FACULTY OF SCIENCE

DOORNFONTEIN CAMPUS
(DFC)

RULES AND REGULATIONS

IMPORTANT NOTICE

Always compare the information contained in this copy of the Rules and Regulation book with the copy on the Internet. The electronic copy is updated regularly.

www.uj.ac.za/science

DECEMBER 2011

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DOCUMENTS REQUIRED FOR ADMISSION

1. All undergraduate students enrolling at University of Johannesburg for the first time must submit *certified copies of their symbol statements and ID* at registration. *Certified copies of all university admission documents* must be handed to the faculty officer concerned.

2. Students transferring from other universities who wish to continue their studies at University of Johannesburg must submit an *original academic record* issued by the previous university at registration. In respect of subjects or topics for which credit is sought, the official syllabus of the equivalent subject or topic, must accompany the application.

3. Students who previously studied at other Higher Education Institutions and wish to continue their studies at University of Johannesburg must supply the University with an *Academic Record and Certificate of conduct* at registration.

4. Prospective students applying for endorsement on the basis of post-school qualifications must finalise such applications before registration. In this regard please consult the faculty officer concerned.

5. All admission documents required by the University relating to undergraduate or postgraduate students registering for the first semester must be submitted by ***no later than 15 June*** of the year of registration.

6. Admission documents of candidates registering for the second semester must be submitted ***before 15 September*** of the year preceding the registration.

7. Failure to submit admission documents on time will result in cancellation of registration. Registration of new students remains provisional until all admission requirements as set out above have been complied with.

FEES PAYABLE

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) 559-6022/3935/4339/3910/3277/4303.

PART 1

SC.1 ADMISSION CRITERIA

SC.1.1 THE FACULTY OF SCIENCE OFFERS THE FOLLOWING PROGRAMMES AT THE DOORNFONTEIN CAMPUS (DFC)

- National Diploma (N Dip) in the following:
  - Analytical Chemistry
  - Biotechnology
  - Food Technology
- Baccalaureus Technologiae (B Tech)
- Magister Technologiae (M Tech)
- Philosophiae Doctor (PhD)

SC.1.2 ADMISSION REQUIREMENTS TO THE FACULTY OF SCIENCE

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

CODE	NAME OF QUALIFICATION	Group A				Group B			Minimum APS
		Language of Teaching and Learning	Other recognised Language	Mathematics	*Life Orientation* *	Subject 1	Subject 2	Subject 3	
349-1	National Diploma Biotechnology (3 years)	4	3	4	*4**	4^	4#	4	25
348-1	National Diploma Food Technology (3 years)	4	3	4	*4**	4^	4#	4	25
NDAC1E	National Diploma Analytical Chemistry (4 years)	4	3	3	*4**	3^	3	3	21
NDBTE1	National Diploma Biotechnology (4 years)	4	3	3	*4**	3^	3#	3	21
NDFTE1	National Diploma Food Technology (4 years)	4	3	3	*4**	3^	3#	3	21

Mathematical Literacy is not accepted for entrance to the Faculty of Science
* **Life Orientation** is **NOT** counted in the calculation of the APS
^ Minimum Rating for Physical Science
\# Minimum Rating for Life Science

B THE MINIMUM ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WHO MATRICULATED PRIOR TO 2008

M-Scores are calculated as follows:

SUBJECT SYMBOL	A	B	C	D	E
HIGHER GRADE	5	4	3	2	1
STANDARD GRADE	4	3	2	1	0

ADMISSION REQUIREMENTS
(Applicable to applicants who matriculated prior to 2008)

CODE	NAME OF QUALIFICATION	REQUIRED GR 12 SUBJECTS (minimum requirements)					M-SCORE
		MATHE-MATICS		PHYSICAL SCIENCE		OTHER	
		HG	SG	HG	SG		
349-1	National Diploma Biotechnology (3 years)	D	C	D	C	Biology HG D-symbol SG C-symbol	10
348-1	National Diploma Food Technology (3 years)	D	C	D	C	Biology HG D-symbol SG C-symbol	-
NDAC1E	National Diploma Analytical Chemistry (4 years)	E	C	E	C	English First Language - pass Second Language HG E-symbol or SG C-symbol	-
NDBTE1	National Diploma Biotechnology (4 years)	E	D	E	D	Biology HG E-symbol SG C-symbol	-
NDFTE1	National Diploma Food Technology (4 years)	E	C	E	C	Biology HG E-symbol SG C-symbol	-

ADMISSION REQUIREMENTS FOR ENTRY TO THE BACCALAUREUS TECHNOLOGIAE (B TECH) DEGREE

A National Diploma in an appropriate field or an equivalent qualification at an equivalent standard, as determined by the Faculty Board.

SC.1.3 REGULATIONS

SC.1.3.1 THE FACULTY REGULATIONS MUST BE READ TOGETHER WITH:

- The *Academic Regulations* of the University of Johannesburg
- The Regulations for the particular programme as provided in this publication
- The Postgraduate Research Manual
- The University Research Development Policy
- The University Work Integrated and Service Learning Policy

SC.1.3.2 WORK INTEGRATED LEARNING

- Several academic programmes within the Faculty of Science require work integrated learning modules.
- Work integrated learning (WIL) modules focus on the application of learning in an authentic work-based context under the supervision and/or mentorship of a person/s in a workplace aligned with the purpose of the programme. All prescribed compulsory and elective theory modules (instructional offerings) and the prescribed work integrated learning modules must be passed in order to graduate from programmes requiring work integrated learning.
- In instances where work integrated learning is conducted at a workplace, the employment agreement creates a separate contract between the employer and the student.

- *Specific rules and aspects regarding Work Integrated Learning:* The Department in which the academic programmes requiring work integrated learning reside are responsible for identifying opportunities and supporting the student in the placement process. Specific work integrated learning guidelines are available from the Departments concerned.
- Students must register with the University for work integrated modules. Students must submit documentary evidence of work integrated learning as specified by Departmental guidelines.
- A student engaged in any work integrated learning shall at all times conduct him/herself in a professional and responsible manner as a representative of the University of Johannesburg and the work integrated learning programme. To this end the student undertakes to conform to the employer's policies and procedures and to follow safety regulations.
- The student shall not represent an interest which competes or conflicts with that of the employer.
- The student shall complete assigned tasks as instructed by the employer diligently and within the required time.
- The student shall notify the relevant Work Integrated Learning Coordinator of the required placement details within one week of acceptance of such placement.
- The student shall notify the relevant Work Integrated Learning Coordinator immediately should:
  - Any work integrated learning related problems arise
  - He/she is laid off temporarily or permanently
  - There is a strike in the workplace
  - He/she will be absent from the workplace for a long period due to illness or other emergency
  - Disciplinary proceedings are instituted against him/herself by the employer
  - He/she is injured in the workplace.
- The student shall not commit any action deemed to be irregular or brings the University into disrepute. The University disciplinary process will be followed should this occur.

(Also refer to Part 3 Regulation 10.6.1 and Part 5 of this book)

SC.1.3.3 A NATIONAL DIPLOMA (ND) 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)

Biochemistry	(BIC)
Biotechnology	(BTN)
Chemical Technology	(CET)
Food Technology	(FTN)
Mathematics	(MAT)
Statistics	(STA)
Microbiology	(MCB)
Physics	(PHY)
Zoology	(ZOO)

Please note:
*The remainder of the code indicates the year level and semester of presentation, for example PHY**1A**BT is a first year module (1) in Physics (PHY) that will be presented in the first semester (A).*

SC.1.3.4 The modules with prerequisites are listed under Part 2 of this book.

SC.1.3.5 Students' attention is specifically drawn to the stipulations of regulations regarding requirements for promotion.

SC.1.3.6 FOUR YEAR DIPLOMA PROGRAMMES (EXTENDED)

The four-year diploma programme extends the three-year curriculum over four years and starts with a generic first semester component. The first semester presents with a fundamental curriculum as the core of the programme with foundational provision embedded in the teaching and learning. Specialised methodology will provide students with the content and skills to continue with the second semester which is the one component of the first year main stream curriculum. The support and foundational provision extends into the second year where the curiculum provide the second component of the first year main stream curriculum. After completion of the first two years students will be well rounded with foundational principles in subject discipline, skills in language, computers and academic literacies and would then continue to the second and third year curriculum.

Assessment of the extended curriculum modules
Assessment will be done in accordance with the Faculty Assessment Policy. An early identification of risk will be performed within the first four weeks of the first semester.

Criteria for continuation of the programme
Students in the four year programme will be permitted to continue with their studies during the second semester of their first year of study, provided they have passed all the modules in the first semester (generic foundational provision phase).

Entrance requirements for the final assessment
To be allowed access to the half-year and final formative assessment, a student is required to obtain a minimum semester mark of 40%.

Final Assessment
Students will write a final assessment at the end of the module, in June and November, which will be an integrated assessment of all the outcomes.

Pass requirements
- Students in the four year programme will be permitted to continue studies into their second year of study provided they have passed all their modules in the first year.

- However, a student who failed only one module (which is not a prerequisite for entry to any module in the second year and is therefore not a critical requirement for progress) may be granted an opportunity to register and continue with his/her studies to the second year and be allowed to register for the outstanding first year module, provided it does not clash with any other module on the time-table.
- Students *must pass all modules* in the four year programme in the first two years of study to be able to continue studying.

Students transferring from the Mainstream to the Four year programme
A mainstream diploma student may articulate into the four year programme if their progress in their three year diploma course is unsatisfactory according to the criteria and procedure(s) below.

Minimum qualifying mark for the transfer at end of the first semester
A mainstream diploma student may articulate to the four year programme if he/she has obtained a progress mark of at least 35% in 50% of the modules.

Procedure for transfer of mainstream students to the Four year programme
Interested/referred qualifying students will have to complete an application form for consideration in the four year programme. For application of entrance into a four year programme, the transfer form should be signed by the mainstream lecturer, four year programme lecturer and the head of the department involved, after consultation with the Coordinator.

Progress Mark for transferring students

- ***Students transferring at end of the first term***
  At the start of the first term, transferring students will write an official comprehensive programme entrance test on the work covered in the first term in the extended curriculum programme. The attained mark will then serve as a progress mark for the first semester.

- ***Students transferring at end of the first semester***
  At the end of the first semester, transferring students will have had to obtain at least 35% for the mainstream module to register for the coinciding extended module. Successful strudents (at the end of the second semester) will be awarded with credits for the first semester module (fundamental content), which they have been unable to attend due to registration in the mainstream.

Deadlines for applications for transfer of students from the three year to the four year programme
There are two deadline periods for the transfer of students from the three year to the four year diploma. The deadline for the fist semester transfers is the end of the first quarter, while the deadline for the second semeter transfers will be the end of the first semester.

For further information, please contact the Unit for Programme, Enrolment and Quality Management (UPEQ):

Tel 011 559 4619/ 4166 (office hours)
Fax 011 559 4670/ 3207

PART 2

SC.2 ALPHABETICAL LIST OF MODULES WITH PREREQUISITES

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
ANALYTICAL CHEMISTRY			
Analytical Chemistry 1AY1 (Theory)	CET1AY1	Chem Tech	CET1A1E
Analytical Chemistry 1AY2 (Practical)	CET1AY2	Chem Tech	CET1A1E
Analytical Chemistry 2AY1 (Theory)	CET2AY1	Chem Tech	CET1AY1, CET1AY2
Analytical Chemistry 2AY2 (Practical)	CET2AY2	Chem Tech	CET1AY1, CET1AY2
Analytical Chemistry 2	CET1BA3	Chem Tech	CET1AC1, CET1AC2, CET1AA1, CET1AA2, Co*: CSA1111
Analytical Chemistry: Practical 2	CET1BA4	Chem Tech	Co**: CET1BA3, CET1BO3
Analytical Chemistry 3 (Instrumental Techniques)	CET2BAA	Chem Tech	CET1BA3, PHY1ABT, PHY1ABP Co**: CSA1112
Analytical Chemistry 3 (Analytical Technology)	CET2BAT	Chem Tech	CET1BA3, PHY1ABT, PHY1ABP Co**: CET2AP5, CSA1112
Analytical Chemistry: Practical 3	CET2BAP	Chem Tech	CET1BA4, Co**:CET2BAT, CET2BAA
Chemistry 1A1E	CET1A1E	Chem Tech	Refer to Regulation SC 1.2
Chemistry 1CY1 (Theory)	CET1CY1	Chem Tech	CET1A1E, MAT1AE1
Chemistry 1CY2 (Practical)	CET1CY2	Chem Tech	CET1A1E, MAT1AE1
Chemistry 2CY1 (Theory)	CET2CY1	Chem Tech	CET1CY1, CET1CY2, MAT1YE2
Chemistry 2CY2 (Practical)	CET2CY2	Chem Tech	CET1CY1, CET1CY2, MAT1YE2
Chemical Quality Assurance	CET2BQA	Chem Tech	Co*: CSA1112, CET2BAP
Chemical Technology Practical Training	CET3BPT	Chem Tech	All modules for S1-S5 passed
English Communication Skills 1 (Module 1)	CSA1111	Applied Comm	Refer to Regulation SC 1.2
English Communication Skills 1 (Module 2)	CSA1112	Applied Comm	CSA1111
End-User Computing	BEU111	EUC	-
Entrepreneurial Skills	CET3AES	Entrepreneurship	-
Inorganic Chemistry 2	CET2A13	Chem Tech	CET2CY1, CET2CY2, Co**:CSA1111
Inorganic Chemistry 3	CET2B15	Chem Tech	CET2A13, Co**: CSA1112
Materials and Processing Science	CET3AMP	Chem Tech	CET2BAA, CET2BAT, CET2AP5, CET2A05, CET2A06, Co**: CET3APC
Mathematics 1AE1	MAT1AE1	Mathematics	Refer to Regulation SC 1.2
Mathematics 1YE2	MAT1YE2	Mathematics	MAT1AE1
Mathematics 1YE3	MAT1YE3	Mathematics	MAT1YA1, MAT1YE2
Engineering Mathematics 2	MAT2AW2	Mathematics	MAT1AW1/ MAT1AE1, MAT1YE2, MAT1YE3
Organic Chemistry 2	CET1BO3	Chem Tech	CET1AC1, CET1AC2, Co**:CSA1111
Organic Chemistry 3 (Theory)	CET2A05	Chem Tech	CET1BO3, MAT1AW1/ MAT1AE1, MAT1YE2, MAT1YE3 Co**: PHY1ABT,PHY1ABP/ PHY1AE1, PHY1YT2, PHY1YP2 and CSA1112
Organic Chemistry 3 (Practical)	CET2A06	Chem Tech	CET1BA4, CET1BO3, Co**: CET2A05
Physical Chemistry 2	CET1BP3	Chem Tech	CET2CY1, CET2CY2, MAT1YE3 Co*: CSA1111

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
Physical Chemistry 3	CET2AP5	Chem Tech	CET1BP3, Co*: PHY1YT2, PHY1YP2 and CSA1112
Physics 1AE1	PHY1AE1	Physics	Refer to Regulation SC 1.2
Physics 1YT1 (Theory)	PHY1YT1	Physics	PHY1AE1
Physics 1YP1 (Practical)	PHY1YP1	Physics	PHY1AE1
Physics 1YT2 (Theory)	PHY1YT2	Physics	PHY1YT1, PHY1YP1
Physics 1YP2 (Practical)	PHY1YP2	Physics	PHY1YT1, PHY1YP1
Physics 2	PHY2ZAT	Physics	PHY1ABT, PHY1ABP/ PHY1YT2, PHY1YP2
Polymer Chemistry 3	CET3APC	Chem Tech	CET2A05, CET2A06, Co*: CET2AP5, CSA1112
Co* Simultaneous enrolment or credit			
BIOTECHNOLOGY			
Analytical Biochemistry 3	BIC2AAB	Biochemistry	BIC21B1
Analytical Chemistry 2BBF Theory	CET1BT2	Chem Tech	CET1AT1, CET1AP1/ CET1A1E, CET1A2E, CET1A3E
Analytical Chemistry 2BBF Practical	CET1BP2	Chem Tech	CET1AT1, CET1AP1/ CET1A1E, CET1A2E, CET1A3E
Biochemistry 2	BIC21B1	Biochemistry	CET1AP1, CET1AT1/ CET1A1E, CET1A2E, CET1A3E
Biodiversity and Ecology 1	ZOO1ABD	Zoology	Refer to Regulation SC 1.2
Biodiversity and Ecology 1AE2	ZOO1AE2	Zoology	ZOO1AE1
Biodiversity and Ecology 1AE3	ZOO1AE3	Zoology	ZOO1AE2
Bioprocessing 3	BTN2BBP	Biotechnology	BTN2AFT
Biotechnology Practical Training	BTN3WPT	Biotechnology	All S1, S2 & S3 modules
Business Entrepreneurial Skills 1	BTN1AE4	Entrepreneurship	-
Calculations & Statistics	STA1ABF	Statistics	Refer to Regulation SC 1.2
Chemistry 1A1E	CET1A1E	Chem Tech	Refer to Regulation SC 1.2
Chemistry 1A2E	CET1A2E	Chem Tech	CEM1A1E
Chemistry 1A3E	CET1A3E	Chem Tech	CEM1A2E
Chemistry 1BBF Theory	CET1AT1	Chem Tech	Refer to Regulation SC 1.2
Chemistry 1BBF Practical	CET1AP1	Chem Tech	Refer to Regulation SC 1.2
End-User Computing A	BEU11A1	EUC	-
End-User Computing B	BEU11B1	EUC	BEU11A1
Disease and Immune Response 2	BTN2ADR	Biotechnology	-
Fundamental Bioscience 1AE1	ZOO1AE1	Zoology	Refer to Regulation SC 1.2
Fermentation Technology 2	BTN2AFT	Biotechnology	MCB1AM1/ MCB1AE1, MCB1AE2
Food Microbiology 3	FTN3BFM	Food Tech	MCB1BM2/ MCB1AE1, MCB1AE2
Industrial Biotechnology 4	BTN1Y14	Biotechnology	BTN2BBP
Mathematics 1AE1	MAT1AE1	Mathematics	Refer to Regulation SC 1.2
Mathematics 1AE2	MAT1AE2	Mathematics	MAT1AE1
Microbial Biochemistry 3	BIC2BMB	Biochemistry	CET1A3E,CET1BT2, CET1BP2, BIC21B1
Microbial Biochemistry 4	BTN1YB4	Biotechnology	BIC2BMB
Microbiology 1	MCB1AM1	Biotechnology	-
Microbiology 1AE1	MCB1AE1	Biotechnology	Refer to Regulation SC 1.2

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
Microbiology 1AE2	MCB1AE2	Biotechnology	MCB1AE1
Microbiology 2	MCB1BM2	Biotechnology	MCB1AM1/ MCB1AE1, MCB1AE2
Microbiology 3	MCB2AM3	Biotechnology	MCB1BM2
Plant Biotechnology 4	BTN1YP4	Biotechnology	-
Process Technology Management 1	BTN2BPT	Biotechnology	-
Recombinant DNA Technology 4	BTN1YD4	Biotechnology	-
Research Methods and Techniques	BTN1AW4	Biotechnology	-
Research Project 4	BTN1YR4	Biotechnology	BTN1AW4
Sanitation, Safety & Hygiene 1	BTN1BSH	Biotechnology	-
Statistics 1AE1	STA1AE1	Statistics	MAT1AE1, MAT1E2
FOOD TECHNOLOGY			
Analytical Chemistry 2BBF Theory	CET1BT2	Chem Tech	CET1AT1, CET1AP1/ CET1A1E, CET1A2E, CET1A3E
Analytical Chemistry 2BBF Practical	CET1BP2	Chem Tech	CET1AT1, CET1AP1/ CET1A1E, CET1A2E, CET1A3E
Biochemistry 2	BIC21B1	Biochemistry	CET1AT1, CET1AP1/ CET1A1E, CET1A2E, CET1A3E
Calculations and Statistics	STA1ABF	Statistics	Refer to Regulation SC 1.2
Chemistry 1A1E	CET1A1E	Chem Tech	Refer to Regulation SC 1.2
Chemistry 1A2E	CET1A2E	Chem Tech	CET1A1E
Chemistry 1A3E	CET1A3E	Chem Tech	CET1A2E
Chemistry 1BBF Theory	CET1AT1	Chem Tech	Refer to Regulation SC 1.2
Chemistry 1BBF Practical	CET1AP1	Chem Tech	Refer to Regulation SC 1.2
End-User Computing A	BEU11A1	EUC	-
End-User Computing B	BEU11B1	EUC	BEU11A1
Food Biochemistry 3	FTN2ABC	Food Tech	BIC21B1
Food Components 4	FTN1AC4	Food Tech	FTN2ABC
Food Microbial Assurance 4	FTN1BM4	Food Tech	FTN2AQA, FTN3BFM
Food Microbiology 3	FTN3BFM	Food Tech	MCB1BM2
Food Process Engineering 1	FTN2AE1	Food Tech	STA1ABF/ STA1AE1
Food Process Engineering 2	FTN3BE2	Food Tech	FTN2AE1
Food Process Engineering 3	FTN1AE3	Food Tech	-
Food Product Development 4	FTN1AD4	Food Tech	-
Food Production 3	FTN3BFP	Food Tech	FTN2AF2
Food Production 4	FTN1BP4	Food Tech	FTN3BFP
Food Project 4	FTN1YPR	Food Tech	FTN1ARM
Food Quality Assurance	FTN2AQA	Food Tech	-
Food Technology 1	FTN1BF1	Food Tech	-
Food Technology 2	FTN2AF2	Food Tech	FTN1BF1
Food Technology 3	FTN3BF3	Food Tech	FTN2AF2
Food Technology 4	FTN1BF4	Food Tech	FTN3BF3
Food Technology Practical Training A	FTN3APT	Food Tech	FTN2AF2
Food Technology Practical Training B	FTN3BPT	Food Tech	FTN2AF2

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
Fundamental Bioscience 1AE1	ZOO1AE1	Zoology	Refer to Regulation SC 1.2
Mathematics 1AE1	MAT1AE1	Mathematics	Refer to Regulation SC 1.2
Mathematics 1AE2	MAT1AE2	Mathematics	MAT1AE1
Microbiology 1	MCB1AM1	Biotechnology	Refer to Regulation SC 1.2
Microbiology 1AE1	MCB1AE1	Biotechnology	Refer to Regulation SC 1.2
Microbiology 1AE2	MCB1AE2	Biotechnology	MCB1AE1
Microbiology 2	MCB1BM2	Biotechnology	MCB1AM1/ MCB1AE1, MCB1AE2
Physics 1B Theory	PHY1ADT	Physics	Refer to Regulation SC 1.2
Physics 1B Practical	PHY1ADP	Physics	Refer to Regulation SC 1.2
Physics 1AE1	PHY1AE1	Physics	Refer to Regulation SC 1.2
Physics 1AE2	PHY1AE2	Physics	PHY1AE1
Physics 1AE3	PHY1AE3	Physics	PHY1AE2
Research Methodology: Natural Science	FTN1ARM	Entrepreneurship	-
Statistics 1AE1	STA1AE1	Statistics	Refer to Regulation SC 1.2
CIVICS FOR SCIENCE			
Adapting to Science in Higher Education	SCIT01	Science	-
Plagiarism and Copyright	SCIT02	Science	-
Rights and responsibilities of Citizens	SCIT03	Science	-
Science in Society	SCIT04	Science	-

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 general Academic Regulation applies.

2.2.4 **"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.

2.2.5 **"Supplementary summative assessment"** means an assessment that supplements the original assessment granted to students.

2.2.8 **"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 study guides in accordance with regulation 10.2.

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

a) **"Module mark"** means the mark obtained from summative assessment opportunities during the period of registration for the module. The module 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.

b) **"Final mark"** means a mark calculated according to a prescribed ratio/proportion and/or weighting per programme of the module 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.

2.2.14 **"Module"** means the following in the defined context:

a) **"Module"** means a predetermined unit of teaching and learning.

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

c) **"Couplet module"** means two semester modules of a specific year, the second module following on from the first.

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

e) **"Semester module"** means a module that extends over approximately 14 to 15 academic weeks spread over half a year, in accordance with the academic calendar approved by Senate.

f) **"Term module"** means a module that extends over approximately 7 academic weeks spread over three months.

2.2.18 **"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 Faculty Board concerned, approved by Senate and contained in the Faculty Rules and Regulations.

The conditions for promotion as set out in Regulations 6.6, 6.7, 6.8, 6.9 and 6.10 apply. Any deviations from these will be programme-specific and set out in the Faculty Rules and Regulations under the particular programme.

2.2.23 **"Service Learning"** Form of teaching and learning which is directed at specific community needs and integrated into a credit bearing academic programme and curriculum in which students participate in contextualized, well-structured and organized 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 (HEQC). 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.

2.2.29 **"Work Integrated Learning"** 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 learner 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 academic employees.

2.2.30 **Plagiarism"** is the act of representing the ideas, writings, works or inventions of others as the fruits of one's own original intellectual endeavours without adequately acknowledging the author or source. Within the copyright law, provision is only made for a limiting or legitimate curtailment of the copyright of the holder of the right if the infringement qualifies as "fair dealing" which presupposes adequate and full acknowledgement of the source. Any contravention is not merely immoral and unethical but a contravention of the law. "Fair dealing" includes research or private study, criticism or review of that work or for the purpose of reporting on current events in a periodical provided the source of the work as well as the name of the author must be mentioned in full. Where a student or researcher's work is not authentically his/her own, such work does not qualify as an academic output, whether this is a student assignment or employee research, and will be viewed as plagiarism, which is defined as the appropriation of another's work, whether intentionally or unintentionally, without proper acknowledgement. Copyright is the specific intellectual property right, which an author acquires in accordance with the Copyright Act, No. 98 of 1978 in respect of a protected work. Copyright infringement includes the infringement of the economic rights of the right holder and the moral rights of the author. Academic dishonesty is a denial of ethical values - it undermines the credibility of research results and is a negation of sound academic practice. No value is added if copyright is infringed or where unethical research practices are used. Material gained through dishonesty adds nothing to existing knowledge: there is no growth in the independence of the writer's intellectual involvement and the writer's academic integrity is compromised. Unethical research practices undermine the purpose of education by casting doubt on the institution's ability to promote sound and efficient scholarship and will not be tolerated.

4. ADMISSION

4.1 General admission requirements for undergraduate programmes

4.1.1 Admission requirements for study at the University may include one or more of the following:

a) Scholastic achievements: (M-score SC i.e. obtained prior to 2008) or APS (NSC i.e. obtained in 2008 or thereafter), language requirements and faculty and qualification/module requirements;
b) Admission and placement tests as approved by Senate;
c) Personal interviews;
d) Biographical information;
e) Portfolios of evidence;
f) RPL;
g) SAQA or HESA certification of equivalents;
h) Language proficiency tests.

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 Admissions before 2008

4.2.1 If the M-score is used, points are awarded for the six best symbols (taking faculty and programme-specific requirements into account) in the Grade 12 (M-score) report according to the scale below. A maximum of six subjects will be used to calculate the M-score with a maximum M-score of 30.

4.2.2 A Senior Certificate/Grade 12 M-score is calculated as follows:

SUBJECT SYMBOL	A	B	C	D	E
HIGHER GRADE	5	4	3	2	1
STANDARD GRADE	4	3	2	1	0

4.2.3 Admission scores for other types of school-end certificates such as the HIGCSE, the IGCSE, the A-level, the O-level, the AS-level, the IB and the IEB are calculated in the same manner as above in the following way:

UJ M-Score	A Level	O Level	HIGCSE	IGCSE	AS Level	IB	IEB
5	A		1		A	7	5
4	B		2		B	6	4
3	C	A	3	A	C	5	3
2	D	B	4	B	D	4	2
1	E	C		C	E	3	1
0	F	D		D			0

4.2.4 School-end certificates not included in the above score card are dealt with on an *ad hoc* basis within faculties and departments.

The required M-scores or APS for admission to programmes in the Faculty of Science are set out in regulation SC.1 in the Faculty Rules and Regulations.

4.2.5 Prospective learners that obtained the Senior Certificate prior to 2008 will be considered for admission to study at the University in accordance with their final Grade 12 results (M-Scores).

4.2.6 The minimum M-scores required for admission of prospective students that obtained the SC prior to 2008 are determined by the Faculty Board concerned, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.3 Admission Requirements for students who obtained the National Senior Certificate (NSC) in 2008 or later

4.3.1 A new Admission Points Score (APS) expounded hereunder has been developed for the NSC based on the Achievement Rating of each subject. The APS is basically the sum of the achievement ratings of the seven school subjects, keeping in mind that the performance rating achieved for Life Orientation must be divided by two. Admission scores for the new Namibian Senior Secondary Certificate (ordinary and higher level) and the new IEB score table are also included.

UJ admission point score table

NSC%	NSC Rating	New NSSC Ordinary	New NSSC Higher level	New IEB
80-100	7		1	7
70-79	6		2	6
60-69	5	A	3	5
50-59	4	B	4	4
40-49	3	C		3
30-39	2			2
0-29	1			1

Prospective students currently in Grade 12 will be considered for admission to study at the University based on the final Grade 11 results. Any student who has been admitted on the Grade 11 results will have to satisfy the minimum admission requirements in Grade 12 for registration for the relevant qualification as laid down by the University.

4.3.4 The following are minimum requirements for the National Senior Certificate (NSC) as well as the calculation formula for the APS:

a) The prescribed seven subjects are used for the calculation of the APS.
b) The APS of an applicant is the sum of the achievement ratings of the NSC subjects of that applicant.
c) 40% (achievement rating 3) must be achieved in three subjects, one of which is an official language at home-language level, and 30% (achievement rating 2) in three subjects.
d) The APS achievement rating of Life Orientation (10 credits) is divided by two in the calculation of the APS.
e) If an applicant included more than the minimum of three electives in his/her NSC, the four compulsories and the best three of the electives are used.
f) If an elective is compulsory for admission, this subject must be included in the calculation.
   The GES is calculated in the same way as the APS using the achievement ratings of the Grade 11 subjects.

4.3.5 School-end certificates not included in the above score card are dealt with on an *ad hoc* basis within faculties and departments.

4.3.6 Prospective students who comply with the minimum legal requirements for admission into a National Diploma or Bachelor's degree programme, but who do not meet the additional faculty specific admission requirements for a particular diploma or degree programme (i.e, they have not met the minimum Admission Points Score), may, upon good cause shown, be granted admission to such programme in the discretion of the Executive Dean concerned. If a prospective student does not meet faculty specific admission requirements in respect of a module in such a programme that is taught in a faculty other than the faculty in which the programme is offered, the Executive

Dean must consult with the Executive Dean of the Faculty within which the module resides before admission into the programme is granted.

4.4 Admission requirements for students who obtained the NCV

Admission requirements for applicants with NCV are in accordance with relevant legislation and faculty rules and regulations related to the various academic programmes.

4.5 Alternative admissions

4.5.1 **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 requirements.

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

4.6 Application for admission to study at the University

4.6.1 Prospective students must apply for admission to programmes not later than the determined closing dates. An annually determined application fee is payable.

4.6.2 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.

4.6.3 Admission is also subject to:

a) The University's Enrolment Management Plan approved by the Department of Education, the Senate and Faculty Boards
b) Quota determination of 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.

4.7 Admission of non-South African resident students

Refer to the General Academic Regulations

5. REGISTRATION

5.1.12 Students may not register simultaneously for two programmes at the University or for a programme or module at another university without prior written consent of the Executive Deans of the relevant faculties and the relevant authority of the other university.

5.1.14 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.

