanical waves, and thermodynamics. Through the acquisition of appropriate skills, the student will discover the application of these topics and be able to reflect on the role of these concepts of physics, in our technological environment.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws encountered in mechanics, oscillations and mechanical waves, and thermodynamics.
- Derive equations, explain, interpret and evaluate elementary theoretical models in basic mechanics, oscillations and mechanical waves, and thermodynamics.
- Integrate basic concepts and theories to solve elementary problems in mechanics, oscillations and mechanical waves, and thermodynamics.
- Recognize and explain aspects of the application of the topics covered in this module in everyday life.

SC.5.16.4 PHYSICS LEVEL 5 (First Year)

Module -PHYG1A1	General Physics for Earth Sciences
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	Providing the first-year geology and earth science student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in physics applicable to the broader earth sciences. Through the acquisition of appropriate skills, the student will discover the application of these laws to their daily environment as an earth scientist/ physics student.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of physics applicable to the earth sciences.
- Explain, interpret and evaluate elementary theoretical models in physics applied to the earth sciences.
- Integrate basic concepts and theories to solve problems of elementary physics applied to the earth sciences.
- Recognize and explain aspects of the application of elementary physics as applied in a geological and earth science context.

SC.5.16.5 PHYSICS LEVEL 5 (First Year)

Module-PHYG1B1	Physics of the Earth and its Natural Environment
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	PHYG0A1
Purpose	Providing the first year student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in Physics with applications to the broader earth sciences. Through the acquisition of appropriate skills, the student will discover the application of these laws to their daily environment as an earth scientist/ physics student. In particular, the course provides the physical foundation needed for the understanding of geological and geomorphological processes, the oceans, the atmosphere and weather and the solar system.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of Physics relevant to the broader earth sciences.
- Understanding the physical functioning of basic natural phenomena related to the earth, the atmosphere, the oceans and the solar system.
- Recognize and explain aspects of the application of physics in the geological, geographical and natural environment.

SC.5.16.6 PHYSICS LEVEL 5 (First Year)

Module PHE2LB1	Physics for Life Sciences L02E
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisite	PHY1EA1
Purpose	Providing the first year life science student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in Physics in the context of the life sciences. Through the acquisition of appropriate skills, the student will discover the application of these laws to their daily environment as a biological scientist/ physics student.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of physics applicable to the life sciences.
- Explain, interpret and evaluate elementary theoretical models in physics applied to the life sciences.
- Integrate basic concepts and theories to solve problems of elementary physics applied to the life sciences.
- Recognize and explain aspects of the application of elementary physics as applied in a biological context.

SC.5.16.7 PHYSICS LEVEL 5 (First Year)

Module PHE3LA1	Physics for Life Sciences L03E
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisite	PH2LB1
Purpose	Providing the first year life science student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in Physics in the context of the life sciences. Through the acquisition of appropriate skills, the student will discover the application of these laws to their daily environment as a biological scientist/ physics student.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of physics applicable to the life sciences.

- Explain, interpret and evaluate elementary theoretical models in physics applied to the life sciences.
- Integrate basic concepts and theories to solve problems of elementary physics applied to the life sciences.
- Recognize and explain aspects of the application of elementary physics as applied in a biological context.

SC.5.16.8 PHYSICS LEVEL 5 (First Year)

Module PHYL1A1	Physics for Life Sciences 1A
NQF Level	5
Credits	15
Presentation	Semester 1
Purpose	Providing the first year life science student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in Physics in the context of the life sciences. Through the acquisition of appropriate skills, the student will discover the application of these laws to their daily environment as a biological scientist/ physics student.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of physics applicable to the life sciences.
- Explain, interpret and evaluate elementary theoretical models in physics applied to the life sciences.
- Integrate basic concepts and theories to solve problems of elementary physics applied to the life sciences.
- Recognize and explain aspects of the application of elementary physics as applied in a biological context.

SC.5.16.9 PHYSICS LEVEL 5 (First Year)

Module PHYS1A1	Introductory Physics A (for Physics major)
NQF Level	5
Credits	15
Presentation	Semester 1
Pre-requisite	Mathematics Grade 12 – APS 5
Purpose	To supply students with the conceptual foundation for the laws, principles and methods used in elementary mechanics, waves and heat from the perspective of a physicist. Through the acquisition of appropriate skills, the student will discover the application of the laws, principles and methods relating to elementary mechanics, waves and heat, and will be able to reflect on the role thereof in physics and the technological environment.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws encountered in elementary mechanics, waves and heat.
- Derive equations in, explain, interpret and evaluate elementary theoretical models in basic mechanics, waves and heat.
- Demonstrate a sufficiently deep conceptual understanding of elementary mechanics, waves and heat to tackle advanced level Physics topics.
- Integrate basic concepts and theories to solve elementary problems in basic mechanics, waves and heat.
- Recognize and explain aspects of the application of elementary mechanics, waves and heat in everyday life.

SC.5.16.10 PHYSICS LEVEL 5 (First Year)

Module PHYS1B1	Introductory Physics B (Physics major)
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	PHY1S0A1
Purpose	To supply students with the conceptual foundation of the laws, principles and methods in elementary electricity and magnetism from the perspective of a physicist. Through the acquisition of appropriate skills, the student will discover the application of elementary electricity and magnetism, optics and special relativity and will be able to reflect on the role thereof in physics and the technological environment.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws encountered in elementary electricity and magnetism, optics and special relativity.
- Derive equations in, explain, interpret and evaluate elementary theoretical models in basic electricity and magnetism, optics and special relativity.
- Demonstrate a sufficiently deep conceptual understanding of elementary electricity and magnetism, optics and special relativity to tackle advanced level Physics topics.
- Integrate basic concepts and theories to solve elementary problems in basic electricity and magnetism, optics and special relativity.
- Recognize and explain aspects of the application of elementary electricity and magnetism, optics and special relativity in everyday life.

SC.5.16.11 PHYSICS LEVEL 6 (Second Year)

Module PHY00A2	Classical Mechanics and Special Relativity
NQF Level	6
Credits	16
Presentation	Semester 1
Prerequisites	PHYS1B1 **and** MAT01B1 **or** ASMA1B1 **or** MATENB1 **or** ASME1B1
Purpose	o Providing qualifying students with intellectual and practical skills to analyse, interpret and apply scientific laws and methods in various reference frames, advanced Newtonian mechanics, gravitational and central forces, inertial and non-inertial frames, Lagrange-mechanics, vibrations and various type of oscillations in Advanced Mechanics. Through the acquisition of appropriate skills the student will discover the application of advanced mechanics and will be able to reflect upon the application thereof in Physics and in the technological environment. o Presenting an overview of the development of classical mechanics from Galileo to Einstein o Providing students with knowledge and appreciation of the significance of special relativity. o Providing students with practical skills to execute advanced experiments in electricity, optics, mechanics and thermodynamics. To analyse, interpret and evaluate the collected data and to report on the experiments.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the definitions of physical quantities, the principles and the laws encountered, in classical mechanics and special relativity.
- Derive equations in, explain, interpret and evaluate advanced theoretical models in classical mechanics and special relativity.
- Integrate basic concepts and theories to solve problems in advanced mechanics and waves.
- Recognize and explain aspects of the application of classical mechanics and special relativity in everyday life.

SC.5.16.12 PHYSICS LEVEL 6 (Second Year)

Module PHY00B2	Static and Dynamic Electromagnetism
NQF Level	6
Credits	16
Presentation	Semester 2
Prerequisites	PHYS1B1 **and** (MAT01A2 **or** ASMA2A1 **and** MAT02A2 **or** ASMA2A2) **or** APM02A2
Purpose	To equip students with a working knowledge of the concepts and methods in electromagnetism: origins and use of the differential forms of the laws of Gauss, Ampere, and Faraday, Maxwell's equations, alternating currents, and the physics of magnetic materials. The student shall, by acquiring the appropriate skills, be able to discover the applications of electromagnetism, and be in a position to recognize the applications thereof in the technological environment. This module is also to provide the students with practical skills to execute advanced experiments in electricity, optics, mechanics and thermodynamics. To analyse, interpret and evaluate the collected data and to report on the experiments.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the definitions of physical quantities, the principles and the laws encountered in static and dynamic electromagnetism.
- Derive equations in, explain, interpret and evaluate advanced theoretical models in static and dynamic electromagnetism.
- Integrate basic concepts and theories to solve problems in static and dynamic electromagnetism.
- Recognize and explain aspects of the application of in static and dynamic electromagnetism in everyday life.
- To execute, collect data, and report on experiments electricity, optics, mechanics, and thermodynamics.

