UNDERGRADUATE 2024

Doornfontein Campus

Faculty of Science

UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DOORNFONTEIN CAMPUS
(DFC)

RULES AND REGULATIONS
FOR UNDERGRADUATE PROGRAMMES

2024

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

Updated December 2023

GENERAL INFORMATION AND CONTACT DETAILS

EXECUTIVE DEAN
Prof A Moteetee
C Ring 211, APK
011 559 4554

VICE-DEAN: TEACHING & LEARNING
Vacant
011 559

VICE-DEAN: RESEARCH & POSTGRADUATE
Prof R Meijboom
011 559 2367

HEAD: FACULTY ADMINISTRATION
Mrs C Burger
C Ring 214, APK
011 559 2961

DEAN'S SECRETARY
Ms B Fasser
C Ring 212, APK
011 559 4554

SENIOR FACULTY OFFICERS
Mr GT Miza
C Ring 216, APK
011 559 2471

Mr C Mashele
Postgraduate studies
C Ring 218, APK
011 559 4168

FACULTY COORDINATOR
Mrs Y Sibran
C Ring 220, APK
011 559 3357

FINANCIAL BUSINESS PARTNER
Mr T Gamede
C Ring 209B, APK
011 559 3976

FACULTY OFFICERS
Ms A Greyling
C Ring 202, APK
011 559 2374

Ms B Mkhabela
C Ring 204, APK
011 559 4175

Mrs H Mtyoboza
C Ring 205, APK
011 559 3718

Mrs T Nyoka
C Ring 203, APK
011 559 3826

MS ML Mampa
C Ring 206, APK
011 559 2459

Doornfontein Campus
3205 John Orr Building, DFC
011 559 6349

FINANCIAL ASSISTANT
Ms G Jacobs
C Ring 209A, APK
011 559 4916

FACULTY MARKETER
Miss C Brown
C Ring 224, APK
011 559 2393

RECEPTIONIST/ ADMIN ASSISTANT
Mrs L Bessick
C Ring 201, APK
011 559 4562

ADMIN ASSISTANT
Ms MS Rakgoho
Soweto Campus & Doornfontein Campus
011 559 2547

GENERAL ASSISTANT
Mr B Mpila
C Ring 201, APK
011 559 2547

RESEARCH INFO MANAGEMENT
Mr T Thanyani
C Ring 217, APK
011 559 4644

GENERAL ENQUIRIES
Tel: 011 559 6349/ 4562
Fax: 011 559 3207
E-mail: web-science@uj.ac.za
Faculty of Science on the Internet www.uj.ac.za/science

POSTAL ADDRESS
University of Johannesburg
Faculty of Science: C Ring 201
PO Box 524
Auckland Park 2006

ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING
Kingsway Campus
Contact Person: Ms G Ndevu / Ms L De Ponte
Tel : 011 559 2967/ 2839
E-mail : gndevu@uj.ac.za

DEPARTMENT OF BIOCHEMISTRY
Kingsway Campus
Contact Person: Mrs L de Kooker
Tel : 011 559 2370
E-mail : ldekooker@uj.ac.za

DEPARTMENT OF BIOTECHNOLOGY AND FOOD TECHNOLOGY
Doornfontein Campus
Contact Person: C Robbetze
Tel : 011 559 6456
E-mail : christabo@uj.ac.za

DEPARTMENT OF BOTANY AND PLANT BIOTECHNOLOGY
Kingsway Campus
Contact Person: Ms L Nondlala
Tel : 011 559 2436
E-mail : louisan@uj.ac.za

DEPARTMENT OF CHEMICAL SCIENCES
Doornfontein Campus
Contact Person: Ms L Moshe
Tel : 011 559 6148
E-mail : lmoshe@uj.ac.za

Kingsway Campus
Contact Person: Mrs E O'Rourke
Tel : 011 559 2363 (mornings only)
E-mail : eurekao@uj.ac.za

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL MANAGEMENT AND ENERGY STUDIES
Kingsway Campus
Contact Person: Ms D Mekwe
Tel : 011 559 2433/ 3736
E-mail : dmekwe@uj.ac.za

DEPARTMENT OF GEOLOGY
Kingsway Campus
Contact Person: Ms E Minnaar
Tel : 011 559 4701
E-mail : elainem@uj.ac.za

DEPARTMENT OF PHYSICS
Doornfontein Campus
Contact Person: Ms R Motloung
Tel : 011 559 6007
E-mail : refiloem@uj.ac.za

Kingsway Campus
Contact Person: Ms D Pitsi
Tel : 011 559 2327
E-mail : physics@uj.ac.za or pitsidw@uj.ac.za

DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS
***Doornfontein Campus* (Applied Mathematics)**
Contact Person: Ms E Sibiya
Tel : 011 559 6817
E-mail : esibiya@uj.ac.za

***Kingsway Campus* (Mathematics)**
Contact Person: Ms P Mapimele
Tel : 011 559 2831
E-mail : pmapimele@uj.ac.za

DEPARTMENT OF STATISTICS
Kingsway Campus
Contact Person: Mrs AM Bothma
Tel : 011 559 2852
E-mail : lettieb@uj.ac.za

DEPARTMENT OF ZOOLOGY
Kingsway Campus
Contact Person: Ms NM Dunge
Tel : 011 559 2441
E-mail : zoologysecretary@uj.ac.za

SPECTRUM
Kingsway Campus
Contact Person: Dr W Oldewage
Tel : 011 559 2274
E-mail : willieho@uj.ac.za

GENERAL INFORMATION

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

STUDENT FINANCE

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

If you are not in possession of this brochure and you need information urgently, please contact STUDENT FINANCES: (011) 559-6022/3935/4339/3910/3277/4303.

DIVISION FOR INTERNATIONALISATION

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

Auckland Park Kingsway Campus
Next to the Library
011 559 4517

PART 1

SC.1 ADMISSION CRITERIA

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

- Diploma (Dip) in:
  - Analytical Chemistry
  - Biotechnology
  - Food Technology
- Advanced Diploma in:
  - Analytical Chemistry
  - Biotechnology
  - Food Technology
- BSc Hons (Hons)
- Master of Science (MSc)
- Magister Technologiae (M Tech) *(phasing out)*
- Master of Biotechnology, Chemistry and Food Technology
- Doctor Technologiae (D Tech) *(phasing out)*
- Philosophiae Doctor (PhD)

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

SC.1.2 ADMISSION REQUIREMENTS TO THE FACULTY OF SCIENCE

UNDERGRADUATE PROGRAMMES (DFC)

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 table that follows.

ADMISSION REQUIREMENTS

NAME OF QUALIFICATION		Group A		Group B		Minimum APS
		Language of Teaching and Learning **English**	**Mathematics**	**Physical Science**	**Life Science**	
DIPLOMA (4 years)						
D2ACEQ	Diploma in Analytical Chemistry (*phasing out)*	4	3	4^	-	21
D2ACXQ	Diploma in Analytical Chemistry (4 years)	4	3	4^	-	21
D2BTEQ	Diploma in Biotechnology (4 years)	4	3	3^	3#	21
D2FTEQ	Diploma in Food Technology (4 years)	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 ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WITH A NATIONAL CERTIFICATE (VOCATIONAL)

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

- An NCV (level 4) issued by the Council for General and Further Education and Training
- Achieved a minimum of 60% for 6 of the 7 subjects – fundamental and vocational categories
- Passed English as Language of Teaching and Learning/First Additional Language as fundamental component with a minimum of 70%
- Passed Mathematics and Physical Sciences as Fundamental Components with a minimum score of 60%
- Passed Life Sciences as Fundamental Component with a minimum score of 60% for entry into the Diploma Biotechnology (4 year) or Diploma Food Technology (4 year).

Applicants must complete the National Benchmark Test prior to admission. The result of the NBT will inform decisions taken on placement of the applicant.

C ADMISSION REQUIREMENTS APPLICABLE TO APPLICANTS WITH A TECHNICAL SUBJECTS

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

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

D ADMISSION REQUIREMENTS FOR ENTRY TO THE DIPLOMA AND ADVANCED DIPLOMA

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

Minimum admission requirements applicable to Diplomas

4.9 The minimum admission requirements for a diploma are:

(a) SC or NSC with Diploma or Bachelor's degree endorsement;
(b) Language requirements;
(c) APS requirements;
(d) Admission/placement tests (if applicable) as approved by Senate;
(e) Faculty and/or programme-specific requirements as determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

Minimum admission requirements applicable to Advanced Diplomas

4.9.1 Advanced Diploma applicants must have successfully completed a Diploma or Bachelor's degree in the same or relevant field of study as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.

4.9.2 Programme-specific admission requirements, such as a minimum achievement in the relevant majors or other approved appropriate modules in the prerequisite qualification, are determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.

4.9.3 For Advanced Diplomas in the Faculty of Education, refer to the minimum requirements for Teacher Education Qualification as contained in the Faculty Rules and Regulations.

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 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 learning 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 and Part 5 of this book)

SC.1.3.3 A DIPLOMA (DIP) 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)
Chemistry	(CET/CEM)
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 MAT2W**A2** is a second-year module (2) in Mathematics (MAT) 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 AFRICAN INSIGHTS

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

The purpose of the module is to develop an appreciation of Africa's many and rich inheritances and to familiarise students with Africa's "great" ideas and issues. An appreciation will be developed for Africa and its place in the world by providing the theoretical underpinning and a platform for students to read and respond to a number of key African texts with a focus on concerns with contemporary significance.

Outcomes of the module should enable students to:
- develop an informed appreciation of the role of Africa in the world and of its inheritances.
- discuss key historical and political concepts in African studies.
- display a basic understanding of South African rights paradigm, and
- display a basic understanding of epistemology / African epistemology.