5.1.15 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 modules per academic year. Repeat modules are not included in the abovementioned two modules. *(Also refer to SC1.3.5)*

5.1.19 *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 time table period.*
- *The module on the lower academic level will have to be completed before registration for the other module/s will be permitted.*

5.2 Documents to be submitted upon registration

At registration, prospective students who register for the first time at the University must submit, together with their registration documents, certified copies of the documents specified below:

5.2.1 **First-year students**

a) Identity document or permanent residence permit.
b) Senior Certificate or National Senior Certificate or equivalent qualification and statement of symbols.

5.2.2 **Transfer students from other higher education institutions**

a) Identity document or permanent residence permit.
b) Senior Certificate or National Senior Certificate or equivalent qualification and statement of symbols.
c) Academic record from the previous higher education institution(s).
d) Certificate of conduct.
e) Additional faculty programme requirements determined by the Faculty Boards concerned.

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

5.2.3 **First registration for honours, master's and doctoral students who completed their previous degree at another higher education institution**

a) Identity document or permanent residence permit.
b) Degree certificate.
c) Academic record.
d) Certificate of conduct.
e) Additional faculty or programme requirements as determined by the Faculty Board.

Confirmation by the Head of Department that the student has been accepted is required. (This also applies to B Tech degree registrations). A certificate of conduct from the previous higher education institution is required.

5.2.4 **Non-South African resident students: documents**

a) Passport.
b) Study permit.
c) Postgraduates: South African Qualifications Authority (SAQA) evaluation of previous qualification.
d) Undergraduates: Higher Education South Africa (HESA) evaluation of the school-leaving certificate.
e) IELTS certificate: English proficiency test or proof of English passed at school-leaving level.
f) Proof of South African medical insurance cover.
g) Proof of sufficient financial repatriation funds for purposes of the student's fees.

5.7 Programme and module changes

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

5.7.2 Application for programme changes must be made on the prescribed form. These changes are subject to adherence to closing dates.

5.8 Cancellation of studies

5.8.1 Students cancel their studies in a particular programme or module by official notification thereof before the date determined by the University. This notification is submitted to the Faculty Officer concerned.

6. CREDIT AND PROMOTION REQUIREMENTS FOR UNDERGRADUATE PROGRAMMES

6.2 A module passed at a particular NQF level may not serve as an equivalent for a module at a higher NQF level.

6.3 Students retain credit for exemption and/or renewal of registration purposes for a module passed in a period in accordance with the programme-specific requirements contained in the Faculty Rules and Regulations. Such period may not exceed seven years, provided that there are no material changes to the curriculum content in this period and provided further that there has been no change in the statutory regime regulating the relevant qualification. Exceptions may be granted by the Executive Dean in consultation with the Head of Department.

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 following regulations.

These regulations refer to students who are rated as E1/E2 or F7

*An **E1** rating 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** rating 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** rating 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** 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 rating will not be permitted to continue with their studies in the faculty.

6.5 In case of substantial changes to the content of a module in which students have temporarily discontinued their studies, promotion to a higher level will not be permitted for that particular module.

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 on recommendation of the relevant Head of Department after consultation with the Lecturer, or on recommendation of the faculty's examination or Assessment Committee.

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

6.7 To be admitted to any module in the second or third academic year of study, and progress to the following year of study, a student must have passed at least 60% of the modules in the previous year of study.

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 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 except with the special permission of the Executive Dean. The Executive Dean 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 Academic Regulation 6.6 and Academic Regulation 6.8, the Executive Dean may refuse continuation of studies if their work 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.

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 A Regulation 6.6, A Regulation 6.8 and A Regulation 6.9.

6.11 Students who are registered for a three- or four-year programme and fail to complete the programme within a further period of two years will only be allowed to continue with the programme if granted special permission by the Executive Dean on recommendation of the relevant Head of Department or the faculty's Examination or Assessment Committee.

6.12 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.

The description of unsatisfactory attendance is determined by each department.

6.13 The Executive Dean of a Faculty may cancel a student's registration during any year of study or refuse readmission if, on the recommendation of the relevant Lecturer(s), the Executive Dean is of the opinion that the student has not made satisfactory progress with studies.
The description of unsatisfactory attendance is determined by the relevant lecturer and the Executive Dean.

7. EXEMPTION AND RECOGNITION REQUIREMENTS

7.1 A Head of Department may, in consultation with the Executive Dean or in accordance with a list of exemptions approved by the Executive Dean, grant exemption for a module and award a credit on the grounds that students have passed a relevant module at the University or at another accredited higher education institution.

7.2 Exemption from modules and awarding of credit, as stipulated in A Regulation 7.1, 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 major modules where appropriate, should be passed at the University in order for the University to confer the degree. For purposes of this sub-regulation a year module counts as two semester modules, and one term module counts as half a semester module.

7.3 Only in exceptional circumstances may the Executive Dean grant exemption from an exit-level final year or semester core module (major module) that has been passed at another institution or in another programme.

The Executive Dean will determine whether exceptional circumstances apply.

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

9. DURATION OF PROGRAMME

9.1 The minimum and maximum duration of each programme (study period) is contained in the Faculty Rules and Regulations, in accordance with the original programme submission and accredited by the Council on Higher Education (CHE) and registered by SAQA.

The minimum duration of each programme is according to the curricula of the programmes offered by the Faculty. The maximum duration of each undergraduate programme is an additional two years beyond the specified minimum time, subject to regulations 6.6, 6.7, 6.8, 6.9 and 6.10.

9.2 Students who are granted credit for modules towards a specific programme must be registered at the University for this specific programme for a minimum of one semester if it is a one-year programme, a minimum of one year if it is a two-year programme, or a minimum of two years if it is a three-year or four-year programme.

10. TEACHING, LEARNING AND ASSESSMENT

10.1.4 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. *Refer to Regulation 2.2.30.*

10.2.5 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.

10.2.6 When a traditional examination is used as a last (comprehensive) summative assessment opportunity, a module mark of at least 40% is required for admission to this last summative assessment opportunity (examination).

10.4 Appeals

10.4.1 After the final mark for a module is made known, students:

a) who failed the module with a final mark of at least 45%, or
b) whose last summative assessment (examination) mark is at least 15% lower than their module mark, or
c) who passed a module without distinction, but whose module mark or last summative assessment (examination) mark was a distinction mark, may apply to the Lecturer who awarded marks in the final or last summative assessment opportunity for an explanation of the final mark obtained.

10.4.2 Requests for the explanation of the award of final marks in the final summative assessment opportunity as indicated in A-Regulation 10.4.1 above must be made within 10 days after the beginning of the following semester as reflected in the University's brochure on Administrative Procedures and Deadlines. In respect of a July and December supplementary examination, requests must be made 10 calendar days from the date of publication of the global results as indicated in the University's brochure on Administrative Procedures and Deadlines of 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 them.

10.4.3 If, after the explanation has been provided as described in A Regulation 10.4.2, students are still dissatisfied with the award of marks, they may appeal to the Executive Dean. The Executive Dean may, at own discretion decide to appoint an external arbitrator to reassess the final and/or last summative assessment. A fee as determined by the University is payable for the assessment by arbitration. The decision of the Executive Dean is final.

10.4.4 The fee is refunded if the arbitrator alters results from a fail to a pass, or from a pass without distinction to a pass with distinction. In all other cases the fee is forfeited to the University.

10.5 Special summative assessment and supplementary summative assessment opportunities

10.5.1 Special assessment opportunities are considered 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 summative assessment opportunity concerned. The Faculty Board determines the procedure for and manner of such application in accordance with University procedure. The application procedure must be contained in a relevant programme-specific information or learning guide.

10.5.2 The Assessment Committee or a Senior Administrative Officer of a faculty may grant students a supplementary summative assessment opportunity if they:

a) failed a module but obtained a final module mark of at least 45%;
or
b) failed a module but obtained a module mark of at least 60%
or
c) require not more than the equivalent of two semester modules for the completion of the qualification concerned, provided that they:
    i) are registered for the module concerned in the current academic year;
    and
    ii) were admitted to, and participated in, the last assessment opportunity in the module concerned;

and

iii) have complied with all the experiential or practical requirements prescribed for the qualification (where applicable);
and

iv) were not granted a supplementary last assessment opportunity in the module concerned during the current academic year.

10.5.3 Supplementary assessment results are, subject to A Regulation 10.5.9, combined with the module mark for calculation of the final mark.

10.5.4 Supplementary assessments for continuous assessments are scheduled as part of the assessment plan for a particular module. The following applies:

a) A minimum of 45% in the predetermined assessment is required to gain access to a supplementary assessment.
b) Supplementary assessments are limited to a minimum of one scheduled assessment per semester module, or two scheduled assessments per year module, or according to each faculty's internal assessment policy.
c) A maximum of no more than a pass mark is awarded for the supplementary assessment.

10.5.6 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.

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

10.5.8 Students may not be granted another supplementary summative assessment opportunity if they have used and failed a previous one.

10.5.9 The final mark for a supplementary summative assessment opportunity is capped at 50%.

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

10.6 Obtaining a qualification

10.6.1 Students obtain a qualification if they have passed every prescribed module for a programme and have successfully completed experiential, service or work-integrated learning where applicable (also refer to Regulation 6.3 and Part 1, regulation SC1.3.2).

10.6.2 Students obtain a qualification *cum laude* if:

a) they complete the programme in the minimum period of study specified for the programme, unless the Executive Dean has approved a longer period of study;
and

b) they have achieved a weighted and/or proportional calculated average of at least 75% as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.

In addition to the requirements set out above, the following stipulations apply:

- *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.*
- *Each module was passed at the first attempt, with due consideration of the last paragraph of Reg. 6.6.*
- *In each major module, or its equivalent, a minimum average mark of 75% must be attained for both semesters in the final year.*
- *An overall average mark of 75% of all modules is achieved.*
- *Only the minimum number of requisite courses is taken into account in the calculation of the average mark.*
- *Only the courses accepted in the relevant curriculum are considered in the calculation of the final mark.*

An additional year is accepted in the case of students who were promoted to second year at the end of the first year of study and then changed their curriculum to such an extent that the new curriculum could not be completed in the initial minimum period.

10.7 Students with disabilities

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

10.7.2 Students should submit the application, together with the relevant medical/ psychological reports supporting the request, to the Coordinator: People with Disabilities at the beginning of every semester/year. The request should clearly specify the needs and concessions requested. After consideration, the Coordinator: People with Disabilities will refer the request, together with a recommendation to the Executive Dean, other divisions and Lecturers. Extension/granting of the concession should be reaffirmed every semester/year.

10.8 Access Control

10.8.2 Students must produce their access cards 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.

10.9 Offences during summative assessment opportunities

10.9.1 Students commit an offence if:

a) they commit plagiarism;

b) during a formal assessment opportunity, they are in possession of any book, cell phone that has not been switched off, memorandum, notes in whatsoever form, 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 such other sources that the invigilator has authorised;

c) they 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) they help other students to commit an offence (also considering that they are under an obligation to take all reasonable measures to ensure that other students do not have access to their work);

e) they 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) they cause a disturbance in or in the proximity of the assessment venue, or conduct themselves in an improper or unbecoming manner;

g) they disregard the instructions of invigilators or assessors;
h) they pose as other students.

10.9.2 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.

10.10 Irregularities during participation in summative assessment opportunities

10.10.4 If the suspected offence involves an electronic device, the invigilator will consult the assessor before responding to the offence as described in A-Regulation 10.9.1.

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 10.10.2.

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 elapsed (refer to Regulation 10.8.3)).

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.

10.11 Assessment of experiential, service or work-integrated learning

10.11.2 Programme-specific requirements in this regard are addressed in the Faculty Assessment Policies and Work-integrated and Service Learning Policy.

14. ACADEMIC REGULATIONS APPLICABLE TO DIPLOMAS

14.1 Minimum admission requirements

The minimum admission requirements for a national diploma are in accordance with the requirements as defined in the NATED report 150, the Government Gazette July 2008 Policy and HEQF 2007. This implies the following:

a) Senior Certificate or a National Senior Certificate endorsed with diploma admission;
b) Senior Certificate-based complete/conditional admission certificate;
c) NATED Report 150 requirements;
d) M-score, APS or other equivalent scores;
e) Language requirements
f) Admission/placement tests as approved by Senate;
g) Faculty and programme-specific requirements as determined by the Faculty Board concerned approved by Senate and contained in the relevant Faculty Rules and Regulations.

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

15. ACADEMIC REGULATIONS APPLICABLE TO BACHELOR'S PROGRAMMES

15.1 Minimum admission requirements

The minimum admission requirements for a bachelor's programme are in accordance with the requirements as defined in the NATED Report 116: A qualification structure for Universities in South Africa, Government Gazette July 2008 Policy and the HEQF 2007. This implies the following:

a) Senior Certificate complete/conditional exemption;
b) National Senior Certificate endorsed with admission to a bachelor's degree **or**
c) Senate discretionary admission may be considered for candidates with a National Senior Certificate endorsed with admission to a national diploma who have applied for admission to an undergraduate bachelor's degree at the University. Senate may consider such matter on recommendation by the Executive Dean concerned in accordance with clause 31 of the Regulations on Senate Discretionary Exemption for Senior Certificate holders, and as contained in the HESA guidelines regarding Senate discretionary exemption;
d) Admission/placement tests, as approved by Senate;
e) M-score, APS and other relevant scores;
f) Language requirements;
g) Faculty and programme-specific requirements as determined by the Faculty Board concerned, approved by Senate and contained in the relevant Faculty Rules and Regulations

The admission requirement to a B Tech degree is a National Diploma.
The requirements for admission to the Faculty of Science are set out in Regulation SC.1 of the Faculty Rules and Regulations.

16. ACADEMIC REGULATIONS APPLICABLE TO HONOURS DEGREES

16.1 Minimum admission requirements

In addition to minimum admission requirements, special admission requirements will apply to specific programmes as set out below.

16.1.1 For admission to an honours programme, an applicant must have successfully completed a bachelor's degree or an equivalent qualification in the same or relevant field of study, as determined by the Faculty Board concerned, approved by Senate and contained in the relevant Faculty Rules and Regulations.

The academic requirements for admission to an Honours programme are programme-specific subject to confirmation by the Faculty Board. Generally an average mark of 60% in the relevant module in the final year of the preceding qualification will be required. Admission to an Honours programme is not automatic even if the applicant is in possession of an appropriate preceding qualification.

A department may, module to approval by the Executive Dean, require a student to successfully complete certain specified components of the Bachelor's degree prior to, or during the Honours programme before the Honours degree can be awarded.

16.1.2 Programme-specific admission requirements (achievement in the relevant majors in the prerequisite qualification) are determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

A department could limit the number of admissions due to constraints of space and facilities. Also refer to Regulation 16.1.1.

16.1.3 Students will only be admitted to register at honours level if they have obtained a bachelor's degree, or a relevant national diploma in the case of a B Tech, and have passed the relevant modules or approved appropriate other modules at the level of a primary major module.

16.1.4 The Executive Dean may, in consultation with the Head of Department and Lecturer concerned, determine preconditions for successful completion by prospective students before admission to the honours programme.

16.1.6 The Head of Department may, where applicable, initiate the University's Policy and Procedure on RPL to award academic status equivalent to that of the prerequisite qualification to applicants in order to allow them access to an honours programme as determined by the Faculty Board concerned and approved by Senate.

The Faculty of Science Policy on RPL will be followed.

16.1.7 The University reserves the right not to admit applicants to a particular honours programme in accordance with programme-specific selection and other relevant criteria. Applicants who have applied for admission and have been refused may request written reasons for such refusal from the Head of Department.

16.1.8 Applicants for admission to an Honours programme must follow the application process and closing dates as determined by the relevant department. Intending applicants are advised to approach the department of their choice before the end of October in the academic year preceding their expected registration.

16.2 Registration

16.2.3 A student registers for the Honours programme on a full-time or part-time basis, in accordance with the specific requirements of the programme as contained in the relevant Faculty Rules and Regulations, as approved by Senate, and with due regard to the requirements for registration as a professional scientist.

16.2.4 A Head of Department may, subject to approval by the Executive Dean, permit a student to replace a maximum of two Honours modules in the formal curriculum with modules of equivalent weight from another department within the Faculty of Science or, in exceptional cases, from another Faculty.

16.2.5 If a student's progress is unsatisfactory the Executive Dean, in consultation with the relevant Head of Department, may terminate the student's registration for the honours programme. Each department may set its own description of what constitutes unsatisfactory progress.

16.3 Assessment

The assessment requirements are determined by the relevant Faculty Board and contained in the relevant Faculty Rules and Regulations. This includes the consideration and awarding of supplementary summative assessment opportunities for modules failed.

16.3.1 Every module in the Honours course has to be passed separately and individually for the Honours degree to be awarded.

16.3.2 Supplementary summative assessment opportunities can be awarded in modules which have been failed, except in modules based on a research project, practicals or field excursions.

16.3.3 General Regulations 10.1 to 10.10, which apply to undergraduate programmes, are equally applicable to Honours degrees with the specific exclusion of General Regulation 10.5.2 (b). Also refer to Regulation 16.3.6 where the requirements for the Honours degree cum laude *are specified.*

16.3.4 Re-assessment by way of a supplementary examination is permitted in Honours modules, subject to Regulations 10.5.2 (a) and (b), 10.5.8, 10.5.9 and 16.3.2, provided that no more than 25% of the number of modules prescribed for the specific degree require to be re-assessed.

16.3.5 *A student who fails more than 25% of the number of modules prescribed for the specific degree will have his/her registration as student cancelled with immediate effect. Failure is taken to mean that a pass mark has not been achieved in a module, including after re-assessment.*

16.3.6 *Re-registration for a failed module can only be done with the specific approval of the Executive Dean on recommendation of the Head of Department involved.*

16.3.7 *Students obtain the Honours degree* cum laude *if:*

a) They complete the programme in the minimum period of study specified for the programme, unless the Executive Dean has approved a longer period of study;

AND

b) The final mark in all required modules is at least 65% and an unweighted average of all the required modules is 75% or higher.

General Regulation 10.6.2 applies where appropriate.

16.4 Duration of study

16.4.1 *The duration of a full-time Honours programme is one academic year and two academic years for a part-time Honours programme. Reduced residency less than this prescribed minimum shall not be granted.*

16.4.2 *An additional year of study may be granted in exceptional cases by the Executive Dean in consultation with the Head of Department concerned.*

16.5 Ethical considerations

16.5.1 *Research in Honours programmes is conducted in accordance with ethical requirements as contained in the University's Higher Degrees and Postgraduate Studies Policy, the University's Academic Ethics Policy, faculty-specific procedures, as determined by the Faculty Board concerned, with due regard to statutory and professional regulatory requirements and general best-practice principles to protect human and animal dignity in research.*

16.5.2 *Research projects in Honours programmes will not require formal registration but must be approved by the Department concerned.*

16.5.3 *It is incumbent on all staff members of academic departments to ensure that the above requirements are met.*

17. ACADEMIC REGULATIONS APPLICABLE TO MASTER'S PROGRAMMES

17.2 Admission

17.2.1 The minimum admission requirement for a master's programme is an honours qualification in the same or a relevant field of study or discipline, in which case the relevant field of study or discipline is determined by the Faculty Board concerned, approved by the Senate Higher Degrees Committee and ratified by Senate. The admission requirement for an M Tech is a B Tech degree.

Admission requirements are programme specific and approved by the Executive Dean. Admission to a Master's programme is not automatic even if the applicant is in possession of an appropriate preceding qualification. A department may, subject to approval by the Executive Dean, require a student to successfully complete certain specified components before the Master's degree can be awarded

17.2.2 Applicants apply for admission and, if successful, register either for a research master's programme or a coursework master's programme.

17.2.3 In the case of a research master's programme, the Faculty Rules and Regulations determine whether the successful completion of a research dissertation is the sole academic requirement for the qualification, or whether the successful completion of both a research dissertation and an oral examination is required.

The form that the assessment will take is programme specific, subject to approval by the Executive Dean. An external assessor may, however, request an oral examination.

17.2.4 In the case of a coursework master's programme, the successful completion of prescribed coursework modules and a minor dissertation is the academic requirement for the qualification.

17.2.5 Additional admission and selection requirements may be determined by the relevant Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations concerned.

17.2.8 The University reserves the right not to admit applicants to a particular master's programme in accordance with programme-specific selection criteria and other relevant criteria such as:

i) the limitations of enrolments per programme;
ii) capping of admissions in terms of the University's approved enrolment plan or professional regulatory requirements;
iii) refusal by the Head of Department to admit applicants who meet the minimum entry requirements but according to the Head's assessment are unlikely to succeed in the chosen research project;
iv) the inability to identify an appropriate supervisor within the University.

A department may limit the number of admissions due to constraints of space and facilities in the interests of quality of instruction.

17.3 Registration

17.3.1 A student registers for a master's programme as follows:

a) Coursework modules: First-year coursework applicants register in the first semester of the academic year in accordance with the registration dates set by the relevant faculty.
b) Research first-year registration: An applicant registers up to and including the second Friday in March, in which case residency begins in the first semester. Registration may also take place during the second semester up to and including the third Friday in July, in which case residency begins in the second semester.
c) Renewal of registration for a minor dissertation or dissertation takes place during the first semester of the academic year as contained in the University's Year Programme.
d) Failure to submit the research or minor research proposal within the specified time frame may result in cancellation of registration.

17.3.2 Students register for a master's programme full time or part time in accordance with the specific requirements of the programme as contained in the relevant Faculty Rules and Regulations as approved by Senate, and with due regard to the programme qualification mix as approved by the Department of Education.

17.3.3 The minimum duration of a master's programme is one academic year. Residency less than the prescribed minimum study period may not be granted.

17.3.4 The maximum period of registration for a master's programme is two years full-time or three years part-time. Further registration may be granted by the relevant Executive Dean in accordance with the University's Higher Degrees and Postgraduate Studies Policy.

17.3.5 The approval of students' research proposals, supervisors, study fields, provisional and/or final title of the minor dissertation or dissertation takes place in accordance with the University's Higher Degrees and Postgraduate Studies Policy and faculty-specific regulations as determined by the Faculty Board concerned, approved by Senate and contained in the Faculty Rules and Regulations.

The proposed topic of the dissertation/minor dissertation, the name of the supervisor(s) as well as confirmation of the requirements set out below, are submitted to the Higher Degrees Committee of the Faculty of Science for recommendation to the Dean's Committee. This proposal must be submitted within three months of registration of the student.

The requirements that have to be met are:

- *That the supervisor considers the student competent to undertake the study;*
- *That the supervisor(s) and assessor(s) have at least M-degrees or equivalent;*
- *That the proposed field of study falls within the department's or supervisor(s)' field of research;*
- *That the proposed field of study is of sufficient academic merit to justify a Master's degree;*
- *That the proposed study can be undertaken with available equipment and facilities without delays due to overcrowding.*

17.3.6 Any amendment to a project or research title is done in accordance with faculty-specific requirements. The amendment is approved by the relevant Faculty Board or Faculty Committee with delegated authority (i.e. Faculty Higher Degrees Committee). A change in project title at any stage does not constitute valid grounds for the extension of registration, residency or formal duration of study.

17.3.7 The renewal of students' registration for a master's programme is subject to satisfactory progress in accordance with the University's Higher Degrees and Postgraduate Studies Policy, faculty-specific requirements and, where applicable, professional regulatory requirements, with due regard also to the University's Enrolment Management Plan and subsequent throughput interventions.

Satisfactory progress will be determined by regular quarterly reports from the supervisors to the Higher Degrees Committee of the Faculty.

17.3.8 If students' progress is unsatisfactory, the Faculty Board may decide to terminate their registration for the master's programme.

A department can formulate its own description of what constitutes unsatisfactory progress, subject to approval by the Executive Dean.

17.4 Ethical considerations

Research in master's programmes is conducted in accordance with ethical requirements as contained in the University's Higher Degrees and Postgraduate Studies Policy, the University's Academic and Research Ethics Policy, faculty-specific procedures as determined by the Faculty Board concerned, and with due regard to statutory and professional regulatory requirements and general best-practice principles to protect human and animal dignity in research.

17.5 Health and safety

The supervisors of research projects are responsible for assessing whether or not such projects have health and safety implications in accordance with the University's Occupational Health and Safety Policy.

17.6 Conversion/transfer of a master's degree to a doctoral degree

17.6.1 In exceptional cases, where the scope and impact of a project originally registered for a master's programme prove to expand considerably beyond the initial expectation, the candidates – with the concurrence of a supervisor and all co-supervisors – may apply to have their registration converted/transferred to a doctoral level.

17.7 Assessment

17.7.3 The master's candidate is responsible for the technical and linguistic editing of the minor dissertation or dissertation prior to submission for final summative assessment.

17.7.4 The final research report (minor dissertation or dissertation) is submitted for assessment (with reference to the presentation format, content and layout) in accordance with the faculty-specific regulations as determined by the relevant Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.

The Master's dissertation is a single document, prepared for the purpose of meeting the requirements for the attainment of the degree.

17.7.6 The final submission of the minor dissertation or dissertation takes place in accordance with the final submission dates per semester as contained in the University's Year Programme to ensure timely completion of the assessment process. Late submission could imply the renewal of a registration.

17.7.7 The minor dissertation or dissertation is assessed in accordance with the University's Higher Degrees and Postgraduate Studies Policy and faculty-specific criteria as determined by the Faculty Board and approved by the Senate.

For a research Master's degree, a dissertation must furnish proof that a student is capable of scientific research and the application thereof, and does not have the generation of original or unique knowledge as its primary aim.

The master's student has, therefore, to demonstrate the ability to

a. Identify a problem and formulate a hypothesis
b. Find and collate the relevant literature on the problem
c. Devise an appropriate strategy to address the hypothesis
d. Generate legitimate results with which to address the hypothesis
e. Place the results found in correct context against the known literature
f. Present a cohesive acceptable summation of the study performed, with due regard to the appropriate conventions of style and terminology

17.7.8 The final mark is calculated in accordance with the requirements determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

In the case of the research master's degree the dissertation is the only assessment requirement that has to be fulfilled. The final assessment mark (which carries a weight of 100%) is the average of the marks given by the external assessors.

In the case of the master's degree by course-work the minor dissertation as well as the successful completion of additional courses, are the assessment requirements that have to be met. Calculation of the final mark in the case of the minor or course-work dissertation is department specific and set out in the Faculty Rules and Regulations. The minor dissertation mark (determined as for the research dissertation) and the average of the course-work modules will each contribute 50% to the final mark.

17.7.14 A candidate is not deemed to have completed the requirements for conferment of the degree if the specified number of final corrected copies of the minor dissertation or dissertation has not been submitted to the relevant Faculty Administration Officer prior to the graduation ceremony and closure of the graduation list for the forthcoming graduation ceremony.

17.9 Dissemination and publication of the minor dissertation and dissertation

17.9.3 In addition to the submission of the final minor dissertation or dissertation, and except where faculty regulations exempt them, master's candidates are required to submit to their supervisors the manuscript of at least one research article meeting the requirements for publication in a relevant accredited research and/or academic journal for that specific field, by the time the faculty-specific research Assessment Committee meets to consider the assessors' reports.

If required by a department/supervisor, candidates must submit to their supervisor(s) a manuscript based on a topic of the dissertation, in the format of a research article meeting

the requirements for publication. Once the supervisor is satisfied that the appropriate scientific conventions have been mastered, the student is certified as having met this requirement. Note that submission of the manuscript to an editor is not a requirement.

Departments that require submission of such manuscripts must include the certification in the final report on the student to the Faculty Higher Degrees Committee.

17.9.5 Candidates are not deemed to have completed the requirements for graduation until the corrected manuscript of the research article has been submitted to the supervisors.

Subject to Regulation 17.9.3

17.10 Dispute resolution

17.10.1 In the event of an unresolved dispute between two or more of the supervisors, student or Head of Department, the Executive Dean of the relevant faculty will in the first instance take steps to resolve the matter.

17.11 Appeals procedure

17.11.1 The faculty-specific Assessment Committee may invoke individually or jointly any of the following procedures to resolve an impasse (in accordance with the Senate Higher Degrees and Postgraduate Studies Policy) *Refer to A Regulation 17.11.1*

17.12 Intellectual property

17.12.1 Supervisors are responsible for monitoring all master's projects for potential inventions or other commercially viable intellectual property implications and disclosing such inventions or implications to the Executive Director: Research and Innovation.

17.12.2 Students who develop inventions or other forms of commercially valuable intellectual property must disclose such inventions to the supervisors, in accordance with the University's policy on Intellectual Property.

17.12.3 Where disclosures have been made about intellectual property emerging from a master's research project, the Executive Director: Research and Innovation, or an applicant duly mandated in this regard, must certify that any intellectual property matters attendant to the project have been dealt with in terms of relevant University policy as a condition of graduation.

18. ACADEMIC REGULATIONS APPLICABLE TO DOCTORAL DEGREES

18.2 Admission

18.2.1 For admission to a doctoral programme, applicants must have successfully completed a relevant master's programme in the same or relevant field of study, as determined by the Faculty Board concerned, approved by Senate and contained in the Faculty Rules and Regulations concerned.

18.2.2 The extent to which applicants meet admission requirements is assessed by the Head of Department concerned, in consultation with the prospective supervisors, in accordance with the admission requirements for the particular doctoral programme determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations concerned. The Head of Department, in consultation with the relevant Executive Dean, may set additional admission requirements, as approved by the relevant Faculty Higher Degrees Committee, for a particular candidate.

Admission requirements are programme specific and approved by the Executive Dean. Admission to a Doctoral programme is not automatic even if the applicant is in possession of an appropriate preceding qualification. A department may, subject to approval by the Executive Dean, require a student to successfully complete certain specified components before the Doctoral degree can be awarded.

18.2.5 The University reserves the right not to admit applicants to a particular doctoral programme, in accordance with the programme-specific selection criteria and other relevant criteria. Compliance with minimum admission requirements does not constitute automatic right of admission to the programme.

18.2.6 Applicants who have applied for admission and have been refused may request written reasons for such refusal from the Executive Dean concerned.

18.3 Registration

18.3.1 Students register for the doctoral programme concerned, in accordance with the faculty-specific procedure.

18.3.2 A student registers for a doctoral programme as follows:

a) First-year registration for the degree: up to and including the second Friday in March in which case the residency commences in the first semester. Registration may also take place during the second semester up to and including the third Friday in July in which case the residency commences in the second semester.
b) Renewal of registration takes place during the first semester of the academic year.
c) Failure to submit the research proposal within the specified time frame may result in cancellation of registration

18.3.3 Students register for the doctoral programme full-time or part-time in accordance with the specific requirements of the programme as contained in the relevant Faculty Rules and Regulations, as approved by Senate, and with due regard to the approval of the Department of Education (DoE), as accredited by the CHE (HEQC) and listed by South African Qualifications Authority (SAQA). Compliance with minimum admission requirements does not constitute automatic right of admission to the programme.

18.3.4 The minimum duration of a doctoral programme is two academic years (part-time or full-time). Residency less than the prescribed minimum period is not granted.

18.3.5 The maximum period of registration for a doctoral programme is four years. Renewal of further registration may be granted by the relevant Executive Dean.

18.3.6 The approval of a students' research proposals, supervisors, study fields and provisional or final titles of theses is in accordance with the University's Higher Degrees and Postgraduate Studies Policy and faculty-specific regulations determined by the Faculty Board concerned, approved by Senate as recommended by the Senate Higher Degrees Committee.