SC.5.16.13 PHYSICS LEVEL 6 (Second Year)

Module PHY00Y2	Thermal Physics, Optics and Waves
NQF Level	6
Credits	8
Presentation	Year
Prerequisites	PHYS1B1 **and** MAT01B1 **or** ASMA1B1 or MATENB1 or ASME1B1
Purpose	o This module is to provide qualifying students with intellectual and practical skills to analyse, interpret and apply scientific laws and methods in thermal physics, waves, optics and basic quantum mechanics. Through the acquisition of appropriate skills the student will discover the application of thermal physics, waves, optics and basic quantum physics and will be able to reflect upon the application thereof in Physics and in the technological environment. o This module is to provide students with practical skills to execute advanced experiments in electricity, optics, mechanics and thermodynamics. To analyse, interpret and evaluate the collected data and to report on the experiments.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the definitions of physical quantities, the principles and the laws encountered, in thermal physics, waves, optics and basic quantum physics.
- Derive equations in, explain, interpret and evaluate advanced theoretical models in thermal physics, waves, optics and basic quantum physics.
- Integrate basic concepts and theories to solve problems in thermal physics, waves, optics and basic quantum physics.
- Recognize and explain aspects of the application of thermal physics, waves, optics and basic quantum physics in everyday life.

SC.5.16.14 PHYSICS LEVEL 7 (Third Year)

Module PHY00A3	Quantum Mechanics and Modern Physics
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	PHY00A2, PHY00B2 **and** MAT01B2 **or** ASMA2B1 **and** MAT02B2 **or** ASMA2B2 **or** APM02B2
Purpose	The purpose of this module is to provide qualifying students with intellectual and practical skills to analyse, interpret and apply scientific laws and methods in quantum mechanics and some fields of physics using these methods (nuclear and particle physics). Through the acquisition of appropriate skills the student will discover the application of quantum mechanics, nuclear and particle physics and will be able to reflect upon the application thereof in other branches of physics and in the technological environment. To provide the students with practical skills to execute experiments in electronics, to analyse, interpret, evaluate the collected data and to report on the experiments, and to apply this knowledge to everyday appliances.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and the definitions of physical quantities, the principles and the laws encountered in quantum mechanics.
- Derive equations in, explain, interpret and evaluate theoretical models in quantum mechanics, nuclear and particle physics.
- Integrate concepts and theories to solve problems in quantum mechanics, nuclear and particle physics.
- Recognise and explain aspects of the application of quantum mechanics, nuclear and particle physics in other branches of physics and in technology.
- Execute experimental projects in electronics effectively and responsibly.
- Collect, analyse, interpret and evaluate experimental data collected from experiments electronics.
- Integrate the data collected in the experiments with elementary theories in electronics.
- Write clear and concise reports on their experiments in electronics.

SC.5.16.15 PHYSICS LEVEL 7 (Third Year)

Module PHY00B3	Introduction to Statistical and Solid State Physics
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	PHY00A3
Purpose	The purpose of this module is to provide qualifying students with intellectual, mathematical and practical skills to analyse, interpret and apply concepts and functions in statistical physics. These concepts include Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac statistics, specific heat of solids, lasers, phonon and photon gas, free electron gas, and Bose condensation. The student is exposed to scientific laws and methods in working with crystal and electron structures, magnetic, electronic and superconducting properties of materials. Through the acquisition of appropriate skills, the student will discover the application of statistical and solid state physics and will be able to reflect upon the application thereof in other branches of physics and in the technological environment. The statistical physics and solid state physics sections are examined separately and the marks are combined to obtain the final course mark.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Grasp and master the mathematical formalism on which modern advanced physics is based.
- Formulate, discuss and explain the definitions of physical quantities, the principles and the basic laws encountered in statistical physics and solid state physics.
- Derive equations in, explain, interpret and evaluate theoretical models in statistical physics and solid state physics.
- Integrate concepts and theories to solve problems in statistical physics and solid state physics.

- Recognize and explain aspects of the application of statistical physics and solid state physics in everyday life and in technology.
- Conduct appropriate experimental work in the laboratory, analyse data and report her/his results.

SC.5.16.16 PHYSICS LEVEL 5 (First Year)

Module PHYE0A1	Engineering Physics 1A
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisites	Mathematics Grade 12 – APS 5
Purpose	To supply students with the conceptual foundation for the laws, principles and methods used in elementary mechanics, waves and heat. Through the acquisition of appropriate skills, the student will discover the application of the laws, principles and methods relating to elementary mechanics, waves and heat, and will be able to reflect on the role thereof in physics and the technological environment.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws encountered in elementary mechanics, waves and heat.
- Derive equations in, explain, interpret and evaluate elementary theoretical models in basic mechanics, waves and heat.
- Integrate basic concepts and theories to solve elementary problems in basic mechanics, waves and heat.
- Recognize and explain aspects of the application of elementary mechanics, waves and heat in everyday life.

SC.5.16.17 PHYSICS LEVEL 5 (First Year)

Module PHYE0B1	Engineering Physics 1B
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	PHYE0A1
Purpose	To supply students with the conceptual foundation for the laws, principles and methods used in Electricity, Magnetism and Optics. Through the acquisition of appropriate skills, the student will discover the application of the laws, principles and methods relating to electricity, magnetism and optics, and will be able to reflect on the role thereof in physics and the technological environment.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the basic properties of electric charges, how one may generate these charges directly and indirectly.
- Derive equations in, explain, interpret and evaluate elementary theoretical models in electricity, magnetism and optics
- Integrate basic concepts and theories to solve elementary problems in basic electricity, magnetism and optics
- Recognize and explain aspects of the application of electricity, magnetism and optics in everyday life.

SC.5.16.18 PHYSICS LEVEL 6 (Second Year)

Module PHYE2A2	Engineering Physics 2: Static and Dynamic Electromagnetism
NQF Level	6
Credits	15
Presentation	Semester 1
Prerequisites	PHYE0B1 **and** MAT01A2 **or** MATECA2 **or** ASMA2A1 **or** ASME2A1 **and** MATEAA2 **or** ASME2A2 **or** MAT02A2 **or** ASMA2A2 **or** APME0A2
Purpose	To equip electrical engineering students with a working knowledge of the theoretical concepts and methods in electromagnetism: origins and use of the differential forms of the laws of Gauss, Ampere, and Faraday, Maxwell's equations, alternating currents, and the physics of magnetic materials, as well as other physics topics relevant to modern electrical engineering applications. The student shall, by acquiring the appropriate skills, be able to discover the applications of electromagnetism, and be in a position to recognize the applications thereof in the technological environment. This module is also to provide the students with practical skills to execute advanced experiments in electricity, optics, mechanics and thermodynamics. To analyse, interpret and evaluate the collected data and to report on the experiments.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Formulate, discuss and explain the definitions of physical quantities, the principles and the laws encountered in static and dynamic electromagnetism, as well as other physics topics relevant to modern electrical engineering applications.
- Derive equations in, explain, interpret and evaluate advanced theoretical models in static and dynamic electromagnetism.
- Integrate basic concepts and theories to solve problems in static and dynamic electromagnetism.
- Recognize and explain aspects of the application of in static and dynamic electromagnetism in everyday life.
- To execute, collect data, and report on experiments electricity, optics, mechanics, and thermodynamics.

SC.5.17 PHYSIOLOGY PHS

Practicals form an integral part of the theory discussed during lectures. A sub-minimum of 40% for practicals is required for admission to semester examinations in Physiology.

Practicals:

PHS02A2, PHS02B2 = 1 x 4 hours per week
PHS03A3, PHS03B3 = 1 x 4 hours per week

A student needs a module mark of 40% to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A final mark of 50% is required to pass a module. The semester mark also contributes towards the calculation of the supplementary assessment. The final result of a supplementary assessment is capped on 50%. The weights of assessments in each module e.g. practicals, assignments and theory for the determination of access to the final assessment are explained in the learner guides.