PART 2

SC.2 ALPHABETICAL LIST OF MODULES WITH PREREQUISITES

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
DIPLOMA IN ANALYTICAL CHEMISTRY			
Analytical Chemistry 1A (Theory)	CETTAB1	Chemical Sciences	CET1XA1, Co* CETXTB1
Analytical Chemistry 1A (Practical)	CETPAB1	Chemical Sciences	CET1XA1, Co* CETTAB1
Analytical Chemistry 1B (Theory)	CETATA2	Chemical Sciences	CETXTB1, CETXPB1, CETTAB1, CETPAB1
Analytical Chemistry 1B (Practical)	CETAPA2	Chemical Sciences	CETXTB1, CETXPB1, CETTAB1, CETPAB1, Co* CETATA2
Analytical Chemistry 2	CETATB1	Chemical Sciences	CETATA2, CETAPA2, Co* CSA1AA1
Analytical Chemistry: Practical 2	CETAPB1	Chemical Sciences	Co*****: CETATB1
Analytical Chemistry 3 (Instrumental Techniques)	CETAIB3	Chemical Sciences	CETATB1, PHY1TB1, PHY1PB1 Co* CSA1AA1
Analytical Chemistry 3 (Analytical Technology)	CETAAB3	Chemical Sciences	CETATB1, PHY1TB1, PHY1PB1 Co* CSA1AA1, CETP3A3
Analytical Chemistry: Practical 3	CETAPB3	Chemical Sciences	CETAPB1 Co*****: CETAIB3, CETAAB3
Chemistry 1XA1	CET1XA1	Chemical Sciences	Physical Science Grade 12 – APS 4
Chemistry 1A (Theory)	CETXTB1	Chemical Sciences	CET1XA1, MATCXA1
Chemistry 1A (Practical)	CETXPB1	Chemical Sciences	CET1XA1, MATCXA1
Chemistry 1B	CETXTA2	Chemical Sciences	CETXTB1, CETXPB1, MATCXB1
Chemical Quality Assurance	CETQAB3	Chemical Sciences	Co*: CSA1BB1, CETAPB3
Analytical Chemistry Practical Training	CETW1B3	Chemical Sciences	All modules for S1-S5 passed
English Communication Skills 1 (Module 1)	CSA1AA1	Applied Comm.	English Grade 12 – APS 4
English Communication Skills 1 (Module 2)	CSA1BB1	Applied Comm.	CSA1AA1
End-User Computing 1A	EUC01A1	EUC	-
Entrepreneurial Skills	CETESA3	Entrepreneurship	-
Inorganic Chemistry 2	CETI2A3	Chemical Sciences	CETXTA2, Co***** CSA1AA1
Inorganic Chemistry 3	CETI3B3	Chemical Sciences	CETI2A3, Co***** CSA1BB1
Materials and Processing Science	CETMPA3	Chemical Sciences	CETAIB3, CETAAB3, CETP3A3, CETOTA3, CETOPA3, Co***** CETPCA3
Mathematics CXA1	MATCXA1	Mathematics	Mathematics Grade 12 – APS 3
Mathematics CXB1	MATCXB1	Mathematics	MATCXA1
Mathematics 2A	MAT2WA2	Mathematics	MATCXA1, MATCXB1
Mathematics 2B	MAT2WB2	Mathematics	MAT2WA2
Organic Chemistry 2	CETO2B1	Chemical Sciences	CETXTA2, Co***** CSA1BB1
Organic Chemistry 3 (Theory)	CETOTA3	Chemical Sciences	CETO2B1, MAT2WA2, Co***** PHY1TB1, PHY1PB1 and CSA1BB1
Organic Chemistry 3 (Practical)	CETOPA3	Chemical Sciences	CETO2B1, Co***** CETOTA3

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
Physical Chemistry 2	CETP2B1	Chemical Sciences	CETXTA2, Co*: CSA1AA1, MAT2WB2
Physical Chemistry 3	CETP3A3	Chemical Sciences	CETP2B1, Co**:** PHY1TB1, PHY1PB1 and CSA1AA1
Physics 1XA1	PHY1XA1	Physics	Physical Science Grade 12 – APS 4
Physics 1XTB1 (Theory) *Phasing out*	PHYXTB1	Physics	PHY1XA1
Physics 1XPB1 (Practical) *Phasing out*	PHYXPB1	Physics	PHY1XA1
Physics 1XTA2 (Theory) *Phasing out*	PHYXTA2	Physics	PHYXTB1, PHYXPB1
Physics 1XPA2 (Practical) *Phasing out*	PHYXPA2	Physics	PHYXTB1, PHYXPB1
Physics 1TB1 (Theory)	PHY1TB1	Physics	PHY1XA1
Physics 1PB1 (Practical)	PHY1PB1	Physics	PHY1XA1, Co*: PHY1TB1
Physics 2	PHY2ZA3	Physics	PHY1TB1, PHY1PB1
Polymer Chemistry 3	CETPCA3	Chemical Sciences	CETOTA3, CETOPA3, Co**:** CETP3A3, CSA1AA1
Co* Simultaneous enrolment or credit			
DIPLOMA IN BIOTECHNOLOGY			
Analytical Biochemistry 3	BIC3AA2	Biochemistry	BIC12B1
Analytical Chemistry 2BBF Theory	CET2TB1	Chemical Sciences	CET1XA1, CET1XB1, CET1XA2
Analytical Chemistry 2BBF Practical	CET2PB1	Chemical Sciences	CET1XA1, CET1XB1, CET1XA2
Biochemistry 2	BIC12B1	Biochemistry	CET1XA1, CET1XB1, CET1XA2
Biodiversity and Ecology 1XB1	ZOO1XB1	Zoology	ZOO1XA1
Biodiversity and Ecology 1XA2	ZOO1XA2	Zoology	ZOO1XB1
Biotechnology 3A	BTN03A2	Biotechnology	-
Biotechnology 3B	BTN03B2	Biotechnology	BTN03A2
Biotechnology Practical Training	BTN3WA3	Biotechnology	All Y1, Y2 & Y3 modules
Biotechnology Practical Training	BTN3WB3	Biotechnology	All Y1, Y2 & Y3 modules
Chemistry 1XA1	CET1XA1	Chemical Sciences	Physical Science Grade 12 – APS 3
Chemistry 1XB1	CET1XB1	Chemical Sciences	CET1XA1
Chemistry 1XA2	CET1XA2	Chemical Sciences	CET1XB1
End-User Computing 1A	EUC01A1	EUC	-
End-User Computing 1B	EUC01B1	EUC	-
Fundamental Bioscience 1XA1	ZOO1XA1	Zoology	Life Science Grade 12 – APS 3
Fundamental Genetics	BTN1GB1	Biotechnology	MCB1XB1, MCB1XA2
Food Microbiology 3	FTN3MB3	Food Technology	MCB1XB1, MCB1XA2, MCB2MB1
Mathematics 1XA1	MAT1XA1	Mathematics	Mathematics Grade 12 – APS 3
Mathematics 1XB1	MAT1XB1	Mathematics	MAT1XA1
Microbial Biochemistry 3	BIC3MB2	Biochemistry	CET1XA2, CET2TB1, CET2PB1, BIC12B1
Microbiology 1XB1	MCB1XB1	Biotechnology	-
Microbiology 1XA2	MCB1XA2	Biotechnology	MCB1XB1
Microbiology 2	MCB2MB1	Biotechnology	MCB1XB1, MCB1XA2
Microbiology 3	MCB3MA2	Biotechnology	MCB2MB1
Process Engineering	FTN1PE2	Biotechnology	STA1XA2

NAMES OF MODULES	CODE	DEPT	PREREQUISITES
Sanitation, Safety & Hygiene	BTNSHA2	Biotechnology	-
Statistics 1XA2	STA1XA2	Statistics	MAT1XA1, MAT1XB1
DIPLOMA IN FOOD TECHNOLOGY			
Analytical Chemistry 2BBF Theory	CET2TB1	Chemical Sciences	CET1XA1, CET1XB1, CET1XA2
Analytical Chemistry 2BBF Practical	CET2PB1	Chemical Sciences	CET1XA1, CET1XB1, CET1XA2
Biochemistry 2	BIC12B1	Biochemistry	CET1XA1, CET1XB1, CET1XA2
Chemistry 1XA1	CET1XA1	Chemical Sciences	Physical Science Grade 12 – APS 3
Chemistry 1XB1	CET1XB1	Chemical Sciences	CET1XA1
Chemistry 1XA2	CET1XA2	Chemical Sciences	CET1XB1
End-User Computing 1A	EUC01A1	EUC	-
End-User Computing 1B	EUC01B1	EUC	-
Food Biochemistry 3	FTNBCA2	Food Technology	BIC12B1
Food Microbiology 3	FTN3MB3	Food Technology	MCB1XB1, MCB1XA2, MCB2MB1
Food Operations Management 3	FTN3OB3	Food Technology	FTN2AF2
Food Regulation	FTN2RA2	Food Technology	FTN1FB1
Food Safety and Quality	FTN2QA3	Food Technology	FTN1FB1
Food Technology 1	FTN1FB1	Food Technology	-
Food Technology 2	FTN2FA2	Food Technology	FTN1FB1
Food Technology 3	FTN3FB3	Food Technology	FTN2FA2
Food Technology Practical Training 1	FTNW1B2	Food Technology	FTN2FA2
Food Technology Practical Training 2	FTNW2A3	Food Technology	FTN2FA2
Intro to Food Science and Technology	FTN1SB1	Food Technology	ZOO1XA1
Fundamental Bioscience 1XA1	ZOO1XA1	Zoology	Life Science Grade 12 – APS 3
Mathematics 1XA1	MAT1XA1	Mathematics	Mathematics Grade 12 – APS 3
Mathematics 1XB1	MAT1XB1	Mathematics	MAT1XA1
Microbiology 1XB1	MCB1XB1	Biotechnology	-
Microbiology 1XA2	MCB1XA2	Biotechnology	MCB1XB1
Microbiology 2	MCB2MB1	Biotechnology	MCB1XB1, MCB1XA2
Nutrition	FTN1NA2	Food Technology	FTN2FA2
Process Engineering	FTN1PE2	Food Technology	MAT1XB1, STA1XA2
Statistics 1XA2	STA1XA2	Statistics	MAT1XA1, MAT1XB1

ADVANCED DIPLOMA ANALYTICAL CHEMISTRY			
Analytical Chemistry Theory	CHM7XT1	Chemistry	Analytical Chemistry 3 Theory
Analytical Chemistry Practical	CHM7XP1	Chemistry	Analytical Chemistry 3 Practical
Inorganic Chemistry Theory	CHM7XT2	Chemistry	Inorganic Chemistry 3 Theory
Inorganic Chemistry Practical	CHM7XP2	Chemistry	Inorganic Chemistry 3 Practical
Physical Chemistry Theory	CHM7XT3	Chemistry	Physical Chemistry 3 Theory
Physical Chemistry Practical	CHM7XP3	Chemistry	Physical Chemistry 3 Practical
Organic Chemistry Theory	CHM7XT4	Chemistry	Organic Chemistry 3 Theory
Organic Chemistry Practical	CHM7XP4	Chemistry	Organic Chemistry 3 Practical
ADVANCED DIPLOMA BIOTECHNOLOGY			
Operations Management and Entrepreneurship	BTN7X06	Entrepreneurship	-
Applied Disease and Immune Response	BTN7X01	Biotechnology	-
Applied Industrial Biotechnology	BTN7X04	Biotechnology	BTN03B2
Applied Microbial Biochemistry	BTN7X02	Biotechnology	BIC3MB2
Applied Plant Biotechnology	BTN7X03	Biotechnology	-
Applied Molecular Biotechnology	BTN7X05	Biotechnology	-
Research Methodology Biotechnology	BTN7X00	Biotechnology	-
ADVANCED DIPLOMA FOOD TECHNOLOGY			
Food Components	FTN7X01	Food Tech	FTNBCA2
Food Product Development	FTN7X02	Food Tech	-
Process Engineering	FTN7X03	Food Tech	FTN2QA3, FTN3MB3
Food Packaging	FTN7X04	Food Tech	FTN3OB3
Food Technology	FTN7X05	Food Tech	FTN3FB3
Food Quality and Safety Assurance	FTN7X06	Food Tech	FTN1ARM
Operations Management and Entrepreneurship	FTN7X07	Entrepreneurship	
Research Methodology Food Technology	FTN7X00	Food Tech	-