The proposed topic of the thesis, the name of the supervisors as well as confirmation of the requirements set out below, are submitted to the Higher Degrees Committee of the Faculty for recommendation to the Dean's Committee. This proposal must be submitted within 6 months of registration of the student.

The requirements that have to be met are:

a. That the supervisor considers the student competent to undertake the study;
b. That the supervisor(s) and assessors have D-degrees or its equivalent;
c. That the proposed field of study falls within the department's or supervisor's field of research;
d. That the proposed field of study is of sufficient academic merit to justify a Doctor's degree;
e. That the proposed study can be undertaken with available equipment and facilities without undue delays due to overcrowding.

18.3.7 Any amendment to the title of the thesis is in accordance with faculty-specific requirements, and such amendment is considered by the relevant Faculty Board or Faculty Committee with delegated authority, and approved by the Senate Higher

Degrees Committee. A change in project title at any stage does not constitute valid grounds for the extension of registration or residency/formal duration of study.

18.3.8 Scholarship development at doctoral level may consist of at least the following formative and integrated assessment opportunities, as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations:

a) quarterly discourse engagement with members of the doctoral committee or the supervisor, as contained in the faculty-specific guidelines for doctoral programmes
b) two doctoral seminars during the course of the programme: one to present and defend the research proposal and one to present the results of the research project and simultaneously to justify the originality of the thesis.

18.3.9 The renewal of students' registration for a doctoral programme is subject to their satisfactory progress in accordance with the University's Higher Degrees and Postgraduate Studies Policy, faculty-specific requirements and, where applicable, professional regulatory requirements, with due regard also to the University's Enrolment Management Plan and subsequent throughput interventions.

Satisfactory progress will be determined by regular quarterly report from the supervisor to the Faculty Higher Degree Committee.

18.3.10 In the event of students' progress being unsatisfactory, the Faculty Board concerned recommends to the Senate Higher Degrees Committee that their registration for the doctoral programme be terminated. The decision of the Senate Higher Degrees Committee is final.

18.6 Assessment

18.6.1 A doctoral study is assessed on the basis of a doctoral thesis only. The Faculty Rules and Regulations may, however, determine that an oral examination forms part of the academic requirements for the qualification.

18.6.3 Doctoral degree candidates are responsible for the technical and linguistic editing of the thesis, prior to submission for final summative assessment.

18.6.5 A thesis is submitted for final summative assessment, subject to the written permission of the supervisors. If a dispute should arise about the readiness of the thesis for final summative assessment, the Executive Dean of the Faculty makes a final decision in accordance with the Higher Degrees and Postgraduate Studies Policy.

18.6.7 The assessment of the thesis is in accordance with the University's Higher Degrees and Postgraduate Studies Policy and the faculty-specific criteria as determined by the Faculty Board and approved by the Senate.

A Doctoral thesis must be an original or unique contribution to the knowledge and philosophy of the module. The extent of the original contribution will be determined by the supervisor(s), assessors and the Faculty Higher Degrees Committee.

18.6.9 A candidate is not deemed to have completed the requirements for conferment of the degree if the specified number of final corrected copies of the thesis has not been submitted to the relevant faculty administration officer prior to the graduation ceremony and closure of the graduation list for the forthcoming graduation ceremony.

18.8 Dissemination and publication of the thesis

18.8.3 In addition to the final submission of the thesis, and except where faculty regulations exempt them or set a higher number, doctoral candidates are required to submit to their supervisor/s the manuscript of at least one research article meeting the requirements for publication in a relevant accredited research and/or academic

journal for that specific field by the time the faculty-specific research Assessment Committee meets to consider the assessors' reports.

Once the supervisor is satisfied that the appropriate scientific conventions have been mastered, the student is certified as having met this requirement.

Departments that require submission of such manuscripts must include the certification in the final report on the student to the Faculty Higher Degrees Committee.

18.8.5 Candidates will not be deemed to have completed the requirements for graduation until such time as the aforementioned manuscript of the research article has been submitted to the supervisors.

18.8.8 Candidates may not submit an article based on their doctoral research before the thesis has formally been accepted, unless written permission is granted by the supervisors, due regard being given by the supervisors to the possibility that publication may result in public disclosure of valuable intellectual property.

18.9 Dispute resolution

18.9.1 If an unresolved dispute should arise between two or more of the supervisors, student or Head of Department, the Executive Dean of the relevant Faculty will in the first instance take steps to resolve the matter.

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

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

Programme content

1. The diploma or degree 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 modules 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 SACNASP.

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PART 4

SC.4 CURRICULA FOR NATIONAL DIPLOMA PROGRAMMES

Purpose and characteristics of the programme

These qualifications are primarily vocational or industry specific. The central purpose of the diploma programmes is to develop graduates who can demonstrate focused knowledge and skills in analytical chemistry, biotechnology and food technology. The programmes therefore focus centrally on equipping students with an in-depth and specialised knowledge of the general principles and practical skills applicable to the analytical chemistry, biotechnology or food technology industry. As part of the diploma study, and in collaboration with the relevant workplace institutions/ bodies/ organisations, students are also exposed to the relevant world of work in order to gain experience in applying the acquired knowledge and practical skills in the workplace context. The tuition and workplace experience enable successful students to access a number of career and employment opportunities relating to analytical chemistry, biotechnology, food technology from the onset.

Exit level outcomes

Students should be able to:

- Identify, evaluate and solve both routine and unfamiliar problems using correct procedures/methods/techniques.
- Work effectively with others in a team.
- Manage well-defined and new learning activities within a structured learning environment.
- Analyse, synthesise and evaluate information, theories and ideas associated with analytical chemistry/ biotechnology/ food technology.
- Demonstrate an understanding of the scope and main areas of analytical chemistry/ biotechnology/food technology and how the respective discipline/field relates to other areas or systems.
- Monitor their own performance and assess it against given criteria.
- Present and communicate information effectively and meaningfully using scientific and academic/ professional discourse conventions and formats.
- Show responsibility towards the environment and health of others by using science and technology in accordance with recognised professional and/or ethical codes or practices.

Refer to Part 1 for General Rules of Admission

CURRICULA

SC.4.1	National Diploma in Analytical Chemistry (4 years)	NDAC1E

FIRST YEAR

First Semester		Second Semester	
Chemistry 1A1E	CET1A1E	Analytical Chemistry 1AY1 (Theory)	CET1AY1
Mathematics 1AE1	MAT1AE1	Analytical Chemistry 1AY2 (Practical)	CET1AY2
Physics 1AE1	PHY1AE1	Chemistry 1CY1 (Theory)	CET1CY1
End-User Computing 1	BEU111	Chemistry 1CY2 (Practical)	CET1CY2
Skills for Success	SFS1EXT	Mathematics 1YE2	MAT1YE2
Adapting to Science in Higher Education	SCIT01	Physics 1YT1 (Theory)	PHY1YT1
		Physics 1YP1 (Practical)	PHY1YP1
		Skills for Success	SFS1EXT
		Plagiarism and Copyright	SCIT02

SECOND YEAR

First Semester		Second Semester	
Analytical Chemistry 2AY1 (Theory)	CET2AY1	Analytical Chemistry 2	CET1BA3
Analytical Chemistry 2AY2 (Practical)	CET2AY2	Analytical Chemistry Practical 2	CET1BA4
Chemistry 2CY1 (Theory)	CET2CY1	Organic Chemistry 2	CET1BO3
Chemistry 2CY2 (Practical)	CET2CY2	Physical Chemistry 2	CET1BP3
Communication Skills 1 (Module 1)	CSA1111	Communication Skills 1 (Module 2)	CSA1112
Mathematics 1YE3	MAT1YE3	Rights and Responsibilities of Citizens 3	SCIT03
Physics 1YT2 (Theory)	PHY1YT2		
Physics 1YP2 (Practical)	PHY1YP2		

THIRD YEAR

First Semester		Second Semester	
Inorganic Chemistry 2	CET2A13	Analytical Chemistry 3 (Instrumental Tech)	CET2BAA
Organic Chemistry 3 (Theory)	CET2A05	Analytical Chemistry 3 (Analytical Tech)	CET2BAT
Organic Chemistry 3 (Practical)	CET2A06	Analytical Chemistry Practical 3	CET2BAP
Physical Chemistry 3	CET2AP5	Chemical Quality Assurance	CET2BQA
Science in Society	SCIT04	Inorganic Chemistry 3	CET2B15
		Science in Society	SCIT04

FOURTH YEAR

First Semester		Second Semester	
Engineering Mathematics 2	MAT2AW2	Chemical Technology Practical Training	CET3BPT
Entrepreneurial Skills	CET3AES		
Materials and Processing Science	CET3AMP		
Physics 2	PHY2ZAT		
Polymer Chemistry 3	CET3APC		

SC.4.2	National Diploma in Biotechnology (4 years)	NDBTE1

FIRST YEAR

First Semester		**Second Semester**	
Fundamental Bioscience 1AE1	ZOO1AE1	Biodiversity and Ecology 1AE2	ZOO1AE2
Chemistry 1A1E	CET1A1E	Chemistry 1A2E	CET1A2E
End-User Computing A	BEU11A1	End-User Computing B	BEU11B1
Mathematics 1AE1	MAT1AE1	Mathematics 1AE2	MAT1AE2
Skills for Success 1	SFS1EXT	Microbiology 1AE1	MCB1AE1
Adapting to Science in Higher Education	SCIT01	Skills for Success 1	SFS1EXT
		Plagiarism and Copyright	SCIT02

SECOND YEAR

First Semester		**Second Semester**	
Biodiversity and Ecology 1AE3	ZOO1AE3	Analytical Chemistry 2BBF (Theory)	CET1BT2
Chemistry 1A3E	CET1A3E	Analytical Chemistry 2BBF (Practical)	CET1BP2
Microbiology 1AE2	MCB1AE2	Biochemistry 2	BIC21B1
Statistics 1AE1	STA1AE1	Microbiology 2	MCB1BM2
		Sanitation, Safety and Hygiene 1	BTN1BSH
		Rights and Responsibilities of Citizens	SCIT03

THIRD YEAR

First Semester		**Second Semester**	
Analytical Biochemistry 3	BIC2AAB	Bioprocessing 3	BTN2BBP
Disease and Immune Response 2	BTN2ADR	Food Microbiology 3	FTN3BFM
Fermentation Technology 2	BTN2AFT	Microbial Biochemistry 3	BIC2BMB
Microbiology 3	MCB2AM3	Process Tech. and Management 1	BTN2BPT
Science in Society	SCIT04	Science in Society	SCIT04

FOURTH YEAR

First Semester		**Second Semester**	
Biotechnology Practical Training	BTN3WPT	Biotechnology Practical Training	BTN3YPT

SC.4.3	National Diploma in Food Technology (4 years)	NDFTE1

FIRST YEAR

First Semester		Second Semester	
Fundamental Bioscience 1AE1	ZOO1AE1	Microbiology 1AE1	MCB1AE1
Chemistry 1A1E	CET1A1E	Chemistry 1A2E	CET1A2E
Mathematics 1AE1	MAT1AE1	Mathematics 1AE2	MAT1AE2
End-User Computing	BEU11A1	End-user Computing	BEU11B1
Physics 1AE1	PHY1AE1	Physics 1AE2	PHY1AE2
Skills for Success	SFS1EXT	Skills for Success	SFS1EXT
Adapting to Science in Higher Education	SCIT01	Plagiarism and Copyright	SCIT02

SECOND YEAR

First Semester		Second Semester	
		Analytical Chemistry 2BBF (Theory)	CET1BT2
Chemistry 1A3E	CET1A3E	Analytical Chemistry 2BBF (Practical)	CET1BP2
Microbiology 1AE2	MCB1AE2	Microbiology 2	MCB1BM2
Statistics 1AE1	STA1AE1	Biochemistry 2	BIC21B1
Physics 1AE3	PHY1AE3	Food Technology 1	FTN1BF1
		Rights and Responsibilities of Citizens	SCIT03

THIRD YEAR

First Semester		Second Semester	
Food Process Engineering 1	FTN2AE1	Food Technology Practical Training 1	FTN2APT
Food Biochemistry 3	FTN2ABC		
Food Technology 2	FTN2AF2		
Food Quality Assurance	FTN2AQA		
Science in Society	SCIT04		

FOURTH YEAR

First Semester		Second Semester	
Food Technology Practical Training 2	FTN3YPT	Food Microbiology 3	FTN3BFM
		Food Technology 3	FTN3BF3
		Food Production 3	FTN3BFP
		Food Process Engineering 2	FTN3BE2
		Science in Society	SCIT04

SC.4.4	National Diploma in Analytical Chemistry	344-3

NO NEW INTAKE – PROGRAMME IN PROCESS OF PHASING OUT (pipeline students only)

FIRST YEAR

First Semester		**Second Semester**	
Analytical Chemistry 1 (Theory)	CET1AA1	Analytical Chemistry 2	CET1BA3
Analytical Chemistry 1 (Practical)	CET1AA2	Analytical Chemistry: Practical 2	CET1BA4
Chemistry 1 (Theory)	CET1AC1	Organic Chemistry 2	CET1BO3
Chemistry 1 (Practical)	CET1AC2	Physical Chemistry 2	CET1BP3
Communication Skills 1 (Module 1)	CSA1111	Communication Skills 1 (Module 2)	CSA1112
Engineering Mathematics 1	MAT1AW1	Plagiarism and Copyright	SCIT02
Physics 1 (Theory)	PHY1ABT		
Physics 1 (Practical)	PHY1ABP		
Adapting to Science in Higher Education	SCIT01		

SECOND YEAR

First Semester		**Second Semester**	
Inorganic Chemistry 2	CET2A13	Analytical Chemistry 3 (Inst Tech)	CET2BAA
Organic Chemistry 3 (Theory)	CET2A05	Analytical Chemistry 3 (Analyt. Tech)	CET2BAT
Organic Chemistry 3 (Practical)	CET2A06	Analytical Chemistry: Practical 3	CET2BAP
Physical Chemistry 3	CET2AP5	Inorganic Chemistry 3	CET2B15
End-User Computing	BEU111	Chemical Quality Assurance	CET2BQA
		Rights and Responsibilities of Citizens	SCIT03

THIRD YEAR

First Semester		**Second Semester**	
Polymer Chemistry 3	CET3APC	Chemical Technology Practical Training	CET3BPT
Materials and Processing Science	CET3AMP	Science in Society	SCIT04
Entrepreneurial Skills	CET3AES		
Engineering Mathematics 2	MAT2AW2		
Physics 2	PHY2ZAT		
Science in Society	SCIT04		

SC.4.5	National Diploma in Biotechnology	349-1

FIRST YEAR

First Semester		Second Semester	
Biodiversity and Ecology 1	ZOO1ABD	Biochemistry 2	BIC21B1
Calculations and Statistics 1	STA1ABF	Sanitation, Safety, Hygiene 1	BTN1BSH
Chemistry 1BBF Theory	CET1AT1	Analytical Chemistry 2BBF Theory	CET1BT2
Chemistry 1BBF Practical	CET1AP1	Analytical Chemistry 2BBF Practical	CET1BP2
Microbiology 1	MCB1AM1	Microbiology 2	MCB1BM2
End-User Computing A	BEU11A1	End-User Computing B	BEU11B1
Adapting to Science in Higher Education	SCIT01	Plagiarism and Copyright	SCIT02

SECOND YEAR

First Semester		Second Semester	
Analytical Biochemistry 3	BIC2AAB	Bioprocessing 3	BTN2BBP
Disease and Immune Response 2	BTN2ADR	Food Microbiology 3	FTN3BFM
Fermentation Technology 2	BTN2AFT	Microbial Biochemistry 3	BIC2BMB
Microbiology 3	MCB2AM3	Process Tech. and Management 1	BTN2BPT
		Rights and Responsibilities of Citizens	SCIT03

THIRD YEAR

First Semester		Second Semester	
Biotechnology Practical Training	BTN3WPT	Biotechnology Practical Training	BTN3YPT
Science in Society	SCIT04	Science in Society	SCIT04

SC.4.6	National Diploma in Food Technology	348-1

FIRST YEAR

First Semester		**Second Semester**	
Calculation and Statistics	STA1ABF	Analytical Chemistry 2BBF Theory	CET1BT2
Chemistry 1BBF Theory	CET1AT1	Analytical Chemistry 2BBF Practical	CET1BP2
Chemistry 1BBF Practical	CET1AP1	Biochemistry 2	BIC21B1
Microbiology 1	MCB1AM1	Microbiology 2	MCB1BM2
End-User Computing A	BEU11A1	End-User Computing B	BEU11B1
Physics 1 (Theory)	PHY1ADT	Food Technology 1	FTN1BF1
Physics 1 (Practical)	PHY1ADP	Plagiarism and Copyright	SCIT02
Adapting to Science in Higher Education	SCIT01		

SECOND YEAR

First Semester		**Second Semester**	
Food Process Engineering 1	FTN2AE1	Food Technology Practical Training	FTN3APT
Food Biochemistry 3	FTN2ABC		
Food Technology 2	FTN2AF2		
Food Quality Assurance	FTN2AQA		
Rights and Responsibilities of Citizens	SCIT03		

THIRD YEAR

First Semester		**Second Semester**	
Food Technology Practical Training	FTN3YPT	Food Microbiology 3	FTN3BFM
Science in Society	SCIT04	Food Technology 3	FTN3BF3
		Food Production 3	FTN3BFP
		Food Process Engineering 2	FTN3BE2
		Science in Society	SCIT04

PART 5

SC.5 LEARNING OUTCOMES FOR NATIONAL DIPLOMA MODULES

SC.5.1	BIOCHEMISTRY	BIC

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.1.1 BIOCHEMISTRY LEVEL 5 (Second Year)

Module BIC21B1	Biochemistry 2
NQF-level	5
NQF credits	16
Presentation	Semester 2
Prerequisites	Chemistry 1BBF Theory (CET1AT1) and Chemistry 1BBF Practical (CET1AP1) or Chemistry 1 (CET1A1E, CET1A2E, CET1A3E)
Purpose	The module aims at introducing students to the general principles of biochemistry with emphasis on the major classes of biological molecules. Practical application is emphasised and the student must demonstrate understanding of biochemical principles by performing procedures and operating equipment in a basic biochemistry laboratory.

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

- Discuss the chemical properties of water and the ability of biological molecules to interact in an aqueous environment.
- Deliberate on the types and composition of nucleotides and their use in construction of nucleic acid polymers which can be manipulated for cloning.
- Describe the chemical structures, properties and characteristics of amino acids and amino acid stereochemistry.
- Discuss the structure and chemical nature of proteins in addition to the different levels of structural organisation in these molecules.
- Review the chemistry, structure and function of the simple sugars, storage carbohydrates and structural polysaccharides with application of the stereochemistry of carbohydrates.
- Examine the chemical structure of lipids as well as their properties, characteristics and importance in biological systems.
- Construct a coherent argumentative assay delineating enzyme catalysis, kinetics, inhibition and regulation of enzymes.
- Describe, using appropriate diagrams, the mechanism in which biological information is copied from DNA and the process by which a copy of the DNA is transferred into RNA, which will eventually serve as a template for synthesis of a specific polypeptide chain.

SC.5.1.2 BIOCHEMISTRY LEVEL 5 (Second Year)

Module BIC2AAB	Analytical Biochemistry 3
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Biochemistry 2 (BIC21B1)
Purpose	The module aims at preparing students to discuss and apply the principles, procedures and equipment used in recombinant DNA technology and to conduct experiments that aim to integrate the theory with the practical sessions in relation to the requirements of the Biotechnology programme.

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

- Accurately maintain a laboratory notebook; reproduce the framework of an experimental report, scientific paper, oral presentation and scientific poster and Identify safe practices in the Biochemistry laboratory.

- Access relevant biological web-sites to obtain a general idea of what is available with regard to the profession.
- Discuss the principles of the pH meter; biosensor; protein and DNA concentration assays and perform buffer and radioactivity calculations.
- Differentiate between different types of centrifugation, the types of gradients and centrifuges used and perform calculations concerning centrifugation.
- Differentiate and discuss between the various forms of column and planar chromatography.
- Differentiate and discuss various horizontal and vertical electrophoretic systems for separation of biological compounds.
- Discuss the techniques using electromagnetic radiation to detect biological material.
- Provide a review of the structure of antibodies and apply this knowledge to immunological techniques.
- Draw the chemical structure of RNA and DNA and illustrate an understanding of the techniques used to manipulate the molecules.
- Integrate the knowledge obtained from the other sections to establish how these techniques are used specifically is produce, purify and characterise proteins.

SC.5.1.3 BIOCHEMISTRY LEVEL 5 (Second Year)

Module BIC2BMB	Microbial Biochemistry 3
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Biochemistry 2 (BIC21B1), Analytical Chemistry 2BBF Theory (CET1BT2) and Analytical Chemistry 2BBF Practical (CET1BP2)
Purpose	The module aims at preparing students to discuss the processes by which biological molecules are broken down and re-synthesized; form a complex yet highly regulated network of interdependent enzymatic reaction that are collectively known as life and to perform the associated laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Give an overview of the field of Biochemistry showing an understanding of classification of living organisms, differences between Prokaryotes and Eukaryotes as well as Microbial Biochemistry.
- Explain the general concepts of metabolism.
- Discuss carbohydrate metabolism comprehensively.
- Fully describe oxidative processes using selective examples.
- Explain oxidative phosphorylation and the electron transport chain.
- Discuss gluconeogenesis as well as the glyoxylate and pentose phosphate pathways.
- Give an overview of photosynthesis.
- Discuss lipid metabolism.
- Elaborate comprehensively on the expression and transmission of genetic information.

SC.5.2	BIOTECHNOLOGY	BTN

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.2.1 BIOTECHNOLOGY LEVEL 5 (First Year)

Module BTN1BSH	Sanitation, Safety and Hygiene 1
NQF-level	5
NQF credits	14
Presentation	Semester 2
Purpose	The module aims at preparing students to discuss the principles of sanitation, safety and hygiene and provide students with the necessary ability to apply acquired knowledge and skills in the workplace of a biotechnologist in relation to the requirements of the Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Outline the concepts related to health and safety as well as first aid.
- Assess and describe laboratory safety and design a safe laboratory.
- Discuss the principles and practices of cleaning and sanitizing.
- Describe and motivate the key points outlined in the occupational health and safety act of 1993 regarding safety and reporting in the work place.
- Describe legislation regarding food with regards to health and also discuss food- and personal hygiene practices.
- Discuss uses of water as well as water quality management.
- Describe and explain the principles regarding waste management, biological hazards and air pollution in the workplace.
- Discuss pests in the food industry and what measures can be taken against infestation.

SC.5.2.2 BIOTECHNOLOGY LEVEL 5 (Second Year)

Module BTN2ADR	Disease and Immune Response 2
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Microbiology 1 (MCB1AM1 or MCB1AE1, MCB1AE2)
Purpose	The module aims at preparing students to discuss the standard principles of Disease and Immune Response and to provide students with the necessary knowledge and competency to conduct standard laboratory experiments in relation to the requirements of the Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe the principles and terminology associated with antigens and antibodies.
- Give an overview of the Immune response in terms of its chemical mediators, B- and T-cell biology and Immune Disorders.
- Give an overview of the Immune response in terms of Antigen-Antibody reactions.
- Briefly describe Antimicrobial Chemotherapy in general.
- Discuss the Epidemiology of infectious diseases.
- Give an overview of human diseases caused by Viruses.
- Discuss human diseases caused primarily by gram-positive and gram-negative Bacteria.
- Discuss human diseases caused by other Bacteria.
- Discuss human diseases caused by Fungus and Protozoa.

SC.5.2.3 BIOTECHNOLOGY LEVEL 5 (Second Year)

Module BTN2AFT	Fermentation Technology 2
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Microbiology 1 (MCB1AM1 or MCB1AE1, MCB1AE2)
Purpose	The module aims at preparing students to discuss the standard principles of Fermentation Technology and to provide students with the necessary knowledge and competency to conduct standard laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Describe and successfully perform the processes of sampling, screening and isolation for industrially important microbes from natural sources.
- Deliberate on the types and composition of fermentation media and inoculation media and correctly prepare fermentation and inoculation media for selected products (Wine, rice-wine, ginger-beer), produce and recover the products.
- Describe the Processes and Mechanisms of Sterilization and the Condition of Sterility and perform the practical sterilization of bulk media and gases.
- Discuss inoculum preparation and successfully prepare good quality inoculum within prescribed time constraints.
- Explain the processes of and differences between Batch, Fed-Batch, Continuous as well as Duel & Multiple fermentations and explain the differences between these processes.
- Discuss the theoretical aspects related to requirements of a Bioreactor as well as the theoretical principles related to Bioreactor designs.
- Define and explain the meaning of the terms and definitions related to bioreactor instrumentation.
- Explain the principles, procedures and equipment used in Downstream Processing and successfully recovering products from selected fermentation processes.
- Explain how the market potential and other cost factors influences fermentation economics.

SC.5.2.4 BIOTECHNOLOGY LEVEL 5 (Second Year)

Module BTN2BBP	Bioprocessing 3
NQF-level	5
NQF credits	16
Presentation	Semester 2
Prerequisites	Fermentation Technology 2 (BTN2AFT)
Purpose	The module aims at preparing students to discuss the advanced principles of bioprocessing and to provide students with the necessary knowledge and competency to conduct advanced laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Describe the production of and successfully produce and recover the following selected fermentation products: amino-acids, antibiotics, solvents, beer, vinegar, sauerkraut, pickles, olives, cheese, yoghurt and single cell proteins.
- Discuss Biotransformation and analyze the differences between Biotransformation and Bioprocessing.
- Describe the immobilization of cells and enzymes and its applications in Biotechnology and draw comparisons between immobilization systems and fermentation systems.
- Analyze and discuss the sewage purification processes and systems and the microbiology and chemistry associated with these processes.

SC.5.2.5 BIOTECHNOLOGY LEVEL 5 (Second Year)

Module BTN2BPT	Process Technology and Management 1
NQF-level	5
NQF credits	12
Presentation	Semester 2
Purpose	The module aims at preparing students to become aware of and discuss some elements of minor importance in the Biotechnology industry on an introductory level relevant to the Biotechnology programme.

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

- Discuss flow-dynamics and its applications in the Biotechnology industry.
- Explain pressure drop in pipes and through packed solids such as filters.
- Give a brief account of the friction approach to heat and mass transfer.
- Give a brief account of the application of steam in Biotechnology processes.
- Give a brief account of the application of Computers in Biotechnology.
- Discuss Quality Assurance in general.
- Analyze and discuss management in general.
- Discuss the basic of communication briefly.
- Give a brief account of cultural differences and how it may influence relationship in the work situation.

SC.5.2.6 BIOTECHNOLOGY LEVEL 6 (Third Year)

Module BTN3WPT	Biotechnology Practical Training
NQF-level	6
NQF credits	120
Presentation	Semester 1
Prerequisites	All first, second and third semester modules
Purpose	This module aims at exposing students to the suitable industry in order for them to gain supervised industrial experience and skills in the research, production and/or quality assurance fields related to the Biotechnology programme.

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

- Comply with the workplace and work integrated learning requirements of a student biotechnologist.
- Apply theoretical learning and practical skills to quality assurance and/or the laboratory within the relevant industry.
- Apply theoretical learning and practical skills to product development and/or research and development within the relevant industry.
- Apply theoretical learning and practical skills to the production environment within the relevant industry.
- Construct a written report which follows the rules and standards of academic discourse and displays evidence of the learning achieved during the work integrated learning period.
- Deliver an oral presentation that communicates the learning achieved during work integrated learning.

SC.5.2.7 BIOTECHNOLOGY LEVEL 6 (Third Year)

Module BTN3YPT	Biotechnology Practical Training
NQF-level	6
NQF credits	120
Presentation	Semester 2
Prerequisites	All first, second and third semester modules
Purpose	This module aims at exposing students to the suitable industry in order for them to gain supervised industrial experience and skills in the research, production and/or quality assurance fields related to the Biotechnology programme.

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

- Comply with the workplace and work integrated learning requirements of a student biotechnologist.
- Apply theoretical learning and practical skills to quality assurance and/or the laboratory within the relevant industry.
- Apply theoretical learning and practical skills to product development and/or research and development within the relevant industry.
- Apply theoretical learning and practical skills to the production environment within the relevant industry.
- Construct a written report which follows the rules and standards of academic discourse and displays evidence of the learning achieved during the work integrated learning period.
- Deliver an oral presentation that communicates the learning achieved during work integrated learning.

SC.5.3 CHEMICAL TECHNOLOGY CET

Theory modules: Students are expected to attend all lectures and tutorials. In accordance with the Academic Regulation 6.12 unsatisfactory attendance of lectures and tutorials will be taken into consideration when unsatisfactory progress in a student's studies is determined.

Practical modules: All practical sessions are compulsory. If no medical certificate is presented to the department within seven days of the practical session missed, all marks for that particular session will be forfeited. However, if a student misses more than two practical sessions for whatever reason, the student will be considered not to have complied with the minimum attendance requirements for the module and the entire module will have to be repeated. In modules where the practical component forms part of the module, a subminimum of 50% for the practical component is required for admission to semester examination in that module.

National Diploma: Analytical Chemistry (4 years)

Assessment
In addition to assessments done in the first semester, students will write a mid-year assessment in June. A progress mark will be calculated using the marks obtained in the mid-year assessment and all the other assessments done in the first semester. Based on this progress mark, the student's continuation of the programme will be decided on.

Entrance requirements for the mid-year assessment
To be allowed access to the mid year assessment, a student is required to obtain a minimum first semester mark of 40%.

Criteria for continuation of the programme
Students in the extended programme will be permitted to continue with their studies during the second semester of their first year of study, provided they attain a progress mark of at least 40% in their extended curriculum modules in the first semester (basic foundational provision phase).

Final Assessment
During the second semester several assessments will be done. The marks of all the assessments done during the year will be used to calculate the year mark. A student must obtain a minimum

year mark of 40% to be granted entrance to the final integrated assessment of all the modules that will be written at the end of the year.

Pass requirements

- Students in the extended programme will be permitted to continue to their second year of study provided they have passed all their modules in the first year.
- However, a student who failed only one module which is not a prerequisite for entry to any module in the second year and therefore not a critical requirement for progress, may be granted an opportunity to register and continue with his/her studies in the second year and be allowed to register for the pending first year module provided it does not clash with any other module on the time table.
- In order to be allowed to continue with their third year of studies, students must have passed all modules of the first and second year at the end of their second year.

SC.5.3.1 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1A1E	Chemistry 1A1E
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The purpose of this module is two-fold: firstly, to build foundational knowledge, understanding and practical skills of the composition of atoms and to identify and predict how different atoms will react, and to name and use symbolic representations of the compounds formed. Secondly, to develop foundational knowledge, understanding and practical skills of organic concepts, the element carbon and the various functional groups of biological importance.

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

- List the different classes of elements in the periodic table and describe how they are likely to react and give their nuclear and electronic structures.
- Predict the reactivity of elements in the periodic table based on their location and describe the compounds formed, their physical and chemical properties, bonding and names.
- Recognise organic compounds, explain the bonding on specific carbon atoms, interpret different formulas and recognise various organic functional groups.
- Demonstrate the use of organic concepts learnt to explain specific reaction mechanisms.
- Conduct experiments linked to the theory.

SC.5.3.2 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1A2E	Chemistry 1A2E
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	12
Presentation	Semester 2
Purpose	The purpose of this module is two-fold: firstly, to use the foundation knowledge, understanding and practical skills to predict how chemicals will react, represent these reactions symbolically and to use the information contained therein to perform basic chemical calculations. Secondly, to develop basic knowledge, understanding and practical skills that would include reactions and mechanisms of the hydrocarbons, alcohols, ethers, aldehyde and ketone functional groups.