SC.5.17.1 PHYSIOLOGY LEVEL 6 (Second Year)

Module PHS02A2	Basic Physiological Concepts and Movement
NQF Level	6
Credits	20
Presentation	Semester 1
Purpose	The purpose of this module is to enable the student to explain introductory concepts of physiology, including basic concepts of chemical reactions, functions of cellular components and the different tissue types. The student should also be able to discuss the relationship of structure and function of the integumentary, skeletal and muscular systems, with reference to related homeostatic imbalances

Module learning outcomes: On completion of this module, the students should be able to:

- Explain introductory concepts of physiology and discuss homeostatic principles.
- Explain basic concepts of chemistry and the general structure, biological functions and reactions of the important organic and inorganic compounds in the body.
- Discuss the cellular organisation of the body by referring to the functions and interactions of the different cell components.
- Microscopically identify the different tissue types and discuss the relationship of structure and function with special reference to inflammation and regeneration.
- Discuss the structure and functions of the integument and related homeostatic imbalances.
- Discuss the structure and function of the skeletal system.
- Explain the principles of the neuromuscular junction and muscle contraction.

SC.5.17.2 PHYSIOLOGY LEVEL 6 (Second Year)

Module PHS02B2	Control Systems
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	Physiology (PHS02A2)
Purpose	The purpose of this module is to enable the student to understand and discuss the basic principles of the control systems, i.e. the nervous system and the endocrine system, including the structure and function of the central and peripheral nervous systems, the special senses, and all the tissues that make up the endocrine system.

Module learning outcomes: On completion of this module, the students should be able to:

- Explain the generation and propagation of an action potential.
- Describe the effect of neurotransmitters and neuromodulators on the postsynaptic membranes.
- Explain the processing of information in the neural tissue.
- Explain basic histological, chemical, physical and physiological concepts of the nervous system.
- Discuss structure and function of the different sections of the brain
- Give an overview of the reflex activities of the nervous system with the aid of descriptive illustrations and diagrams.
- Discuss basic concepts and interactions of the autonomic nervous system.
- Give an overview of the general senses of the body.
- Discuss the structure and function of the specific organs of the endocrine system and explain the functional aspects thereof.

SC.5.17.3 PHYSIOLOGY LEVEL 7 (Third Year)

Module PHS03A3	Visceral Organ Systems
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	Control Systems (PHS02B2)
Purpose	The purposes of this module are to enable the student to explain histological and functional aspects of the cardiovascular system with special reference to blood tests, the cardiac cycle and blood circulation, and immunity~~,~~ . To explain histological and functional aspects of the respiratory, digestive and urinary systems, and the basic principles of the pulmonary ventilation, digestion and urine formation. To discuss the histological and functional adaptations of the male and female reproductive systems, oogenesis, spermatogenesis, the process of fertilisation~~,~~

Module learning outcomes: On completion of this learning event, the students should be able to:

- Discuss functional aspects of blood with reference to specific diagnostic blood tests.
- Explain the histology and functional anatomy of the heart, as well as the electrical and mechanical aspects of the cardiac cycle.
- Explain the basic concepts of the blood circulation.
- Discuss the functional aspects of the lymphatic system to explain the non-specific and specific defence mechanisms of the body.
- Microscopically identify the tissues of respiratory organs and explain physical and functional aspects thereof.
- Microscopically identify the organs of the digestive tract and explain functional adaptations and implications thereof.
- Microscopically identify the organs of the urinary system and discuss functional aspects with special reference to basic concepts of the formation of urine.
- Explain histological and functional adaptations of the male and female reproductive organs.
- Discuss oogenesis, spermatogenesis and related processes.
- Explain the process of fertilisation, pregnancy, parturition.
- Use dissections, descriptive illustrations and diagrams to explain foetal circulation and the changes that occur after birth.

SC.5.17.4 PHYSIOLOGY LEVEL 7 (Third Year)

Module PHS03B3	Advanced Integration
NQF Level	7
Credits	30
Presentation	Semester 2
Prerequisites	Visceral Organ Systems (PHS03A3)
Purpose	The purpose of this module is to explain the relationship between the interaction and integration of the specialized functions of the different organ systems to maintain homeostasis.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Discuss the interaction and control in positive and negative feedback mechanisms including blood clotting, labour and lactation.
- Explain the principles of reflex activities with reference to neural, hormonal and humeral control and the integration of neural and hormonal control.
- Compare the interaction of the different organ systems to maintain metabolism, water balance regulation and reproduction

SC.5.18 STATISTICAL METHODS SMT

Only one of Mathematical Statistics or Statistical Methods or Analytical Techniques will be accredited if more than one is included in the same curriculum.

SC.5.18.1 STATISTICAL METHODS LEVEL 5 (First Year)

Module SMT01A1	Statistical Methods 1A
NQF Level	5
Credits	15
Presentation	Semester 1
Pre-requisite	Mathematics Grade 12 – APS 5
Purpose	To provide the student with a perspective of the basics of probability theory and to illustrate its application to the solution of practical problems. The student will also be given a basic perspective of a variety of discrete probability distributions and will be able to apply them to solve problems in various fields of application.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Distinguish between different measurement scales.
- Tabulate data and derive information from frequency distributions.
- Derive and interpret information from graphical representations of data.
- Describe a data set numerically in terms of location and spread.
- Apply various elementary principles of probability theory.
- Use the standardized normal distribution table to find probabilities.
- Apply elementary principles of the sampling distribution of the mean.
- Perform hypothesis testing.
- Measure and model linear relationships between two variables.

SC.5.19 ZOOLOGY ZOO

Introduction to General Chemistry for Biological and Earth Sciences (CEM1AC1) and Environmental Chemistry: Atmosphere, Hydrosphere and Soil (CEM1DB1) are compulsory ancillary modules for Zoology as a major.

Excursions: One long excursion is compulsory for students taking Ecology (ZOO33A3) and Comparative Animal Physiology (ZOO33B3) and Honours students.

Practicals:

ZOO11B1	=	1 x 3 hours per week
ZOO22A2	=	1 x 4.5 hours per week
ZOO22B2	=	1 x 4.5 hours per week
ZOO33A3	=	1 x 4.5 hours per week
ZOO33B3	=	1 x 4.5 hours per week

Practicals form an integral part of the theory discussed during lectures. A sub-minimum of 40% for practicals is required for admission to semester examinations in Zoology.

A student needs a module mark of 40% to gain entrance to the final assessment opportunity. The semester and final assessment mark weight is 50:50. A student needs a final mark of 50% to pass a module. The semester mark also contributes to the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%. The weights of assessments in each module e.g. practicals, assignments and theory for the determination of access to the final assessment are explained in the learner guides.

SC.5.19.1 ZOOLOGY LEVEL 5 (First Year)

Module ZOO11B1	Animal Diversity
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	Biology 1A (BIO10A1) or BIO1EB1 and BIO2EA1
Purpose	In this semester module the student is introduced to the principles of animal classification. The description of fundamental characteristics of animal phyla and the morphology, general biology and special adaptations of the Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata are also included.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Explain animal classification and the origin of the fundamental characteristics of the major animal phyla (Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata).
- Describe the morphology and general biology of the major animal phyla (Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata).
- Describe the morphology, general biology and special adaptations of the animals.
- Collect, mount and classify insects up to Family level.
- Demonstrate the ability to identify the anatomical features of the major animal phyla during practical sessions.

SC.5.19.2 ZOOLOGY LEVEL 6 (Second Year)

Module ZOO22A2	General Parasitology
NQF Level	6
Credits	20
Presentation	Semester 1
Prerequisites	Animal Diversity (ZOO11B1)
Purpose	This module has the purpose to equip students with knowledge of the major parasitic diseases of humans, animals and plants.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Define, explain and explore fundamental concepts of parasite ecology.
- Explain host parasite interfaces.
- Identify and diagnose parasitic diseases.
- Explain and explore life cycles of parasites.
- Use an appropriate referencing system.
- Discuss prevention and treatment of parasitic diseases.

SC.5.19.3 ZOOLOGY LEVEL 6 (Second Year)

Module ZOO22B2	Vertebrate anatomy, function and evolution.
NQF Level	6
Credits	20
Presentation	Semester 2
Prerequisites	Animal Diversity (ZOO11B1)
Purpose	Students are introduced to vertebrate classification, description of fundamental characteristics of vertebrates and the morphology, general biology and evolutionary history of the jawless and gnathostomate fishes and the morphology, general biology and evolutionary adaptations of amphibians, reptiles, birds and mammals are covered. Evolutionary traits from ontogenetic studies and investigations of the skulls of extinct and extant vertebrates are inferred. The definition of zoogeographical regions of the world and understanding of vertebrate distribution within these regions are also done. The different hypotheses on the origin and diversification of vertebrates and organic evolution are studied.