LIST OF PRE- AND CO-REQUISITES FOR MODULES PRESENTED TO OTHER FACULTIES

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
Chemical Sciences	FCHED01	Foundation Chemistry	Grade 12 Physical Science – APS 5
Chemical Sciences	CET1YHT	Chemistry 1CH (Theory)	Grade 12 Physical Science – APS 4
Chemical Sciences	CEM1CA1	Chemistry 1C	Grade 12 Physical Science – APS 5
Chemical Sciences	CETH1Y1	Chemistry	Grade 12 Physical Science – APS 4
Chemical Sciences	CET1DA1	Basic Science: Chemistry	Grade 12 Physical Science – APS 4
Chemical Sciences	CET1DB1	Basic Science: Chemistry 1B	Grade 12 Physical Science – APS 4
Chemical Sciences	CHB1BB1	Basic Science: Chemistry	Grade 12 Physical Science – APS 4
Chemical Sciences	CETM1A1	Engineering Chemistry (Metallurgy) 1A	Grade 12 Physical Science – APS 5
Chemical Sciences	CETM1B1	Engineering Chemistry (Metallurgy) 1B	CETM1A1
Chemical Sciences	CETM2A1	Engineering Chemistry (Metallurgy) 2A1	ECMSED1, ECMSED2
Chemical Sciences	CETE1A1	Engineering Chemistry (Chemical) 1A	Grade 12 Physical Science – APS 5
Chemical Sciences	CETE1B1	Engineering Chemistry (Chemical) 1B	CETE1A1
Chemical Sciences	ECMSED1	Chemistry X1 (Theory)	Grade 12 Physical Science – APS 5
Chemical Sciences	ECMSED2	Chemistry X1 (Practical)	ECMSED2
Chemical Sciences	CETCHY1	Chemistry CH1	Grade 12 Physical Science – APS 5
Chemical Sciences	CEMH1A1	Chemistry 1A	Grade 12 Physical Science – APS 5
Biotechnology	BICH1A1	Biochemistry	Grade 12 Life Science – APS 4
Biotechnology	MCB01A2	Microbiology 01A2	BIO10A1, CEM01A1/1CA1, CEM01B1/1DB1
Biotechnology	MCBH1Y1	Microbiology	Grade 12 Life Science – APS 4
Geology	GCISCB1	Engineering Geology (Civil) 1B	-
Geology	GLGE2A2	Engineering Geology (Mining) 2A	-
Geology	GMESCA2	Engineering Geology (Metallurgy) 2A	-
Geology	GMESCB2	Engineering Geology (Metallurgy) 2B	GMESCA2
Geology	GLGB2B2	Engineering Geology (Construction) 2B	-
Mathematics	ALGED01	Algorithms	Grade 12 Mathematics – APS 5
Mathematics	FOMED01	Foundation Mathematics	Grade 12 Mathematics – APS 5
Mathematics	MATE1A1	Engineering Mathematics V 1A	Grade 12 Mathematics – APS 5
Mathematics	MATE1A1	Engineering Mathematics V 1A	FOMED01
Mathematics	MATE1B1	Engineering Mathematics V 1B	MATE1A1 **or** MATHED1
Mathematics	MATEAD1	Engineering Mathematics V 1A	Grade 12 Mathematics – APS 5
Mathematics	MATEBD1	Engineering Mathematics V 1B	MATEAD1
Mathematics	MATM2A1	Engineering Mathematics 2A1	MATHED1
Mathematics	MATM1A1	Measurement Mathematics 1A	Grade 12 Mathematics – APS 5
Mathematics	MATM1B1	Measurement Mathematics 1B	MATE1A1
Mathematics	MATHED1	Mathematics X1	Grade 12 Mathematics – APS 4
Mathematics	MATE2A2	Engineering Mathematics V 2A	MATE1A1 and MATE1B1
Mathematics	MATE2B2	Engineering Mathematics V 2B	MATE2A2
Physics	APP01Y1	Applied Physics	Grade 12 Physical Science – APS 4
Physics	PHY1DA1	Basic Science: Physics 1A	Grade 12 Physical Science – APS 4

DEPT	CODE	NAMES OF MODULES	PREREQUISITES
Physics	PHY1D1B	Basic Science: Physics	Grade 12 Physical Science – APS 4
Physics	PHB1AA1	Basic Science: Physics	Grade 12 Physical Science – APS 4
Physics	PHBH1Y1	Physics	Grade 12 Physical Science – APS 4
Physics	PHY1CA1	Physics 1C	Grade 12 Physical Science – APS 5
Physics	PHY1DB1	Physics 1D	PHY1CA1
Physics	FPYED01	Foundation Physics	Grade 12 Physical Science – APS 5
Physics	PHYE1A1	Engineering Physics X 1A	Grade 12 Physical Science – APS 5
Physics	PHYE1B1	Engineering Physics X 1B	PHYE1A1
Physics	PHYSCA1	Engineering Physics (Chemical) 1A	Grade 12 Physical Science – APS 5
Physics	PHYSCB1	Engineering Physics (Electrical) 1B	PHYE1A1
Physics	PHASED1	Engineering Physics X 1A (Theory) *(Phasing out)*	Grade 12 Physical Science – APS 5
Physics	PHASED2	Engineering Physics X 1A (Practical) *(Phasing out)*	PHASED1
Physics	PHADTX1	Engineering Physics TX1 (Theory)	Grade 12 Physical Science – APS 5
Physics	PHADPX1	Engineering Physics PX1 (Practical)	PHATX1
Physics	PHADTX2	Engineering Physics TX2 (Theory)	PHADTX1, PHADPX1
Physics	PHADPX2	Engineering Physics PX2 (Practical)	PHADTX2
Physics	PHYB1Y1	Construction Science 1	Grade 12 Physical Science – APS 5
Physics	PMEDP01	Physics (Mechanics) Practical	Grade 12 Physical Science – APS 5
Physics	PHYCHA1	Physics CH1	
Physics	PHYH1B1	Physics 1B	
Statistics	STASCA1	Engineering Statistics 1A	Grade 12 Mathematics – APS 5
Statistics	STAE1B1	Engineering Statistics 1B	Grade 12 Mathematics – APS 5
Statistics	STAQTA1	Quantitative Techniques A	Grade 12 Mathematics – APS 3 or Mathematical Literacy – APS 5
Statistics	STAQTB1	Quantitative Techniques B	-
Statistics	SMT01A1	Statistical Methods 1A	Grade 12 Mathematics – APS 5
Statistics	STA7AQT	Statistical Quality Techniques A	-
Statistics	STA7BQT	Statistical Quality Techniques B	STA7AQT

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 from the Academic Regulations** 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.*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

assessment of the learning experience together with the University's academic employees. See also service learning

4. ADMISSION

4.1 General minimum admission requirement principles for an undergraduate programme

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

(a) A National Senior Certificate (NSC) with higher certificate endorsement is a legal requirement for admission into a higher certificate.
(b) A NSC with diploma endorsement is a legal requirement for admission into an undergraduate diploma.
(c) A NSC with bachelor's degree endorsement is a legal requirement for admission into an undergraduate bachelor's degree.
(d) A SC(A) with relevant endorsement, with a pass of three subjects at 40%, one of which must be an official language at Home Language Level or pass subjects at 30%, one of which must be an official language at First Additional or Home Language Level or obtained a subminimum of 20% in the sixth subject.
(e) A NASCA is awarded at certification of 120 credits with at least four subjects passed, carrying 30 credits each.
(f) An applicant who has successfully completed a Higher Certificate at an accredited Higher Education Institution (HEI) may be admitted into an appropriate Advanced Certificate.
(g) An applicant who has successfully completed a Higher Certificate at an accredited HEI and has accumulated relevant credits may be admitted to a related undergraduate diploma programme, subject to the candidate being granted a NSC with diploma endorsement by Universities South Africa (USAf) after the successful completion of the Higher Certificate (refer to AR 6 for credit requirements).
(h) An applicant who has successfully completed an undergraduate diploma, may be admitted into an undergraduate bachelor's degree programme, subject to the candidate being granted an NSC with bachelor's degree endorsement by USAf (refer to AR 6 for credit requirements).
(i) Other progression and/or articulation requirements, as reflected in the Higher Education Qualifications Sub Framework (HEQSF), are applicable.
(j) Applicants who have completed their (NSC) or (SC) must comply with the minimum Admission Point Score (APS).
(k) All applicants must comply with the language requirements, faculty and qualification or module requirements for admission into each programme as outlined by the relevant faculty.
(l) International applicants wishing to register for undergraduate or postgraduate fully online qualifications will be required to demonstrate equivalence with the above admission requirements, with certification of equivalence by SAQA or USAf where required.
(n) Other additional admission requirements may be:
    (i) Admission and placement tests as approved by Senate;
    (ii) Interviews in person or online;
    (iii) Portfolios of evidence;
    (iv) Recognition of Prior Learning (RPL) process;
    (v) SAQA or USAf certification of equivalents;
    (vi) Language proficiency tests;
    (vii) Senate discretionary admission.

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

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

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

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

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

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

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

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

4.7 Minimum admission requirements applicable to Diplomas

4.7.1 The minimum admission requirements for a Diploma are:

(a) SC or NSC with diploma or bachelor's degree endorsement; SC-based complete/conditional exemption;
(c) Language requirements;
(d) Admission/placement tests as approved by Senate;
(e) Faculty- and/or programme-specific requirements as determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.8 Minimum admission requirements applicable to BTech and Advanced Diplomas

For Advanced Diplomas in the Faculty of Education refer to the minimum requirements for Teacher Education Qualification as contained in the Faculty Rules and Regulations.

4.8.1 BTech and Advanced Diploma applicants must have successfully completed a relevant diploma or bachelor's degree in the same or relevant field of study as determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.8.2 Programme-specific admission requirements such as a minimum achievement in the relevant majors or other approved appropriate modules in the prerequisite qualification are determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations

4.9 Minimum admission requirements applicable to Bachelor's programmes

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

b) National Senior Certificate (NSC) endorsed with admission to a bachelor's degree endorsement,

or

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

c) Admission tests, as approved by Senate;

d) APS;

e) Language requirements;

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

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

4.10 Alternative admission requirements

4.10.1 **Senate Discretionary Conditional Admission**

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

4.10.2 **School of Tomorrow applicants**

The Executive Dean, together with the Registrar, may approve admission of School of Tomorrow applicants via the Senate discretional admission process subject to Faculty Rules and Regulations, the applicant successfully completing a PsyCaD assessment and the NBT (obtaining at least Higher Intermediate level).

The request for Senate Discretionary Admission should serve at the first Senate meeting, following the conditional admission for final Approval by Senate.

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

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

The Faculty of Science Policy on RPL will be followed. A student who has obtained entry to any level 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.

4.11 Application for admission to study at the University

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

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

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

4.11.5 Admission is also subject to:

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

4.12 Admission of International applicants

Refer to the Academic Regulations

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

5. REGISTRATION

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

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

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

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

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

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

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

Unless approved by the Executive Dean:

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

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

5.2 Documents to be submitted upon registration

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

5.2.1 First-year students

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

5.2.2 Transfer students from other higher education institutions

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

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

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

5.2.3 International students

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

5.7 Programme and module changes

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

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

5.8 Cancellation of studies

5.8.1 Students cancelling their studies in a particular programme or module should notify the University by submitting the cancellation on the prescribed form and in accordance with the prescribed procedure before the date determined by the University. This form is submitted to the relevant faculty officer for processing.

5.8.2 Students who fail to notify the University officially before the prescribed cancellation dates will forfeit any claim to the reimbursement of money paid to the University.

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

5.9 Service or work integrated learning

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

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

5.10 Registration and assessment

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

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

5.11 Class attendance

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

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

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

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

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

5.12.3 Unsatisfactory participation is taken into consideration when decisions are made regarding the academic exclusion of students.

6. CREDIT AND PROMOTION REQUIREMENTS FOR UNDERGRADUATE PROGRAMMES

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

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

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

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

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

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

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

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

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

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

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

6.6 Students who have failed a module twice will not be allowed to continue their studies in the same module at the University, except with the permission of the Executive Dean or his**/**her delegated authority on recommendation of the relevant HOD after consultation with the lecturer, or on recommendation of the faculty's examination or assessment committee. When a module is failed, a student must repeat the module at the first opportunity when it is offered again.