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

- Balance chemical equations and perform various chemical calculations using the formulas of compounds and balanced equations.
- Differentiate between the physical and chemical reactions of the listed types of organic functional groups.
- Classify biological molecules according to the functional groups.

- Link theoretical knowledge of the functional groups to solve mechanisms and chemical reactions.
- Conduct experiments linked to the theory.

SC.5.3.3 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1A3E	Chemistry 1A3E
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The purpose of this module is two-fold: firstly, to identify different types of solutions, to identify acids and bases and redox reactions and to perform appropriate chemical calculations associated with these reactions. Secondly, to develop basic knowledge and biological application of specific functional groups that would include reactions and mechanisms of carboxylic acids and their derivatives, carbohydrates, proteins and amines.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Classify different types of solutions, explain their properties and calculate their acidity.
- Classify different types of equations and to identify reduction and oxidation.
- Differentiate between the physical and chemical reactions of the listed types of organic functional groups.
- Classify biological molecules according to the functional groups.
- Link theoretical knowledge of the functional groups to solve mechanisms and chemical reactions.
- Conduct experiments linked to the theory.

SC.5.3.4 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AY1	Analytical Chemistry 1AY1 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	12
Presentation	Semester 2
Prerequisites	CET1A1E
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and stoichiometry so as to solve analytical chemistry problems.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Use theoretical concepts to solve problems
- Process and use data to solve problems.
- Use scientific language to explain chemical principles.
- Predict the outcome of chemical reactions.

SC.5.3.5 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AY2	Analytical Chemistry 1AY2 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 2
Prerequisites	CET1A1E
Purpose	The primary purpose of this module is to develop the basic knowledge, and understanding of the techniques as well as the practical skills required for analytical chemistry.

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

- Manipulate laboratory equipment.
- Correctly understand scientific language and be able it to apply to practical situations.
- Carry out routine wet chemical analyses with the required level of accuracy and precision
- Demonstrate and implement safety in the laboratory.
- Demonstrate time management skills.

SC.5.3.6 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1CY1	Chemistry 1CY1 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	7
Presentation	Semester 2
Prerequisites	CET1A1E
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Chemistry.

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

- Use theoretical principles to explain physical phenomena.
- Use theoretical principles to predict the behaviour of chemical species.
- Use data and stoichiometry to perform calculations.

SC.5.3.7 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1CY2	Chemistry 1CY2 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	3
Presentation	Semester 2
Prerequisites	CET1A1E
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding of theoretical principles through observation of physical phenomena in the laboratory as required for further modules in Chemistry.

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

- Handle chemicals safely and correctly.
- Record observations using appropriate scientific terminology.
- Relate the observations to theoretical chemistry concepts.
- Use the observations to predict the behaviour of similar substances.

SC.5.3.8 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET2AY1	Analytical Chemistry 2AY1 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	12
Presentation	Semester 1
Prerequisites	CET1AY1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of analytical chemistry related to the use of chemical equilibria as required for further modules in Analytical Chemistry.

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

- Predict the behaviour of chemical species in equilibrium reactions.
- Apply chemical equilibria to solve problems.

SC.5.3.9 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET2AY2	Analytical Chemistry 1AY2 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 1
Prerequisites	CET1AY1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills required for wet chemical analytical techniques. Furthermore to develop the ability to report analytical data as required for further modules in Analytical Chemistry.

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

- Use volumetric glassware correctly.
- Carry out routine wet chemical analyses with the required precision and accuracy.
- Report data and results.
- Demonstrate and implement safety in the laboratory.
- Demonstrate time management.

SC.5.3.10 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET2CY1	Chemistry 2CY1 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	7
Presentation	Semester 1
Prerequisites	CET1CY1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Chemistry.

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

- Use scientific language to explain chemical principles.
- Use chemical principles and concepts to explain and predict the behaviour of chemical species.
- Apply the IUPAC rules for organic and inorganic nomenclature.

SC.5.3.11 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET2CY2	Chemistry 2CY2 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	3
Presentation	Semester 1
Prerequisites	CET1CY1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding of theoretical principles through observation of physical phenomena in the laboratory as required for further modules in Chemistry.

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

- Record observations using appropriate scientific terminology.
- Relate the observations to theoretical chemistry concepts.
- Use the observations to predict the behaviour of similar substances.

SC.5.3.12 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AA1	Analytical Chemistry 1 (Theory)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of analytical chemistry as required for further modules in Analytical Chemistry.

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

- Describe the role of analytical chemistry.
- Access, process and use data.
- Link theoretical concepts to solve problems.
- Demonstrate the use scientific language to explain principles.

SC.5.3.13 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AA2	Analytical Chemistry 1 (Practical)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of analytical chemistry as required for further modules in Analytical Chemistry.

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

- Use theoretical concepts to solve problems.
- Manipulate laboratory equipments.
- Use scientific language to explain principles.
- Demonstrate and implement safety in the laboratory.
- Demonstrate time management.

SC.5.3.14 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AC1	Chemistry 1 (Theory)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	7
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Link macroscopic and microscopic understanding.
- Access, process and use data to perform calculations.
- Analyse and solve problems.
- Use scientific language to explain principles.
- Apply the IUPAC rules for nomenclature.

SC.5.3.15 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AC2	Chemistry 1 (Practical)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	3
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Use the apparatus and chemicals when performing experiments.
- Record the observations and experiences using appropriate scientific terminology.
- Relate the observations and experiences to the theoretical chemistry concepts.
- Use the observations and experiences to predict the behaviour of similar substances.

SC.5.3.16 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AT1	Chemistry 1BBF Theory
Programme	ND Biotechnology; ND Biomedical Technology; ND Food Technology
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Biotechnology, Biomedical Technology and Food Technology.

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

- List the different classes of elements in the periodic table and describe how they are likely to react and give their nuclear and electronic structures.
- Predict the reactivity of elements in the periodic table based on their location and describe the compounds formed, their physical and chemical properties, bonding and names.
- Perform various chemical calculations using the formulas of compounds and balanced equations.
- Classify different types of solutions, explain their properties and calculate their acidity.
- Recognise organic compounds, explain the bonding on specific carbon atoms, interpret different formulas and recognise various organic functional groups.
- Differentiate between the physical and chemical reactions of various types of organic compounds.
- Classify biological molecules and explain how they react.

SC.5.3.17 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AP1	Chemistry 1BBF Practical
Programme	ND Biotechnology; ND Biomedical Technology; ND Food Technology
NQF-level	5
NQF credits	6
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of general chemistry as required for further modules in Biotechnology and Food Technology.

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

- Prepare standard solutions and dilutions as well as perform basic titrimetric analyses.
- Perform all the calculations involved in preparing and analysing solutions.
- Execute basic organic chemistry experiments.
- Execute experiments safely.

SC.5.3.18 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BA3	Analytical Chemistry 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Chemistry 1 (Theory) (CET1AC1/ CET2CY1), Chemistry 1 (Practical) (CET1AC2/CET2CY2), Analytical Chemistry 1 (Theory) (CET1AA1), Analytical Chemistry 1 (Practical) (CET1AA2), Simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1111).
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of analytical chemistry as required for further modules in Analytical Chemistry.

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

- Use statistics to evaluate analytical data.
- Use scientific language to effectively describe the concepts of gravimetry and the different volumetric methods.
- Use theoretical concepts to accurately solve problems.
- Use scientific language to effectively describe the basics of extraction and chromatography.

SC.5.3.19 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BA4	Analytical Chemistry Practical 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Simultaneous enrolment or credit for Analytical Chemistry 2 (CET1BA3) and Organic Chemistry 2 (CET1BO3)
Purpose	The primary focus of this module is to expand the student's knowledge, understanding and practical skills of analytical chemistry as required for further modules in Analytical Chemistry.

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

- Link theoretical concepts to the solving of problems.
- Manage time.
- Utilise laboratory apparatus/equipment.
- Apply laboratory safety principles during all facets of the practical.

SC.5.3.20 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BO3	Organic Chemistry 2
Programme	ND Analytical Chemistry; ND Engineering: Chemical
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Chemistry 1 (Theory) (CET1AC1), Chemistry 1 (Practical) (CET1AC2) and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1111).
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of organic chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Apply IUPAC rules for nomenclature.
- Use scientific language to explain organic concepts.
- Analyse and solve problems.

SC.5.3.21 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BP3	Physical Chemistry 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Chemistry 1 (Theory) (CET1AC1), Chemistry 1 (Practical) (CET1AC2) and simultaneous enrolment or credit for Mathematics 1 (MAT1AW1) and English Communication Skills 1 (Module 1) (CSA1111).
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of physical chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Describe and examine the relationships between chemical reactions and energy changes.
- Describe the physical properties of gases and apply in calculations.
- Describe the physical properties of liquids and apply in calculations.
- Explain the effect of concentration on the physical properties of the solution.
- Determine the rate at which reactions occur and how these rates are expressed mathematically.
- Describe the chemical equilibrium and express the equilibrium position of a reaction in quantitative terms.
- Explain the behaviour of acids and bases in terms of their structure, bonding and chemical equilibrium.
- Explain the behaviour of buffered solutions, slightly soluble salts and metal complexes in solutions.
- Describe oxidation-reduction reactions and the application of electrochemistry.

SC.5.3.22 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BT2	Analytical Chemistry 2BBF Theory
Programme	ND Biotechnology; ND Food Technology
NQF-level	5
NQF credits	10
Presentation	Semester 2
Prerequisites	Chemistry 1BBF Theory (CET1AT1) and Chemistry 1BBF Practical (CET1AP1)
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of analytical chemistry as required for further modules in Biotechnology and Food Technology.

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

- Explain and apply the fundamental theory, including the physical and chemical principles of each analytical method.
- Analyse problems in selected topics of analytical chemistry and manipulate scientific data in order to obtain analytically meaningful & correct answers.
- Interpret and use scientific language relevant to Analytical Chemistry.

SC.5.3.23 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET1BP2	Analytical Chemistry 2BBF Practical
Programme	ND Biotechnology; ND Food Technology
NQF-level	5
NQF credits	6
Presentation	Semester 2
Prerequisites	Chemistry 1BBF Theory (CET1AT1) and Chemistry 1BBF Practical (CET1AP1)
Purpose	The primary focus of this module is to expand the student's knowledge, understanding and practical skills of general chemistry as required for further modules in Biotechnology and Food Technology.

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

- Perform basic as well as more advanced titrimetric analyses, including back-titrations, precipitation and EDTA titrations, by using the correct equipment, preparation and titration techniques, including accurate weighing of chemicals and preparing of standard solutions.
- Perform all the calculations involved in preparing and analyzing solutions.
- Execute practicals safely.

SC.5.3.24 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2A13	Inorganic Chemistry 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Chemistry 1 (Theory) (CET1AC1/CET1CY1), Chemistry 1 (Practical) (CET1AC2/CET1CY2) and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1111)
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of inorganic chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Predict the type of bonding in various inorganic substances using bonding theories and describe the shapes these substances have.
- Use atomic theory to explain the trends in physical and chemical properties across the periodic table and down the groups.

- Isolate the common trends within each group and predict how they will change on moving from one group to another.
- Explain the industrial processes used to manufacture important elements/compounds for each group.

SC.5.3.25 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2A05	Organic Chemistry 3 (Theory)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Organic Chemistry 2 (CET1BO3) and Mathematics 1 (MAT1AW1/MAT1YE3) and simultaneous enrolment or credit for Physics 1 (Theory) (PHY1ABT/PHY1YT2), Physics 1 (Practical) (PHY1ABP/ PHY1YP2) and Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of organic chemistry as required for further modules in Analytical Chemistry.

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

- Demonstrate the use of spectroscopic techniques in the identification of simple organic molecules.
- Distinguish between different conformations and configurations of molecules with an emphasis on cyclic structures, and illustrate physical properties of these using computational techniques.
- Demonstrate an understanding of basic stereochemical precepts, reactions and implications.
- Demonstrate an understanding of the principles and reactions of organic molecules with particular emphasis on carbonyl compounds, aromatic and heteroaromatic compounds, and alkenes.
- Demonstrate the application of retrosynthetic analysis to some simple organic compounds.
- Be able to predict the likely outcome of selected pericyclic reactions and sigmatropic rearrangements based on FMO theory.
- Select and apply modern analysis and computational techniques to simple organic systems.
- Demonstrate an understanding of synthesis and properties of synthetic and natural polymers including DNA, proteins, and peptides.
- Demonstrate the usefulness and unusual reactivity of radicals in the synthesis of simple molecules and polymers, and contrast these with polar reactions.

SC.5.3.26 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2A06	Organic Chemistry 3 (Practical)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Analytical Chemistry Practical 2 (CET1BA4), Organic Chemistry 2 (CET1BO3) and simultaneous enrolment or credit for Organic Chemistry 3 (Theory) (CET2A05).
Purpose	The primary focus of this module is to provide a proper knowledge, understanding and practical skills of organic chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Prepare for a practical.
- Manage time.
- Apply safe laboratory practice.
- Acquire meaningful data, process, make sense of data.
- Apply good writing skills.

SC.5.3.27 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2AP5	Physical Chemistry 3
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Physical Chemistry 2 (CET1BP3), Simultaneous enrolment or credit for Physics 1 (Theory) (PHY1ABT/PHY1YT2), Physics 1 (Practical) (PHY1ABP/PHY1YP2) and Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of physical chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Define key concepts relating to: thermodynamics, phase equilibria, electrochemistry, quantum theory, spectroscopy, kinetics, the solid state, and surface chemistry.
- Explain the mathematical relationships that exist between various forms of matter and its properties with reference to: thermodynamics, phase equilibria, electrochemistry, quantum theory, spectroscopy, kinetics, the solid state and surface chemistry.
- Apply the known laws and mathematical relationships of matter and its properties with respect to: thermodynamics, phase equilibria, electrochemistry, quantum theory, spectroscopy, kinetics, the solid state and surface chemistry.
- Analyse a complex chemistry problem by discriminating between relevant and irrelevant pieces of information in order to calculate an appropriate mathematical solution.
- Assess given data or information and construct a logical and coherent argument to explain the trends contained therein.

SC.5.3.28 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2BAA	Analytical Chemistry 3 (Instrumental Techniques)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	10
Presentation	Semester 2
Prerequisites	Analytical Chemistry 2 (CET1BA3), Physics 1 (Theory) (PHY1ABT/PHY1YT2), Physics 1 (Practical) (PHY1ABP/PHY1YP2) and simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of analytical chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Apply the general theory, as well as the physical and chemical principles of each instrumental method.
- Analyse problems and manipulate scientific data in order to obtain meaningful answers.
- Interpret and use scientific language pertaining to especially instrumentation effectively.

SC.5.3.29 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2BAT	Analytical Chemistry 3 (Analytical Technology)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	10
Presentation	Semester 2
Prerequisites	Analytical Chemistry 2 (CET1BA3), Physical Chemistry 3 (CET2AP5), Physics 1 (Theory) (PHY1ABT/PHY1YT2), Physics 1 (Practical) (PHY1ABP/PHY1YP2), and simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of analytical chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Use scientific language to describe the processes occurring during the different methods of instrumental analysis.
- Explain the mechanisms by which the different instrumental components achieve the desired outcome.
- Use theoretical concepts to solve problems.
- Process analytical data in order to determine sample concentrations.

SC.5.3.30 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2BAP	Analytical Chemistry 3 (Practical)
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Analytical Chemistry Practical 2 (CET1BA4) and simultaneous enrolment or credit for Analytical Chemistry 3 (Instrumental Techniques) (CET2BAA), Analytical Chemistry 3 (Analytical Technology) (CET2BAT).
Purpose	The primary focus of this module is to provide a proper knowledge, understanding and practical skills of analytical chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Link theoretical concepts to the solving of problems.
- Manipulate scientific data in order to obtain meaningful answers.
- Use scientific language effectively in order to successfully execute the experiment and report on the results obtained.
- Utilise laboratory apparatus/equipment effectively in order to successfully execute the experiment and achieve meaningful results.
- Apply safe laboratory practices during all phases of execution of experiment.
- Manage time effectively.

SC.5.3.31 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2B15	Inorganic Chemistry 3
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Inorganic Chemistry 2 (CET2A13) and simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of inorganic chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Apply the different theories of bonding to predict, or determine the electron distribution, the stereochemistry, and the physical properties of molecules and co-ordination complexes.
- Discuss and explain the physical and chemical properties of transition metals in comparison with the metals of the main group.
- Define and explain the different methods and terminology used in the extraction of transition metals.
- Give the mineral source, the uses, the extraction process, the physical and chemical properties, the representative compounds and the toxicity of all the metals of the first transition series, the coinage metals and all the metals of group XII.
- Perform basic transition metal tests in the laboratory and use chemical equations to explain observations.

SC.5.3.32 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2BQA	Chemical Quality Assurance
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1112), Analytical Chemistry Practical 3 (CET2BAP).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of chemical quality assurance as required in Analytical Chemistry.

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

- Process data using statistics.
- Use scientific language to discuss noise in instrumental analysis.
- Apply principles to ensure quality in chemical analyses.
- Apply management principles to independent problem solving in the working environment.
- Use scientific language to discuss the principles of quality assurance and quality control.

SC.5.3.33 CHEMICAL TECHNOLOGY LEVEL 6 (Third Year)

Module CET3AES	Entrepreneurial Skills
Programme	ND Analytical Chemistry
NQF-level	6
NQF credits	5
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of entrepreneurship as required of an analytical chemist.

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

- Describe types and establishment of enterprises, define factors of production, and compare various forms of business ownership, as well as analyse economic systems and discuss the factors affecting the business environment, also using examples.
- Identify what constitutes an entrepreneur, describe the factors affecting choice of location of a business, and critically discuss generation and evaluation of ideas, as well as examine reasons for business failure and ways of achieving competitive advantage.
- Describe and compare the objectives and instruments of marketing, examine consumer issues also using examples, as well as summarize criteria for market segmentation, the steps involved in marketing research, market forecasting and marketing strategy.
- Describe and illustrate concepts and terminology of financial management, the capital requirements of an enterprise, various forms of financing and fixed vs. current assets, by making use of appropriate examples; as well as calculate and assess cash budgets and the impact of time value of money in the success of a business.
- Discuss basic tasks of general management and production management, define, list and explain human resource aspects like job analysis and specifications, recruiting techniques, selection, employment contracts, training, remuneration, labour relations, working conditions and taxation, making use of relevant examples.
- Discuss the nature as well as the guidelines for preparing a business plan and describe the basic contents and format thereof.

SC.5.3.34 CHEMICAL TECHNOLOGY LEVEL 6 (Third Year)

Module CET3AMP	Materials and Processing Science
Programme	ND Analytical Chemistry
NQF-level	6
NQF credits	15
Presentation	Semester 1
Prerequisites	Analytical Chemistry 3 (Instrumental Techniques) (CET2BAA), Analytical Chemistry 3 (Analytical Technology) (CET2BAT), Physical Chemistry 3 (CET2AP5), Organic Chemistry 3 (Theory) (CET2A05), Organic Chemistry 3 (Practical) (CET2A06) and simultaneous enrolment or credit for Polymer Chemistry (CET3APC).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of applied chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Use scientific language to effectively formulate the principles of environmental stewardship, nanomaterial science and water quality management.
- Evaluate current technologies.
- Apply principles and technologies to current world-wide chemical problems to propose solutions.
- Evaluate and compare modern water treatment technologies, emerging trends, new tools and materials, and challenges for water treatment in a South African context.
- Correctly distinguish between the physical and chemical properties that organic or inorganic nanomaterials have, based upon the data collected through the main characterisation techniques.

- Argue in a logical and coherent manner which physical and/or chemical properties that organic or inorganic nanomaterials have, could be used in industrial applications.
- Synthesise and characterise an organic or inorganic nanomaterial.

SC.5.3.35 CHEMICAL TECHNOLOGY LEVEL 6 (Third Year)

Module CET3APC	Polymer Chemistry 3
Programme	ND Analytical Chemistry
NQF-level	6
NQF credits	15
Presentation	Semester 1
Prerequisites	Organic Chemistry 3 (Theory) (CET2A05) and Organic Chemistry 3 (Practical) (CET2A06) and simultaneous enrolment or credit for Physical Chemistry 3 (CET2AP5) and Communication Skills 1 (Module 2) (CSA1112).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of polymer chemistry as required in Analytical Chemistry. It will enable the student to function independently in the workplace.

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

- Classify polymers according to a given criteria (origin, chain structure, thermal behaviour, chain configuration).
- Assess the feasibility of polymerization reactions.
- Explain and apply Flory's principle in polymerization reactions.
- Evaluate principles and limiting factors of condensation polymerisation reactions.
- Evaluate principles and limiting factors of addition polymerisation reactions.
- Synthesise co-polymers and evaluate the advantages of co-polymers compared to homopolymers.
- Describe polymerisation techniques as applied in the manufacture of specific types of polymers in industry.
- Predict the solubility of polymers using Gibbs's thermodynamic equation.
- Apply analytical techniques in order to calculate molecular mass and molecular mass distribution in polymers.
- Explain and evaluate intrinsic structural effects on polymers when subjected to thermal and mechanical stresses.
- Propose how additives improve the physical properties of polymers and how polymers are converted in plants to useful products.

SC.5.3.36 CHEMICAL TECHNOLOGY LEVEL 6 (Third Year)

Module CET3BPT	Chemical Technology Practical Training
Programme	ND Analytical Chemistry
NQF-level	6
NQF credits	60
Presentation	Semester 2
Prerequisites	All S1 to S5 modules passed
Purpose	The purpose of this module is to provide an opportunity for the application of Analytical Chemistry in an authentic, work-based context.

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

- Demonstrate a clear understanding of career prospects and the qualification(s) and skills requirements for advancement within the organisation.
- Explain the production of a product and the importance of analytical chemistry in the process. Alternatively, demonstrate a clear understanding of laboratory organisation and administration.
- Discuss the procedures for the maintenance of adequate stock levels and for the ordering of consumables.
- Demonstrate the ability to motivate for the purchase of capital equipment and obtain and critically evaluate quotations from suppliers.
- Assess and critically discuss the safety equipment and procedures in the laboratory.

- Demonstrate a clear theoretical and practical understanding of water purification for the laboratory.
- Show a clear understanding of the theoretical and practical application of titrimetric; gravimetric and instrumental techniques, as well as the relevant evaluation and statistical interpretation of results.

SC.5.4	FOOD TECHNOLOGY	FTN

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.4.1 FOOD TECHNOLOGY LEVEL 5 (First Year)

Module FTN1BF1	Food Technology 1
Programme	ND Food Technology
NQF-level	5
NQF credits	18
Presentation	Semester 2
Purpose	This module aims to introduce the student to food technology and emphasises a) the principles and application of sensory evaluation, b) properties, significance, nutritive and functional aspects of food constituents, as well as c) an introduction and detail of selected unit operations performed in the food industry.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe the principles and methods of sensory analysis, design and conduct simple sensory analysis and interpret the results obtained.
- Describe the properties, nutritive and functional aspects of food constituents including proteins, carbohydrates, fats, water, smaller constituents e.g. organic acids and enzymes, as well as vitamins and minerals.
- Discuss the following unit operations in the food industry:
  - Raw materials and the process
  - Cleaning, sorting and grading
  - Peeling
  - Size reduction and screening
  - Mixing and emulsification
  - Filtration and membrane separation
  - Centrifugation
  - Solid-liquid extraction and expression
- Conduct practical sessions and write assignments.

SC.5.4.2 FOOD TECHNOLOGY LEVEL 5 (Second Year)

Module FTN2ABC	Food Biochemistry 3
Programme	ND Food Technology
NQF-level	5
NQF credits	14
Presentation	Semester 1
Prerequisites	Biochemistry 2 (BIC21B1)
Purpose	This module aims to further develop the student's knowledge and understanding of biochemistry, with specific reference to biochemistry of food and related products. The student must demonstrate detailed understanding of proteins, carbohydrates, fats and colour in food and related products and apply this knowledge to predict and evaluate the production and quality of foods.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Classify and describe the structure and functional properties of proteins.
- Discuss the influence of protein substances such as enzymes on the quality of food products.
- Discuss protein sources, protein quality and protein requirements of man and determine the protein content of foods practically.
- Describe mono-, di- and polysaccharides with specific reference to those most important in the food industry.
- Report the morphology and composition of starch, describe in detail the technological uses of unmodified and modified starches in food applications, and determine the starch content of foods practically.
- Describe the structures, properties and industrial applications of cellulose, pectin and gums.
- Describe component fatty acids, component glycerides, phospholipids and unsaponifiables, and determine fat content of foods practically.
- Evaluate and formulate methods to prevent the process of autoxidation in foods.
- Describe processes and components that are used in the industry to modify properties of fats and oils.
- Describe the occurrence and uses of food pigments.
- Perform proximate analyses on food products to determine its composition.

SC.5.4.3 FOOD TECHNOLOGY LEVEL 5 (Second Year)

Module FTN2AE1	Food Process Engineering 1
Programme	ND Food Technology
NQF-level	5
NQF credits	18
Presentation	Semester 1
Prerequisites	Calculation and Statistics (STA1ABF/ MAT1AE1, MAT1AE2, STA1AE1)
Purpose	To introduce the students to the role of process engineering in the manufacture of foods and related products and to develop their ability to apply process engineering principles to the manufacturing steps commonly used in the manufacture of food.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Explain the role of process engineering in the manufacture of food and beverages.

- Define, convert and apply units and dimensions with emphasis on the units of measurement of energy and mass.
- Explain the concepts of material balance, construct basic material balance equations, conduct calculations and interpret the results.
- Explain the concepts of energy balance, construct basic energy balances, perform basic energy balance calculations and interpret the results.
- Describe the concepts and principles of heat transfer and heat balances, construct basic heat balances, perform basic heat balance calculations and interpret the results.
- Explain and differentiate between heat transfer processes used in the manufacture food and beverages.

SC.5.4.4 FOOD TECHNOLOGY LEVEL 5 (Second Year)

Module FTN2AF2	Food Technology 2
Programme	ND Food Technology
NQF-level	5
NQF credits	19
Presentation	Semester 1
Prerequisites	Food Technology 1 (FTN1BF1)
Purpose	This module aims to further develop knowledge in the field of food technology. Additional unit operations applicable to food manufacture as well the manufacture of food products such as sugar, chocolate, processed fruits and vegetables are covered. Packaging materials used in food packaging are introduced.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Describe, compare and evaluate the various heat processing and preservation methods.
- Describe the principles and application of evaporation in the manufacture of foods and beverages and detail evaporator design and operating principles.
- Explain the principles of dehydration and differentiate between dehydration processes used in the manufacture dried foods.
- Explain the principles of refrigeration and freezing and describe the use of freezing to produce high quality frozen foods.
- Describe and evaluate food irradiation as a method of food preservation.
- Define and explain crystallisation and the use of crystallisation in the food industry.
- Describe and evaluate extrusion as a food processing method.
- Describe the processing of fruits and vegetables.
- Explain the production of sugar, chocolate and candy.
- Produce fabricated foods.
- Evaluate and discuss the different forms and packaging materials used in food and beverage packaging.

SC.5.4.5 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN2APT	Food Technology Practical Training 1
Programme	ND Food Technology
NQF-level	6
NQF credits	120
Presentation	Semester 1 and 2
Prerequisites	Food Technology 2 (FTN2AF2) and all first, second and third semester modules.
Purpose	This module aims to develop the skills of the students with supervised practical experience in a suitable industrial setting in order to apply theoretical knowledge and gain practical experience in the research and development, production and/or quality assurance fields of food technology.

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

- Comply with the workplace and work integrated learning requirements of a student food technologist.
- Apply theoretical learning and practical skills to quality assurance and/or the laboratory within the relevant industry.
- Apply theoretical learning and practical skills to product development and/or research and development within the relevant industry.
- Apply theoretical learning and practical skills to the production environment within the relevant industry.
- Construct a written report which follows the rules and standards of academic discourse and displays evidence of the learning achieved during the work integrated learning period.
- Deliver an oral presentation that communicates the learning achieved during work integrated learning.

SC.5.4.6 FOOD TECHNOLOGY LEVEL 5 (Second Year)

Module FTN2AQA	Food Quality Assurance
Programme	ND Food Technology
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The aim of this module is to develop detailed knowledge of the elementary quality assurance principles, food safety and quality standards and to be identify, evaluate and solve problems with the within the food and related industries.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Demonstrate an understanding of the concepts and scope of quality with special reference to the food and related industries.
- Describe Total Quality Management (TQM) in terms of principles, tools, continuous improvement and benchmarking.
- Compare and contrast the quality and safety standards applicable to the South African food industry.
- Describe and apply the principles of Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP) and Pre-requisite programmes (PRP).
- Discuss hygiene and sanitation in the food industry.
- Demonstrate basic learning and apply principles of Hazard Analysis Critical Control Points (HACCP).
- Resolve problems by means of the problem solving model.

SC.5.4.7 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN3BE2	Food Process Engineering 2
Programme	ND Food Technology
NQF-level	6
NQF credits	15
Presentation	Semester 2
Prerequisites	Food Process Engineering 1 (FTN2AE1)
Purpose	To introduce the students to the role of process engineering in the safe processing of food and protection of the environment through the design of the food plant, factory systems, manufacturing processes including the use of automated processes, process control and control of the water supply and treatment.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Describe the role and principles of various stages of a manufacturing system including materials handling and storage and primary and secondary processing.
- Describe process control systems and their role in the automation, measurement, manipulation and control of the manufacturing process.
- Determine the role and importance of materials handling and classify and describe materials handling equipment.
- Determine the importance and use of principles of process engineering in the production of safe food and beverages.
- Demonstrate the importance of plant and equipment design in the manufacturing systems and the production of safe foods and beverages.
- Recognise the importance of water supply and water disposal in food/beverage processing plants.
- Explain the causes and significance of environmental pollution and describe methods which can be employed in the design of food premises and manufacturing processes to ensure environmental protection.

SC.5.4.8 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN3BFM	Food Microbiology 3
Programme	ND Food Technology, ND Biotechnology
NQF-level	6
NQF credits	16
Presentation	Semester 2
Prerequisites	Microbiology 2 (MCB1BM2/ MCB1AE1, MCB1AE2)
Purpose	This module aims to prepare the student to explain and apply the principles of food microbiology to the production of safe and wholesome foods. The student must be able to apply detailed knowledge to produce fermented foods and to implement safety programmes such as HACCP to ensure the manufacture of safe foods free of harmful microorganisms and with an adequate shelf-life.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Define food microbiology and describe microorganisms that influence microbial quality/safety or can be used in the manufacture of foods.

- Demonstrate deep learning of the influence of intrinsic (pH, a_w, nutrients, etc.) and extrinsic (temperature of storage, atmosphere of storage, etc.) parameters on microbial growth and apply this to ensure the microbial stability and safety of foods and beverages.
- Describe and manufacture fermented foods.
- Describe and predict the spoilage patterns of foods and beverages.
- Describe the various food preservation techniques such as pasteurisation, heat sterilisation, irradiation, freezing, etc. and their role in the manufacture of safe food and beverage products.
- Identify and describe food poisoning organisms, elaborate on factors that lead to food-borne illness and methods to prevent/limit the incidence of food-borne illness.
- Demonstrate learning and apply principles of Hazard Analysis Critical Control Points (HACCP), microbiological criteria and the use of microbiological analysis to monitor food quality and safety.