Module learning outcomes: On completion of this learning event, the students should be able to:

- Discuss the characteristics used for the classification of the Vertebrata.
- Discuss the hypotheses on the origin of the Vertebrata.
- Describe the morphology, general biology and special adaptations of the vertebrate classes.

- Define the zoogeographical regions of the world and explain the distribution of tetrapods within these zoogeographical regions.
- Discuss the different evolutionary models and processes involved in organic evolution.
- Demonstrate their ability to identify the anatomical features of the vertebrates during practical sessions.
- Demonstrate their competency of doing independent literature reviews.

SC.5.19.4 ZOOLOGY LEVEL 7 (Third Year)

Module ZOO33A3	Ecology
NQF Level	7
Credits	30
Presentation	Semester 1
Prerequisites	-
Purpose	This module has the purpose to equip students with the knowledge to be able to define and explain fundamental principles in ecology and the structure of an ecosystem. Learners will be able to discuss the limiting effects of the physical environment and basic principles of population and community ecology. Terrestrial, freshwater and marine ecosystems will be studied.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Discuss fundamental principles of population and community ecology~~,~~ including ecosystem structure and energy flow.
- Explain the fundamental principles of various ecosystems including terrestrial, freshwater and marine.
- Communicate aspects of ecology orally and in writing (e.g. scientific report writing, oral and poster presentations)

SC.5.19.5 ZOOLOGY LEVEL 7 (Third Year)

Module ZOO33B3	Comparative Animal Physiology
NQF Level	7
Credits	30
Term of presentation	Semester 2
Prerequisites	BIO10A1 or BIO1EB1, BIO2EA1 and CEM01A1 and CEM01B1 or CEM1AC1 and CEM1DB1
Purpose	To teach the necessary background knowledge to understand the principles of the physiological processes followed in different organisms and the integrated physiology of organs and organ systems in invertebrate and vertebrate organisms. The content supports the purpose of the programme in Life and Environmental Sciences.

Module learning outcomes: On completion of this learning event, the students should be able to:
- Discuss the physical basis of neuronal function, communication along and between neurons and sensing the environment.
- Write explanatory notes on the characteristics of cellular secretions.
- Explain the mechanisms of hormone regulation and action.
- Distinguish between muscle types.
- Compare the mechanisms of movement in different animals.
- Discuss the role of blood in the circulatory system as well as circulation in vertebrates and invertebrates.
- Compare mechanisms of respiration in different organisms and understand the respiratory abilities of organisms in aquatic and terrestrial environments.
- Comment on the effectiveness of the process of feeding, digestion and nutrition in different organisms.
- Evaluate the importance of temperature regulation and the general effects of temperature on metabolism.

PART 6

SC.6 ACADEMIC SUPPORT PROGRAMMES IN THE FACULTY

SC.6.1 BACHELOR OF SCIENCE EXTENDED DEGREE

An Extended degree programme supports students who are unable to fully meet the requirements for direct entry into the different degree programmes. The programme prepares students for continued studies in the Faculty of Science with Foundational Provision modules.

Entrance requirements for the various extended degree programmes differ slightly and are listed in Part 1 of this booklet.

Please note: No student will be exempted from these modules.

The following modules are incorporated to support students' academic development in the extended qualifications:

SC.6.1.1 COMPUTER COMPETENCE

Module CCE1EXT	Computer Competence 1
NQF-level	5
Credits	6
Presentation	Year module
Purpose	The purpose of the module is to expose students to the basic concepts of information technology. Students will also be introduced to the use of word processing, spreadsheets, graphical presentations and the Internet.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Basic principles and concepts of IT;
- Use of MS Windows systems;
- Use of the MS Office environment;
- Use of Internet search engines and electronic mail.

SC.6.1.2 LANGUAGE FOR SCIENCE

Module LSS01Y1	Language for Science
NQF-level	5
Credits	12
Presentation	Year module
Purpose	The main purpose of this module is to develop the academic literacy that students need for higher education, thereby facilitating learning and enabling them to succeed in their studies. **NOTE: In order for a student to continue with the module in the second semester, a minimum half year mark of 40% is required.**

Module learning outcomes: On completion of this learning event, the student should be able to:

- Identify and apply the importance of language in academic reading, writing, annotation and vocabulary.
- Access, process, evaluate and use information from a variety of sources and situations to apply in experimental environments such as laboratory report writing.
- Identify and apply language and literacy practices and conventions in academic contexts.
- Produce coherent and cohesive academic texts in a style appropriate to the chosen field of study.
- Use appropriate communication strategies for specific purposes and situations.

PART 7

SC.7 LIST OF MODULES AND OUTCOMES PRESENTED BY THE FACULTY OF SCIENCE AS PART OF THE TEACHER PROGRAMMES TO THE FACULTY OF EDUCATION

SC.7.1 MODULES IN BEd PROGRAMME

SC NO	MODULE	CODE
7.1.1	Geography 1A for FET	GR1AFET
7.1.1	Geography 1B for FET	GR1BFET
7.1.2	Geography 2A for FET	GR2AFET
7.1.2	Geography 2B for FET	GR2BFET
7.1.3	Geography 3A for FET	GR3AFET
7.1.3	Geography 3B for FET	GR3BFET
7.1.4	Life Sciences 1A for FET	LSFT0A1
7.1.5	Life Sciences 1B for FET	LSFT0B1
7.1.6	Life Sciences 2A for FET	LSFT0A2
7.1.7	Life Sciences 2B for FET	LSFT0B2
7.1.8	Life Sciences 3A for FET	LSFT0A3
7.1.9	Life Sciences 3B for FET	LSFT0B3
7.1.10	Mathematics 1A for FET	MAFT0A1
7.1.11	Mathematics 1B for FET	MAFT0B1
7.1.12	Mathematics 2A for FET	MAFT0A2
7.1.13	Mathematics 2B for FET	MAFT0B2
7.1.14	Mathematics 3A for FET	MAFT0A3
7.1.15	Mathematics 3B for FET	MAFT0B3
7.1.16	Physical Sciences 1A for FET (Physics)	PSFT0A1
7.1.17	Physical Sciences 1B for FET (Chemistry)	PSFT0B1
7.1.18	Physical Sciences 2A for FET (Physics)	PSFT0A2
7.1.19	Physical Sciences 2B for FET (Chemistry)	PSFT0B2
7.1.20	Physical Sciences 3A for FET (Physics)	PSFT0A3
7.1.21	Physical Sciences 3B for FET (Chemistry)	PSFT0B3

SC.7.1 OUTCOMES OF MODULES IN BEd PROGRAMMES

SC.7.1.1 GEOGRAPHY LEVEL 5 (First Year)

Module GR1AFET and GR1BFET	Geography 1A for FET Geography 1B for FET
NQF Level	5
Credits	15
Presentation	Semester 1 and 2
Prerequisites	Grade 12 Physical Science (min APS 3) **or** Grade 12 Life Sciences (min APS 3) **and** Mathematics (min APS 4) **or** Mathematics Literacy (min APS 6); **and** Geography (min APS 3)
Purpose	The purpose of this module is to provide geography educators with the content knowledge, applied skills and methods needs to effectively and efficiently teach Grade 10-12 (FET) Geography at school level.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and explain the basic concepts within human population studies (including HIV/AIDs), physical geography (climatology and geomorphology) and environmental issues (such as water management, oceans and floods).
- Critically engage with various theoretical concepts and paradigms within human population studies and environmental science.
- Formulate appropriate responses to the challenges facing the global population, such as aging, mortality patterns and environmental problems.
- Describe the nature of the South African population and the challenges facing the country in terms of population.
- Engage with appropriate cartographic methods [maps, diagrams, graphs and statistics] to deconstruct, describe and infer meaning.
- Demonstrate competence in conducting practical work or investigations.
- Write scientifically in academically appropriate ways.
- Know, understand and comply with the norms and standards of professional, ethical and academic conduct.
- Describe, explain be able to use the basic methods used to teach and assess human population studies, physical geography and environmental issues at FET level.
- Design an appropriate teaching, learning and assessment units of work for Grade 10-12 (FET) Geography taking relevant contextual issues into account.