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

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

To be admitted to any module in the 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 academic year of study.*

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

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

The Executive Dean will determine what constitutes unsatisfactory performance.

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

7. APPEALS AGAINST ACADEMIC EXCLUSION

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

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

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

8. EXEMPTION AND RECOGNITION REQUIREMENTS

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

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

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

The Executive Dean will determine whether exceptional circumstances apply.

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

10. DURATION OF PROGRAMME

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

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

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

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

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

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

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

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

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

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

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

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

Table 3. Duration of Programmes

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

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

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

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

11. TEACHING, LEARNING AND ASSESSMENT

11.1 General

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

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

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

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

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

11.2 Assessment opportunities

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

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

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

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

11.3 Assessment results

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

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

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

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

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

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

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

11.4 Appeals

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

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

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

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

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

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

11.5 Special summative assessment and supplementary summative assessment opportunities

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

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

11.5.2 The Assessment Committee/Vice-Dean/HOD/senior administrative officer of a faculty in which the module resides may grant a student a supplementary last summative assessment opportunity if:

(a) the student failed a module but obtained a final mark of at least 40%; or

(b) the student failed a module but obtained a semester/year mark of at least 60%.

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

(a) was registered for the relevant module in the current academic year; and

(b) was admitted to, and participated in the last assessment opportunity in the relevant module; and

(c) has complied with all the experiential or practical requirements prescribed for the qualification (where applicable), excluding work-integrated modules.

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

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

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

(a) To be granted a supplementary assessment opportunity for a particular component in the continuous assessment portfolio, a minimum of 40% must have been obtained for that particular component.

(b) Supplementary assessments are according to each faculty's internal assessment policy.

(c) A maximum of no more than a pass mark is awarded for the supplementary assessment of the particular component in the continuous assessment portfolio.

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

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

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

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

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

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

11.6 Obtaining a qualification

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

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

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

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

(c) A student must never have failed a module as a first attempt in the relevant programme.

(d) A student must have obtained a minimum mark of 65% in every prescribed module at NQF level 6 for Diplomas, NQF 7 for Advanced Diplomas/BTech and Degrees, NQF level 8 for Professional Bachelor degrees, Postgraduate Diplomas and Honours Degrees and NQF level 9 for Master's Degrees and, in the case of a master's qualification by coursework, in the minor dissertation as well.

(e) Students must have been registered for the full curriculum as prescribed for each academic year on a full-time or part-time basis, as the case may be.

(f) If students are transferred from another Higher Education Institution in the same qualification to UJ the same requirements as stated shall apply.

(g) If students change programmes within the UJ, only the modules related to the new programme will be taken into consideration in calculating whether the qualification is obtained with distinction.

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

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

11.7 Students with disabilities

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

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

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

11.8 Access control during assessments

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

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

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

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

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

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

11.9 Transgressions during any assessment opportunity

11.9.1 Students commit a transgression when

(a) they commit plagiarism;

(b) during a formal assessment opportunity, the student is in possession of any book, cell phone, electronic devices that has not been switched off, memorandum, notes in

whatsoever form, or any papers, documents or database equipment, except for access to such answer books or other books, papers or documents that the invigilator has supplied or access to such other sources that the invigilator authorised as per instructions of the examiner;

(c) students help or attempt to help other students, or obtain help or attempt to obtain help from other students, or obtain help or attempt to obtain help from any source of information, with the exception of explicitly approved sources as permitted by the assessor;

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

(e) students have unauthorised information stored on a pocket calculator, cellphone or any other device brought into the assessment venue, whether or not they have had the opportunity to access such information;

(f) students cause a disturbance in the proximity of, or inside the assessment venue, or conduct themselves in an improper or unbecoming manner;

(g) students disregard the instructions of invigilators or assessors;

(h) students pose as other students.

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

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

11.10 Irregularities during participation in summative assessment and practical opportunities

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

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

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

Any cell phone or other unauthorized electronic device that is seen to be held in the hand or operated in any way for whatever reason once the assessment has formally begun, will be confiscated by the invigilator. Any scripts will be dealt with in accordance with Regulation 11.10.1.

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

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

11.17 Assessment of service or work integrated learning

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

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 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.

NATIONAL DIPLOMA	SC. NO	CODE
DIPLOMA IN ANALYTICAL CHEMISTRY (4 years) *(phasing out)*		D2ACEQ
DIPLOMA IN ANALYTICAL CHEMISTRY (4 years)	4.1	D2ACXQ
DIPLOMA IN BIOTECHNOLOGY (4 years)	4.2	D2BTEQ
DIPLOMA IN FOOD TECHNOLOGY (4 years)	4.3	D2FTEQ

Refer to Part 1 for General Rules of Admission

CURRICULA

	Diploma in Analytical Chemistry (4 years)	**D2ACEQ**

No new intake - programme in process of phasing out (pipeline only)

FIRST YEAR

First Semester		**Second Semester**	
Chemistry 1XA1	CET1XA1	Analytical Chemistry 1A (Theory) *	CETTAB1
End-User Computing 1	EUC01A1	Analytical Chemistry 1A (Practical) *	CETPAB1
		Chemistry 1A (Theory) *	CETXTB1
		Chemistry 1A (Practical) *	CETXPB1
Mathematics CXA1	MATCXA1	Mathematics CXB1	MATCXB1
Physics 1XA1	PHY1XA1	Physics 1XA1 (Theory)	PHYXTB1
		Physics 1XB1 (Practical)	PHYXPB1
Skills for Success	SFS1XY1	Skills for Success	SFS1XY1

SECOND YEAR

First Semester		**Second Semester**	
Analytical Chemistry 1B (Theory) *	CETATA2	Analytical Chemistry 2 *	CETATB1
Analytical Chemistry 1B (Practical) *	CETAPA2	Analytical Chemistry Practical 2 *	CETAPB1
Chemistry 1B (Theory) *	CETXTA2	Organic Chemistry 2 *	CETO2B1
		Physical Chemistry 2 *	CETP2B1
Communication Skills 1 Module 1	CSA1AA1	Communication Skills 1 Module 2	CSA1BB1
Mathematics 2A	MAT2WA2	Mathematics 2B	MAT2WB2
Physics 1XA2 (Theory)	PHYXTA2		
Physics 1XA2 (Practical)	PHYXPA2		

THIRD YEAR

First Semester		**Second Semester**	
Inorganic Chemistry 2	CETI2A3	Analytical Chemistry 3 (Instrumental Tech)	CETAIB3
Organic Chemistry 3 (Theory)	CETOTA3	Analytical Chemistry 3 (Analytical Tech)	CETABB3
Organic Chemistry 3 (Practical)	CETOPA3	Analytical Chemistry Practical 3	CETAPB3
Physical Chemistry 3	CETP3A3	Chemical Quality Assurance	CETQAB3
		Inorganic Chemistry 3	CETI3B3

FOURTH YEAR

First Semester		**Second Semester**	
Entrepreneurial Skills	CETESA3	Chemical Technology Practical Training	CETW1B3
Materials and Processing Science	CETMPA3		
Physics 2	PHY2ZA3		
Polymer Chemistry 3	CETPCA3		

NOTE: The asterisk (*) marks the critical modules in year 1 and 2.

SC.4.1	Diploma in Analytical Chemistry (4 years)	D2ACXQ

FIRST YEAR

First Semester		**Second Semester**	
Chemistry 1XA1	CET1XA1	Analytical Chemistry 1A (Theory) *	CETTAB1
End-User Computing 1	EUC0100	Analytical Chemistry 1A (Practical) *	CETPAB1
		Chemistry 1A (Theory) *	CETXTB1
		Chemistry 1A (Practical) *	CETXPB1
Mathematics CXA1	MATCXA1	Mathematics CXB1	MATCXB1
Physics 1XA1	PHY1XA1	Physics 1TB1 (Theory)	PHY1TB1
		Physics 1PB1 (Practical)	PHY1PB1
Skills for Success	SFS1XY1	Skills for Success	SFS1XY1

SECOND YEAR

First Semester		**Second Semester**	
Analytical Chemistry 1B (Theory) *	CETATA2	Analytical Chemistry 2 *	CETATB1
Analytical Chemistry 1B (Practical) *	CETAPA2	Analytical Chemistry Practical 2 *	CETAPB1
Chemistry 1B *	CETXTA2	Organic Chemistry 2 *	CETO2B1
		Physical Chemistry 2 *	CETP2B1
Communication Skills 1 Module 1	CSA1AA1	Communication Skills 1 Module 2	CSA1BB1
Mathematics 2A	MAT2WA2	Mathematics 2B	MAT2WB2
Physics 2	PHY2ZA3		

THIRD YEAR

First Semester		**Second Semester**	
Inorganic Chemistry 2	CETI2A3	Analytical Chemistry 3 (Instrumental Tech)	CETAIB3
Organic Chemistry 3 (Theory)	CETOTA3	Analytical Chemistry 3 (Analytical Tech)	CETAPB3
Organic Chemistry 3 (Practical)	CETOPA3	Analytical Chemistry Practical 3	CETAAB3
Physical Chemistry 3	CETP3A3	Chemical Quality Assurance	CETQAB3
		Inorganic Chemistry 3	CETI3B3

FOURTH YEAR

First Semester		**Second Semester**	
Entrepreneurial Skills	CETESA3	Chemical Technology Practical Training	CETW1B3
Materials and Processing Science	CETMPA3		
Polymer Chemistry 3	CETPCA3		

NOTE: The asterisk (*) marks the critical modules in year 1 and 2.

SC.4.2	Diploma in Biotechnology (4 years)	D2BTEQ

FIRST YEAR

First Semester		**Second Semester**	
Fundamental Bioscience 1XA1	ZOO1XA1	Biodiversity and Ecology 1XB2	ZOO1XB1
Chemistry 1XA1	CET1XA1	Chemistry 1XB1	CET1XB1
End-User Computing A	EUC01A1	End-User Computing B	EUC01B1
Mathematics 1XA1	MAT1XA1	Mathematics 1XB1	MAT1XB1
Skills for Success 1	SFS1XY1	Skills for Success 1	SFS1XY1
		Microbiology 1XB1	MCB1XB1

SECOND YEAR

First Semester		**Second Semester**	
Biodiversity and Ecology 1XA2	ZOO1XA2	Analytical Chemistry 2BBF (Theory)	CET2TB1
Chemistry 1XA2	CET1XA2	Analytical Chemistry 2BBF (Practical)	CET2PB1
Microbiology 1XA2	MCB1XA2	Biochemistry 2	BIC12B1
Statistics 1XA2	STA1XA2	Microbiology 2	MCB2MB1
		Fundamental Genetics	BTN2GB1

THIRD YEAR

First Semester		**Second Semester**	
Analytical Biochemistry 3	BIC3AA2	Microbial Biochemistry 3	BIC3MB2
Biotechnology 3A	BTN03A2	Biotechnology 3B	BTN03B2
Microbiology 3	MCB3MA2	Food Microbiology 3	FTN3MB3
Sanitation, Safety and Hygiene	BTNSHA2	Process Engineering	FTN1PE2

FOURTH YEAR

First Semester		**Second Semester**	
Biotechnology Practical Training	BTN3WA3	Biotechnology Practical Training	BTN3WB3