SC.5.4.9 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN3BFP	Food Production 3
Programme	ND Food Technology
NQF-level	6
NQF credits	15
Presentation	Semester 2
Prerequisites	Food Technology 2 (FTN2AF2)
Purpose	This module is made up of two sections, food legislation and operations management. The purpose of the legislation section is to provide the student with an overview of legislation of importance to the food industry, including the interpretation and requirements of legislation applicable to the production and labelling of food, hygiene and the safety of food processing premises. The purpose of the operations management section is to provide the student with basic knowledge and understanding of essential issues related to the principles, development and application of operation management systems for the production of services/goods in the food manufacturing environment.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

LEGISLATION SECTION:

- Explain the role that food legislation plays in the food, beverage and related industries.
- Identify, source, interpret and apply South African legislation that that regulates the formulation, manufacture, packaging, sale and distribution of food and beverage products and state the purpose and scope of each Act.
- Interpret the requirements of national legislation with regard to HACCP, hygiene and sanitation requirements and food safety and suggest systems within food premises to ensure that they comply with the requirements.
- Describe the scope, application and influence of the Codex Alimenatrius.
- Explain the importance and role of the following on the development, manufacture and labelling of foods:
  - Vegetarianism
  - Food allergies and intolerances
  - Kosher food requirements
  - Halaal food requirements

OPERATIONS MANAGEMENT SECTION:

- Interpret the function of operations in the execution of a company mission and strategy.
- Select and apply a suitable quantitative demand forecasting technique to facilitate decision-making.

- Describe the imperatives of product selection and design to meet the market demand with a competitive advantage.
- Critically analyse the contribution and importance of quality management in the management of operations.
- Recognise the appropriate process strategy for the transformation of resources into goods or services.
- Identify and describe the main considerations relevant to different types of production layout and workflow systems.
- Distinguish between the basic approaches to the management of capacity of a production system.

SC.5.4.10 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN3BF3	Food Technology 3
Programme	ND Food Technology
NQF-level	6
NQF credits	19
Presentation	Semester 2
Prerequisites	Food Technology 2 (FTN2AF2)
Purpose	This module aims to develop the student's understanding of food commodities (including meat, dairy, poultry, beverages, eggs, fats and oils) as well as the development of grades and standards, and reporting and recording.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Discuss the production of the following commodities:
  - Meat and meat products
  - Milk and milk products
  - Poultry products
  - Eggs
  - Beer
  - Fats and oils (and products made from them)
  - Cereal grains (wheat, maize, rice, barley, sorghum and breakfast cereals)
  - Bread baking
- Evaluate and describe how quality control is performed in the food industry.
- Produce the following products:
  - Hard cheese
  - Soft cheese
  - Yogurt
  - Sausages
  - Salami
  - Fermented vegetables
  - Baked products
- Develop a new food product and present it to the food industry.

SC.5.4.11 FOOD TECHNOLOGY LEVEL 6 (Third Year)

Module FTN3BPT	Food Technology Practical Training 2
Programme	ND Food Technology
NQF-level	6
NQF credits	120
Presentation	Semester 1 and 2
Prerequisites	Food Technology 2 (FTN2AF2) and all first, second and third semester modules.
Purpose	This module aims to develop the skills of the students with supervised practical experience in a suitable industrial setting in order to apply theoretical knowledge and gain practical experience in the research and development, production and/or quality assurance fields of food technology.

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

- Comply with the workplace and work integrated learning requirements of a student food technologist.
- Apply theoretical learning and practical skills to quality assurance and/or the laboratory within the relevant industry.
- Apply theoretical learning and practical skills to product development and/or research and development within the relevant industry.
- Apply theoretical learning and practical skills to the production environment within the relevant industry.
- Construct a written report which follows the rules and standards of academic discourse and displays evidence of the learning achieved during the work integrated learning period.
- Deliver an oral presentation that communicates the learning achieved during work integrated learning.

SC.5.5 MATHEMATICS MAT

Assessment Criteria
Four types of assessment may be used:

Self assessment: The learner is expected to perform self assessment by completing the assessments at the end of each study unit in the textbook.

Continuous assessment: During and/or after each study unit, the student may be assessed by means of projects, tutorials, class tests or Edulink assignments.

Formative assessment: At least TWO MAJOR ASSESSMENTS per module will be written during the semester.

Summative assessment: One (two in certain modules) examination papers will be written at the end of the semester.

Pass requirements
All assessments are ***compulsory***.
The **pass mark** for any assessment/assignment/exam is **50%**

Entrance requirements for the exam
The semester mark (SM) carries a weight of 50% towards the final module mark.
If SM < 40%, the student fails to enter the exam and will have to repeat the module.
If SM $\geq$ 40%, the student may enter the exam and must obtain a sub-minimum of 40% for the exam.
The final module mark (FM) is the average of Semester mark and Exam mark.
If 45% < FM < 49%, the student qualifies for a supplementary exam, also in cases where the student had obtained a semester mark of at least 60% but failed the exam with mark of 30% less than the semester mark.
The final result of a supplementary exam may not exceed 50% and will therefore be capped at 50%.

Please note:
Where the mode of assessment is continuous, please refer to the specific modules (i.e **WWEC121 and WWEA22C**).

SC.5.5.1 MATHEMATICS LEVEL 5 (First Year)

Module MAT1AE1	Mathematics 1AE1
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	Biotechnology and Food Technology require that students are proficient in basic calculating and data handling skills. The purpose of this module is to empower students to be able to do calculations and to manipulate data encountered in the curricula of the respective programmes and research topics, and to correctly interpret this data either verbally or in writing, in a meaningful and comprehensive way.

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

- Resolve expressions into factors, and perform the basic operations such as addition, subtraction, multiplication and division on them.
- Formulate and apply the laws of exponents and logarithms.
- Solve linear equations with one, two and three variables.

Module MAT1AE1	Mathematics 1AE1
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	50
Presentation	Semester 1
Purpose	The integral part of the National Diploma in Analytical Chemistry is to equip students with application of mathematics in the real life and work environment. The qualification is primarily vocational and on its completion the students are equipped with both the theoretical and the practical knowledge base required for the labour market in Chemical Industries such as for example MINTEK, SASOL, AECI, etc. The component demands high level of involvement, initiative and intellectual independence.

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

- Have a solid understanding of the basic algebraic concepts and vocabulary used in mathematics.
- Apply the standard operations such as addition, subtraction, multiplication and division to algebraic expressions.
- Factorize algebraic expressions.
- Apply the standard operations to algebraic fractions.
- Solve linear and quadratic algebraic equations.
- Solve simultaneous algebraic equations.
- Resolve fractions into their partial components.
- Identify, represent and solve inequalities.

SC.5.5.2 MATHEMATICS LEVEL 5 (First Year)

Module MAT1AE2	Mathematics 1AE2
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 2
Purpose	Biotechnology and Food Technology require that students are proficient in basic calculating and data handling skills. The purpose of this module is to empower students to be able to do calculations and to manipulate data encountered in the curricula of the respective programmes and research topics, and to correctly interpret this data either verbally or in writing, in a meaningful and comprehensive way.

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

- Evaluate variables in scientific formulae.
- Comprehend and evaluate the basic trigonometric ratios (such as sine, cos and tan) and their inverses of angles in any quadrant, convert angles from degrees to radian measure and distinguish between Cartesian and polar coordinates.
- Reduce non-linear data equations into linear form and use these to determine unknown variables.

SC.5.5.3 MATHEMATICS LEVEL 5 (First Year)

Module MAT1YE2	Mathematics 1YE2
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	50
Presentation	Semester 2
Prerequisites	MAT1AE1
Purpose	The integral part of the National Diploma in Analytical Chemistry is to equip students with application of mathematics in the real life and work environment. The qualification is primarily vocational and on its completion the students are equipped with both the theoretical and the practical knowledge base required for the labour market in Chemical Industries such as for example MINTEK, SASOL, AECI, etc. The component demands high level of involvement, initiative and intellectual independence.

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

- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.
- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.
- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Solve trigonometric equations and their graphs.
- Interpret the general sine equation, $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.

SC.5.5.4 MATHEMATICS LEVEL 5 (First Year)

Module MAT1YE3	Mathematics 1YE3
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	50
Presentation	Semester 3
Prerequisites	MAT1YE2
Purpose	The integral part of the National Diploma in Analytical Chemistry is to equip students with application of mathematics in the real life and work environment. The qualification is primarily vocational and on its completion the students are equipped with both the theoretical and the practical knowledge base required for the labour market in Chemical Industries such as for example MINTEK, SASOL, AECI, etc. The component demands high level of involvement, initiative and intellectual independence.

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

- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.5.5.5 MATHEMATICS LEVEL 5 (First Year)

Module MAT1AW1	Engineering Mathematics 1
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	10
Presentation	Semester 1
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics for real life and work environments.

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

- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.
- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.
- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Interpret the general sine equation, $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.
- Solve trigonometric equations and their graphs.

- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.5.5.6 MATHEMATICS LEVEL 5 (Second Year)

Module MAT2AW2	Engineering Mathematics 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	24
Presentation	Semester 2
Prerequisites	Engineering Mathematics 1 (MAT1AW1 or MAT1AE1,MAT1YE2,MAT1YE3)
Purpose	The module is designed in consultation with the Engineering Council of South Africa (ECSA). Its primary purpose is to equip students with the knowledge base, theory and methodology of mathematics and life skills such as the identification and problem solving essential for study and work in a variety of engineering contexts.

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

- Apply, integrate, evaluate, synthesize and interpret the rules of differentiation for algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, implicit and parametric functions.
- Identify different types of functions and synchronize according to prescribed differentiation procedures.
- Present answers of all differentiation procedures according to agreed format.
- Perform, synchronize and analyze various methods on higher derivatives.
- Apply, integrate, evaluate, synthesize and interpret the rules of partial differentiation involving first and second order derivatives to real world problems relating to small increments and rates of change.
- Apply, evaluate and distinguish the different integration principles and manipulation techniques.
- Formulate and evaluate a definite integral relating to areas and volumes of revolution.
- Classify and formulate a differential equation and use one of the methods to solve the differential equation.

SC.5.6	MICROBIOLOGY	MCB

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.6.1 MICROBIOLOGY LEVEL 5 (First Year)

Module MCB1AE1	Microbiology 1AE1
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF Level	5
NQF credits	15
Presentation	Semester 2
Purpose	The module aims at preparing students to discuss the basic principles of microbiology and to provide students with the necessary knowledge and competency to conduct standard laboratory experiments in relation to the requirements of the Biotechnology and Food Technology programmes.

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

- Give an overview of the history of microbiology and its development into the science it is today and discuss how microbiology is implemented in modern life.
- Differentiate between typical prokaryotic and eukaryotic cells and discuss prokaryotic cell structure and function.
- Understand and implement the preparation of specimens for microscopy and give a detailed explanation of the following techniques and successfully perform these techniques in the laboratory:
  - Microscopy
  - Media preparation
  - Inoculation and incubation
  - Slide preparation and staining
  - Clean-up
- Describe microbial nutrition and growth, selective growth and enumeration.

SC.5.6.2 MICROBIOLOGY LEVEL 5 (Second Year)

Module MCB1AE2	Microbiology 1AE2
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF Level	5
NQF credits	18
Presentation	Semester module
Prerequisites	Microbiology 1AE1 (MCB1AE1)
Purpose	The module aims at preparing students to discuss the advanced principles of microbiology and to provide students with the necessary knowledge and competency to conduct advanced laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Discuss factors that affect microbial growth.
- Describe microbial nutrition, selective growth and enumeration.
- Discuss the control of micro-organisms.
- Recognise microbial diversity and its place in the five, six and eight kingdom classification systems.
- Discuss the basic concepts around virus, bacterial, Archeael, fungal, algal and protozoan taxonomy.
- Discuss selected microbial diseases based on their epidemiology and the organisms responsible.

SC.5.6.3 MICROBIOLOGY LEVEL 5 (First Year)

Module MCB1AM1	Microbiology 1
Programme	ND Biotechnology, ND Food Technology
NQF Level	5
NQF credits	15
Presentation	Semester 1
Purpose	The module aims at preparing students to discuss the basic principles of microbiology and to provide students with the necessary knowledge and competency to conduct standard laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Give an overview of the history of microbiology and its development into the science it is today and discuss how microbiology is implemented in modern life.
- Differentiate between typical prokaryotic and eukaryotic cells and discuss prokaryotic cell structure and function.
- Understand and implement the preparation of specimens for microscopy and give a detailed explanation of the following techniques and successfully perform these techniques in the laboratory:
  - Microscopy
  - Media preparation
  - Inoculation and incubation
  - Slide preparation and staining
  - Clean-up
- Describe microbial nutrition and growth, selective growth and enumeration.
- Discuss the control of micro-organisms.
- Recognise microbial diversity and its place in the five kingdom classification system.
- Discuss stock cultures and preservation techniques for microbes.
- Describe the foundations of microbial ecology and interactions.

SC.5.6.4 MICROBIOLOGY LEVEL 5 (First Year)

Module MCB1BM2	Microbiology 2
Programme	ND Biotechnology, ND Food Technology
NQF Level	5
NQF credits	16
Presentation	Semester 2
Prerequisites	Microbiology 1 (MCB1AM1 or MCB1AE1, MCB1AE2)
Purpose	The module aims at preparing students to discuss the advanced principles of microbiology and to provide students with the necessary knowledge and competency to conduct advanced laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Explain the development of microbial taxonomy and phylogeny.
- Elaborate on microbial diversity and identification.
- Discuss factors that affect microbial growth.
- Describe Fungi and their structures.
- Elaborate on the structure, classification and properties of viruses.
- Discuss stock cultures and the preservation of micro-organisms.
- Explain microbial ecology.

SC.5.6.5 MICROBIOLOGY LEVEL 5 (Second Year)

Module MCB2AM3	Microbiology 3
Programme	ND Biotechnology
NQF Level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Microbiology 2 (MCB1BM2)
Purpose	The module aims at preparing students to discuss the applications of microbiology, provide students with the necessary knowledge and competency to conduct advanced techniques using elementary and advanced equipment in a microbiology laboratory in relation to the Biotechnology programme.

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

- Discriminate between the characteristics of the major divisions of algae, fungi and protozoa.
- Elaborate on microbial diseases.
- Discuss the control of microbial diseases.
- Integrate and conceptualised knowledge of bacterial genetics.
- Discuss the applications of genetic engineering.
- Evaluate significant bacteria and fungi for industrial uses.
- Discuss the role of micro-organisms in selected products of industrial importance.

SC.5.7 PHYSICS PHY

Assessment criteria

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%.

Continuous assessment is based on the assessment of ongoing tests.

SC.5.7.1 PHYSICS LEVEL 5 (First Year)

Module PHY1AE1	Physics 1AE1
Programme	ND Food Technology (4 years)
NQF-level	5
NQF credits	7.5
Presentation	Semester 1
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination). A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.
Purpose	To develop the necessary conceptual and mathematical competencies.

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

- Distinguish standard units and systems of units.
- Describe the SI and specify the references for the three main base quantities of length, mass and time system.
- Use common metric prefixes and non-standard metric.
- Explain the advantages of and apply dimensional analysis and unit analysis.
- Explain conversion-factor relationships and apply them in converting units within a system or from one system of units to another.
- Determine the number of significant figures in a numerical value and report the proper number of significant figures after performing simple calculations.

- Apply trigonometric functions in solving problems.
- To sketch and interpret graphs.
- Establish a problem-solving procedure and apply it to typical problems e.g. geometrical shapes.

SC.5.7.2 PHYSICS LEVEL 5 (First Year)

Module PHY1AE2	Physics 1AE2
Programme	ND Food Technology (4 years)
NQF-level	5
NQF credits	7.5
Presentation	Semester 2
Prerequisites	Physics 1AE1
Pass requirements	A minimum mark of 40% is required to gain entrance to the final assessment opportunity (examination. **The semester mark comprises 70% theory and 30% practical assessments**. A final summative mark (year mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics and a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Food Technology.

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

- Manipulate vector quantities, describe and solve problems on motion in a straight line with constant acceleration.
- Discuss and apply Newton's laws to objects moving on horizontal surfaces with and without friction.
- To analyze projectile motion in order to find position, time of flight and range.
- Define work, energy and power and solve related problems.
- To compute linear momentum and the components of momentum.
- Perform experiments in mechanics.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.3 PHYSICS LEVEL 5 (First Year)

Module PHY1AE3	Physics 1AE3
Programme	ND Food Technology (4 years)
NQF-level	5
NQF credits	7.5
Presentation	Semester 1
Prerequisites	Physics 1AE1
Pass requirements	A minimum mark of 40% is required to gain entrance to the final assessment opportunity (examination).The final assessment opportunity (examination) is based on **PHY1AE2 and PHY1AE3**. **The year mark comprises 50% theory and 50% practical assessments**. A final summative mark (year mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics and a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Food Technology.

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

- Formulate laws and explain the concepts in hydrostatics and apply these concepts to stationary fluids.
- Discuss and explain the effects of heat transfer such as expansion of solids, liquids and gasses and apply the law of conservation of energy in problem solving.
- Define the concept and formulate the laws encountered in direct current electricity and solve elementary problems.
- Explain and formulate the basic principles and laws encountered in geometrical and physical optics, draw ray diagrams and solve problems using formulae and sign convention.
- Perform experiments in optics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.4 PHYSICS LEVEL 5 (First Year)

Module PHY1YT1	Physics 1YT1 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 2
Prerequisites	PHY1AE1
Pass requirements	A minimum mark of 40% is required to gain entrance to the final assessment opportunity (examination). A final summative mark (year mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Analytical Chemistry.

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

- Manipulate vector quantities, describe and solve problems on motion in a straight line with constant acceleration.
- Discuss and apply Newton's laws to objects moving on horizontal surfaces with and without friction.
- To analyse projectile motion in order to find position, time of flight and range.
- Define work, energy and power and solve related problems.
- Explain and formulate the basic principles and laws encountered in geometrical and physical optics, draw ray diagrams and solve problems using formulae and sign convention
- Perform experiments in mechanics.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.5 PHYSICS LEVEL 5 (First Year)

Module PHY1YP1	Physics 1YP1 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 2
Prerequisites	PHY1AE1
Purpose	To develop the applied practical and laboratory skills required of the student in the Analytical Chemistry field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.6 PHYSICS LEVEL 5 (First Year)

Module PHY1YT2	Physics 1YT2 (Theory)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 1
Prerequisites	PHY1YT1
Pass requirements	A minimum mark of 40% is required to gain entrance to the final assessment opportunity (examination). A final summative mark (year mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Analytical Chemistry.

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

- Formulate laws and explain the concepts in hydrostatics and apply these concepts to stationary fluids.
- Discuss and explain the effects of heat transfer such as expansion of solids, liquids and gasses and apply the law of conservation of energy in problem solving.
- Define the concept and formulate the laws encountered in direct current electricity and solve elementary problems
- Perform experiments in optics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.7 PHYSICS LEVEL 5 (First Year)

Module PHY1YP2	Physics 1YP2 (Practical)
Programme	ND Analytical Chemistry (4 years)
NQF-level	5
NQF credits	8
Presentation	Semester 1
Prerequisites	PHY1AE1
Purpose	To develop the applied practical and laboratory skills required of the student in the Analytical Chemistry field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.8 PHYSICS LEVEL 5 (First Year)

Module PHY1ABT	Physics 1 Theory
Programme	ND Analytical Chemistry *(no new intake – phasing out)*
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for the qualification chosen.

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

- Compute scientifically and convert units in the decimal system.
- Explain the basic principles, formulae, laws and definitions for physical quantities encountered in geometrical optics, draw ray diagrams and solve problems using optical formulae in reflection and refraction on plane and spherical surfaces.
- Explain the principles related to the wave and particle properties of light and use relevant formulae to solve simple problems on analyses of spectra.
- Manipulate vectors representing vector quantities, describe and solve problems on motion in a straight line with constant acceleration, discuss and apply Newton's laws to objects moving on both frictionless and roughness, horizontal and inclined surfaces, and define work and energy and solve problems in context with topics previously covered.
- Explain the laws of pressure in fluids and use appropriate formulae to solve problems.
- Define and explain the physical quantities and units in direct current electricity and solve problems relating to various electric quantities and simple circuits, using relevant formulae.
- Discuss and explain the physical effects of heat transfer such as expansion in solids, liquids and gases and apply the law of heat conservation of heat in problem solving.
- Apply all theoretical concepts studied into practical situations relevant to the Chemistry discipline.

SC.5.7.9 PHYSICS LEVEL 5 (First Year)

Module PHY1ABP	Physics 1 Practical
Programme	ND Analytical Chemistry *(no new intake – phasing out)*
NQF Level	5
Credits	
Presentation	Semester 1
Purpose	The purpose of this course is to provide Students with practical skills to execute experiments in mechanics, heat, optics and electricity, to analyse, interpret and evaluate the collected data and present the results.

Module learning outcomes: Students should be able to:

- Execute experiments in mechanics, heat, optics and electricity.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Integrate the data obtained from the experiments with theories on mechanics, heat, optics and electricity.
- Present results obtained from the experiments.

SC.5.7.10 PHYSICS LEVEL 5 (First Year)

Module PHY1ADT	Physics 1 (Theory)
Programme	ND Food Technology
NQF-level	5
NQF credits	7.5
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics and a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed by the Food Technologist.

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

- Compute scientifically and convert units in the decimal system.
- Explain and formulate the basic principles and laws encountered in geometrical optics, draw ray diagrams and solve problems using formulae and sign convention.
- Manipulate vector quantities, describe and solve problems on motion in a straight line with constant acceleration.
- Discuss and apply Newton's laws to objects moving on horizontal surfaces with and without friction.
- Define work and energy and solve problems.
- Formulate laws and explain the concepts in hydrostatics and apply these concepts to stationary fluids.
- Discuss and explain the effects of heat transfer such as expansion of solids, liquids and gasses and apply the law of conservation of energy in problem solving.
- Define the concept and formulate the laws encountered in direct current electricity and solve elementary problems.
- Apply theoretical concepts studied into relevant practical situations pertaining to the Food Technology industry.

SC.5.7.11 PHYSICS LEVEL 5 (First Year)

Module PHY1ADP	Physics 1 (Practical)
Programme	ND Food Technology
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	To develop the applied practical and laboratory skills of the students required in the Food Technology field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.5.7.12 PHYSICS LEVEL 5 (Second Year)

Module PHY2ZAT	Physics 2
Programme	ND Analytical Chemistry
NQF-level	5
NQF credits	36
Presentation	Semester 1
Prerequisites	Physics 1 Theory (PHY1ABT) and Physics 1 Practical (PHY1ABP)
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of current and future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Analytical Chemistry.

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

- Describe the properties of electromagnetic radiation such as interference, diffraction, polarization and solve associated practical problems.
- Explain the nature and properties of nuclear radiations such as alpha, beta and gamma.
- Derive from basic principles the law of radioactive decay and apply it in solving application problems.
- Explain time-dilation, length-contraction, mass-increase and mass-energy equivalence from the special theory of relativity.
- Derive the equation of continuity, Bernoulli's equation, Poiseuille's formula, Stokes formula in fluid dynamics and apply them in solving practical problems.
- Define wave-particle duality, quantization of energy and complementary principle.
- Explain the fundamental theories of photo-electric effect, Compton-effect and Young's double slit experiment for electrons.
- Describe and identify spectral lines of the Bohr model and exhibit an understanding of the quantum mechanical picture of an atom.
- Define magnetic field, magnetic force, Hall-effect, motional emf, magnetic flux, electromagnetic induction and Lenz's law.
- Describe the motion of a particle in an electric and magnetic field.

SC.5.8 STATISTICS STA

Assessment criteria

A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.8.1 STATISTICS LEVEL 5 (Second Year)

Module STA1AE1	Statistics 1AE1
Programme	ND Biotechnology (4 years), ND Food Technology (4 years)
NQF-level	5
NQF credits	24
Presentation	Semester 1
Purpose	Biotechnology and Food Technology require that students are proficient in basic calculating and data handling skills. The purpose of this module is to empower students to be able to do calculations and to manipulate data encountered in the curricula of the respective programmes and research topics, and to correctly interpret this data either verbally or in writing, in a meaningful and comprehensive way.

- Collect, organise, summarise present and evaluate numerical data.
- Describe and perform calculations involving probabilities and probability distributions.

- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis resolve expressions into factors, and perform the basic operations such as addition, subtraction multiplication and division on them.

SC.5.8.2 STATISTICS LEVEL 5 (First Year)

Module STA1ABF	Calculations and Statistics
NQF-level	5
NQF credits	24
Presentation	Semester 1
Purpose	All courses in the Health Sciences such as Biotechnology, Biomedical Technology and Food Technology require that students are proficient in basic calculating and data handling skills. The purpose of this module is to empower students to be able to do calculations and to manipulate data encountered in the curricula of the respective programmes and research topics, and to correctly interpret this data either verbally or in writing, in a meaningful and comprehensive way.

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

STATISTICS

- Collect, organise, summarise present and evaluate numerical data.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis.

MATHEMATICS

- Resolve expressions into factors, and perform the basic operations such as addition, subtraction multiplication and division on them.
- Formulate and apply the laws of exponents and logarithms.
- Solve linear equations with one, two and three variables.
- Evaluate variables in scientific formulae.
- Comprehend and evaluate the basic trigonometric ratios (such as sine, cos en tan) and their inverses of angles in any quadrant, convert angles from degrees to radian measure and distinguish between Cartesian and polar coordinates.
- Reduce non-linear data equations into linear form and use these to determine unknown variables.

SC.5.9 ZOOLOGY ZOO

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.5.9.1 ZOOLOGY LEVEL 5 (First Year)

Module ZOO1AE1	Fundamental Bioscience 1AE1
Programme	ND Biotechnology (4 years), Food Technology (4 years)
NQF Level	5
NQF credits	14
Presentation	Semester 1
Purpose	The module aims at preparing students to discuss different types of life forms and their interactions with one another and to conduct elementary experiments to develop laboratory skills and to confirm theoretical aspects of Biodiversity and Ecology in the laboratory in relation to the requirements of the Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
Module 1
This module gives students a broad overview of fundamental bioscience. The student will be introduced to:
- The laboratory environment with special reference to laboratory safety and procedures
- Identification and use of glassware
- Handling of chemicals and apparatus

Module 2
During this module the students will be introduced to:
- Chemicals of life
- Cell variation
- Autotrophic feeding
- Microbiology and Biotechnology
- Man and Environmental Issues
- Variation of life
- Enzymes
- Energy utilization

SC.5.9.2 ZOOLOGY LEVEL 5 (First Year)

Module ZOO1AE2	Biodiversity and Ecology 1AE2
Programme	ND Biotechnology (4 years)
NQF Level	5
NQF credits	14
Presentation	Semester 2
Purpose	The module aims at preparing students to discuss different types of life forms and their interactions with one another and to conduct elementary experiments to develop laboratory skills and to confirm theoretical aspects of Biodiversity and Ecology in the laboratory in relation to the requirements of the Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Differentiate between Prokaryote and Eukaryote cells and plant and animal cells and also the structures and functions of organelles and cell membranes.
- Describe the genetic basis of life.
- Describe the diversity and classification of the animal kingdom.

SC.5.9.3 ZOOLOGY LEVEL 5 (First Year)

Module ZOO1AE3	Biodiversity and Ecology 1AE3
Programme	ND Biotechnology (4 years)
NQF Level	5
NQF credits	14
Presentation	Semester 1
Purpose	The module aims at preparing students to discuss different types of life forms and their interactions with one another and to conduct elementary experiments to develop laboratory skills and to confirm theoretical aspects of Biodiversity and Ecology in the laboratory in relation to the requirements of the Biotechnology programme.

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

- Describe the diversity and classification of plants, fungi and algae.
- Describe the characteristics, structure, and reproduction of viruses and write on overview of bacteriophage.
- Describe the kingdom Protista and its general characteristics and name some of its important

SC.5.9.4 ZOOLOGY LEVEL 5 (First Year)

Module ZOO1ABD	Biodiversity and Ecology 1
Programme	ND Biotechnology
NQF Level	5
NQF credits	14
Presentation	Semester 1
Purpose	The module aims at preparing students to discuss different types of life forms and their interactions with one another and to conduct elementary experiments to develop laboratory skills and to confirm theoretical aspects of Biodiversity and Ecology in the laboratory in relation to the requirements of the Biotechnology programme.

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

- Differentiate between Prokaryote and Eukaryote cells and plant and animal cells and also the structures and functions of organelles and cell membranes.
- Describe the genetic basis of life.
- Describe the diversity and classification of living organisms.
- Describe the characteristics, structure, and reproduction of viruses and write on overview of bacteriophage.
- Describe the kingdom Protista and its general characteristics and name some of its important examples.
- Describe the kingdom Fungi and its general characteristics and name some of its important examples.
- Describe the kingdom Animalia and its general characteristics and name some of its important examples.
- Describe the kingdom Plantae and its general characteristics and name some of its important examples.
- Map out the ecology of populations.
- Explain interactions within communities.
- Evaluate some environmental concerns.

SC.5.10	CIVICS FOR SCIENCE	SCI

The pedagogical approach employed is learning through active engagement with issues and making the students aware of their civic responsibilities as citizens in relation to Science, Technology and Society. The staff in the Faculty of Science will facilitate this module.

SC.5.10.1 CIVICS FOR SCIENCE LEVEL 5

Module SCIT01	Adapting to Science in Higher Education
NQF-level	5
Credits	3
Presentation	Semester 1
Assessment	Four workshops will be presented during First Year Orientation and attendance is compulsory. Assessment will be in the form of a Questionnaire on Edulink as well as a written assignment.
Purpose	The main purpose of this module is to engage students with the new academic environment of higher education. The transition from school to higher education is being facilitated in a formal programme as part of the orientation thereby enabling students to adapt to university.

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

- Relate to the environment in the higher education as introduced through class etiquette.
- Recognise the different study skills applicable for various disciplines in first year modules.
- Apply and recall the content and skills acquired from “The First Lecture” on the Science of HIV during the First Year Orientation programme.
- Demonstrate the cognisance of the “Introduction to laboratory skills and safety” exposure.
- Develop a sense of adapting to the university from school.

SC.5.10.2 CIVICS FOR SCIENCE LEVEL 5

Module SCIT02	Plagiarism and Copyright
NQF-level	5
Credits	1
Presentation	Semester 2
Assessment	Two workshops will be presented as part of the extended orientation and attendance is compulsory. Assessment will be in the form of an Edulink Questionnaire and/or a written assignment.
Purpose	The main purpose of this module is to expose students to the UJ values and cultural integration initiatives. The application will be found in the expressing an awareness of plagiarism and copyright.

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

- Identify and apply the UJ values in everyday practices.
- Illustrate the values and ethics in the academic environment.
- Adopt the values as an integrate element of conceptualisation of Science

SC.5.10.3 CIVICS FOR SCIENCE LEVEL 5

Module SCIT03	Rights and responsibilities of Citizens
NQF-level	6
Credits	1
Presentation	Semester 2
Assessment	One workshop will be presented and attendance is compulsory. Assessment will be in the form of an Edulink Questionnaire and/or a written assignment.
Purpose	The main purpose of this module is to expose students to the rights and responsibilities of citizens in the world. The application will be found in the expression of an awareness of rights and responsibilities in Science.

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

- Identify and value the rights of citizens in the global society and specifically in the South African environment.
- Integrate the rights towards obligations and be responsible in everyday life (in the human, social, political, legal, civic and moral arena).
- Explore contested areas surrounding rights and responsibilities, for the checks and balances needed in relation to the scientific world.