SC.7.1.2 GEOGRAPHY LEVEL 6 (Second Year)

Module GR2AFET and GR2BFET	Geography 2A for FET Geography 2B for FET
NQF Level	6
Credits	15
Presentation	Semester 1 and 2
Prerequisites	GR1AFET **and** GR1BFET
Purpose	The purpose of this module is to provide geography educators with the content knowledge, applied skills and methods needs to effectively and efficiently teach Grades 10-12 (FET) Geography at school level.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and explain the basic concepts within development studies (including trade), physical geography (climatology, geomorphology and soil science) and environmental issues (such as energy management, sustainability and resources).
- Critically engage with various theoretical concepts and paradigms within development studies and sustainable development.
- Formulate appropriate responses to the developmental challenges facing the global to local population.
- Engage with appropriate cartographic methods [maps, diagrams, graphs and statistics] to deconstruct, describe and infer meaning.

- Demonstrate competence in conducting practical work or investigations.
- Write scientifically in academically appropriate ways.
- Know, understand and comply with the norms and standards of professional, ethical and academic conduct, such as how and why to avoid plagiarism, how to cite sources correctly amongst others.
- Describe, explain be able to use the basic methods used to teach and assess development studies, physical geography and environmental issues at FET level.
- Design an appropriate teaching, learning and assessment units of work for Grade 10-12 (FET) Geography taking relevant contextual issues into account.

SC.7.1.3 GEOGRAPHY LEVEL 7 (Third Year)

Module GR3AFET and GR3BFET	Geography 3A for FET Geography 3B for FET
NQF Level	6
Credits	15
Presentation	Semester 1 and 2
Prerequisites	GR2AFET and GR2BFET
Purpose	The purpose of this module is to provide geography educators with the content knowledge, applied skills and methods needs to effectively and efficiently teach Grades 10-12 (FET) Geography at school level.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe and explain the basic concepts within economic geography, settlement geography and physical geography (climatology and geomorphology).
- Critically engage with various theoretical concepts and paradigms within economic and settlement geography.
- Formulate appropriate responses to the economic and urban challenges facing the global population and South Africa in particular.
- Engage with appropriate cartographic methods [maps, diagrams, graphs] to deconstruct, describe and infer meaning within geographical issues.
- Demonstrate competence in conducting practical GIS work.
- Write scientifically in academically appropriate ways.
- Know, understand and comply with the norms and standards of professional, ethical and academic conduct, such as how and why to avoid plagiarism.
- Describe, explain be able to use the basic methods used to teach and assess economic geography, settlement geography and physical geography at FET level.
- Design an appropriate teaching, learning and assessment units of work for Grade 10-12 (FET) Geography taking relevant contextual issues into account.

SC.7.1.4 LIFE SCIENCE LEVEL 5 (First Year)

Module LSFT0A1	Life Sciences 1A for FET
NQF Level	5
Credits	15
Presentation	Semester Module
Prerequisites	Grade 12 Mathematics (APS 4) **or** Grade 12 Mathematical Literacy (min. APS 6) **and** Physical Sciences **or** Life Sciences (min. APS 4)
Purpose	The purpose of the module is to provide life science educators with the advanced knowledge, skills and content necessary to relevantly teach the structure and functions of the molecules of life, the basic structure of a cell, cell division, structure and functions of different organic tissues needed at grade 10, 11 and 12 level as part of the FET Life Science curriculum

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify, discuss and interpret the organization, structure and functions of the various plant- and animal tissues.
- Identify and discuss the different biological compounds as related to their role in the biotic environment and human health.
- Understand and apply the knowledge of the emergent properties of water in a specific environment and how that affects quality of life.

- Analyse and examine the structure, functions and division process of the fundamental units of life: cells.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.
- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade10 to 12 content.
- Effectively assess the Grade 10 and 11 Life Science content.

SC.7.1.5 LIFE SCIENCE LEVEL 5 (First Year)

Module LSFT0B1	Life Sciences 1B for FET
NQF Level	5
Credits	15
Presentation	Semester Module
Prerequisites	LSFT0A1
Purpose	The purpose of the module is to provide life science educators with the advanced knowledge, skills and content necessary to relevantly teach the processes needed to produce food and energy by plants, structure and functions of the human digestive- and respiratory systems, functioning of the ecosystems in the biosphere, biodiversity, classification and history of life on Earth needed at grade 10, 11 and 12 level as part of the FET Life Science curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify, discuss and interpret the organization, structure and functions of the various parts of the human digestive – and respiratory systems.
- Understand and discuss the importance of the processes used by living organisms to produce energy for metabolic functioning.
- Analyse, discuss, understand and interpret the vital life processes that occur in plants through the exploration of cellular respiration and photosynthesis.
- Demonstrate the comprehensive understanding of ecology and related ecosystems with regard to the different biomes in the biosphere.
- Realize and understand the enormous biodiversity on Earth and the classification systems needed to organize this vast number of species.
- Comprehend the history of life on Earth with regard to theories and research.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.
- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade10 to 12 content.
- Effectively assess the Grade 10 and 11 life science content.

SC.7.1.6 LIFE SCIENCE LEVEL 6 (Second Year)

Module LSFT0A2	Life Sciences 2A for FET
NQF Level	6
Credits	20
Presentation	Semester Module
Prerequisites	LSFT0A1 and LSFT0B1
Purpose	The purpose of the module is to provide life science educators with the advanced knowledge, skills and content necessary to relevantly teach the structure and functioning of various micro-organisms, biodiversity of plants and animals, including invertebrates, support systems vital in plants and animals, needed for grade 10, 11 and 12 level as part of the FET Life Science curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify and explain the complexity of several micro-organisms.
- Understand and discuss the vital role of diversity of plants and animals in different ecosystems.

- Specialize in the structure and functioning of certain invertebrates that play a role in the diversity structure of an ecosystem.
- Identify, examine and interpret the structures and functioning of the support systems found in plants and humans.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.
- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade 10 to 12 content.
- Effectively assess the Grade 10 and 12 life science content.

SC.7.1.7 LIFE SCIENCE LEVEL 5 (Second Year)

Module LSFT0B2	Life Sciences 2B for FET
NQF Level	6
Credits	20
Presentation	Semester Module
Prerequisites	LSFT0A2
Purpose	The purpose of the module is to provide life science educators with the advanced knowledge, skills and content necessary to relevantly teach human biological processes and structures of vital human systems like transport and excretion, population ecology, human influences on the environment, evolution by natural selection and human evolution needed for grade 10, 11 and 12 level as part of the FET Life Science curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify and explain the different parts and functions of the human circulatory- and excretion systems.
- Understand and discuss the concept of population ecology and how it plays a role in the survival of species on earth.
- Analyse and apply knowledge of evolution and human evolution to comprehend the fundamentals of life and biology as a unit in totality.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.
- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade 10 to 12 content.
- Effectively assess the Grade 10 and 12 life science content.

SC.7.1.8 LIFE SCIENCE LEVEL 7 (Third Year)

Module LSFT0A3	Life Sciences 3A for FET
NQF Level	7
Credits	30
Presentation	Semester Module
Prerequisites	LSFT0A2 and LSFT0B2
Purpose	The purpose of the module is to provide life science educators with advanced knowledge, skills and content necessary to actively and relevantly teach the structure and functions of the units of heredity, meiosis, reproduction in vertebrates and ultimately human reproduction and the concepts that lead to life or death, needed beyond a grade 12 level.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify the major patterns of inheritance as well as the associated processes.
- Analyse, discuss, understand and interpret the genetic laws and diagrams.
- Apply knowledge about biotechnology hands-on.
- Understand, identify and apply the knowledge of reproductive systems to the validity of life on earth.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.

- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade 10 to 12 contents.
- Effectively assess the Grade 10 and 12 life science content.