SC.4.3	Diploma in Food Technology (4 years)	D2FTEQ

FIRST YEAR

First Semester		**Second Semester**	
Fundamental Bioscience 1XA1	ZOO1XA1	Microbiology 1XB1	MCB1XB1
Chemistry 1XA1	CET1XA1	Chemistry 1XB1	CET1XB1
Mathematics 1XA1	MAT1XA1	Mathematics 1XB1	MAT1XB1
End-User Computing 1A	EUC01A1	End-user Computing 1B	EUC01B1
Skills for Success	SFS1XY1	Skills for Success	SFS1XY1
		Intro to Food Science and Technology	FTN1SB1

SECOND YEAR

First Semester		**Second Semester**	
Chemistry 1XA2	CET1XA2	Analytical Chemistry 2BBF (Theory)	CET2TB1
Microbiology 1XA2	MCB1XA2	Analytical Chemistry 2BBF (Practical)	CET2PB1
Statistics 1XA2	STA1XA2	Microbiology 2	MCB2MB1
Nutrition	FTN1NA2	Biochemistry 2	BIC12B1
		Food Technology 1	FTN1FB1

THIRD YEAR

First Semester		**Second Semester**	
Food Biochemistry 3	FTNBCA2	Food Technology Practical Training 1	FTNW1B2
Food Technology 2	FTN2FA2		
Food Regulation	FTN2RA2		
Food Safety and Quality	FTN2QA3		

FOURTH YEAR

First Semester		**Second Semester**	
Food Technology Practical Training 2	FTNW2A3	Food Microbiology 3	FTN3MB3
		Food Technology 3	FTN3FB3
		Food Operations Management	FTN3OB3
		Process Engineering	FTN1PE2

PART 5

SC.5 LEARNING OUTCOMES FOR DIPLOMA AND DEGREE MODULES

SC.5.1 BIOCHEMISTRY	
MODULE CODE	**SC NR**
BIC12B1	5.1.1
BIC3AA2	5.1.2
BIC3MB2	5.1.3
SC.5.2 BIOTECHNOLOGY	
MODULE CODE	**SC NR**
BTNSHA2	5.2.1
BTN1GB1	5.2.2
BTN03A2	5.2.3
BTN03B2	5.2.4
BTN3WA3	5.2.5
BTN3WB3	5.2.6
SC.5.3 CHEMISTRY	
MODULE CODE	**SC NR**
CET1XA1	5.3.1
CET1XB1	5.3.2
CET1XA2	5.3.3
CETTAB1	5.3.4
CETPAB1	5.3.5
CETXTB1	5.3.6
CETXPB1	5.3.7
CETATA2	5.3.8
CETAPA2	5.3.9
CETXTA2	5.3.10
CETATB1	5.3.11
CETAPB1	5.3.12
CETO2B1	5.3.13
CETP2B1	5.3.14
CET2TB1	5.3.15
CET2PB1	5.3.16
CET12A3	5.3.17
CETOTA3	5.3.18
CETOPA3	5.3.19
CETP3A3	5.3.20
CETAIB3	5.3.21
CETAAB3	5.3.22
CETAPB3	5.3.23
CET13B3	5.3.24
CETQAB3	5.3.25
CETESA3	5.3.26
CETMPA3	5.3.27
CETPCA3	5.3.28
CETW1B3	5.3.29
CEM01A1	5.3.30
CEM01B1	5.3.31
CETA2T2	5.3.32
CETA2P2	5.3.33
CETB2T2	5.3.34
CETB2P2	5.3.35

SC.5.4 FOOD TECHNOLOGY	
MODULE CODE	**SC NR**
FTN1SB1	5.4.1
FTN1PE2	5.4.2
FTN1FB1	5.4.3
FTNBCA2	5.4.4
FTN1PE2	5.4.5
FTN2FA2	5.4.6
FTNW1B2	5.4.7
FTN2QA3	5.4.8
FTN2RA2	5.4.9
FTN3BM3	5.4.10
FTN3OB3	5.4.11
FTN3FB3	5.4.12
FTNW2A3	5.4.13
SC.5.5 MATHEMATICS	
MODULE CODE	**SC NR**
MAT1XA1	5.5.1
MATCXA1	5.5.2
MATCXB1	5.5.3
MAT1XB1	5.5.4
MAT2WA2	5.5.5
MAT2WB2	5.5.6
SC.5.6 MICROBIOLOGY	
MODULE CODE	**SC NR**
MCB1XB1	5.6.1
MCB1XA2	5.6.2
MCB2BM1	5.6.3
MCB3MA2	5.6.4
SC.5.7 PHYSICS	
MODULE CODE	**SC NR**
PHY1XA1	5.7.1
PHY1TB1	5.7.2
PHY1PB1	5.7.3
PHY2ZA3	5.7.4
SC.5.8 STATISTICS	
MODULE CODE	**SC NR**
STA1XA2	5.8.1
SC.5.9 ZOOLOGY	
MODULE CODE	**SC NR**
ZOO1XA1	5.9.1
ZOO1XB1	5.9.2
ZOO1XA2	5.9.3

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 6 (Second Year)

Module BIC12B1	Biochemistry 2
NQF-level	6
NQF credits	16
Presentation	Semester 2
Prerequisites	Chemistry 1XA1 (CET1XA1), Chemistry 1XB1 (CET1XB1), Chemistry 1XA2 (CET1XA2)
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 7 (Third Year)

Module BIC3AA2	Analytical Biochemistry 3
NQF-level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Biochemistry 2 (BIC12B1)
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 websites 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 7 (Third Year)

Module BIC3MB2	Microbial Biochemistry 3
NQF-level	7
NQF credits	15
Presentation	Semester 2
Prerequisites	Biochemistry 2 (BIC12B1), Analytical Chemistry 2BBF Theory (CET2TB1) and Analytical Chemistry 2BBF Practical (CET2PB1)
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 glycosylate 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 7 (Third Year)

Module BTNSHA2	Sanitation, Safety and Hygiene 1
NQF-level	7
NQF credits	12
Presentation	Semester 1
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 workplace.
- 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 LEVEL6 (Second Year)

Module BTN1GB1	Fundamental Genetics
NQF-level	6
NQF credits	12
Presentation	Semester 2
Prerequisites	-
Purpose	

Module learning outcomes: On completion of this learning event, the student should be able to:
- Demonstrate an understanding of the basic concepts of genetics, including genes, DNA, genetic traits, chromosome structure in prokaryotes and eukaryotes. They should also be able to demonstrate an understanding of somatic cells, germ cells, ploidy and other relevant terms, nuclear structure, gene structure and function as well as mitosis and meiosis.
- Show an understanding of patterns of inheritance, Mendelian inheritance, mono- and di-hybrid crosses, Punnett squares, gender-linked inheritance and co-dominance.
- Explain Nucleic Acid structure and function, the experiments that proved that DNA is the genetic material, comparison of the structure of DNA and RNA, replication, transcription and translation.
- Give a definition and classification of mutation and repair, describe effects of mutation, types of mutation and repair of DNA damage.
- Demonstrate a thorough understanding of the concepts of Recombinant DNA Technology such as cloning, restriction enzymes and show competence in the skills associated with the basic techniques used in the manipulation of DNA, including blotting, hybridization, PCR, libraries and their screening, vectors, electrophoresis, sequencing etc. and the associated applications and ethics.

- Show a thorough knowledge about Human Genetics, Inherited disease (autosomal dominant, autosomal recessive and X-linked) cancer genetics, early detection(diagnosis) of genetic disease, transplantation and gene therapy

SC.5.2.3 BIOTECHNOLOGY LEVEL 7 (Third Year)

Module BTN03A2	Biotechnology 3A
NQF-level	7
NQF credits	12
Presentation	Semester 1
Prerequisites	
Purpose	

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 recover products from selected fermentation processes.
- Explain how the market potential and other cost factors influences fermentation economics

SC.5.2.4 BIOTECHNOLOGY LEVEL 7 (Third Year)

Module BTN03B2	Biotechnology 3B
NQF-level	7
NQF credits	12
Presentation	Semester 2
Prerequisites	Biotechnology 3A (BTN03A2)
Purpose	

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 analyse 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.
- Analyse and discuss the sewage purification processes and systems and the microbiology and chemistry associated with these processes.
- Discuss Quality Assurance in general.

SC.5.2.5 BIOTECHNOLOGY LEVEL 7 (Third Year)

Module BTN3WA3	Biotechnology Practical Training
NQF-level	7
NQF credits	60
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.5.2.6 BIOTECHNOLOGY LEVEL 7 (Third Year)

Module BTN3WB3	Biotechnology Practical Training
NQF-level	7
NQF credits	60
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 CHEMISTRY	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.

Diploma: Analytical Chemistry (4 years)

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 CHEMISTRY LEVEL 5 (First Year)

Module CET1XA1	Chemistry 1XA1
Programme	Dip Analytical Chemistry (4 year), Dip Biotechnology (4 year), Dip Food Technology (4 year)
NQF-level	5
NQF credits	30
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, stoichiometric calculations are performed based on balanced chemical equations and the mole concept. These concepts are further applied in solution stoichiometry.

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 routine calculations based on balanced chemical equations.
- Apply the mole concept in basic solution stoichiometry.
- Conduct experiments linked to the theory.

SC.5.3.2 CHEMISTRY LEVEL 5 (First Year)

Module CET1XB1	Chemistry 1XB1
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF-level	5
NQF credits	30
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 CHEMISTRY LEVEL 6 (Second Year)

Module CET1XA2	Chemistry 1XA2
Programme	Dip Biotechnology (4 year), Dip Food Technology (4 year)
NQF-level	6
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 CHEMISTRY LEVEL 5 (First Year)

Module CETTAB1	Analytical Chemistry 1B (Theory)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	5
NQF credits	30
Presentation	Semester 2
Prerequisites	CET1XA1
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:

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

SC.5.3.5 CHEMISTRY LEVEL 5 (First Year)

Module CETPAB1	Analytical Chemistry 1A (Practical)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	5
NQF credits	30
Presentation	Semester 2
Prerequisites	CET1XA1, MATCXA1
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:

- Use theoretical concepts to solve problems.
- Manipulate laboratory equipment.
- Use scientific language to explain principles.
- Carry out simple 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 CHEMISTRY LEVEL 5 (First Year)

Module CETXTB1	Chemistry 1A (Theory)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	5
NQF credits	30
Presentation	Semester 2
Prerequisites	CET1XA1, MATCXA1
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:

- Access, process and use data to perform calculations.
- Analyse and solve problems.
- Use scientific language to explain principles.
- Predict the shapes and polarities of organic and inorganic molecules as well as polyatomic ions.

SC.5.3.7 CHEMISTRY LEVEL 5 (First Year)

Module CETXPB1	Chemistry 1A (Practical)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	5
NQF credits	30
Presentation	Semester 2
Prerequisites	CET1XA1, MATCXA1
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:

- Use the apparatus and chemicals when performing experiments.
- Record observations and experiences 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 CHEMISTRY LEVEL 6 (Second Year)

Module CETATA2	Analytical Chemistry 1B (Theory)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	6
NQF credits	30
Presentation	Semester 1
Prerequisites	CETTAB1, CETPAB1, CETXTB1, CETXPB1
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:

- Use statistics to evaluate analytical data.
- Use scientific language to effectively describe the basic concepts of titrations for more complex acid-base systems.
- Use theoretical concepts to accurately solve problems in complex acid-base titrations.
- Use scientific language to effectively describe the basic concepts in the different applications of acid-base titrations.
- Use theoretical concepts to accurately solve problems in the different applications of acid-base titrations.
- Use scientific language to effectively describe the basic concepts of redox titrations.
- Use theoretical concepts to accurately solve problems in redox titrations.