SC.5.10.4 CIVICS FOR SCIENCE LEVEL 5

Module SCIT04	Science in Society
NQF-level	7
Credits	3
Presentation	Year module
Assessment	A series of 15 public lectures (workshops) will be presented and attendance is compulsory of at least eight sessions. Assessment will be in the form of an Edulink Questionnaire and/or a written assignment.
Purpose	The main purpose of this module is to expose final year students to the application of responsibility and acquired values within the broader society.

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

- Relate to relevant and authentic topics of interest that will be provided as public lectures.
- Engage with contentious issues within the science environment.

PART 6

SC.6 BACCALAUREUS TECHNOLOGIAE PROGRAMMES

Purpose of the programme
Graduates of this programme are able to devise and apply specialized strategies and relevant management principles in quality control (QC) and research and development (R&D). They may work as supervising technicians and technologists in product and process development, and quality control. Employment may be in a laboratory, or production or sales environments.

Exit-level outcomes

Students should be able to:

- Identify a problem, formulate an appropriate hypothesis, generate experimental data, make correct interpretations and appropriate deductions.
- Work harmoniously with co-workers in the same working environment - work in groups with others in the solution of problems and the carrying out projects.
- Work independently in the mastery of module contents, the performance of practical projects and the compilation of reports.
- Find, evaluate and integrate technical literature, use appropriate and correct technical language and terminology in reports.
- Perform the practice of science and technology effectively and responsibly without endangering the environment or the well-being of co-workers.
- Use different techniques to assimilate and analyze data, by reading, discussion, reporting and presentation of projects and seminars.
- Participate responsibly in activities that impinge on societal quality of life.
- Investigate further possibilities of training and employment.
- Demonstrate the ability to relate the field of study to society and thus know where those skills are likely to be required.

SC.6.1	Baccalaureus Technologiae : Biotechnology	514-1

FIRST YEAR

Business Entrepreneurial Skills 1 (S1)	BTN1AE4
Research Methods & Techniques (S1)	BTN1AW4
Recombinant DNA Technology 4	BTN1YD4
Industrial Biotechnology 4	BTN1Y14
Plant Biotechnology 4	BTN1YP4
Microbial Biochemistry 4	BIC1YB4
Research Project 4	BTN1YR4

SC.6.2	Baccalaureus Technologiae : Food Technology	520-1

FIRST YEAR

Research Methodology: Natural Science (S1)	FTN1ARM
Food Microbial Assurance 4 (S2)	FTN1BM4
Food Production 4 (S2)	FTN1BP4
Food Technology 4 (S2)	FTN1BF4
Food Project 4	FTN1YPR

Choose one set of elective modules:

Option 1 - Food Product Development

Food Components 4 (S1)	FTN1AC4
Food Product Development 4 (S1)	FTN1AD4

OR

Option 2 - Food Production

Food Components 4 (S1)	FTN1AC4 **OR**
Food Product Development 4 (S1)	FTN1AD4
	AND
Food Process Engineering 3 (S1) *(Not currently offered)*	FTN1AE3

PART 7

SC.7 MODULE LEARNING OUTCOMES FOR BACCALAUREUS TECHNOLOGIAE (B TECH)

SC.7.1 BIOCHEMISTRY BIC

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.7.1.1 BIOCHEMISTRY LEVEL 7 (B Tech)

Module BIC1YB4	Microbial Biochemistry 4
Programme	B Tech Biotechnology
NQF Level	7
NQF credits	15
Presentation	Year module
Prerequisites	Microbial Biochemistry 3 (BIC2BMB)
Purpose	The module aims at preparing students to grasping the involved in the advanced metabolic processes concerning micro-organisms in relation to the Biotechnology programme.

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

- Construct a logical, coherent essay describing the growth and nutrition requirement of micro organisms in addition to the chemical and physical agents used to control their growth.
- Discuss the chemical work of biosynthesis, transport work and mechanical work and contrast this to the use of energy required to chemotropic micro organisms during energy metabolism making reference to amphibolic pathways.

- Construct a logical, coherent and argumentative essay describing the roles of lipids in cell structure and metabolism.
- Discuss the biosynthesis of inorganic nitrogen and compare it to the biogenesis of organic nitrogen including nitrogenous by-products from amino acid degradation.
- Review the mechanisms by which amino acids play an important role as energy metabolites; the conversion of excess dietary amino acids to common metabolic intermediates and the amino acids as metabolic fuels.
- Examine the biosynthetic pathways of nucleic acids both *de novo* and from the degredative products of nucleic acids and discuss how their regulation and the consequences of genetic defects and chemotherapeutic agents.
- Construct a coherent argumentative assay delineating enzyme catalysis, kinetics, inhibition and regulation of enzymes.
- Discuss the energy acquisition, exchange and utilization in microbes utilizing thermodynamic principles.

SC.7.2 BIOTECHNOLOGY BTN

Assessment criteria
A student requires 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 towards the result of a supplementary assessment. The final result of a supplementary assessment is capped on 50%.

SC.7.2.1 BIOTECHNOLOGY LEVEL 7

Module BTN1AE4	Business Entrepreneurial Skills 1
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	12
Presentation	Semester 1
Purpose	The module aims at introducing students to the entrepreneurial process as a first step towards successfully launching and growing his/her own venture in coherence with the requirements of the Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Discuss the key theories of entrepreneurship and the development of entrepreneurship theories.
- Identify and discuss entrepreneurial risks.
- Describe the different sources of finance and discuss the implications of selecting a specific source.
- Draw up business plans.

SC.7.2.2 BIOTECHNOLOGY LEVEL 7

Module BTN1AW4	Research Methods and Techniques
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	12
Presentation	Semester 1
Purpose	The module aims at preparing the student to conduct research by giving them the required knowledge of specific approaches and methods (qualitative and quantitative) and skills employed in applied research as is required for the B Tech Biotechnology programme.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Discuss the basic concepts of research.
- To identify and initiate an appropriate research project.
- Describe the processes of designing a research project and collecting data.

- Conduct data and statistical analysis and interpretation of results.
- Prepare a research proposal and poster, write research reports and publications, and outline the format of dissertation or thesis.
- Critically discuss ethical consideration in research, including plagiarism.

SC.7.2.3 BIOTECHNOLOGY LEVEL 7

Module BTN1Y14	Industrial Biotechnology 4
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	15
Presentation	Year module
Prerequisites	Bioprocessing 3 (BTN2BBP)
Purpose	The module aims at preparing students to critically analyze and explain advanced and sophisticated industrial biotechnology principles, procedures and equipment and the cells and enzymes used in these processes in relation to the Bachelor of Technology: Biotechnology programme.

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

- Define and explain the purpose, applications and procedures of the various immobilization techniques.
- Define industrial enzymes and deliberate on its applications, sources, production, biochemistry and genetic engineering. You should also be able to describe the recovery and immobilization of enzymes.
- Deliberate on the production and commercial applications of amino acids.
- Describe the production of baker's yeast including control of ethanol production and process control.
- Describe the production of ethanol.
- Analyze and describe production of Beer.
- Analyze Single Cell Protein production.

SC.7.2.4 BIOTECHNOLOGY LEVEL 7

Module BTN1YD4	Recombinant DNA Technology
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	15
Presentation	Year module
Purpose	The module aims at preparing students the principles, procedures and equipment used in recombinant DNA technology and to conduct experiments that aims to integrate the theory with the practicals. This course forms a major component in the B Tech syllabus which is essential in understanding the molecular mechanisms of sections covered in other modules. This relates to the requirements of the B Tech: Biotechnology programme.

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

- Discuss the various stages in meiosis and mitosis and understand the cell cycle.
- Describe the Model experimental approach that Mendel used to study patterns of inheritance.
- Describe the direct and indirect evidence to support the concept that DNA is the genetic material in prokaryotes and eukaryotes and differentiate between the various analytical techniques used in the investigation of DNA and RNA.
- Describe the process of semi-conservative DNA replication in prokaryotes, eukaryotes and some viruses.
- Describe the process of transcription and the importance of the genetic code and provide a model of the splicing mechanism involved with the removal of an intron from a pre-mRNA.
- Demonstrate translation of mRNA by dividing the metabolic process in three steps and discuss how protein structure forms the basis of biological diversity.

- Recognise and apply the various techniques used in recombinant DNA technology and describe, by means of examples, how recombinant DNA technology creates artificial combinations of DNA molecules and how these molecules aid molecular biologists.
- Discuss how tuatomeric shifts and transposable elements induce mutations and grasp the genetic mechanisms leading to common human diseases and discuss the use of DNA repair mechanisms to counteract mutations.
- Describe how bacterial conjugation assists in genetic analysis and mapping in Bacteria and Bacteriophages.
- Differentiate between the different forms of regulation of gene expression in both prokaryotes and eukaryotes.
- Illustrate how the DNA structure of eukaryotic chromosomes and discuss how the function of histones affect chromatin structure.
- Discuss how checkpoints monitor the progress of the cell through the cell cycle and discuss how mutations in the proliferation decision points lead to various forms of cancer in humans and compare this mechanism of oncogenesis to that of oncogenic viruses and chromosome translocational events.

SC.7.2.5 BIOTECHNOLOGY LEVEL 7

Module BTN1YP4	Plant Biotechnology 4
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	15
Presentation	Year module
Purpose	The module aims at preparing students to critically analyze and explain basic Plant Biotechnology principles and procedures and the use of plants as biotechnological tools and to perform the associated laboratory experiments in relation to the requirements of the Biotechnology programme.

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

- Describe plant structure, function and development.
- Discuss plant metabolism in general.
- Review the development of plant biotechnology.
- Describe laboratory organization for tissue culture laboratories.
- Discuss what plant nutrient medium should contain.
- List the types of tissue culture that can be used.
- Discuss micropropagation.
- Explain cell suspensions and secondary metabolites.
- Elaborate on the *in vitro* production of haploids.
- Describe protoplast isolation and fusion.
- Discuss germplasm storage and cryopreservation.
- Describe how transgenes are designed.
- Illustrate the location of genetic information in plant cells.
- Review different gene transfer methods.
- List different selection and marker genes.
- Outline the methodology of obtaining different characteristics in plants through genetic engineering.

SC.7.2.6 BIOTECHNOLOGY LEVEL 7

Module BTN1YR4	Research Project 4
Programme	B Tech Biotechnology
NQF-level	7
NQF credits	36
Presentation	Year module
Prerequisites	Research Methods and Techniques (BTN1AW4)
Purpose	The objective of this course is to allow the students to demonstrate competency by applying theoretical knowledge to developing an original food product, process or quality assurance/control method or strategy, or to test a research hypothesis in relation to the requirements of the B Tech: Biotechnology programme.

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

- Develop a proposal, conduct the relevant research, prepare and submit a report.

SC.7.3 FOOD TECHNOLOGY FTN

SC.7.3.1 FOOD TECHNOLOGY LEVEL 7

Module FTN1AC4	Food Components 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Semester 1
Prerequisites	Food Biochemistry 3 (FTN2ABC)
Purpose	To further develop the student's understanding and integrated knowledge of the biochemistry of food and to prepare students to apply the functional properties of food components in the formulation of food products.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Categorise and explain the forms of water in foods, and review and appraise the role that water plays in the quality of food.
- Discuss starch, modified starch and corn sweeteners; evaluate the factors that affect gelatinisation as well as the functional roles these components fulfil in foods.
- Describe and identify applications for the following structural polysaccharides: cellulose, seaweed extracts, plant exudates, seed gums, plant extracts and microbial gums.
- Evaluate proteins in general, with regards to functionality, denaturation and modification of functional properties.
- Discuss the role of wheat protein, carbohydrates, sugar and pre-harvest sprouted grain in bread-making.
- Describe and evaluate the following proteins: milk, egg, muscle, plant and single-cell proteins.
- Describe lipids with regards to modification and processing effects and evaluate the role of lipids in the following products: cooking and salad oils, salad dressings, muscle, cereals and bakery goods.
- Categorise the major classes of enzymes, including immobilised enzymes, and select and evaluate appropriate enzymes for food applications.

SC.7.3.2 FOOD TECHNOLOGY LEVEL 7

Module FTN1AD4	Food Product Development 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Semester 1
Prerequisites	Food Technology 3 (FTN3BF3)
Purpose	This module aims to give the student an overview of the food product development process to enable them to develop and introduce successful, new and innovative food products to the market.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Discuss reasons for food product development, the categories of new food products and the role of the food technologist/scientist and consumer in the development of new food products.
- Present various approaches to food product development and deliberate on the various steps and activities associated with the traditional process.
- Apply basic project management skills to the food product development process.
- Identify the role of technical development in the food product development process and initiate technical development of a new food product.
- Apply relevant methods of product screening in the food product development process.
- Propose appropriate packaging and labelling for new food products taking in to account legislation and packaging trends.
- Communicate reflectively on the role of marketing in food product development and the successful launch of new food products.
- Identify case studies to demonstrate the principles and process of food product development.
- Develop a new food product applying the principles of food product development.

SC.7.3.3 FOOD TECHNOLOGY LEVEL 7

Module FTN1ARM	Research Methodology: Natural Sciences
Programme	B Tech Food Technology
NQF-level	7
NQF credits	15
Presentation	Semester 1
Purpose	This module prepares the student to conduct research by giving them the required knowledge of research methodology including specific approaches and methods (qualitative and quantitative) and skills employed to conduct applied research which is required to successfully develop a project as per the B Tech programme requirements.
Pass requirements	The final pass mark is 50% Final Mark Compilation: • Two written class tests weighting 40% of the final mark: 40% • Group seminar and task weighting 20% of the final mark: 20% • Research proposal weighting 40% of the final mark: 40%

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

- Discuss the basic concepts of research methodology.
- Identify and initiate an appropriate research project.
- Describe the processes of designing a research project and collecting data.
- Conduct data and statistical analysis and interpretation of results.
- Prepare a research proposal and poster, write research reports and publications, and outline the format of dissertations or thesis.
- Critically discuss ethical consideration in research, including plagiarism.

SC.7.3.4 FOOD TECHNOLOGY LEVEL 7

Module FTN1BF4	Food Technology 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Semester 1
Prerequisites	Food Technology 3 (FTN3BF3)
Purpose	This module aims to prepare the student to interrogate topics that reflect changes that occur in foods during processing as well as to understand and apply the chemical, physical and engineering properties of foods and related products. The complexities of food packaging including the selection of appropriate packaging material are also covered.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Categorise, explain and appraise food chemistry and the changes that occur in foods during processing.
- Describe and evaluate the physical properties of foods important in the food processing.
- Review and appraise the engineering properties of foods with specific reference to rheology, thermal properties and mass transfer.
- Evaluate and compare different packaging materials and select appropriate packaging materials.

SC.7.3.5 FOOD TECHNOLOGY LEVEL 7

Module FTN1BM4	Food Microbial Assurance 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Semester 2
Prerequisites	Food Quality Assurance 2 (FTN2AQA) and Food Microbiology 3 (FTN3BFM)
Purpose	This module aims to further develop the student's knowledge and skills in food microbiology and food quality assurance with emphasis on food safety and the manufacture of safe foods.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

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

- Discuss the importance of food microbial assurance and the influence that management and legislation exert on the safe processing of foods and beverages.
- Describe microorganisms important in food and beverages and the factors that influence their growth and survival.
- Present programmes, practices and preservation techniques important to the safe processing of foods and beverages and communicate their role in the success of quality management systems.
- Deliberate on relevant quality management systems and apply the principles of quality management to the production of microbiologically safe foods and beverages.
- Demonstrate learning of HACCP systems by developing and implementing new HACCP systems and/or evaluating and improving existing HACCP systems.

- Describe and apply the principles of hygiene and sanitation important to the safety of food products, including the design of premises/equipment and hygiene and sanitation programmes.
- Source, communicate, develop and/or apply sampling methods, microbiological analysis methods and criteria to monitor and verify quality assurance programmes and the safety of foods and beverages.

SC.7.3.6 FOOD TECHNOLOGY LEVEL 7

Module FTN1BP4	Food Production 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Semester 2
Prerequisites	Food Production 3 (FTN3BFP)
Purpose	The purpose of this module is to further develop the student's understanding and skills of production management techniques with emphasis on how they may be applied to food production and operations management.
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination) A final mark (semester mark: final assessment mark weighted 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according the UJ and Faculty of Science regulations.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Plan and schedule production requirements effectively.
- Optimize operations economically with limited resources.
- Make effective decisions on factory location.
- Make effective decisions based on financial and investment opportunities.
- Identify and implement production controls.
- Describe and implement continuous improvement tools, methods and strategies.
- Explain, implement and manage production activities and techniques to achieve improved performance.

SC.7.3.7 FOOD TECHNOLOGY LEVEL 7

Module FTN1YPR	Food Project 4
Programme	B Tech Food Technology
NQF-level	7
NQF credits	20
Presentation	Year module
Prerequisites	Research Methodology (FTN1ARM)
Purpose	The objective of this module is to allow the students to demonstrate competency by applying theoretical knowledge to developing an original food product, process or quality assurance/control method or strategy, or to test a research hypothesis.
Pass requirements	The final pass mark is 50% A written research report: 100%

Module learning outcomes: On completion of this learning event, the student should be able to:
- Develop an original food product, process or quality assurance/control method or strategy, or test a research hypothesis.

PART 8

SC.8 MASTER'S PROGRAMMES – LEVEL 8

Purpose and characteristics of the programme

The primary purpose of the MSc or M Tech dissertation is to provide students with specialised advanced education and training while meeting the requirements of a specific research component so that students can master the required experimental and technological skills and necessary fieldwork competencies such as innovation, decision-making, strategic thinking and organisational skills. A dissertation-based Master of Science degree consists of a comprehensive study of a specialized area in the field of specialization, reported on and submitted in the form of a dissertation at the end of the programme. The degree demands a high level of intellectual and theoretical knowledge and insight into problems related to the field of study and of critical reasoning, formulation, analysis and evaluation of a specific problem in the field of study.

Exit level outcomes

Students should be able to:

- Use a range of specialized skills to identify, analyse and deal with complex problems and issues drawing systematically and creatively on the theories, research methodologies, methods/techniques, literature and materials of their discipline/field of specialisation
- Operate autonomously and take responsibility for their own work and be accountable for the work of others when working with others in a team
- Manage learning tasks autonomously and professionally and continue and sustain independent learning and academic professional development
- Demonstrate advanced information retrieval and processing skills to identify, analyse, synthesise and independently evaluate quantitative and/or qualitative data, using appropriate Information Communication Technology (ICT)
- Demonstrate a comprehensive, systematic and integrated specialist knowledge of the discipline/field with a coherent and critical understanding of the theories, research methodologies, epistemologies, and methods/techniques relevant to their science discipline/field of specialization
- Evaluate their own and others' academic work and initiatives against a range of criteria
- Present and communicate the results of research by appropriate academic/professional discourse, and produce a dissertation or research report which meets the standards of scholarly/ professional writing/presentation
- Operate in specialised science contexts and utilize ethical decision-making skills in dealing with complex ethical and professional issues and make informed judgements on such issues
- Critique and evaluate current research and participate in scholarly debates, addressing both theory and practice, in the science area of specialization
- Develop a mastery of the application of research methodologies, methods/techniques and technologies applicable to the science area of specialization
- Plan, execute and write up research, investigation or development in the science area of specialisation under some supervision

SC.8.1 MAGISTER TECHNOLOGIAE (M Tech) – Level 8

SC.8.1.1 BIOTECHNOLOGY 515-1

Admission requirements
A B Tech: Biotechnology or an equivalent qualification at an equivalent standard.

Programme structure
Nature of programme: Year programme
Minimum duration: 1 year full-time or 2 years part-time
Maximum duration: 2 years full-time or 4 years part-time

The curriculum consists of:
- A dissertation and such additional research work as may be prescribed by the Departmental Head.

BIOTECHNOLOGY DISSERTATION LEVEL 8

Module BTN0118	Dissertation Biotechnology
NQF-level	8
NQF credits	60
Presentation	Semester 1
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct research under guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

Outcomes: On completion of this learning event, the student should be able to:
- Demonstrate knowledge and understanding of the field/area of investigation.
- Apply a range of research methods and techniques appropriately and correctly to investigate, modify and improve or innovating Biotechnology processes.

Module BTN0128	Dissertation Biotechnology
NQF-level	8
NQF credits	60
Presentation	Semester 2
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct research under guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

Outcomes: On completion of this learning event, the student should be able to:
- Demonstrate knowledge and understanding of the field/area of investigation.
- Apply a range of research methods and techniques appropriately and correctly to investigate, modify and improve or innovating Biotechnology processes.

SC.8.1.2 CHEMICAL TECHNOLOGY 742-1

RESEARCH MASTER'S OF TECHNOLOGY (M Tech) CHEMISTRY

The M Tech degree is composed of a research project in a valid research area. A minimum mark of 50% for the research dissertation is taken as sufficient evidence that the candidate has demonstrated the appropriate research capability for this level.

CHEMICAL TECHNOLOGY DISSERTATION LEVEL 8

Module CET0118	Dissertation : Chemical Technology
NQF-level	8
NQF credits	60
Presentation	Semester 1
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct independent research with minimal guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

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

- Analyse and critically evaluate the literature relevant to the field/area of investigation.
- Identify and solve problems and thinking critically and creatively in designing, executing and reporting on a specialised area of Chemistry.
- Conduct research by applying appropriate research methods and techniques independently and effectively in the research process to solve complex problems.
- Collect, organise, analyse and evaluate information by data collection and its synthesising into a logical contribution to the knowledge in the particular field.
- Report findings in an appropriate format.
- Manage his/her time to achieve execution of a research plan and integrate all the conflicting information pertinent to the study.
- Communicate in an internationally acceptable style in written reports and publications.
- Contribute verbally to the knowledge and understanding in the field using science and technology.
- Collaborate effectively with specialised scientists in the particular field at a high academic level.

Module CET0128	Dissertation : Chemical Technology
NQF-level	8
NQF credits	60
Presentation	Semester 2
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct independent research with minimal guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

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

- Analyse and critically evaluate the literature relevant to the field/area of investigation.
- Identify and solve problems and thinking critically and creatively in designing, executing and reporting on a specialised area of Chemistry.
- Conduct research by applying appropriate research methods and techniques independently and effectively in the research process to solve complex problems.
- Collect, organise, analyse and evaluate information by data collection and its synthesising into a logical contribution to the knowledge in the particular field.
- Report findings in an appropriate format.
- Manage his/her time to achieve execution of a research plan and integrate all the conflicting information pertinent to the study.
- Communicate in an internationally acceptable style in written reports and publications.
- Contribute verbally to the knowledge and understanding in the field using science and technology.
- Collaborate effectively with specialised scientists in the particular field at a high academic level.

SC.8.1.3 FOOD TECHNOLOGY	521-1

Admission requirements
A B Tech: Food Technology or an equivalent qualification at an equivalent standard.

Programme structure
Nature of programme: Year programme
Minimum duration: 1 year full-time or 2 years part-time
Maximum duration: 2 years full-time or 4 years part-time

The curriculum consists of:
- A dissertation and such additional research work as may be prescribed by the Departmental Head.

FOOD TECHNOLOGY DISSERTATION LEVEL 8

Module FTN0118	Dissertation : Food Technology
NQF-level	8
NQF credits	60
Term of presentation	Semester 1
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct research under guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

Outcomes: On completion of this learning event, the student should be able to:
- Demonstrate knowledge and understanding of the field/area of investigation.
- Apply a range of research methods and techniques appropriately and correctly to investigate, modify and improve or innovate food or food processes.

FOOD TECHNOLOGY DISSERTATION LEVEL 8

Module FTN0128	Dissertation : Food Technology
NQF-level	8
NQF credits	60
Term of presentation	Semester 2
Prerequisites	B Tech (NQF 7) or RPL
Purpose	The qualifying student will be able to conduct research under guidance in a chosen field, and contribute to knowledge production in that field. The research problem, its justification, process and outcome is reported in a dissertation which complies with the generally accepted norms for research at this level.

Outcomes: On completion of this learning event, the student should be able to:
- Demonstrate knowledge and understanding of the field/area of investigation.
- Apply a range of research methods and techniques appropriately and correctly to investigate, modify and improve or innovate food or food processes.

SC.8.2 MASTER OF SCIENCE (MSc) – Level 8

MASTER'S DEGREE IN CHEMISTRY

The Master's study programme comprises a research project based on an approved topic. A dissertation, which gives evidence of the research capability of the candidate, is required.

PART 9

SC.9 PHILOSOPHIAE DOCTOR (PhD) – LEVEL 9

Purpose and characteristics of the programme

The purpose of the doctoral programme is to provide qualifying students with an in-depth understanding and integrated knowledge of advanced applicable theory in the field of specialization. A doctoral degree in science is a pure science based research study that requires candidates to demonstrate high-level research capability and make a significant and original academic contribution at the frontiers of the discipline of specialization. The degree demands a very high level of intellectual, theoretical and practical specialized science knowledge and insight into problems related to the field of study and of the application of advanced experimental methods and techniques of the modern research, as well as of fundamental scientific and academic values in generating, processing, interpreting and presenting research data orally and in written form.

Exit level outcomes

Students should be able to:

- Apply knowledge, theory and research methodologies and research methods/techniques creatively to complex practical, theoretical and epistemological problems
- Produce substantial, independent, in-depth and publishable work which is judged new and/or innovative by peers and makes a significant contribution to the area of specialisation.
- Operate independently and take full responsibility for their own work and its consequences and also assume significant accountability for the work of others
- Demonstrate intellectual independence, research leadership and management of advanced research and research development in the science area of specialisation
- Demonstrate advanced information retrieval and processing skills, using appropriate Information Communication Technology (ICT)
- Demonstrate a comprehensive, systematic and integrated grasp of the relevant specialist knowledge and expertise at the forefront of the science field and professional area of specialisation
- Demonstrate a critical understanding of the most advanced research methodologies, methods/ techniques and technologies in the discipline/field of specialisation and participate in scholarly debates at the forefront thereof
- Evaluate their own and others' work on the basis of independent criteria
- Present and communicate the results of research and opinion using the full resources of an academic/professional discourse
- Operate autonomously in science specialized, complex, unpredictable or new contexts and identify and address emerging ethical issues
- Use a wide range of complex skills in identifying, conceptualizing, designing and implementing research projects that address complex and challenging problems at the forefront of the discipline/field of specialisation
- Independently undertake a study and evaluate literature/scientific data and current research in the area of specialisation
- Produce a thesis which meets international standards of scholarly/professional writing

SC.9.1 PhD IN CHEMICAL TECHNOLOGY

The Doctorate study programme comprises a thesis which makes an original contribution to the research field approved for the study.

PART 10

SC.10 ACADEMIC SUPPORT PROGRAMMES IN THE FACULTY

FOUR-YEAR NATIONAL DIPLOMA PROGRAMMES

A four-year National Diploma programme is offered to students who do not meet the requirements for direct entry into the different diploma programmes.

Admission requirements for the various four-year national diploma programmes are listed in *Part 1* of this booklet.

The Faculty of Science offers three four-year national diploma programmes at the Doornfontein Campus:

- Analytical Chemistry
- Biotechnology
- Food Technology

The following modules are offered to complement the credit-bearing modules in the four-year national diploma programmes:

SC.10.1 SKILLS FOR SUCCESS

Module SFS1EXT	Skills for Success (S4S)
Programme	ND Analytical Chemistry, Biotechnology, Food Technology (4 years)
NQF-level	5
NQF credits	
Term of presentation	1, 2, 3 and 4
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of English language skills, basic communication skills and life skills
Pass requirements	**Year mark:** This module is tested using continuous evaluation principles. The following assessments form part of this evaluation: • Continuous Current events test (15 marks each) • Various writing assignments • Scaffolded research assessments • Orals (in class, official one at end of year) • Poster presentation • English language term tests – comprising comprehensions, language editing skills, reading skills, basic communication skills & referencing skills • Various assessments that underpin and assess the principles of reading, writing, speaking and listening. Entrance to the examination: no examination required Final mark = Year mark : all assessments (100%) Minimum pass mark = 50%; Distinction = 75%

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

- Apply all required reading/speaking/writing and listening skills as required at tertiary level;
- Learn and apply the Harvard Referencing system;
- Analyse and solve language problems and questions in preparation for other examinations for this course;
- Employ research principles for academic research assignments;
- Present topics in oral and poster presentation forms;
- Submit various assessments as per the required format, layout and presentation guidelines;
- Read up on various current events topic to stay current with world affairs and promote a further general knowledge.

PART 11

SC.11 LIST OF MODULES AND OUTCOMES PRESENTED BY THE FACULTY OF SCIENCE TO OTHER FACULTIES

SC.11.1	CHEMICAL TECHNOLOGY	CET

Theory modules: Students are expected to attend all lectures and tutorials. In accordance with the Academic Regulation 6.12, unsatisfactory attendance of lectures and tutorials will be taken into consideration when unsatisfactory progress in a student's studies is determined.

Practical modules: All practical sessions are compulsory. If no medical certificate is presented to the department within seven days of the practical session missed, all marks for that particular session will be forfeited. However, if a student misses more than two practical sessions for whatever reason, the student will be considered not to have complied with the minimum attendance requirements for the module and the entire module will have to be repeated.

SC.11.1.1 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module FWCMA14	Chemistry 1 (Theory) (Extended)
Programme	Extended ND Engineering Metallurgy
NQF-level	5
NQF credits	10
Presentation	Year
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Engineering Metallurgy.

Module learning outcomes: On completion of this learning event, the student should be able to:
Link microscopic and macroscopic understanding, Use scientific language to explain principles

- Describe fundamental ways in which matter is classified.
- Describe the electronic structure of atom.
- Describe the periodic properties of the elements.
- Describe the concepts of chemical bonding.
- Describe the shapes of simple molecules and ions.
- Describe the physical properties of liquids.
- Access and process data, analyse and solve problems, perform calculations
- Perform calculations with chemical formulas and equations.
- Perform calculations with aqueous reactions and solutions.
- Describe the physical properties of gases and apply in calculations.
- Determine the rate at which reactions occur.
- Describe the chemical equilibrium and express the equilibrium position of a reaction in quantitative terms.
- Explain the behaviour of acids and bases in terms of their structure, bonding and chemical equilibrium.
- Explain the behaviour of buffered solutions, slightly soluble salts and metal complexes in solutions.
- Describe the science and technology of extracting metals from their natural sources and preparing them for practical use.
- Name and draw chemical structure of organic compounds.

SC.11.1.2 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module FWCMB14	Chemistry 1 (Practical) (Extended)
Programme	Extended ND Engineering Metallurgy
NQF-level	5
NQF credits	3
Presentation	Year
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Engineering Metallurgy.

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

- Use the apparatus and chemicals when performing experiments.
- Record the observations and experiences using appropriate scientific terminology.
- Relate the observations and experiences to the theoretical chemistry concepts.
- Use the observations and experiences to predict the behaviour of similar substances.

SC.11.1.3 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AC1	Chemistry 1 (Theory)
Programme	ND Engineering: Chemical
NQF-level	5
NQF credits	7
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Link macroscopic and microscopic understanding.
- Access, process and use data to perform calculations.
- Analyse and solve problems.
- Use scientific language to explain principles.
- Apply the IUPAC rules for nomenclature.

SC.11.1.4 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AC2	Chemistry 1 (Practical)
Programme	ND Engineering: Chemical
NQF-level	5
NQF credits	3
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Use the apparatus and chemicals when performing experiments.
- Record the observations and experiences using appropriate scientific terminology.
- Relate the observations and experiences to the theoretical chemistry concepts.
- Use the observations and experiences to predict the behaviour of similar substances.