SC.7.1.9 LIFE SCIENCE LEVEL 7 (Third Year)

Module LSFT0B3	Life Sciences 3B for FET
NQF Level	7
Credits	30
Presentation	Semester Module
Prerequisites	LSFT0A3
Purpose	The purpose of the module is to provide life science educators with advanced knowledge, skills and content necessary to actively and relevantly teach the structure and functions of the vital human metabolic systems and senses, chemical coordination and plant hormones, needed beyond a grade 12 level.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Identify, discuss and interpret the structural functioning of the human nervous and chemical coordination systems.
- Analyse, discuss, understand and interpret the use of sense as an effect on environmental stimuli.
- Comprehend the role of plant hormones in the survival of plants on Earth.
- Identify and apply the knowledge of the endocrine and nervous systems of humans to understand the occurrence of certain diseases with regard to these systems.
- Communicate and present information skilfully, scientifically and professionally and integrate an awareness of applicable ethical issues.
- Make competent use of biological methodology and laboratory and field investigation techniques.
- Design a teaching and learning strategy for the teaching of Grade 10 to 12 contents.
- Effectively assess the Grade 10 and 12 life science content.

SC.7.1.10 MATHEMATICS LEVEL 5 (First Year)

Module MAFT0A1	Mathematics 1A for FET
NQF Level	5
Credits	15
Presentation	Semester Module
Prerequisites	Grade 12 Mathematics (min. APS 4) or Grade 12 Mathematical Literacy (min. APS 6)
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is Pre-calculus content with a focus on functions.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Use fundamental algebraic techniques to simplify mathematical expressions and solve mathematical equations and inequalities.
- Define complex numbers and solve for complex zeros.
- Draw graphs of polynomial, rational, exponential and logarithmic and inverse functions.
- Use mathematical thinking processes, reasoning and communication skills to interpret and deal with mathematical situations.

SC.7.1.11 MATHEMATICS LEVEL 5 (First Year)

Module MAFT0B1	Mathematics 1B for FET
NQF Level	5
Credits	16
Presentation	Semester module
Prerequisites	MAFT0A1
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is Pre-calculus content with a focus on trigonometry functions and Euclidean geometry.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Convert between radian and degree measure.
- Apply trigonometry identities to simplify expressions and solve equations.
- Use the Law of Sine's and Cosines to solve problems regarding real life applications.
- Draw the graphs and interpret trigonometry functions and inverse functions.
- Solve problems and apply theory that involves Euclidean geometry.
- Use mathematical thinking processes, reasoning and communication skills to interpret and deal with mathematical situations

SC.7.1.12 MATHEMATICS LEVEL 6 (Second Year)

Module MAFT0A2	Mathematics 2A for FET
NQF Level	6
Credits	16
Presentation	Semester Module
Prerequisites	MAFT0A1
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is the study of Sequences and Series, Counting Methods, Financial Mathematics and Statistics.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply the functionalities of arithmetic and geometric sequences and series.
- Apply the principles of Mathematical Induction.
- Apply algebraic concepts and skills to solve problems regarding financial mathematics.
- Organise, represent and analyse data for effective and valid interpretation.
- Study the probability of an event and solve real life related problems.
- Use educational scientific calculators in the teaching of mathematics.
- Use mathematical thinking processes, reasoning and communication skills to interpret and deal with mathematical situations

SC.7.1.13 MATHEMATICS LEVEL 6 (Second Year)

Module MAFT0B2	Mathematics 2B for FET
NQF Level	6
Credits	16
Presentation	Semester Module
Prerequisites	MAFT0B1
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is the theory and applications of differentiation.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Solve systems of equations and inequalities in several variables.
- Decompose fractional expressions as partial fractions.
- Calculate limits numerically, graphically and algebraically.

- Define and describe the basic theoretical concepts underlying differentiation.
- Apply the basic concepts of differentiation to solve calculus-related problems.
- Apply the applications of differentiation to sketch curves.

SC.7.1.14 MATHEMATICS LEVEL 7 (Third Year)

Module MAFT0A3	Mathematics 3A for FET
NQF Level	7
Credits	16
Presentation	Semester Module
Prerequisites	MAFT0B2
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is the theory and applications of integration.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Define and describe the basic theoretical concepts underlying integration.
- Apply calculus to exponential, logarithmic and trigonometric functions.
- Apply the basic concepts of integration to solve calculus-related problems.
- Proof theorems applicable in the teaching of Mathematics.
- Use the applications of L'Hôpital's Rule.

SC.7.1.15 MATHEMATICS LEVEL 7 (Third Year)

Module MAFT0B3	Mathematics 3B for FET
NQF Level	7
Credits	16
Presentation	Semester Module
Prerequisites	MAFT0B1
Purpose	The purpose of this module is to provide intentional mathematics educators with the knowledge, skills and content necessary to effectively teach the FET (Grades 10 – 12) Mathematics curriculum. The primary focus of this module is linear algebra and discrete mathematics.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Define polar coordinates, draw graphs of polar equations and perform operations with polar form of complex numbers.
- Perform operations with vectors in two and three dimensions.
- Solve linear systems using matrices.
- Apply the algebra of matrices, find the inverses of matrices and solve matrix equations.
- Calculate determinants of matrices and apply Cramer's Rule.
- Apply theory involving analytic geometry in working with conics.
- Define basic logical concepts and apply formal logical deductive systems to prove logical consequences and (non)validities in propositional and first-order logic.
- Define and apply basic concepts in set theory.
- Use mathematical thinking processes, reasoning and communication skills to interpret and deal with mathematical situations.

SC.7.1.16 PHYSICAL SCIENCES LEVEL 5 (First Year)

Module PSFT0A1	Physical Science 1 for FET (Physics)
NQF Level	5
Credits	16
Presentation	Year Module
Prerequisites	Grade 12 Physical Science and Mathematics (APS min. 4)
Purpose	The purpose of this module is to provide intentional physical sciences educators with the basic knowledge, skills and content necessary for effective teaching of grade 10-12 Physics part of the FET Physical Sciences curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe the nature of physical science and use the relevant science and mathematical skills, methods and language to investigate phenomena and to solve physics problems in real life.
- Explain and predict events in our physical environment
- Use and apply knowledge and understanding of facts, concepts , principles and theories related to kinematics in one and two dimensions, forces and Newton's laws of motion, work and energy, temperature and heat, electric forces and electric fields, electric potential energy and electric potential, reflection and refraction of light.
- Demonstrate competence in conducting practical work/ experiments or investigations.
- Design a teaching and learning strategy for grade 10-12 Physics part of Physical Science in FET Band.
- Effectively assess the grade 10 - 12 Physics content.

SC.7.1.17 PHYSICAL SCIENCES LEVEL 5 (First Year)

Module PSFT0B1	Physical Science 1 for FET (Chemistry)
NQF Level	5
Credits	16
Presentation	Year module
Prerequisites	Grade 12 Physical Science and Mathematics (APS min. 4)
Purpose	The purpose of this module is to provide intentional physical sciences educators with the basic knowledge, skills and content necessary for effective teaching of grade 10-12 Chemistry part of the FET Physical Sciences curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Describe and use chemical vocabulary.
- Perform chemical calculations and do appropriate unit conversions.
- Describe the structure of atoms, ions, anions, cations and simple molecules.
- Identify a limiting reactant through mole ratios, calculate percentage yield and perform stoichiometric calculations, including solutions.
- Write balanced chemical equations for different types of chemical reactions (combustion, combination, decomposition, single and double displacement, acid-base and redox reactions).
- Describe the behaviour of ideal and non-ideal gases and apply it in calculations.
- Compare different acid-base models and do simple calculations relating to acid-base chemistry.
- Explain and apply the concepts of modern atomic theory.
- Explain the causes and consequences of periodicity.
- Show an understanding of chemistry and its implications in society (the hydrosphere, water and nitrogen cycles).
- Demonstrate competence in doing practical work/ experiments/ investigations.

SC.7.1.18 PHYSICAL SCIENCES LEVEL 6 (Second Year)

Module PSFT0A2	Physical Science 2 for FET (Physics)
NQF Level	6
Credits	16
Presentation	Year module
Prerequisites	PSFT0A1
Purpose	The purpose of this module is to provide intentional physical sciences educators with the advanced knowledge, skills and content necessary for effective teaching of grades 10-12 Chemistry section of the FET Physical Sciences curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:
Do a critical study of the First Year level Chemistry Assessments Standards (content) for Physical Science to address the Learning Outcome 1, 2 and 3:

- Describe in detail the nature of physics and use the relevant science and mathematical skills, methods and language to investigate phenomena and solve physics problems.
- Investigate physical phenomena through scientific inquiry.
- Explain and predict events in our physical environment.
- Understand how the physical environment works, how to benefit from it and how to care for it responsibly
- Use and apply knowledge and understanding of facts, concepts, principles and theories relating to the Dynamics of uniform circular motion, impulse and momentum, electric circuits, magnetic forces and fields, waves and sound, the principle of linear superposition and interference, the wave nature of light.
- Demonstrate competence in doing practical work/ experiments/ investigations.
- Effectively teach and assess the Grade 12 to first year Physics parts of FET Physical Sciences content.