SC.5.3.9 CHEMISTRY LEVEL 6 (Second Year)

Module CETAPA2	Analytical Chemistry 1B (Practical)
Programme	Dip Analytical Chemistry (4 year)
NQF-level	6
NQF credits	30
Presentation	Semester 1
Prerequisites	CETTAB1, CETPAB1, CETXTB1, CETXPB1,
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:

- Link theoretical concepts to the solving of problems.
- 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 CHEMISTRY LEVEL 6 (second Year)

Module CETXTA2	Chemistry 1B
Programme	Dip Analytical Chemistry (4 year)
NQF-level	6
NQF credits	30
Presentation	Semester 1
Prerequisites	CETXTB1, CETXPB1, MATCXB1
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:

- 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.
- Apply IUPAC rules for organic nomenclature.
- Use the scientific language to explain organic chemistry concepts.

SC.5.3.11 CHEMISTRY LEVEL 6 (Second Year)

Module CETATB1	Analytical Chemistry 2 (Theory)
Programme	Dip Analytical Chemistry
NQF-level	6
NQF credits	15
Presentation	Semester 2
Prerequisites	Analytical Chemistry 1B (Theory), Analytical Chemistry 1B (Practical) and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1AA1).
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.5.3.12 CHEMISTRY LEVEL 6 (Second Year)

Module CETAPB1	Analytical Chemistry 2 Practical
Programme	Dip Analytical Chemistry
NQF-level	6
NQF credits	15
Presentation	Semester 2
Prerequisites	CETATA2, CETAPA2 and simultaneous enrolment with CETATB1
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.5.3.13 CHEMISTRY LEVEL 6 (Second Year)

Module CETO2B1	Organic Chemistry 2
Programme	Dip Analytical Chemistry
NQF-level	6
NQF credits	20
Presentation	Semester 2
Prerequisites	Chemistry 1B (Theory), Chemistry 1B (Practical) and simultaneous enrolment or credit for English Communication Skills 1 (Module 2) (CSA1BB1).
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 regarding synthesis, reactions and mechanisms of various functional groups.

SC.5.3.14 CHEMISTRY LEVEL 6 (second Year)

Module CETP2B1	Physical Chemistry 2
Programme	Dip Analytical Chemistry
NQF-level	6
NQF credits	15
Presentation	Semester 2
Prerequisites	Chemistry 1B (Theory), Chemistry 1B (Practical), Mathematics 2A (MAT2WA2) and English Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.15 CHEMISTRY LEVEL 6 (Second Year)

Module CET2TB1	Analytical Chemistry 2BBF Theory
Programme	Dip Biotechnology; Dip Food Technology
NQF-level	6
NQF credits	10
Presentation	Semester 2
Prerequisites	Chemistry 1XA1 (CET1XA1), Chemistry 1XB1 (CET1XB1) and Chemistry 1XA2 (CET1XA2)
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.5.3.16 CHEMISTRY LEVEL 6 (Second Year)

Module CET2PB1	Analytical Chemistry 2BBF Practical
Programme	Dip Biotechnology; Dip Food Technology
NQF-level	6
NQF credits	6
Presentation	Semester 2
Prerequisites	Chemistry 1XA1 (CET1XA1), Chemistry 1XB1 (CET1XB1) and Chemistry 1XA2 (CET1XA2)
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 analysing solutions.
- Execute practicals safely.

SC.5.3.17 CHEMISTRY LEVEL 7 (Third ear)

Module CETI2A3	Inorganic Chemistry 2
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	12
Presentation	Semester 1
Prerequisites	Chemistry 1B (Theory), Chemistry 1B (Practical) and simultaneous enrolment or credit for English Communication Skills 1 (Module 1) (CSA1AA1)
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.5.3.18 CHEMISTRY LEVEL 7 (Third Year)

Module CETOTA3	Organic Chemistry 3 (Theory)
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	12
Presentation	Semester 1
Prerequisites	Organic Chemistry 2 (CETO2B1) and Mathematics 1 (MAT2WA2) and simultaneous enrolment or credit for Physics 1XPA2 Practical (PHYXPA2), Physics 1XTA2 (Theory) (PHYXTA2), and Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.19 CHEMISTRY LEVEL 7 (Third Year)

Module CETOPA3	Organic Chemistry 3 (Practical)
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	12
Presentation	Semester 1
Prerequisites	Organic Chemistry 2 (CETO2B1) and simultaneous enrolment or credit for Organic Chemistry 3 (Theory) (CETOTA3).
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.
- Perform a variety of experiments.
- Acquire meaningful data, process, make sense of data.
- Apply good writing skills.

SC.5.3.20 CHEMISTRY LEVEL 7 (Third Year)

Module CETP3A3	Physical Chemistry 3
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	12
Presentation	Semester 1
Prerequisites	Physical Chemistry 2 (CETP2B1), Simultaneous enrolment or credit for Physics 1XPA2 Practical (PHYXPA2), Physics 1XTA2 (Theory) (PHYXTA2), and Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.21 CHEMISTRY LEVEL 7 (Third Year)

Module CETAIB3	Analytical Chemistry 3 (Instrumental Techniques)
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	30
Presentation	Semester 2
Prerequisites	Analytical Chemistry 2 (CETATB1), Physics 1XPA2 Practical (PHYXPA2), Physics 1XTA2 (Theory) (PHYXTA2), and simultaneous enrolment or credit for Physical Chemistry 3 (CETP3A3) and Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.22 CHEMISTRY LEVEL 7 (Third Year)

Module CETAAB3	Analytical Chemistry 3 (Analytical Technology)
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	30
Presentation	Semester 2
Prerequisites	Analytical Chemistry 2 (CETATB1), Physics 1XPA2 Practical (PHYXPA2), Physics 1XTA2 (Theory) (PHYXTA2), and simultaneous enrolment or credit for Physical Chemistry 3 (CETP3A3) and Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.23 CHEMISTRY LEVEL 7 (Third Year)

Module CETAPB3	Analytical Chemistry 3 (Practical)
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	30
Presentation	Semester 2
Prerequisites	CETATB1, CETAPB1 and simultaneous enrolment of CETAIB3 and CETAAB3
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 solve 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.5.3.24 CHEMISTRY LEVEL 7 (Third Year)

Module CETI3B3	Inorganic Chemistry 3
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	12
Presentation	Semester 2
Prerequisites	Inorganic Chemistry 2 (CETI2A3) and simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.25 CHEMISTRY LEVEL 7 (Third Year)

Module CETQAB3	Chemical Quality Assurance
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	30
Presentation	Semester 2
Prerequisites	Simultaneous enrolment or credit for Communication Skills 1 (Module 2) (CSA1BB1), Analytical Chemistry Practical 3 (CETAPB3).
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.5.3.26 CHEMISTRY LEVEL 7 (Fourth Year)

Module CETESA3	Entrepreneurial Skills
Programme	Dip Analytical Chemistry
NQF-level	7
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.5.3.27 CHEMISTRY LEVEL 7 (Fourth Year)

Module CETMPA3	Materials and Processing Science
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Analytical Chemistry 3 (Instrumental Techniques) (CETAIB3) Analytical Chemistry 3 (Analytical Technology) (CETAAB3), Physical Chemistry 3 (CETP3A3), Organic Chemistry 3 (Theory) (CETOTA3), Organic Chemistry 3 (Practical) (CETOPA3) and simultaneous enrolment or credit for Polymer Chemistry (CETPCA3).
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of 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.5.3.28 CHEMISTRY LEVEL 7 (Fourth Year)

Module CETPCA3	Polymer Chemistry 3
Programme	Dip Analytical Chemistry
NQF-level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Organic Chemistry 3 (Theory) (CETOTA3) and Organic Chemistry 3 (Practical) (CETOPA3) and simultaneous enrolment or credit for Physical Chemistry 3 (CETP3A3) and Communication Skills 1 (Module 2) (CSA1BB1).
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.5.3.29 CHEMISTRY LEVEL 7 (Fourth Year)

Module CETW1B3	Analytical Chemistry Practical Training
Programme	Dip Analytical Chemistry
NQF-level	7
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:

- Comply with the workplace and work-integrated learning requirements of a student analytical chemistry technologist.
- Apply theoretical learning and practical skills to quality assurance and/or the laboratory within the relevant industry.
- 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.
- Access and critically discuss the safety equipment and procedures in the laboratory.
- Show a clear understanding of analytical chemistry techniques used in the workplace as well as the relevant evaluation of the results.

SC.5.3.30 CHEMISTRY LEVEL 5 (First Year)

Module CET01A1	Chemistry 1A
Programme	BSc in Applied Physics
NQF Level	5
Credits	15
Presentation	Semester 1
Pre-requisite	Physical Science Grade 12 – Min APS 5 (60%)
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, stoichiometric calculations are performed based on balanced chemical equations and the mole concept. These concepts are further applied in solution stoichiometry and an introduction to organic chemistry. Basic organic chemistry includes comprehensive nomenclature and identification of functional groups including stereochemistry.

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 routine calculations based on balanced chemical equations.
- Apply the mole concept in basic solution stoichiometry.
- 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.
- Apply IUPAC rules for organic nomenclature.
- Use the scientific language to explain organic chemistry concepts.
- Conduct experiments linked to the theory.

SC.5.3.31 CHEMISTRY LEVEL 6 (Second Year)

Module CET01B1	Chemistry 1B
Programme	BSc in Applied Physics
NQF Level	5
Credits	15
Presentation	Semester 2
Prerequisites	CET01A1
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of organic chemistry and physical chemistry as required for further modules in Physics and Chemistry.

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. Describe and examine the relationships between chemical reactions and energy changes.
- Analyse and solve problems regarding synthesis, reactions and mechanisms of various functional groups.
- 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.
- 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.
- Describe oxidation-reduction reactions and the application of electrochemistry

SC.5.3.32 CHEMISTRY LEVEL 6 (Second Year)

Module CETA2T2	Chemistry 2A (Theory)
NQF Level	6
Credits	15
Presentation	Semester 1
Prerequisites	CET01A1 and CET01B1, CETA2P2
Purpose	The primary focus of this module is to provide a proper knowledge and understanding of analytical techniques. 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.
- 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.5.3.33 CHEMISTRY LEVEL 6 (Second Year)

Module CETA2P2	Chemistry 2A (Practical)
NQF Level	6
Credits	5
Presentation	Semester 1
Prerequisites	CET01A1 and CET01B1
Purpose	The primary focus of this module is to provide a proper knowledge, understanding and practical skills of analytical techniques. 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 solve 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.5.3.34 CHEMISTRY LEVEL 6 (Second Year)

Module CETB2T2	Chemistry 2B (Theory)
NQF Level	6
Credits	15
Presentation	Semester 2
Prerequisites	CET01A1, CET01B1 and CETA2T2, CETA2P2
Purpose	The primary focus of this module is to enable the student's understanding of nanotechnology and nanoscience including its application in the different fields of science. The student will have an in-depth exposure to advanced characterization tools.

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

- Discuss the synthesis and characterisation techniques suitable for producing organic and inorganic nanomaterials.
- Use simple models (e.g. particles in a box, tight binding, molecular orbitals) to describe the electronic structure of molecular and solid state nanosystems.
- Use simple models and examples to describe how the electronic structure of nanosystems is influenced by electron-electron interactions (charge, spin) and coupling to the vibrations.