SC.11.1.5 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AT1	Chemistry 1BBF Theory
Programme	ND Biotechnology; ND Biomedical Technology; ND Food Technology
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Biotechnology, Biomedical Technology and Food Technology.

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

- List the different classes of elements in the periodic table and describe how they are likely to react and give their nuclear and electronic structures.
- Predict the reactivity of elements in the periodic table based on their location and describe the compounds formed, their physical and chemical properties, bonding and names.
- Perform various chemical calculations using the formulas of compounds and balanced equations.
- Classify different types of solutions, explain their properties and calculate their acidity.
- Recognise organic compounds, explain the bonding on specific carbon atoms, interpret different formulas and recognise various organic functional groups.
- Differentiate between the physical and chemical reactions of various types of organic compounds.
- Classify biological molecules and explain how they react.

SC.11.1.6 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AP1	Chemistry 1BBF Practical
Programme	ND Biotechnology; ND Biomedical Technology; ND Food Technology
NQF-level	5
NQF credits	6
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of general chemistry as required for further modules in Biotechnology and Food Technology.

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

- Prepare standard solutions and dilutions as well as perform basic titrimetric analyses.
- Perform all the calculations involved in preparing and analysing solutions.
- Execute basic organic chemistry experiments.
- Execute experiments safely.

SC.11.1.7 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1YHT	Chemistry 1CH (Theory)
Programme	M Tech Chiropractic; M Tech Homoeopathy
NQF-level	5
NQF credits	0.160
Presentation	Year module
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Chiropractic and Homoeopathy.

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

- Link microscopic and macroscopic understanding.
- Access, process and use data.
- Analyse and solve problems.
- Use scientific language to explain principles.
- Analyse and solve organic related problems.

SC.11.1.8 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1YHP	Chemistry 1CH (Practical)
Programme	M Tech Chiropractic; M Tech Homoeopathy
NQF-level	5
NQF credits	0.040
Presentation	Year module
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Chiropractic and Homoeopathy.

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

- Prepare standard solutions and dilutions as well as perform basic titrimetric analyses.
- Perform all the calculations involved in preparing and analyzing solutions.
- Execute basic organic chemistry experiments.
- Execute experiments safely.

SC.11.1.9 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AE1	Chemistry Theory & Practical
Programme	ND Environmental Health
NQF-level	5
NQF credits	0.10
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Environmental Health.

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

- Link microscopic and macroscopic understanding.
- Access, process and use data.
- Analyse and solve problems.
- Use scientific language to explain principles.
- Apply IUPAC rules for nomenclature and analyse and solve organic related problems.
- Use the apparatus and chemicals when conducting experiments.
- Use scientific language to record observations in experiments.
- Link the observations and experiences to theoretical chemistry concepts.
- Use the observations and experiences to predict the behaviour of similar substances.

SC.11.1.10 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BH1	Basic Science 1
Programme	ND Emergency Medical Care; B Tech Podiatry
NQF-level	5
NQF credits	0.100
Presentation	Semester 2
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Emergency Medical Care and Podiatry.

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

- List the different classes of elements in the periodic table and describe how they are likely to react.
- Give the physical and chemical properties of the elements and compounds and use the conventions to name inorganic compounds.
- Perform various chemical calculations using the formulas of compounds and balanced equations.
- Predict how gases behave under certain conditions.
- Classify different types of solutions, explain their properties and calculate their acidity.
- Identify the physical properties of the most common organic compounds and predict how they will react.
- Explain the different types of radiation; know their medical applications and the dangers associated with exposure to each type.

SC.11.1.11 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AMT	Metallurgical Chemistry 1 (Theory)
Programme	ND Engineering Metallurgy; ND Extraction Metallurgy
NQF-level	5
NQF credits	10
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of chemical principles and techniques of general chemistry as required for further modules in Engineering Metallurgy and Extraction Metallurgy.

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

- Describe fundamental ways in which matter is classified.
- Describe the electronic structure of atom.
- Describe the periodic properties of the elements.
- Describe the concepts of chemical bonding.
- Describe the physical properties of liquids.
- Perform calculations with chemical formulas and equations.
- Perform calculations with aqueous reactions and solutions.
- Describe the physical properties of gases and apply in calculations.
- Determine the rate at which reactions occur.
- Describe the chemical equilibrium and express the equilibrium position of a reaction in quantitative terms.
- Explain the behaviour of acids and bases in terms of their structure, bonding and chemical equilibrium.
- Explain the behaviour of buffered solutions, slightly soluble salts and metal complexes in solutions.
- Describe the science and technology of extracting metals from their natural sources and preparing them for practical use.
- Name and draw chemical structure of organic compounds.

SC.11.1.12 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AMP	Metallurgical Chemistry 1 (Practical)
Programme	ND Engineering Metallurgy; ND Extraction Metallurgy
NQF-level	5
NQF credits	3
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop the basic knowledge, understanding and practical skills of chemical principles and techniques of general chemistry as required for further modules in Engineering Metallurgy and Extraction Metallurgy.

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

- Use the apparatus and chemicals when performing experiments.
- Record the observations and experiences using appropriate scientific terminology.
- Relate the observations and experiences to the theoretical chemistry concepts.
- Use the observations and experiences to predict the behaviour of similar substances.

SC.11.1.13 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1AM2	Metallurgical Chemistry 2
Programme	ND Engineering Metallurgy; ND Extraction Metallurgy
NQF-level	5
NQF credits	0.083
Presentation	Semester 2
Prerequisites	Metallurgical Chemistry 1 (Theory) (CET1AMT) and Metallurgical Chemistry 1 (Practical) (CET1AMP) or Chemistry 1 (Theory) Extended (FWCMA14) and Chemistry 1 (Practical) Extended (FWCMB14)
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of physical chemistry as required for further modules in Extraction Metallurgy and Engineering Metallurgy.

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

- Briefly explain what is meant by a colloid, classify them according to their properties as well as discuss their preparation and removal from mixtures.
- Explain the meaning of the rate of a chemical reaction, use Boltzman distribution to predict and explain the effect of temperature on the rate of a chemical reaction, use appropriate equations to discuss the mechanisms of single- and multi-step reaction and discuss catalytic action.
- Calculate equilibrium constants and use them properly in relevant calculations and predict the effect of changes in one or more system parameters on the equilibrium.
- Define molar conductance, compare the conductance ratio of a strong electrolyte with that of a weak electrolyte, derive Ostwald's dilution law, calculate the pH of ionic solutions and buffer solutions and describe the preparation of buffer solutions.
- Discuss the preparation of electrochemical cells, calculate cell potentials from relevant electrode information and use the Nernst equation in calculations.
- State Faraday's Law and apply it in relevant calculations as well as the theory of electrolysis in the separation of metals from aqueous solutions.
- Derive the distribution law and solve problems on extraction by the use of the distribution law.

SC.11.1.14 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BCE	Chemistry Practical 2
Programme	ND Engineering: Chemical
NQF-level	5
NQF credits	0.083
Presentation	Semester 2
Prerequisites	Simultaneous enrolment or credit for Inorganic Chemistry 2 (CET2A13) Organic Chemistry 2 (CET1B03) and Physical Chemistry 2(CET1BP3).
Purpose	The primary focus of this module is to expand the student's knowledge, understanding and practical skills of inorganic chemistry, organic chemistry and physical chemistry as required for further modules in Chemical Engineering.

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

- Identify the physical and chemical properties of various organic and inorganic substances.
- Prepare organic and inorganic compounds using specified techniques.
- Use laboratory equipment successfully.
- Calculate physical constants for various solutions.
- Execute practicals safely.

SC.11.1.15 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BO3	Organic Chemistry 2
Programme	ND Engineering: Chemical
NQF-level	5
Credits	0.100
Presentation	Semester 2
Prerequisites	Chemistry 1 (Theory) (CET1AC1), Chemistry 1 (Practical) (CET1AC2), and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1111)
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of organic chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Apply IUPAC rules for nomenclature.
- Use scientific language to explain organic concepts.
- Analyse and solve problems.

SC.11.1.16 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module CET1BP3	Physical Chemistry 2
Programme	ND Engineering: Chemical
NQF-level	5
NQF credits	15
Presentation	Semester 2
Prerequisites	Chemistry 1 (Theory) (CET1AC1), Chemistry 1 (Practical) (CET1AC2), and simultaneous enrolment or credit for Mathematics 1 (MAT1AW1) and English Communication Skills 1 (Module 1) (CSA1111).
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of physical chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Describe and examine the relationships between chemical reactions and energy changes.
- Describe the physical properties of gases and apply in calculations.
- Describe the physical properties of liquids and apply in calculations.
- Explain the effect of concentration on the physical properties of the solution.
- Determine the rate at which reactions occur and how these rates are expressed mathematically.
- Describe the chemical equilibrium and express the equilibrium position of a reaction in quantitative terms.
- Explain the behaviour of acids and bases in terms of their structure, bonding and chemical equilibrium.
- Explain the behaviour of buffered solutions, slightly soluble salts and metal complexes in solutions.
- Describe oxidation-reduction reactions and the application of electrochemistry.

SC.11.1.17 CHEMICAL TECHNOLOGY LEVEL 5 (Second Year)

Module CET2A13	Inorganic Chemistry 2
Programme	ND Engineering: Chemical
NQF-level	5
NQF credits	15
Presentation	Semester 1
Prerequisites	Chemistry 1 (Theory) (CET1AC1), Chemistry 1 (Practical) (CET1AC2), and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1111)
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of inorganic chemistry as required for further modules in Analytical Chemistry and Chemical Engineering.

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

- Predict the type of bonding in various inorganic substances using bonding theories and describe the shapes these substances have.
- Use atomic theory to explain the trends in physical and chemical properties across the periodic table and down the groups.
- Isolate the common trends within each group and predict how they will change on moving from one group to another.
- Explain the industrial processes used to manufacture important elements/compounds for each group.

SC.11.1.18 CHEMICAL TECHNOLOGY LEVEL 5 (First Year)

Module SCI101	Science 1
Programme	ND Somatology
NQF-level	5
NQF credits	0.100
Presentation	Year module
Purpose	The primary purpose of this module is to develop the basic knowledge and understanding of principles and techniques of science as required for further modules in Somatology.

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

- Discuss the classification, properties and structure of matter, explain atomic structure, the periodic table, chemical bonding, and describe selected compounds and chemical reactions.
- Describe the properties and composition of water, solutions, colloids and emulsions, as well as explain the concepts involved in oxidation-reduction and acid-base reactions.
- Describe the basics of organic chemistry with particular reference to naming selected hydrocarbons and functional groups, including giving selected examples; relate these to applications in carbohydrates, soaps, waxes and colourants.
- Describe the extraction and source of perfumes and deodorants and combine all the concepts learnt in discussing the particular chemistry of hair and skin.
- Demonstrate a basic knowledge of the decimal system and scientific notation as well as convert metric units into S.I. units, including fractions and multiples thereof.
- Differentiate between mass and weight, as well as define and explain concepts of density, pressure, heat and temperature, particularly relevant to Somatology applications.
- Describe light and vision and explain how this affects images in mirrors and through magnifying glasses.
- Interpret and apply significant digits, round-off data to the same accuracy as the measurements given, use the specific notation, manipulate S.I. units and formulae when needed.
- Eliminate the misunderstanding between mass and weight and know the relationship between the two.
- Explain heat capacity, latent heat, linear-, area-, volume-expansivities, correct description of phase changes is explained and discuss the terms conduction, convection and radiation.
- Define the terms density, relative density and pressure. Use RD bottles to do calculations.
- Explain the reflection characteristics of curved mirrors draw ray diagrams of image formation by curved mirrors and draw ray diagrams to scale to determine the position, magnification and properties of images.

SC.11.2	GEOLOGY	GLG

SC.11.2.1 GEOLOGY LEVEL 5 (Second Year)

Module GEO1111	Geology 1
Programme	ND Extraction Metallurgy
NQF-level	5
NQF credits	10
Presentation	Semester 1
Purpose	To provide learners with an overview of the different processes responsible for the formation of ore deposits, and their resultant classification. This is followed by a treatment of the chief occurrences in South Africa of the main deposits of precious metals, base metals, industrial minerals and coal. It provides an understanding of the minerals and rocks that make up the ores and host these mineral deposits, with emphasis on the practical identification of minerals.
Pass requirements	Semester mark derived from a combination of theory and practical tests; Weighting 50% practical, 50% Theory. No subminimum required from either *for entry to the final assessment*. Semester mark makes up 40% of final mark. Final exam. Theory only, no practical component.

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

- Demonstrate an understanding of concepts and principles in the classification and naming of minerals.
- Identify the common ore minerals and rock-forming minerals.
- Demonstrate an understanding of the concepts and principles of the mode of formation of mineral deposits
- Demonstrate an understanding of mode of formation, characteristics and minerals of some South African deposits

SC.11.2.2 GEOLOGY LEVEL 5 (First Year)

Module MET111	Metallurgy 1 (Geology is one module of 3 which make up this subject)
Programme	ND Engineering Metallurgy, ND Extraction Metallurgy
NQF-level	5
NQF credits	10
Term of presentation	Semester 1
Purpose	To provide the students with sufficient introductory geology in the fields of mineralogy, igneous rocks, sedimentary rocks and metamorphic rocks, in order to prepare them for the ensuing modules in Geology in later years

Module learning outcomes:*(For Geology component only)* On completion of this learning event, the student should be able to:

- Demonstrate an understanding of the concept and classification of minerals.
- Demonstrate an understanding of the origin, classification and characteristics of igneous rocks.
- Demonstrate an understanding of the origin, classification and characteristics of sedimentary rocks.
- Demonstrate an understanding of the origin, classification and characteristics of metamorphic rocks.

SC.11.2.3 GEOLOGY LEVEL 5 (Second Year)

Module MGG21-2	Metallurgical Geology 2
Programme	ND Extraction Metallurgy
NQF-level	5
NQF credits	10 (0.083)
Presentation	Semester 2
Prerequisites	Metallurgy 1 (MET111) and Geology 1 (GEO111)
Purpose	To develop a knowledge of rocks and silicate mineral identification using the polarising microscope and practical hand specimens.
Pass requirements	Semester mark derived from a combination of theory and practical tests; Weighting 50% theory 50% practical. No subminimum required from either *for entry to the final assessment*. Semester mark makes up 40% of final mark. Final exam - 50% theory, 50% practical.

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

- Understand the basics of how crystals form and are classified
- Understand light waves, RI, single and double refraction, and polarisation effects.
- Understand and know how to measure colour, cleavage, pleochroism, relief, alteration, twinning, birefringence, and extinction in minerals.
- Identify common rock-forming minerals with a petrographic microscope using the optical properties of the minerals
- Recognise textures and minerals in igneous, sedimentary and metamorphic rocks and use these to name the particular rock
- Recognise common rocks in hand specimen

SC.11.2.4 GEOLOGY LEVEL 7

Module MGG32-2	Metallurgical Geology 3
Programme	B Tech Extraction Metallurgy
NQF-level	7
NQF credits	12 (0.1)
Presentation	Semester 1
Prerequisites	Pass in Metallurgy 1 (MET111), Geology 1 (GEO111) and Metallurgical Geology 2 (MGG21-2). An average overall mark in the diploma of 60%
Purpose	To develop a knowledge of methods of mineral separation, identification of ores and their associations with gangue minerals using the polarising reflecting microscope, and a knowledge of process mineralogy.
Pass requirements	Semester mark derived from combination of theory and practical tests and practical assignments. Weighting: 75% practical 25% theory. Semester mark makes up 40% of final mark. No subminimum *for entry to the final assessment*. Final exam - 60% practical, 40% theory.

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

- Understand the function of a mineralogist in industry.
- Understand and demonstrate the various laboratory methods of mineral separation.
- Use the stereomicroscope to identify common ore minerals and their intergrowths and textures.
- Demonstrate a familiarity with South African case studies where applied mineralogy has been utilized in ore beneficiation.
- Demonstrate an understanding of modern mineralogical methods and techniques.

SC.11.2.5 GEOLOGY LEVEL 7 (Second year)

Module GLG3AMM	Metallurgical Geology 3
Programme	B Tech Extraction Metallurgy
NQF-level	7
NQF credits	12 (0.1)
Presentation	Semester 1
Prerequisites	Pass Metallurgical Geology 2 (MGG21-2). An average overall mark in the diploma of 60%
Purpose	The purpose of this course is to provide the student with an understanding of the geology of various mineral deposits in South Africa, and how they are formed. It also provides an understanding of the minerals and rocks that make up and host these mineral deposits, with emphasis on their practical identification. A further module on Engineering Geology provides an understanding of rock mass strengths and how the geology of an area influences the siting of excavations.
Pass requirements	Semester mark derived from a combination of theory and practical tests; No subminimum required from either *for entry to the final assessment*. Semester mark makes up 40% of final mark. Exam mark makes up 60% of final mark. No practical assessment in exam.

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

- Demonstrate an understanding of concepts and principles in the classification and naming of minerals.
- Identify and classify the common rock-forming minerals and ore minerals. Identify and classify common igneous, sedimentary and metamorphic rocks.
- Demonstrate an understanding of the concepts and principles of the mode of formation of mineral deposits
- Demonstrate an understanding of the mode of formation and characteristics of important South African ore deposits.
- Demonstrate an understanding of the concepts and principles in describing the strength of rocks and rock masses.
- Demonstrate an understanding of the concepts and principles of ground water in rocks
- Demonstrate an understanding of how geology and rock-mass properties influence the siting of excavations.

SC.11.3 MATHEMATICS MAT

Assessment Criteria
Four types of assessment may be used:

Self assessment: The learner is expected to perform self assessment by completing the assessments at the end of each study unit in the textbook.

Continuous assessment: During and/or after each study unit, the student may be assessed by means of projects, tutorials, class tests or Edulink assignments.

Formative assessment: At least TWO MAJOR ASSESSMENTS per module will be written during the semester.

Summative assessment: One (two in certain modules) examination papers will be written at the end of the semester.

Pass requirements
All assessments are **compulsory**.
The **pass mark** for any assessment/assignment/exam is **50%**

Entrance requirements for the exam
The semester mark (SM) carries a weight of 50% towards the final module mark.

If SM < 40%, the student fails to enter the exam and will have to repeat the module.

If SM $\geq$ 40%, the student may enter the exam and must obtain a sub-minimum of 40% for the exam.
The final module mark (FM) is the average of Semester mark and Exam mark.
If 45% < FM < 49%, the student qualifies for a supplementary exam, also in cases where the student had obtained a semester mark of at least 60% but failed the exam with mark of 30% less than the semester mark.
The final result of a supplementary exam may not exceed 50% and will therefore be capped at 50%.

Please note:
Where the mode of assessment is continuous, please refer to the specific modules (i.e. **WWEC121** and **WWEA22C**).

SC.11.3.1 MATHEMATICS LEVEL 5 (First Year)

Module FWWE112	Mathematics 1 Extended
Programme	ND Engineering Metallurgy
NQF-level	5
NQF credits	10
Presentation	Year module
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics for real life and work environments.

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

- Basic algebraic operations with expressions and fractions including factorisation, solution of simple equations, resolving expressions into partial fractions and solving inequalities.
- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.
- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.
- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Interpret the general sine equation, $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.
- Solve trigonometric equations and their graphs.
- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.11.3.2 MATHEMATICS LEVEL 5 (First Year)

Module FABS1PA	Applied Building Science 1A Extended
Programme	ND Applied Building Science
NQF-level	5
NQF credits	10
Presentation	Year module
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics for real life and work environments.

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

- Basic algebraic operations with expressions and fractions including factorisation, solution of simple equations, resolving expressions into partial fractions and solving inequalities.
- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.
- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.
- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Interpret the general sine equation, $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.
- Solve trigonometric equations and their graphs.
- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.11.3.3 MATHEMATICS LEVEL 5 (First Year)

Module MAT1AW1	Engineering Mathematics 1
Programme	ND Electrical Engineering; Comp. Systems Engineering, Mechanical Engineering, Chemical Engineering, Mine Surveying, Engineering Metallurgy, Extraction Metallurgy; Mining Engineering, Industrial Engineering
NQF-level	5
NQF credits	10
Presentation	Semester 1
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics in Electrical Engineering and Mechanical Engineering real life and work environments.

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

- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.

- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.
- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Interpret the general sine equation, $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.
- Solve trigonometric equations and their graphs.
- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.11.3.4 MATHEMATICS LEVEL 5 (First Year)

Module WWEC121	Mathematics 1
Programme	ND Civil Engineering
NQF-level	5
NQF credits	10
Presentation	Semester 1
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics in Engineering real life and work environments.
Assessment Criteria	Assessment is continuous. **Formative Assessment**: Students are assessed continuously throughout the whole semester in the form of tutorials tasks/assessments, written tests, past examinations papers, self-assessment by completing the activities/ exercises in the study material. **Summative Assessment**: **4 Evaluations (which are compulsory**) will be written.
Pass requirements	Students must obtain 50% to pass a test and an average of 60% for all the tests to pass the module. If a student fail a evaluation (< 50%) or has an average between 40% and 59%, the student must write the final evaluation (exam). The final evaluation (exam) will be on all the work, the student must obtain 50% in this exam to pass the module. A student with an average evaluation mark less than 40% fails the module and will not be allowed to write the final evaluation (exam).

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

- Raise a binomial to any rational power using the binomial theorem and find any specified term in the binomial expansion.
- Comprehend the algebraic function concept and its inverse fully, and apply it in examples.
- Draw and interpret graphs of the conics on sets of axes.
- Solve simultaneous algebraic equations.

- Evaluate, manipulate, draw and simplify problems relating to exponents and logarithms and solve these equations.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Interpret the general sine equation $y = \sin(2\pi ft \pm \alpha)$ in terms of frequency; period and phase angles and make sketch graphs of these.
- Solve trigonometric equations and their graphs.
- Introduce and explain the complex number system and represent a complex numbers in various forms, perform algebraic operations with complex numbers in rectangular, polar or exponential form and solve problems involving solutions to complex numbers.
- Use special rules to find the derivative and determine the derivatives of different algebraic functions including transcendental functions such as exponential, logarithmic and trigonometric functions and extend these rules to higher derivatives.
- Explain and use applications of differentiation to determine the maximum and minimum turning points and the point of inflection for graphs and its application to tangents of curves and practical problems.
- Apply the principles of differentiation to solve minimum and maximum problems.
- Perform integration of all algebraic and transcendental functions involving definite and indefinite integrals by using the basic power rule, the general power rule and the quotient rule.
- Integrate rational functions and extend the definite integral to application on calculations of areas for specific graphs and do practical problems.

SC.11.3.5 MATHEMATICS LEVEL 5 (Second Year)

Module MAT2AE2	Mathematics 2
Programme	ND Chemical Engineering; ND Extraction Metallurgy; ND Engineering Metallurgy
NQF-level	5
NQF credits	24
Presentation	Semester 2
Prerequisites	Mathematics 1 (MAT1AW1) or equivalent
Purpose	The module is designed in consultation with The Engineering Council of South Africa (ECSA) and recognised and accredited as such in order for the exit students to acquire a licence to practice their professions. The purpose of the module is to equip students with the basic mathematical content and skills essential for their work and study in their different fields of specialisation.

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

- Apply, integrate, evaluate, synthesize and interpret the rules of differentiation for algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, implicit and parametric functions.
- Present answers of all differentiation procedures according to agreed format.
- Perform, synchronize and analyze various methods on higher derivatives.
- Apply, integrate, evaluate, synthesize and interpret the rules of partial differentiation involving first and second order derivatives to real world problems relating to small increments and rates of change.
- Apply, evaluate and distinguish the different integration principles and manipulation techniques.
- Formulate, interpret and evaluate a definite integral relating to areas and volumes of revolution.

SC.11.3.6 MATHEMATICS LEVEL 5 (Second Year)

Module MAT2AW2	Engineering Mathematics 2
Programme	ND Electrical Engineering, Comp. Systems Engineering, Mechanical Engineering, Mine Surveying, Mining Engineering, Industrial Engineering, Analytical Chemistry
NQF-level	5
NQF credits	24
Presentation	Semester 2
Prerequisites	Engineering Mathematics 1 (MAT1AW1)
Purpose	The module is designed in consultation with the Engineering Council of South Africa (ECSA). Its primary purpose is to equip students with the knowledge base, theory and methodology of mathematics and life skills such as the identification and problem solving essential for study and work in a variety of engineering contexts.

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

- Apply, integrate, evaluate, synthesize and interpret the rules of differentiation for algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, implicit and parametric functions.
- Identify different types of functions and synchronize according to prescribed differentiation procedures.
- Present answers of all differentiation procedures according to agreed format.
- Perform, synchronize and analyze various methods on higher derivatives.
- Apply, integrate, evaluate, synthesize and interpret the rules of partial differentiation involving first and second order derivatives to real world problems relating to small increments and rates of change.
- Apply, evaluate and distinguish the different integration principles and manipulation techniques.
- Formulate and evaluate a definite integral relating to areas and volumes of revolution.
- Classify and formulate a differential equation and use one of the methods to solve the differential equation.

SC.11.3.7 MATHEMATICS LEVEL 5 (Second Year)

Module WWEA22C	Mathematics 2A
Programme	ND Civil Engineering
NQF-level	5
NQF credits	24
Presentation	Semester 2
Prerequisites	Mathematics 1 (WWEC121)
Purpose	This module is designed in consultation with the professional body, the Engineering Council of South Africa (ECSA). Its purpose is to equip students with application knowledge and skills of Mathematics in Engineering real life and work environments.
Assessment Criteria	Assessment is continuous. *Self-assessment*: The student performs self-assessment by completing the activities/ exercises in the study material. 3 Formal evaluations (compulsory) will be written. All students must submit a portfolio of evidence. The portfolio must be neat and in a folder. The content of the folder will be discussed in class. Students who do not submit the portfolio will not pass the module.
Pass requirements	Students must obtain 50% to pass a test and an average of 60% for all the tests to pass the module. If a student fail an evaluation (< 50%) or has an average between 40% and 59%, the student must write the final evaluation (exam). The final evaluation (exam) will be on all module contents, the student must obtain 50% in this exam to pass the module. A student with an average evaluation mark less than 40% fails the module and will not be allowed to write the final evaluation (exam).

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

- Apply, integrate, evaluate, synthesize and interpret the rules of differentiation for algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, implicit and parametric functions.

- Present answers of all differentiation procedures according to agreed format.
- Perform, synchronize and analyze various methods on higher derivatives.
- Apply, integrate, evaluate, synthesize and interpret the rules of partial differentiation involving first and second order derivatives to real world problems relating to small increments and rates of change.
- Apply, evaluate and distinguish the different integration principles and manipulation techniques.
- Formulate, interpret and evaluate a definite integral relating to areas and volumes of revolution.

SC.11.3.8 MATHEMATICS LEVEL 7

Module MAT1AE3	Mathematics: Chemical Engineering 3
Programme	B Tech Chemical Engineering; B Tech Extraction Metallurgy
NQF-level	6
NQF credits	24
Presentation	Semester 1
Prerequisites	Mathematics 2 (MAT2AE2)
Purpose	This module is designed in consultation with The Engineering Council of South Africa (ECSA) and recognized and accredited as such in order for the exit students to acquire a licence to practice a profession in Chemical Engineering and Extraction Metallurgy. The module is aimed at equipping students with the mathematical content and skills essential for work and study in engineering.

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

- Identify, evaluate and solve Directional Derivatives and Maximum and Minimum values of f(x;y).
- Analyse, construct and calculate the Volumes of Solids of revolutions and areas of Centroids.
- Identify, analyse, formulate and solve First Order differential equations (FDE's).
- Apply D-operator methods, solve higher order differential equations by using D-operator methods, evaluate electrical and mechanical applications and solve systems of simultaneous ordinary linear differential equations.
- Use the table of standard transformations to look up the Laplace transforms, determine the inverse Laplace transforms, solve differential equations, using Laplace transforms and apply all the above techniques to solve mechanical and electrical problems.
- Solve a set of linear equations using the Inverse Matrix method and the Gauss elimination technique and apply a numerical method, Runge-Kutta order 4 to a differential equation.

SC.11.3.9 MATHEMATICS LEVEL 6 (Second Year)

Module MAT3AW3	Engineering Mathematics 3
Programme	ND Electrical Engineering; Computer Systems Engineering; Industrial Engineering; Mechanical Engineering
NQF-level	6
NQF credits	24
Presentation	Semester 1 and Semester 2 (programme dependent)
Prerequisites	Engineering Mathematics 2 (MAT2AW2)
Purpose	The module serves an introduction to a number of mathematics topics that are regarded as being essential to engineering students, as the variety of problems which confront today's engineers and scientists have increased in recent years. It also provides the student with a basic introductory knowledge of differential equations, which can be applied in practical techniques in the chosen field of study or workplace.

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

THEORETICAL COMPONENT:

- Solve ordinary differential equations using Laplace transformations.
- Solve ordinary differential equations and a given system of 2 ordinary differential equations using D-operator methods and apply the techniques to solve mathematical models of differential equations.

- Determine Fourier coefficients for full and half range functions and implement approximate methods to determine the numerical harmonic analysis for irregular functions.
- Solve first-order ordinary differential equations using analytical methods (*NOTE*: This unit will be assessed in the MATLAB component).

PRACTICAL COMPONENT:

- Do basic arithmetic using MATLAB commands, use variables in the evaluation of formulae, plot and edit graphs, understand and use loops, Use M-files and save MATLAB codes.
- Approximate ordinary differential equations numerically and apply MATLAB syntax to Euler's and Runge-Kutta order 2 and 4 methods to compare analytical and numerical solutions graphically and in tabular form.
- Define a matrix and be familiar with notations and fundamental characteristics of matrices. Use the appropriate MATLAB syntax to do matrix operations and use matrices to solve a linear system of simultaneous equations, using different methods.

SC.11.3.10 MATHEMATICS LEVEL 7

Module MAT1AW4	Engineering Mathematics 4
Programme	B Tech Electrical Engineering; B Tech Computer Systems Engineering
NQF-level	7
NQF credits	24
Presentation	Semester 1
Prerequisites	Engineering Mathematics 3 (MAT3AW3)
Purpose	This module is designed in consultation with the Engineering Council of South Africa (ECSA) and recognized and accredited as such in order for the exit students to acquire a licence to practice a profession in Electrical Engineering or Computer Systems. The module is aimed at equipping students with the mathematical content and skills essential for work and study in engineering.

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

- Define, determine, evaluate, employ and apply z-transform and its inverse on a discontinuous discrete signal using various methods.
- Design, propose, analyze, evaluate, solve and represent discrete data with the formation of forward and backward difference equations using the three step procedure.
- Recognize, interpret, generate, analyze and solve partial differential equations arising in real world physical problems.
- Perform basic matrix and vector arithmetic to solve a system of linear equations with the prescribed methods using MATLAB.
- Determine, calculate and integrate eigen values and eigenvectors to define an eigen space of solutions using MATLAB.
- Compute, analyze and classify the Jordan canonical form, the Gram-Schmidt algorithm and quadratic forms with various techniques.

SC.11.4	MICROBIOLOGY	MCB

SC.11.4.1 MICROBIOLOGY LEVEL 5 (First Year)

Module MCB1YME	Microbiology 1
Programme	ND Environmental Health
NQF Level	5
NQF credits	18
Presentation	Year module
Purpose	The module aims at preparing students to discuss the standard principles of microbiology and to provide students with the necessary knowledge and competency to conduct standard laboratory experiments in relation to the requirements of the Environmental Health programme.