SC.7.1.19 PHYSICAL SCIENCES LEVEL 6 (Second Year)

Module PSFT0B2	Physical Science 2 for FET (Chemistry)
NQF Level	6
Credits	16
Presentation	Year module
Prerequisites	PSFT0B1
Purpose	The purpose of this module is to provide intentional physical sciences educators with the advanced knowledge, skills and content necessary for effective teaching of grades 10 and 11 Physics parts of the FET Physical Sciences curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:

- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes including the role intermolecular forces have on the properties of compounds.
- Do basic stoichiometric calculations involving solutions
- Describe the concepts of reaction kinetics and dynamic equilibrium, write equilibrium constants equations and predict the effect of stresses applied to systems in equilibrium.
- Discuss different acid-base theories and perform quantitative calculations involving acid-base reactions.
- Identify redox reactions, balance these using half reactions, apply the knowledge in electrochemical cells, and use in various calculations.
- Define and apply principles of thermochemistry and use Hess' law of summation.
- Introduction to organic chemistry: functional groups, IUPAC naming, isomerism, basic substitution, addition and elimination reactions and their respective mechanisms.
- Demonstrate competence in planning and doing practical work/ experiments/ investigations.
- Show an understanding of chemistry and its implications in society (the lithosphere and mining).

SC.7.1.20 PHYSICAL SCIENCES LEVEL 7 (Third Year)

Module PSFT0A3	Physical Science 3 for FET (Physics)
NQF Level	7
Credits	16
Presentation	Year module
Prerequisites	PSFT0A2
Purpose	The purpose of this module is to provide intentional Physical Science educators with the advanced knowledge, skills and higher education content necessary for effective teaching of grades 10-12 of the FET Physical Sciences curriculum.

Module learning outcomes: On completion of this learning event, the student should be able to:
Do a critical study of the Gr 10-12 Curriculum and advanced Physics up to third year university level Assessments Standards (content) for physical science to address the Learning Outcome 1, 2 and 3:

- Use and apply knowledge and understanding of facts, concepts, principles and theories relating to the following: Rotational kinematics and dynamics, simple harmonic motion and elasticity, electromagnetic induction, alternate current circuits, electromagnetic waves, special relativity, particles and waves.
- Demonstrate competence in doing practical work/ experiments/ investigations.
- Effectively teach and assess the Grade 12 to first year Physics parts of FET Physical Sciences content.

SC.7.1.21 PHYSICAL SCIENCES LEVEL 7 (Third Year)

Module PSFT0B3	Physical Science 3 for FET (Chemistry)
NQF Level	7
Credits	16
Presentation	Year module
Prerequisites	PSFT0B2
Purpose	The purpose of this module is to provide intentional Physical Science educators with the advanced knowledge, skills and higher education content necessary for effective teaching of grades 10-12 Chemistry section of the FET Physical Sciences curriculum

Module learning outcomes: On completion of this learning event, the student should be able to:

- Use and apply knowledge and understanding of facts, concepts, principles and theories relating to organic molecules (organic molecule structures, functional groups , systematic naming and structure, basic reactions and mechanisms, physical properties and relationships) and macromolecules (plastics, polymers, biological macromolecules, structure, properties and function).
- Explain and apply additional aspects of acid-base equilibria such as the common-ion effect and buffers.
- Integrate and apply concepts in electrochemistry related to electrochemical cells and electrochemical changes including calculations.
- Describe and apply principles of thermodynamics.
- Apply basic principles of reaction kinetics to determine the reaction rates of reactions (limited to zero and first order reactions only).
- Demonstrate competence in planning and doing practical work/ experiments/ investigations.
- Show an understanding of chemistry and its implications in society (chemical industry resources like in Sasol.

PART 8

SC.8 MODULES IN SCIENCE PROGRAMMES THAT ARE OFFERED BY OTHER FACULTIES

MODULES FROM THE COLLEGE OF BUSINESS AND ECONOMICS

ACCOUNTING (ACC)
BUSINESS MANAGEMENT (BMA)
ECONOMICS (ECO)
FINANCIAL MANAGEMENT (FNM)
INFORMATION MANAGEMENT (IMA)
INVESTMENT MANAGEMENT (IVM)
IT MANAGEMENT (ITM)

MODULES FROM THE FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

ELECTROTECHNICS (ETN)
PROJECT MANAGEMENT (PJB)
SIGNALS AND SYSTEMS 3A (SSTEEA3)
SIGNAL PROCESSING 3B (SIGEEB3)

MODULES FROM THE FACULTY OF HUMANITIES

ANTHROPOLOGY AND DEVELOPMENT (ATL)
PSYCHOLOGY (PSY)
SOCIOLOGY (SOC)
SPORT PSYCHOLOGY (SPP)

PART 9

SC.9 ACADEMIC AWARDS AND PRIZES FOR OUTSTANDING ACHIEVEMENTS IN THE FACULTY OF SCIENCE

Awarded by	Award	Awarded to
Faculty of Science	Faculty of Science Honours Award	Top Honours Graduate in the Faculty of Science
Faculty of Science	S_2A_3(Southern Africa Association for the Advancement of Science)	Awarded every second year to a Master's student who has made exceptional contributions to the advancement of science
Faculty of Science	Chancellor's Medal	Master student for the most meritorious study
Academy of Computer Science and Software Engineering	1st Year Award	Top 1st year students in Computer Science and Informatics
	2nd Year Award	Top 2nd year students in Computer Science and Informatics
	3rd Year Award	Top 3rd year students in Computer Science and Informatics
	3rd Year Award	Top female 3rd year student in ACSSE
	Award	Top 3rd year project in Informatics
	Award	Top 3 Honours projects
	Award	Top female Honours student in ACSSE
	Award	Top Master's student
Applied Mathematics	Applied Mathematics Merit Award	Best achievement in Applied Mathematics 1A/1B10
	Applied Mathematics Merit Award	Best achievement in Applied Mathematics 2A/2B10
	Applied Mathematics Merit Award	Best achievement in Applied Mathematics 3A or 3B
	Applied Mathematics Merit Award	Best achievement in Applied Mathematics 1A1E
	Applied Mathematics Merit Award	Best achievement in Applied Mathematics 1A2E
	Applied Mathematics Merit Award	Best Applied Mathematics Honours Student
Biochemistry	Biochemistry Top Achiever	Top 1st year student
	Biochemistry Top Achiever	Top 2nd year student
	Biochemistry Top Achiever	Top 3rd year student
	Biochemistry Top Achiever	Top Honours student
	Biochemistry Top Achiever	Top Master's student
Botany	Departmental Award	Top 1st year student in Botany 1
	Departmental Award	Top 2nd year student in Botany 2
	Departmental Award	Top 3rd year student in Botany 3
	Robb Wood Floating Trophy	Top Post Graduate student
	Lennon Gold Medal for Honours	For best presentation
	Lennon Gold Medal for MSc	For best presentation
	Lennon Gold Medal for PhD	For best presentation
Chemistry	Merck Award	Top 3rd year student of previous year - stimulation of interest in Chemistry
Geography, Environmental Management and	ABSA Award (Floating Trophy and monetary award sponsored by (ABSA) Auckland Park	Best final year undergraduate student
	Cabanga concepts Award	Top 3rd year student in Environmental Management