SC.5.3.35 CHEMISTRY LEVEL 6 (Second Year)

Module CETB2P2	Chemistry 2A (Practical)
NQF Level	6
Credits	5
Presentation	Semester 2
Prerequisites	CET01A1, CET01B1 and CETA2T2, CETA2P2
Purpose	The primary focus of this module is to expand the student's knowledge and understanding of nanomaterials from synthesis, characterization to application.

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

- Prepare for a practical from scientific journal.
- Manage time.
- Apply safe laboratory practice.
- Perform a variety of experiments.
- Acquire meaningful data, process, make sense of data.
- Apply good writing skills.

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 FTN1SB1	Introduction to Food Science and Technology
Programme	Dip Food Technology
NQF-level	5
NQF credits	18
Presentation	Semester 2
Purpose	

Module learning outcomes: On completion of this learning event, the student should be able to:
- Provide an overview of food sectors and food commodities.
- Identify the main components of foods and the influence that food composition has on functionality and material properties.
- Demonstrate a basic understanding of food processing operations and preservation techniques
- Identify the important roles of microorganisms, both beneficial and detrimental in the food industry
- Apply basic knowledge of food ingredients and processing operations to develop a food product
- Demonstrate an understanding of the importance of food regulation.
- Will be able to communicate current issues and trends in the food industry and appreciate the dynamics and continued evolution of the Food Industry.

SC.5.4.2 FOOD TECHNOLOGY LEVEL 6 (Second Year)

Module FTN1NA2	Nutrition
Programme	Dip Food Technology
NQF-level	6
NQF credits	18
Presentation	Semester 1
Purpose	This module aims at preparing students to discuss the standard principles of nutrition and to provide students with the necessary knowledge and competency to understand the nature and selection of foods with respect to different population groups; fundamentals of human nutrition; relationship that exists between diet, genetics and lifestyle; the effects of under-consumption of nutrients in the diet with the emphasis on deficiency diseases e.g. anaemia, osteoporosis and protein-energy malnutrition; the effects of over-consumption of nutrients in the diet including obesity, hypertension, cardiovascular diseases and diabetes type 2; and the physiological aspects of other nutrients including their role in the diet and prevention of diseases. Nutrition is the process of providing the body with food necessary for health and growth. It deals with the provision of the body with any material that when ingested, it is capable of being assimilated and utilized by the body. Components utilized include the SIX essential nutrients including Carbohydrates, Fibre, Fats, Proteins, Minerals, Vitamins and if possible, to a certain extent, additional nutrients such as Antioxidants and Phytochemicals. Proper nutrition ensures a well-balanced diet that provides a sense of wellbeing and vitality including normal weight, healthy body, etc. Any qualification related to Food Technology would be incomplete without an understanding of nutrition principles, because of the major role which nutrients play on health and processing foods without due consideration on nutrient availability to the body will compromise health.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe the nature of foods, food selection and food groups.

- Describe the fundamentals of human nutrition.
- Demonstrate learning of the relationship between diet, genetics and lifestyle.
- Identify nutrient requirements of different population groups in terms of energy, health and wellness.
- Summarise the effects of under-consumption of nutrients in the diet with the emphasis on deficiency diseases e.g. anaemia, osteoporosis and protein-energy malnutrition.
- Summarise the effects of over-consumption of nutrients in the diet including obesity, hypertension, cardiovascular diseases and diabetes type 2.
- Demonstrate learning of the physiological aspects of macro-, micro- and other nutrients including their role in the diet and prevention of disease including:

SC.5.4.3 FOOD TECHNOLOGY LEVEL 6 (Second Year)

Module FTN1FB1	Food Technology 1
Programme	Dip Food Technology
NQF-level	6
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.5.4.4 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTNBCA2	Food Biochemistry 3
Programme	Dip Food Technology
NQF-level	7
NQF credits	14
Presentation	Semester 1
Prerequisites	Biochemistry 2 (BIC12B1)

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.5.4.5 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN1PE2	Process Engineering
Programme	Dip Biotechnology, Dip Food Technology
NQF-level	7
NQF credits	18
Presentation	Semester 2
Prerequisites	Statistics 1XA2 (STA1XA2)
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 will be able to:

- Explain the role of process engineering in the manufacture of safe and wholesome food and related products including products of biotechnology.
- Identify and demonstrate understanding of common process engineering processes including heating, cooling etc.
- Describe the role and principles of various stages of a manufacturing system including materials handling and storage and primary and secondary processing.
- 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.
- 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.
- Demonstrate the importance of plant and equipment design in the manufacturing systems and the production of safe foods and beverages.

SC.5.4.6 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN2FA2	Food Technology 2
Programme	Dip Food Technology
NQF-level	7
NQF credits	19
Presentation	Semester 1
Prerequisites	Food Technology 1 (FTN1FB1)
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.5.4.7 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTNW1B2	Food Technology Practical Training 1
Programme	Dip Food Technology
NQF-level	7
NQF credits	60
Presentation	Semester 1 and 2
Prerequisites	Food Technology 2 (FTN2FA2) 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.5.4.8 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN2QA3	Food Safety and Quality
Programme	Dip Food Technology
NQF-level	7
NQF credits	18
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:

- Differentiate between safety and quality by demonstrating an understanding of the definitions, concepts and scope of each with special reference to the food and related industries.
- Describe the principles and philosophy of Total Quality Management (TQM) and differentiate TQM, quality management systems and food safety and/or quality management systems.
- Provide an overview of a typical quality assurance department (different laboratories e.g. chemistry, sensory, shelf-life testing, microbial testing, etc.).
- Identify safety and quality attributes associated with raw materials, in-process and finished products including:
    - Writing quality specifications (chemical, physical, sensory and microbiological).
    - Identifying and selecting appropriate methods to monitor these attributes including procedures for evaluation (accept/reject) and documentation for recording.
    - Appropriate in-process control parameters
- Source guidelines, codes of practice and legislation relevant to food hygiene and demonstrate understanding of the requirements for prerequisite programmes (PRP).
- Demonstrate basic learning and apply principles of Hazard Analysis Critical Control Points (HACCP) as an example of a food safety management system.
- Work as a team to identify and evaluate safety and quality issues in order to communicate (verbally and in writing) and propose solutions and/or improvements

SC.5.4.9 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN2RA2	Food Regulation
Programme	Dip Food Technology
NQF-level	7
NQF credits	18
Presentation	Semester 1
Purpose	The purpose of the module is to provide students with an overview of legislation of importance to the food industry, including the interpretation and requirements of legislation applicable to the production, labelling of food, hygiene and safety of food processing premises. The module covers local food legislation, some global legislation and private food safety standards.
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 that food regulation and food control systems play in assuring the safety and quality of food, beverage and related products.
- Describe the scope, application and influence of global food regulation and control initiatives with emphasis on the Codex Alimentarius Commission.
- Identify the role of the Codex Alimentarius Commission in food safety and quality and source Codex standards, codes of practice and guidelines relevant to food safety and quality.
- Review food control and regulation within the Republic of South Africa (SA) and identify and describe acts and regulations that are important in the formulation, manufacture, packaging, sale and distribution of food, beverage and related products.
- Identify, source, interpret and apply SA legislation to the formulation, manufacture, packaging, sale and distribution of a new food or beverage product, including compliance with labelling requirements.
- Identify, source and interpret the requirements of SA legislation with regard to food safety and apply the requirements to a theoretical example.
- Identify current food issues and explain the significance on the formulation, manufacture, packaging, sale and distribution of food and beverage products, including labelling requirements

SC.5.4.10 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN3MB3	Food Microbiology 3
Programme	Dip Food Technology, Dip Biotechnology
NQF-level	7
NQF credits	16
Presentation	Semester 2
Purpose	The purpose of this module is to provide students with a good understanding of the basic biology of foodborne microorganisms. The module offers students with an in depth understanding of the microorganism that are important in food, parameters that affect their growth in food and the application of food safety management systems such as HACCP in the production of safe foods. Students will also be introduced to topics such as food fermentation, food preservation and microbial spoilage of foods.
Prerequisite	Microbiology 2 (MCB2MB1)
	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.5.4.11 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN3OB3	Food Operations Management 3
Programme	Dip Food Technology
NQF-level	7
NQF credits	15
Presentation	Semester 2
Prerequisites	Food Technology 2 (FTN2FA2)
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 will be able to:

- Interpret the function of operations in the execution of a company mission and strategy.
- Select and apply a suitable quantitative demand forecasting techniques 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.
- Recognize 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.
- Describe the inventory control systems for independent and dependent demand.
- Describe enterprise resource planning (ERP) systems.
- Identify business opportunities in the market.
- Appreciate the key elements of a business plan and its purpose.
- Demonstrate understanding of the key resource requirements of a successful business.

SC.5.4.12 FOOD TECHNOLOGY LEVEL 7 (Third Year)

Module FTN3FB3	Food Technology 3
Programme	Dip Food Technology
NQF-level	7
NQF credits	19
Presentation	Semester 2
Prerequisites	Food Technology 2 (FTN2FA2)
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.5.4.13 FOOD TECHNOLOGY LEVEL 7 (Fourth Year)

Module FTNW2A3	Food Technology Practical Training 2
Programme	Dip Food Technology
NQF-level	7
NQF credits	60
Presentation	Semester 1 and 2
Prerequisites	Food Technology 2 (FTN2FA2) 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 FM is 40% - 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%.

ALTERNATIVE SEMESTER MATHEMATICS MODULES
An alternative presentation of first year Mathematics

Alternative Semester modules are presented by the Department of Mathematics and Applied Mathematics, e.g. MATE1A1 is offered in the first semester, while the alternative ASMAV1A is offered in the subsequent (second) semester. This presentation is intended to provide students who had failed the original module, with the opportunity to repeat the same module in the following/alternative semester. Students do not have to wait an entire semester to repeat the module. This opportunity is available for the following modules:

MATE1A1 offered as ASMAV1A and
MATE1B1 offered as ASMAV1B

Pass requirements: At least 50%

For further information contact the Department of Mathematics and Applied Mathematics (DFC)
Tel: (011) 559-6007 (office hours)

SC.5.5.1 MATHEMATICS LEVEL 5 (First Year)

Module MAT1XA1	Mathematics 1XA1
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF-level	5
NQF credits	5
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:

- Convert fractions, calculate an average and a percentage and convert units in metric system, present numbers in scientific notation, round off computation, set up ratios and proportions.
- Perform operations with algebraic expressions and algebraic fractions, factorize with different techniques and solve linear and quadratic equations.
- Evaluate, manipulate and simplify exponential and logarithmic expressions and solve transcendental equations, sketch exponential and logarithmic functions, apply transcendental function in biological field and food industry, manipulate formulae.

SC.5.5.2 MATHEMATICS LEVEL 5 (First Year)

Module MATCXA1	Mathematics CXA1
Programme	Dip Analytical Chemistry (4 years)
NQF-level	5
NQF credits	5
Presentation	Semester 1
Purpose	The integral part of the 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.
- 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.