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

- Define the scope and history of microbiology.
- Perform the necessary practical techniques associated with the module.
- Develop an understanding of basic chemistry, biochemistry and molecular biology required to understand microbiology.
- Explain cellular anatomy and function for Eukaryotic and Prokaryotic cells and apply the knowledge of cellular anatomy towards understanding taxonomy.
- Recall features and characteristics of important Eukaryotic disease causing organisms, highlighting the diseases they cause.
- Describe important bacterial diseases.
- Explain the nature of viral replication, viral/host relationships and pathogenesis.
- Describe the nutritional and environmental requirements of microorganisms for growth, applying this information towards an understanding of microbial growth control methods.
- Describe the relationship between infectious microorganisms and body defence mechanisms developed to combat them.
- Integrate knowledge obtained of microbiology with the field of public health.

SC.11.4.2 MICROBIOLOGY LEVEL 5 (Second Year)

Module MCB2YMM	Medical Microbiology
Programme	ND Chiropractic; ND Homoeopathy
NQF Level	5
NQF credits	15
Presentation	Year module
Purpose	The module aims at preparing students to discuss and apply microbiology principles, procedures and equipment in relation to the vocational degree in Chiropractic or Homoeopathy.

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

- Describe important discoveries in microbiology and explain their influence in modern times.
- Describe the structure and characteristics of the cell membrane.
- Describe interactions between micro-organisms and their human hosts.
- Explain selected examples of serological tests.
- Discuss characteristic, pathogenesis, transmission and effects of selected pathogenic microbes: Staphylococcus, Streptococcus (*S. pyogenes, S.pneumoniae* and viridans), Neisseria, Clostridium (*C. tetani, C. botulinum* and *C. perfringens),* Mycobacteria, Enterobacteriaceae (*Salmonella, Shigella, Escherichia coli)* and *Vibrio cholera.*
- Give a brief overview of Yeasts.
- Describe the classification and characteristics of moulds.
- Give an overview of medically important protozoa and parasites and their diseases and life cycles.
- Give a brief overview of Rickettsia, Chlamydia and Mycoplasma, their cell structures and roles in disease.
- Give an overview of virus characterisation and classification.
- Describe control of micro-organisms.

SC.11.5	PHYSICS	PHY

Assessment criteria
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%.

Continuous assessment based on the assessment of ongoing tests.

SC.11.5.1 PHYSICS LEVEL 5 (First Year)

Module CHM111P	Theory of Mechanics 1 Extended
Programme	ND Mechanical Engineering, ND Industrial Engineering
NQF-level	5
NQF credits	8
Presentation	Year module
Purpose	To develop the applied practical and laboratory skills of the students required in the Mechanical Engineering field.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in mechanics.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.2 PHYSICS LEVEL 5 (First Year)

Module FWFJA14	Physics 1 Theory
Programme	ND Extended Engineering Metallurgy
NQF-level	6
NQF credits	10
Presentation	Year Module
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for the qualification chosen.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Compute scientifically and convert units in the decimal system.
- Explain the basic principles, formulae, laws and definitions for physical quantities encountered in geometrical optics, draw ray diagrams and solve problems using optical formulae in reflection and refraction on plane and spherical surfaces.
- Explain the principles related to the wave and particle properties of light and use relevant formulae to solve simple problems on analyses of spectra.
- Manipulate vectors representing vector quantities, describe and solve problems on motion in a straight line with constant acceleration, discuss and apply Newton's laws to objects moving on both frictionless and roughness, horizontal and inclined surfaces, and define work and energy and solve problems in context with topics previously covered.
- Explain the laws of pressure in fluids and use appropriate formulae to solve problems.

- Define and explain the physical quantities and units in direct current electricity and solve problems relating to various electric quantities and simple circuits, using relevant formulae.
- Discuss and explain the physical effects of heat transfer such as expansion in solids, liquids and gases and apply the law of heat conservation of heat in problem solving.

SC.11.5.3 PHYSICS LEVEL 5 (First Year)

Module FWFJB14	Physics 1 Extended
Programme	ND Extended Engineering Metallurgy
NQF-level	5
NQF credits	8
Presentation	Year module
Purpose	To develop the applied practical and laboratory skills of the students required in the Extraction Engineering Metallurgy field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.4 PHYSICS LEVEL 5 (First Year)

Module PH1AEET	Physics 1A (Theory)
Programme	ND Computer Systems Engineering; ND Electrical Engineering; ND Electronic Engineering; ND Power Engineering
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of current and future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Engineering students.

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

- Describe the properties of electromagnetic radiation such as interference, diffraction and solve associated practical problems.
- Explain the nature and properties of nuclear radiations such as alpha, beta and gamma.
- Derive from basic principles the law of radioactive decay and apply it in solving application problems.
- Define wave-particle duality and quantization of energy.
- Explain the fundamental theories of photo-electric effect.
- Describe and identify spectral lines of the Bohr model and exhibit an understanding of the quantum mechanical picture of an atom.
- Define magnetic field, magnetic force, motional emf, magnetic flux, electromagnetic induction and Lenz's law.
- Describe the motion of a particle in an electric and magnetic field.
- Use SI units and measurements.
- Manipulate vectors representing vector quantities, describe and solve problems on motion in a straight line with constant acceleration, discuss and apply Newton's laws to objects moving on both frictionless and roughness, horizontal and inclined surfaces, and define work power and energy and solve problems in context with topics previously covered.

- Define and explain the physical quantities and units in direct current and alternating current electricity and solve problems relating to various electric quantities and simple circuits, using relevant formulae.
- Apply all theoretical concepts studied into practical situations relevant to the Engineering discipline.

SC.11.5.5 PHYSICS LEVEL 5 (First Year)

Module PH1AEEP	Physics 1A (Practical)
Programme	ND Computer Systems Engineering; ND Electrical Engineering; ND Electronic Engineering; ND Power Engineering
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	To develop the applied practical and laboratory skills required of the students in the Engineering field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, heat radiation and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, draw vector diagrams and graphs for each experiment as required.

SC.11.5.6 PHYSICS LEVEL 5 (First Year)

Module PH1BEET	Physics 1B (Theory)
Programme	ND Computer Systems Engineering; ND Electrical Engineering; ND Electronic Engineering; ND Power Engineering
NQF-level	5
NQF credits	12
Presentation	Semester 2
Prerequisites	PH1AEET
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of current and future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Engineering students.

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

- Describe the properties of electromagnetic radiation such as interference, diffraction and solve associated practical problems.
- Explain the nature and properties of nuclear radiations such as alpha, beta and gamma.
- Derive from basic principles the law of radioactive decay and apply it in solving application problems.
- Define wave-particle duality and quantization of energy.
- Explain the fundamental theories of photo-electric effect.
- Describe and identify spectral lines of the Bohr model and exhibit an understanding of the quantum mechanical picture of an atom.
- Define magnetic field, magnetic force, motional emf, magnetic flux, electromagnetic induction and Lenz's law.
- Describe the motion of a particle in an electric and magnetic field.
- Use SI units and measurements.

- Manipulate vectors representing vector quantities, describe and solve problems on motion in a straight line with constant acceleration, discuss and apply Newton's laws to objects moving on both frictionless and roughness, horizontal and inclined surfaces, and define work power and energy and solve problems in context with topics previously covered.
- Define and explain the physical quantities and units in direct current and alternating current electricity and solve problems relating to various electric quantities and simple circuits, using relevant formulae.
- Apply all theoretical concepts studied into practical situations relevant to the Engineering discipline.

SC.11.5.5 PHYSICS LEVEL 5 (First Year)

Module PH1BEEP	Physics 1B (Practical)
Programme	ND Computer Systems Engineering; ND Electrical Engineering; ND Electronic Engineering; ND Power Engineering
NQF-level	5
NQF credits	8
Presentation	Semester 2
Pre-requisite	PH1AEEP
Purpose	To develop the applied practical and laboratory skills required of the students in the Engineering field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, heat radiation and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, draw vector diagrams and graphs for each experiment as required.

SC.11.5.6 PHYSICS LEVEL 5 (First Year)

Module PHY1ABT	Physics 1 Theory
Programme	ND Chemical Engineering; ND Engineering Metallurgy; ND Extraction Metallurgy
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for the qualification chosen.

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

- Compute scientifically and convert units in the decimal system.
- Explain the basic principles, formulae, laws and definitions for physical quantities encountered in geometrical optics, draw ray diagrams and solve problems using optical formulae in reflection and refraction on plane and spherical surfaces.
- Explain the principles related to the wave and particle properties of light and use relevant formulae to solve simple problems on analyses of spectra.
- Manipulate vectors representing vector quantities, describe and solve problems on motion in a straight line with constant acceleration, discuss and apply Newton's laws to objects moving on both frictionless and roughness, horizontal and inclined surfaces, and define work and energy and solve problems in context with topics previously covered.

- Explain the laws of pressure in fluids and use appropriate formulae to solve problems.
- Define and explain the physical quantities and units in direct current electricity and solve problems relating to various electric quantities and simple circuits, using relevant formulae.
- Discuss and explain the physical effects of heat transfer such as expansion in solids, liquids and gases and apply the law of heat conservation of heat in problem solving.

SC.11.5.2 PHYSICS LEVEL 5 (First Year)

Module PHY1ABP	Physics 1 Practical
Programme	ND Chemical Engineering; ND Engineering Metallurgy; ND Extraction Metallurgy
NQF Level	5
Credits	8
Presentation	Semester 1
Purpose	The purpose of this course is to provide Students with practical skills to execute experiments in mechanics, heat, optics and electricity, to analyse, interpret and evaluate the collected data and present the results.

Specific outcomes: Students should be able to:
- Execute experiments in mechanics, heat, optics and electricity.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Integrate the data obtained from the experiments with theories on mechanics, heat, optics and electricity.
- Present results obtained from the experiments.

SC.11.5.3 PHYSICS LEVEL 5 (First Year)

Module PHY1AET	Physics 1B
Programme	ND Biomedical Technology
NQF-level	5
NQF credits	15
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed by the Biomedical Technician.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Compute scientifically and convert units in the decimal system.
- Explain and formulate the basic principles and laws encountered in geometrical optics, draw ray diagrams and solve problems using formulae and sign convention.
- Manipulate vector quantities, describe and solve problems on motion in a straight line with constant acceleration.
- Discuss and apply Newton's laws to objects moving on horizontal surfaces with and without friction.
- Define work and energy and solve problems.
- Formulate laws and explain the concepts in hydrostatics and apply these concepts to stationary fluids.
- Discuss and explain the effects of heat transfer such as expansion of solids, liquids and gasses and apply the law of conservation of energy in problem solving.
- Define the concept and formulate the laws encountered in direct current electricity and solve elementary problems.

SC.11.5.4 PHYSICS LEVEL 5 (First Year)

Module PHY1ADP	Physics 1 (Practical)
Programme	ND Food Technology; ND Biomedical Technology
NQF-level	5
NQF credits	8
Presentation	Semester 1
Purpose	To develop the applied practical and laboratory skills of the students required in the Food Technology and Biomedical Technology fields.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.5 PHYSICS LEVEL 5 (First Year)

Module PHY1ALT	Basic Science: Physics
Programme	ND Emergency Medical Care, B Tech Podiatry
NQF-level	5
NQF credits	6
Presentation	Semester 1
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Emergency Medical Care and Podiatry.

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

- Use scientific notation and the decimal system to manipulate SI-units.
- Apply knowledge of vector theory in mechanical problems.
- Formulate and explain the laws and definitions in kinetics and dynamics and apply these to solving problems in those fields.
- State the laws and define the physical quantities used in hydrostatics and apply these to solving problems in stationary fluids.
- Explain the processes whereby heat is transferred.

SC.11.5.6 PHYSICS LEVEL 5 (First Year)

Module PHY1YFT	Physics 1A
Programme	ND Homoeopathy; ND Chiropractic
NQF-level	5
NQF credits	20
Presentation	Semester 2
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Homeopathy and Chiropractic.

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

- Interpret and apply significant digits, round-off data to the same accuracy as the measurements given, use the specific notation, manipulate S.I. units and formulae when needed.
- Apply the parallelogram and triangle laws of vector addition, apply the condition for translational equilibrium to solve practical problems and resolve vector quantities into vertical and horizontal components.
- Explain or define the concepts of work done, kinetic energy, potential energy, the law of conservation of energy, power, kilowatt-hour, non-conservative forces and other forms of energy.
- Explain heat capacity, latent heat, linear-, area-, volume-expansivities and discuss the terms conduction, convection and radiation.
- Define the terms density, relative density, pressure and hydraulic press efficiency; explain the terms streamline flow, turbulent flow and flow rate, state Bernoulli's principle and apply the principle in calculating the flow rate, speed and pressure of water flowing in a pipe.
- Explain the production of static electricity by friction using the electron theory, distinguish between the two types of charges and explain the effects and uses of static electricity.
- Describe the nature and properties of alpha, beta and gamma radiations, derive from basic principles the law of radioactive decay and explain the half-life, decay constant, atomic and mass numbers, binding energy, ionization, electron volt, excitation, characteristic radiation, isotope, Becquerel, linear attenuation co-efficient, exponential decrease.
- Explain wave-particle duality, quantum, quantized photon, quantization of energy, photo electric effect, wave nature of electrons and the de Broglie wavelength of a particle.
- Explain the reflection characteristics of curved mirrors draw ray diagrams of image formation by curved mirrors and draw ray diagrams to scale to determine the position, magnification and properties of images.
- Explain the production and transmission of sound in a medium recognise sound as a longitudinal wave and describe the different types of ultrasound scan.

SC.11.5.7 PHYSICS LEVEL 5 (First Year)

Module PHY1YFP	Physics 1 (Practical)
Programme	ND Homoeopathy; ND Chiropractic
NQF-level	5
NQF credits	10
Presentation	Semester 2
Purpose	To develop the applied practical and laboratory skills of the students required in the Homoeopathy field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.

- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.8 PHYSICS LEVEL 5 (First Year)

Module PHY1BGT	Physics Theory & Practical
Programme	ND Environmental Health
NQF-level	5
NQF credits	10
Presentation	Semester 2
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Environmental Health.

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

- Interpret and apply significant digits, round-off data to the same accuracy as the measurements given, use the specific notation, manipulate S.I. units and formulae when needed.
- Apply the parallelogram and triangle laws of vector addition, apply the condition for translational equilibrium to solve practical problems and resolve vector quantities into vertical and horizontal components.
- Explain or define the concepts of work done, kinetic energy, potential energy, the law of conservation of energy, power, kilowatt-hour, non-conservative forces and other forms of energy.
- Explain heat capacity, latent heat, linear-, area-, volume-expansivities and discuss the terms conduction, convection and radiation.
- Define the terms density, relative density, pressure and hydraulic press efficiency.
- Explain the production of static electricity by friction using the electron theory, distinguish between the two types of charges and explain the effects and uses of static electricity.
- Explain the reflection characteristics of curved mirrors, draw ray diagrams of image formation by curved mirrors and draw ray diagrams to scale to determine the position, magnification and properties of images.
- Explain the production and transmission of sound in a medium, recognise sound as a longitudinal wave and describe the different types of ultrasound scan.

SC.11.5.9 PHYSICS LEVEL 5 (First Year)

Module PHY1YHT	Physics 1
Programme	Radiography
NQF-level	5
NQF credits	8
Presentation	Year module
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Radiography.

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

- Describe Bohr's atomic model and its application in explaining the spectra of atoms.
- State basic laws of electrostatics and current electricity and solve basic problems relating to electric circuits.
- Describe the basic concepts that govern the magnetic effect of an electric current and perform calculations relating to these topics.

- Define the physical quantities and concepts related to sound waves and geometrical optics as well as their uses in medicine.
- Define the physical quantities and state the laws related to heat and gases and solve problems related to heat.

SC.11.5.10 PHYSICS LEVEL 5 (First Year)

Module PHY1YKT	Applied Building Science (Theory)
Programme	ND Building and ND Building Extended
NQF-level	5
NQF credits	20
Presentation	Year module
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed in the building construction field.

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

- Compute scientifically and convert units in the decimal system.
- Explain and formulate the basic principles and laws encountered in geometrical optics, draw ray diagrams and solve problems using formulae and sign convention.
- Manipulate vector quantities, describe and solve problems on motion in a straight line with constant acceleration. Apply the principle of moments to solve framework problems. Discuss the effect of forces on materials. Draw shear and bending moment diagrams.
- Discuss and apply Newton's laws to objects moving on horizontal surfaces with and without friction.
- Define work and energy and solve problems.
- Formulate the laws and principles and explain the concepts in hydrostatics and apply these to fluids at rest and in streamline flow.
- Discuss and explain the methods and effects of heat transfer and apply the law of conservation of heat in problem solving.
- Explain the concept of photometry and artificial lighting and apply these to buildings.
- Explain the effects of sound transmission and insulation and use this in problem solving.

SC.11.5.11 PHYSICS LEVEL 5 (First Year)

Module PHY1YKP	Construction Applied Building Science
Programme	ND Building and ND Building Extended
NQF-level	5
NQF credits	7.5
Presentation	Year module
Purpose	To develop the applied practical and laboratory skills of the students required in the Building Construction field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in optics, mechanics, fluids, heat and electricity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.12 PHYSICS LEVEL 5 (First Year)

Module PHY1BCT	Engineering Physics 2 (Theory)
Programme	ND Chemical Engineering
NQF-level	5
NQF credits	16
Presentation	Semester 2
Prerequisites	Physics 1 Theory (PHY1ABT); Physics 1 Practical (PHY1ABP)
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed by the Chemical Engineer.

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

- Describe the complex motion of fluids and solve problems related to fluid motion.
- Explain the emission of nuclear radiations by radio-active isotopes and the interaction of radiation with matter and the biological effects thereof.
- Apply the law of radio-active decay to solve problems.
- Demonstrate an understanding of specific heat capacities at constant volume and constant pressure by solving problems.
- Distinguish between isothermal and adiabatic processes.
- State the first and second laws of thermodynamics and analyse Carnot's cycle of heat engines.
- Explain the three different ways of heat transfer and solve problems applying this knowledge to different situations in nature and everyday life.
- Discuss and explain the principles and physical quantities underlying the production and transfer of alternating current electricity and solve problems on R-, L-, C and RLC circuits.

SC.11.5.13 PHYSICS LEVEL 5 (First Year)

Module PHY1BCP	Engineering Physics 2 (Practical)
Programme	ND Chemical Engineering
NQF-level	5
NQF credits	8
Presentation	Semester 2
Prerequisites	Physics 1 Theory (PHY1ABT); Physics 1 Practical (PHY1ABP)
Purpose	To develop the applied practical and laboratory skills of the students required in the Chemical Engineering field.

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

- Apply the Physics laboratory safety rules and procedures.
- Perform experiments in temperature and heat, alternating current, fluids, and radioactivity.
- Demonstrate the required skills to handle laboratory equipment and to set up an experiment independently.
- Record experimental data obtained from the laboratory instruments accurately.
- Collect, analyse, interpret and evaluate experimental data obtained from such experiments.
- Present and analyse the recorded data numerically and graphically.
- Perform all required calculations, vector diagrams and graphs for each experiment as required.

SC.11.5.14 PHYSICS LEVEL 5 (Second Year)

Module PHY2YHT	Physics 2
Programme	Radiography: Nuclear Medicine
NQF-level	5
NQF credits	8
Term of presentation	Year module
Prerequisites	Physics 1 (PHY1YHT)
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Radiography.

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

- Discuss the structure of matter and its use in explaining phenomena such as excitation and ionisation.
- Describe the processes and quantities relating to X-ray production and accurately explain haw an X-ray tube operates.
- Define the concepts relating to attenuation and dissipation of X-rays and also solve problems relating to these topics.
- Describe the processes and quantities relating to the quality of an X-ray beam and accurately explain the hardening of X-ray beams.
- State the laws of radiation and radioactive decay and solve problems involving application of Planck's law, the inverse square law of radiation, half-life, decay constant and time of decay.
- Describe the processes and quantities relating to radiation hazards and radiation safety and accurately explain the biological effects of radiation exposure and the principles of radiation protection.

SC.11.5.15 PHYSICS LEVEL 5 (Second Year)

Module SCI201	Science 2 (Physics)
Programme	ND Somatology
NQF-level	5
NQF credits	24
Term of presentation	Year module
Purpose	The purpose of this module is to provide a factual knowledge of definitions, methods and principles in Physics, and provide a broad background knowledge of basic Physics to aid in the understanding and interpretation of future scientific and technological development and to acquire the following life skills such as identifying and solving problems, working in groups and communicating effectively as is needed for Somatology.

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

- Explain how the Electromagnetic Spectrum works and the use of UV and IR radiation in the field of Somatology.
- Explain the production of static electricity by friction using the electron theory, distinguish between the two types of charges and explain the effects and uses of static electricity. The effects of heating in current electricity.
- Define the properties of magnetic fields, effects that magnets have on each other, know the shapes and fields of different magnetic fields of different magnets.
- Explain the production and transmission of waves and sound in a medium, recognise sound as a longitudinal wave and describe acoustics, resonance and noise.

SC.11.5.16 PHYSICS LEVEL 6 (Third Year)

Module NMI311	Nuclear Medicine Instrumentation (Physics 3 component)
Programme	Radiography: Nuclear Medicine
NQF-level	6
NQF credits	18
Term of presentation	Semester 1
Prerequisites	Physics 2 Theory (PHY2YHT)
Purpose	To provide the student radiographer with a basic understanding of the origin and measurement of radioactivity, the design and function of Nuclear Medicine Instrumentation and radiation protection in the Nuclear Medicine practice in radiography.

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

- Explain nuclear structure and decay processes, and calculate decay factors and be familiar with units of activity.
- Describe the three interaction processes; evaluate their relative importance in nuclear medicine and the attenuation of radiation.
- Describe the various physical factors affecting counting and the various statistical tests used in counting and how to use each one.
- Describe the basic operating principles of each type of detector, calibrate and use these devices and able to select the appropriate detector for each application in the Nuclear Medicine Practice.

SC.11.6 STATISTICS STA

SC.11.6.1 STATISTICS LEVEL 5 (First Year)

Module STA1ABF	Calculations and Statistics
Programme	ND Biotechnology, ND Biomedical Technology; ND Food Technology
NQF-level	5
NQF credits	24
Presentation	Semester 1
Purpose	All courses in the Health Sciences such as Biotechnology, Biomedical Technology and Food Technology require that students are proficient in basic calculating and data handling skills. The purpose of this module is to empower students to be able to do calculations and to manipulate data encountered in the curricula of the respective programmes and research topics, and to correctly interpret this data either verbally or in writing, in a meaningful and comprehensive way.

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

STATISTICS

- Collect, organise, summarise present and evaluate numerical data.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis.

MATHEMATICS

- Resolve expressions into factors, and perform the basic operations such as addition, subtraction multiplication and division on them.
- Formulate and apply the laws of exponents and logarithms.
- Solve linear equations with one, two and three variables.
- Evaluate variables in scientific formulae.
- Comprehend and evaluate the basic trigonometric ratios (such as sine, cos en tan) and their inverses of angles in any quadrant, convert angles from degrees to radian measure and distinguish between Cartesian and polar coordinates.
- Reduce non-linear data equations into linear form and use these to determine unknown variables.

SC.11.6.2 STATISTICS LEVEL 5 (First Year)

Module STA1ABM	Quantitative Techniques A
Programme	ND Management, Marketing, Finance, Accounting, Economics
NQF-level	5
NQF credits	48
Presentation	Semester 1
Purpose	The primary purpose is providing students majoring in Management, Marketing, Finance, Accounting, Economics and other fields of business administration with knowledge to equip them with the mathematical knowledge base and many applications of descriptive and inferential statistics. Statistics is the science that processes and analyses data in order to provide managers with useful information to aid in decision making. This module is not only relevant to the student's present academic program; it is also relevant to her/his future personal and professional life.

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

- Explain and perform various calculations involving relevant mathematical concepts.
- Collect, summarize and perform calculations based on data.
- Calculation and interpretation of index numbers.

SC.11.6.3 STATISTICS LEVEL 5 (First Year)

Module STA1BBM	Quantitative Techniques B
Programme	ND Management, Marketing, Finance, Accounting, Economics
NQF-level	5
NQF credits	48
Presentation	Semester 2
Purpose	The primary purpose is providing students majoring in Management, Marketing, Finance, Accounting, Economics and other fields of business administration with knowledge to equip them with the mathematical knowledge base and many applications of descriptive and inferential statistics. Statistics is the science that processes and analyses data in order to provide managers with useful information to aid in decision making. This module is not only relevant to the student's present academic program; it is also relevant to her/his future personal and professional life.

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

- Explain, calculate and interpret linear regression and correlation analysis.
- Apply linear models to analyze and project time series.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.

SC.11.6.4 STATISTICS LEVEL 5 (First Year)

Module STA1ZIT	Statistics 1
Programme	ND Industrial Engineering, Town and Regional Planning, Building
NQF-level	5
NQF credits	24
Presentation	Semester 1
Purpose	The primary purpose is providing students majoring in Industrial Engineering and Town and Regional Planning with knowledge to equip them for many applications of descriptive and inferential statistics. Statistics is the science that processes and analyses data in order to provide Engineers and Town Planners with useful information to aid in decision making. This module is not only relevant to the student's present academic program; it is also relevant to his/her future personal and professional life.

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

- Collect, summarize and perform calculations based on data.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis.
- Apply linear models to analyse and project time series.

SC.11.6.5 STATISTICS LEVEL 5 (First Year)

Module STA1BC1	Statistics 2 (Module B)
Programme	ND Civil Engineering
NQF-level	5
NQF credits	12
Presentation	Semester 2
Purpose	The primary purpose is providing students majoring in Civil Engineering with knowledge to equip them for many applications of descriptive and inferential Statistics. Statistics is the science that processes and analyses data in order to provide Engineers with useful information to aid in decision making. This module is not only relevant to the student's present academic programme; it is also relevant to his/her future personal and professional life.

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

- Collect, summarize and perform calculations based on data.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis.

SC.11.6.6 STATISTICS LEVEL 5 (First Year)

Module STA1ZCE	Statistics 2B
Programme	ND Chemical Engineering, ND Extraction Metallurgy, ND Engineering Metallurgy
NQF-level	5
NQF credits	12
Presentation	Semester 1 or 2 (depending on programme)
Prerequisites	Mathematics 1 (MAT1AW1)
Purpose	The primary purpose is providing students majoring in Chemical Engineering, Extraction Metallurgy and Engineering Metallurgy with knowledge to equip them for many applications of descriptive and inferential statistics. Statistics is the science that processes and analyses data in order to provide Engineers and Town Planners with useful information to aid in decision making. This module is not only relevant to the student's present academic program; it is also relevant to his/her future personal and professional life.

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

- Collect, summarize and perform calculations based on data.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret regression and correlation analysis.

SC.11.6.7 STATISTICS LEVEL 5 (Second Year)

Module STA2BEM	Process Statistics 2
Programme	ND Extraction Metallurgy
NQF-level	5
NQF credits	24
Presentation	Semester 2
Prerequisites	Statistics 2 (Module B) (STA1ZCE)
Purpose	The primary purpose of this module as an integral part of the diploma qualification is to provide students with an education that equips them with the inductive/inferential statistical knowledge base, theory and methodology of disciplines that could serve as a basis for entry into the technologically orientated labour market, professional training and practice that enables them to demonstrate initiative and responsibility in Extraction Metallurgy. Students must be proficient in collecting, organising, analysing and interpreting data to establish statistical and probability models to solve related problems. They must be able to solve problems related to models. In order to carry out decisions within the paradigm of inferential statistics. This module is not only relevant to the student's present academic program; it is also relevant to her/his future personal and professional life in Science and Technology.

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

- Collect, summarize and perform calculations based on data.
- Describe and perform calculations involving probabilities and probability distributions (revision).
- Compute and interpret estimates and carry out hypothesis testing.
- Explain, calculate and interpret simple and multiple regression and correlation (also partial) analysis.
- Explain concepts, calculate and perform tests based on ANOVA.
- Apply linear models to analyse and project time series.
- Explain concepts and perform calculations related to decision theory.

SC.11.6.8 STATISTICS LEVEL 7 (B Tech)

Module STA3AQT	Statistical Quality Techniques 3
Programme	B Tech Quality
NQF-level	7
NQF credits	11
Presentation	Semester 1
Purpose	The Primary Purpose is to provide students majoring in Quality with knowledge of Statistical Techniques to use in analysis of data and to show how this analysis helps them in quality assessment. They must also be able to analyse data using computer software and interpret computerised data analysis. Students must be able to show how this data analysis helps them in analysis of production, in quality assessment and in quality management.

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

- Define basic concepts in Statistics and Quality Management and collect, summarise and perform calculations based on data.
- Describe and perform calculations involving probabilities and probability distributions.
- Explain, calculate and interpret regression and correlation analysis.
- Compute and interpret estimates and carry out hypothesis testing.
- Compute and interpret hypothesis testing using non-parametric tests for production related problems.
- Make decisions involving probability and non-probability techniques in Decision Theory.
- Use probability trees to make decisions under conditions of risk and uncertainty and estimate payoffs and losses
- Set up linear equalities based on production examples and maximise profits.
- Use linear programming to solve industrial problems by determining the most effective use of available resources in production.

SC.11.6.9 STATISTICS LEVEL 7 (B Tech)

Module STA4BQT	Quality Techniques 4
Programme	B Tech Quality
NQF-level	7
NQF credits	11
Presentation	Semester 2
Prerequisites	Statistical Quality Techniques 3 (STA3AQT)
Purpose	The Primary Purpose is to provide students majoring in Quality with knowledge of Statistical Techniques to use in assessment of quality and production. Students should be able to use computers to analyse data, make quality based decisions and also meaningful suggestions for quality improvement. They should be able to reflect how this data analysis helps them in analysis of production, in quality assessment and in quality management.

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

- Define and analyse experiments using the analysis of variance within groups, among groups and total variation.
- Use Taguchi techniques to analyse loss functions in production, control variation of products, minimize loss functions and calculate signal to noise ratios.
- Apply the Process Control Charts to analyse production.
- Apply multiple regression methods to analyse best fit models and to validate the significance of individual variables in the models.
- Use Statistical software to analyse all types of data and make meaningful decisions from the analysis of data.

PART 12

SC.12 MODULES IN SCIENCE PROGRAMMES OFFERED BY OTHER FACULTIES

SC.12.1 MODULES FROM THE FACULTY MANAGEMENT

SC.12.1.1 END-USER COMPUTING (BEU)
SC.12.1.2 ENTREPRENEURIAL SKILLS (CET3AES)
BUSINESS ENTREPRENEURIAL SKILLS (BTN1AE4)
RESEARCH METHODOLOGY: NATURAL SCIENCE (FTN1ARM)
SC.12.1.3 COMMUNICATION SKILLS (CSA)

PART 13

LIST OF QUALIFICATIONS

QUALIFICATION CODE	DESCRIPTION
NDAC1E	National Diploma : Analytical Chemistry (4 years)
NDBTE1	National Diploma : Biotechnology (4 years)
NDFTE1	National Diploma : Food Technology (4 years)
344-3	National Diploma : Analytical Chemistry (*phasing out*)
349-1	National Diploma : Biotechnology
348-1	National Diploma : Food Technology
514-1	B Tech : Biotechnology
520-1	B Tech : Food Technology
742-1	M Tech : Chemistry
515-1	M Tech : Biotechnology
521-1	M Tech : Food Technology
MSC006	MSc : Chemistry
749-1	PhD : Chemistry