Awarded by	Award	Awarded to
Energy Studies	Departmental Award	Top 3rd year student in Geography
	Absa Award	Top Honours student in Geography
	Terence Payne Memorial Trophy and Medal	Top Master's student in Environmental Management
Geology	Rand Pioneers	Top 3rd year Geology student
	Geology Merit Awards	Best achievement in Geology First Year
	Geology Merit Awards	Best achievement in Geology Second Year
	Geology Merit Awards	Best achievement in Geology Third Year
	Geology Merit Awards	Best achievement in Geology Honours
Pure Mathematics	Mathematics Merit Award	Best achievement in Mathematics 1A, 1B
	Mathematics Merit Award	Best achievement in Mathematics 1C, 1D
	Mathematics Merit Award	Best achievement in Mathematics E0A1/E0B1
	Mathematics Merit Award	Best achievement in Mathematics 2A/B10
	Mathematics Merit Award	Best achievement in Mathematics 0CA2/0CB2
	Mathematics Merit Award	Best achievement in Mathematics 2A/B20
	Mathematics Merit Award	Best achievement in Mathematics 0AA2/0AB2
	Mathematics Merit Award	Best achievement in Mathematics 2A40
	Mathematics Merit Award	Best achievement in Mathematics 2B40
	Mathematics Merit Award	Best achievement in Mathematics 3A1
	Mathematics Merit Award	Best achievement in Mathematics 3A2
	Mathematics Merit Award	Best achievement in Mathematics 3B1
	Mathematics Merit Award	Best achievement in Mathematics 3B2
	Mathematics Merit Award	Best achievement in Mathematics 1A1E
	Mathematics Merit Award	Best achievement in Mathematics 1A2E
	Mathematics Merit Award	Best achievement in Mathematics 1C2E
	Mathematics Merit Award	Best achievement in Mathematics 1A3E
	Mathematics Merit Award	Best achievement in Mathematics 1C3E
	Mathematics Merit Award	Best achievement in Mathematics 1FET
	Mathematics Merit Award	Best achievement in Mathematics 2FET
	Mathematics Merit Award	Best achievement in Mathematics 3FET
	Mathematics Merit Award	Best achievement in Business Mathematics 100
	Mathematics Merit Award	Best achievement in Mathematics MAA00A1/MAA00B1
	Mathematics Merit Award	Best achievement in Mathematics MATDCA1/MATDCB1
	Mathematics Merit Award	Best achievement in Mathematics for Diploma Students (MFD001)
	Mathematics Merit Award	Best achievement in Mathematics MAEB311/MAEB322
	Mathematics Merit Award	Best Pure Mathematics Honours Student
	Mathematics Merit Award	Best Mathematics Tutor
Physics	Departmental Award	Best Overall Academic Achievement over 75% for students continuing their studies towards BSc Honours in Physics at UJ

Awarded by	Award	Awarded to
Zoology	Physiology Merit Award	Best achievement in Physiology 2A
	Physiology Merit Award	Best achievement in Physiology 2B
	Physiology Merit Award	Best achievement in Physiology 3A
	Physiology Merit Award	Best achievement in Physiology 3B
	Zoology Merit Award	Best achievement in Biology 1A
	Zoology Merit Award	Best achievement in Zoology 1B
	Zoology Merit Award	Best achievement in Zoology 2A
	Zoology Merit Award	Best achievement in Zoology 2B
	Zoology Merit Award	Best achievement in Zoology 3A
	Zoology Merit Award	Best achievement in Zoology 3B
	Merit Award Zoological Society of Southern Africa	Top 3rd year and Honours student in Zoology (criteria set by the Zoological Society of Southern Africa)
	HOD Award	Best project presentation by Honours student
	Juan Heyns Certificate	Best presentation by MSc and PhD students
	Schoonbee medal	Best Master's or Doctoral thesis in Zoology in previous year

PART 10

LIST OF QUALIFICATIONS

DEGREE CODE	PROGRAMME: INFORMATION TECHNOLOGY (4 YEAR)
B2E01Q	COMPUTER SCIENCE AND INFORMATICS
DEGREE CODE	**PROGRAMME: LIFE AND ENVIRONMENTAL SCIENCES (4 YEAR)**
B2E10Q	BIOCHEMISTRY AND BOTANY
B2E11Q	BOTANY AND CHEMISTRY
B2E12Q	BOTANY AND ZOOLOGY
B2E13Q	GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT
B2E14Q	PHYSIOLOGY AND BIOCHEMISTRY
B2E15Q	PHYSIOLOGY AND PSYCHOLOGY
B2E17Q	ZOOLOGY AND BIOCHEMISTRY
B2E18Q	ZOOLOGY AND CHEMISTRY
B2E19Q	ZOOLOGY AND ENVIRONMENTAL MANAGEMENT
B2E20Q	ZOOLOGY AND GEOGRAPHY
B2E21Q	ZOOLOGY AND PHYSIOLOGY
DEGREE CODE	**PROGRAMME: MATHEMATICAL SCIENCES (4 YEAR)**
B2E40Q	APPLIED MATHEMATICS AND COMPUTER SCIENCE
B2E41Q	APPLIED MATHEMATICS AND MATHEMATICAL STATISTICS
B2E42Q	APPLIED MATHEMATICS AND MATHEMATICS
B2E43Q	MATHEMATICAL STATISTICS AND COMPUTER
B2E44Q	MATHEMATICS AND COMPUTER SCIENCE
B2E45Q	MATHEMATICS AND INFORMATICS
B2E46Q	MATHEMATICS AND MATHEMATICAL STATISTICS
B2E47Q	MATHEMATICS AND PSYCHOLOGY
DEGREE CODE	**PROGRAMME: PHYSICAL SCIENCES (4 YEAR)**
B2E70Q	BIOCHEMISTRY AND CHEMISTRY
B2E71Q	CHEMISTRY AND MATHEMATICS
B2E72Q	CHEMISTRY AND PHYSICS
B2E73Q	PHYSICS AND APPLIED MATHEMATICS
B2E74Q	PHYSICS AND MATHEMATICS
DEGREE CODE	**PROGRAMME: INFORMATION TECHNOLOGY**
B2I01Q	INFORMATION TECHNOLOGY
B2I02Q	COMPUTER SCIENCE AND INFORMATICS
B2I03Q	INFORMATION TECHNOLOGY *(phasing out)* (Electrical and Electronic Engineering with IT – B6EITQ)
B2I04Q	COMPUTER SCIENCE AND INFORMATICS WITH ARTIFICIAL INTELLIGENCE
DEGREE CODE	**PROGRAMME: LIFE AND ENVIRONMENTAL SCIENCES**
B2L10Q	BIOCHEMISTRY AND BOTANY
B2L11Q	BOTANY AND CHEMISTRY
B2L12Q	BOTANY AND ZOOLOGY
B2L13Q	BIOCHEMISTRY AND ZOOLOGY
B2L15Q	ENVIRONMENTAL MANAGEMENT AND ZOOLOGY
B2L16Q	GEOGRAPHY AND ZOOLOGY
B2L17Q	PHYSIOLOGY AND ZOOLOGY
B2L18Q	PHYSIOLOGY AND BIOCHEMISTRY
B2L19Q	PHYSIOLOGY AND PSYCHOLOGY
B2L24Q	GEOLOGY AND ENVIRONMENTAL MANAGEMENT
B2L25Q	GEOLOGY AND GEOGRAPHY
DEGREE CODE	**PROGRAMME: MATHEMATICAL SCIENCES**
B2M40Q	APPLIED MATHEMATICS AND COMPUTER SCIENCE
B2M41Q	APPLIED MATHEMATICS AND MATHEMATICAL STATISTICS
B2M42Q	APPLIED MATHEMATICS AND MATHEMATICS
B2M43Q	COMPUTATIONAL SCIENCE

B2M44Q	MATHEMATICAL STATISTICS AND COMPUTER SCIENCE
B2M45Q	MATHEMATICS AND COMPUTER SCIENCE
B2M46Q	MATHEMATICS AND INFORMATICS
B2M47Q	MATHEMATICS and MATHEMATICAL STATISTICS
B2M48Q	MATHEMATICS AND PSYCHOLOGY
B2M49Q	MATHEMATICS AND MATHEMATICAL STATISTICS with financial orientation
B2M50Q	MATHEMATICAL STATISTICS AND ECONOMICS with financial orientation
B2M51Q	MATHEMATICS AND ECONOMICS with financial orientation
B2M52Q	ACTUARIAL SCIENCE
DEGREE CODE	**PROGRAMME: PHYSICAL SCIENCES**
B2P70Q	BIOCHEMISTRY AND CHEMISTRY
B2P71Q	CHEMISTRY AND MATHEMATICS
B2P72Q	CHEMISTRY AND PHYSICS
B2P77Q	PHYSICS AND APPLIED MATHEMATICS
B2P78Q	PHYSICS AND MATHEMATICS
B2P81Q	GEOLOGY AND CHEMISTRY
B2P82Q	GEOLOGY AND MATHEMATICS
B2P83Q	GEOLOGY AND PHYSICS
VNG002	NON-DEGREE PURPOSES (UNDERGRADUATE)