SC.5.5.3 MATHEMATICS LEVEL 5 (First Year)

Module MAT1XB1	Mathematics 1XB1
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF-level	5
NQF credits	5
Presentation	Semester 2
Prerequisites	MAT1XA1
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:

- Identify and define special types of matrices, perform operations with matrices, construct and interpret matrices in real life problems, calculate the determinant of order two and three matrices, apply Cramer's rule to solve linear systems.
- Calculate the linear distance between two points in 2-D space and apply to GPs ordered pairs, apply the midpoint formula to GPS, apply gradient, inclination and linear graphs to real life problems, interpret and analyse experimental data to a linearized model, model non-linear data through suitable substitutions
- Calculate the gradient and secant, interpret rates of change and apply rules of differentiation in real life problems, derive a suitable non-linear model to interpret average gradients relevant to the real-life problem at hand
- Apply the rules of integration, translate a rate of change problem as an anti-derivative, apply definite integration and the net change theorem to real life problems

SC.5.5.4 MATHEMATICS LEVEL 5 (First Year)

Module MATCXB1	Mathematics CXB1
Programme	Dip Analytical Chemistry (4 years)
NQF-level	5
NQF credits	5
Presentation	Semester 2
Prerequisites	Mathematics CXA1
Purpose	The integral part of the 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 number 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 6 (Second Year)

Module MAT2WA2	Mathematics 2A
Programme	Dip Analytical Chemistry (4 years)
NQF-level	6
NQF credits	10
Presentation	Semester 1
Prerequisites	MATCXB1
Purpose	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:
- 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 analyse various methods on higher derivatives.

SC.5.5.6 MATHEMATICS LEVEL 6 (Second Year)

Module MAT2WB2	Mathematics 2B
Programme	Dip Analytical Chemistry (4 years)
NQF-level	6
NQF credits	10
Presentation	Semester 2
Prerequisites	MAT2WA2
Purpose	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:
- 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 MCB1XB1	Microbiology 1XB1
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF Level	5
NQF credits	18
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 6 (Second Year)

Module MCB1XA2	Microbiology 1XA2
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF Level	6
NQF credits	12
Presentation	Semester module
Prerequisites	MCB1XB1
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, Archaeal, fungal, algal and protozoan taxonomy.
- Discuss selected microbial diseases based on their epidemiology and the organisms responsible.

SC.5.6.3 MICROBIOLOGY LEVEL 6 (Second Year)

Module MCB2MB1	Microbiology 2
Programme	Dip Biotechnology, Dip Food Technology
NQF Level	6
NQF credits	16
Presentation	Semester 2
Prerequisites	MCB1XB1 and MCB1XA2
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.5.6.4 MICROBIOLOGY LEVEL 7 (Third Year)

Module MCB3MA2	Microbiology 3
Programme	Dip Biotechnology
NQF Level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Microbiology 2 (MCB2MB1**)**
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 PHY1XA1	Physics 1XA1
Programme	Dip Analytical Chemistry (4 years)
NQF-level	5
NQF credits	10
Presentation	Semester 1
Pass requirements	A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (examination). **The semester mark comprises 70% theory and 30% practical assessment**. A final summative 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.
- 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, energy and power and solve related problems.
- Perform experiments in mechanics, optics 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.5.7.2 PHYSICS LEVEL 5 (First Year)

Module PHY1TB1	Physics 1TB1 (Theory)
Programme	Dip Analytical Chemistry (4 years)
NQF-level	5
NQF credits	10
Presentation	Semester 2
Prerequisites	PHY1XA1
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:

- To analyse projectile motion in order to find position, time of flight and range.
- To compute linear momentum and the components of momentum.
- 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.
- 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.5.7.3 PHYSICS LEVEL 5 (First Year)

Module PHY1PB1	Physics 1PB1 (Practical)
Programme	Dip Analytical Chemistry (4 years)
NQF-level	5
NQF credits	10
Presentation	Semester 2
Prerequisites	PHY1XA1
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.5.7.4 PHYSICS LEVEL 6 (Second Year)

Module PHY2ZA3	Physics 2
Programme	Dip Analytical Chemistry (4 years)
NQF-level	7
NQF credits	8
Presentation	Semester 1
Prerequisites	PHY1XA1, PHY1TB1, PHY1PB1
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 6 (Second Year)

Module STA1XA2	Statistics 1XA2
Programme	Dip Biotechnology (4 years), Dip Food Technology (4 years)
NQF-level	6
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.5.9	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 ZOO1XA1	Fundamental Bioscience 1XA1
Programme	Dip Biotechnology (4 years),Dip Food Technology (4 years)
NQF Level	5
NQF credits	18
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 ZOO1XB1	Biodiversity and Ecology 1XB1
Programme	Dip Biotechnology (4 years)
NQF Level	5
NQF credits	24
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 6 (Second Year)

Module ZOO1XA2	Biodiversity and Ecology 1XA2
Programme	Dip Biotechnology (4 years)
NQF Level	6
NQF credits	24
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

PART 6

SC.6 ADVANCED DIPLOMA – LEVEL 7

Purpose of the programmes

The Advanced Diploma provides further specialisation and develops a deep and systematic understanding of current thinking, practice, theory and methodology in the study area. In addition, this qualification will prepare students for postgraduate study through a deeper knowledge and understanding of research theories, methodologies and practices as well as the development of their ability to formulate, undertake and resolve more complex theoretical and practice-related problems and tasks through the selection and use of appropriate methods and techniques.

Students who successfully complete the Advanced Diploma may proceed to post graduate studies (BSc Honours or Postgraduate Diploma).

ADVANCED DIPLOMA	SC. NO	CODE
BIOTECHNOLOGY	SC.6.1	A2BT7Q
FOOD TECHNOLOGY	SC.6.2	A2FT7Q
ANALYTICAL CHEMISTRY	SC.6.3	A2AC7Q

NOTE: Information About the BSc Hons qualifications are outlined in the Faculty of Science Postgraduate Book.

SC.6.1 BIOTECHNOLOGY	
MODULE CODE	**SC NR**
BTN7X00	6.1.1
BTN7X01	6.1.2
BTN7X02	6.1.3
BTN7X03	6.1.4
BTN7X04	6.1.5
BTN7X05	6.1.6
BTN7X06	6.1.7
SC.6.2 FOOD TECHNOLOGY	
MODULE CODE	**SC NR**
FTN7X00	6.2.1
FTN7X01	6.2.2
FTN7X02	6.2.3
FTN7X03	6.2.4
FTN7X04	6.2.5
FTN7X05	6.2.6
FTN7X06	6.2.7
FTN7X07	6.2.8
SC.6.3 ANALYTICAL CHEMISTRY	
MODULE CODE	**SC NR**
CHM7XT1	6.3.1
CHM7XP1	6.3.2
CHM7XT2	6.3.3
CHM7XP2	6.3.4
CHM7XT3	6.3.5
CHM7XP3	6.3.6
CHM7XT4	6.3.7
CHM7XP4	6.3.8

SC.6.1 BIOTECHNOLOGY BTN

The entrance requirement for the Advanced Diploma in Biotechnology (A2BT7Q) is a Diploma in Biotechnology or equivalent qualification.

The Advanced Diploma in Biotechnology consists of 7 compulsory modules:

Research Methodology Biotechnology (S1)	BTN7X00
Applied Disease and Immune Response	BTN7X01
Applied Microbial Biochemistry	BTN7X02
Applied Plant Biotechnology	BTN7X03
Applied Industrial Biotechnology	BTN7X04
Applied Molecular Biotechnology	BTN7X05
Operations Management and Entrepreneurship (S1)	BTN7X06

Exit Level outcomes

Students should be able to:

- Define the principles and terminology associated with **Disease and Immune response** and Antimicrobial Chemotherapy in general.
- Illustrate **Microbial Biochemistry** concepts including growth and control, nutrition, and energy required by microorganisms. This should also include the roles of lipids, nitrogen, amino acids, nucleic acids as well as enzymes.
- Provide proof of a sound knowledge of the concepts and principles associated with **Applied Plant Biotechnology**, including plant structure, function, metabolism and Plant-biotechnology principles and methods.
- Relate the concepts and procedures associated with **Applied Industrial Biotechnology** including cell and enzyme immobilization and the production of various Industrial products to Biotechnology processes.
- Discuss the various **Applied Molecular Biology** principles and methods and perform the associated methods.
- Express a thorough understanding of the concepts and principles of **operations and quality management** and **entrepreneurship** in the manufacture of food and related products.
- Demonstrate the ability to use **Research Methodology** in the design of a research project.

SC.6.1.1 BIOTECHNOLOGY LEVEL 7

Module BTN7X00	Research Methodology Biotechnology
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	14
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 BSc Honours programme requirements.

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

- Discuss the basic concepts of research methodology.
- Define a research problem and formulate research questions, aims and objectives that emphasize what is intended to be accomplished that will address the research outcomes.
- Identify the most important variables in a causal relationship and distinguish them in terms of dependent and independent variables.
- Develop a research proposal.

- Understand and apply appropriate research methodology, including sampling and the development and use of questionnaires to collect data relevant to the research problem.
- Understand and follow the research processes and research methods used in developing an original food and/or biotechnology product, process or quality assurance/control method or strategy, or testing a research hypothesis.
- Explain the difference between descriptive and inferential statistics and apply statistical tests and calculations to analyse and interpret the data.
- Consider ethical considerations to the feasibility of a research project and prepare documentation for ethical approval.
- Make consistent and correct use of a referencing system.
- Distinguish between the different forms of plagiarism and apply knowledge how to avoid plagiarism.

SC.6.1.2 BIOTECHNOLOGY LEVEL 7

Module BTN7X01	Applied Disease and Immune Response
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	20
Presentation	Year module
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.6.1.3 BIOTECHNOLOGY LEVEL 7

Module BTN7X02	Applied Microbial Biochemistry 4
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	14
Presentation	Year module
Pre-requisite	Microbial Biochemistry 3
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, the student should be able to:

- Construct a logical, coherent essay describing the growth and nutrition requirement of microorganisms 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 microorganisms 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 degradative 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.6.1.4 BIOTECHNOLOGY LEVEL 7

Module BTN7X03	Applied Plant Biotechnology 4
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	22
Presentation	Year module
Purpose	The module aims at preparing students to critically analyse 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 program.

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.6.1.5 BIOTECHNOLOGY LEVEL 7

Module BTN7X04	Applied Industrial Biotechnology 4
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	14
Presentation	Year module
Pre-requisite	Bioprocessing 3
Purpose	The module aims at preparing students to critically analyse 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 program.

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 its 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.
- Analyse and describe production of Beer.
- Analyse Single Cell Protein production.

SC.6.1.6 BIOTECHNOLOGY LEVEL 7

Module BTN7X05	Applied Molecular Biotechnology 4
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	22
Presentation	Year module
Pre-requisite	Basic Genetics and Analytical Biochemistry 3
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 Advanced Diploma syllabus which is essential in understanding the molecular mechanisms of sections covered in other modules. This relates to the requirements of the Biotechnology program.

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 semiconservative 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.
- Recognize 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 tautomeric 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 trans-locational events.

SC.6.1.7 BIOTECHNOLOGY LEVEL 7

Module BTN7X06	Operations Management and Entrepreneurship
Programme	Advanced Diploma Biotechnology
NQF-level	7
NQF credits	14
Presentation	Semester 1
Pre-requisite	Process Engineering 1
Purpose	The purpose of this module is to develop the student's understanding, skills and competencies in operations management and operations management tools with the emphasis on how these can be applied to entrepreneurship within the biotechnology and food technology environments.

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

- Explain the major concepts in the functional areas of accounting, marketing, finance, and management
- Describe and evaluate the legal, social, and economic environments of business.
- Describe and explain the ethical obligations and responsibilities of business.
- Apply decision-support tools to business decision making.
- Apply knowledge of business concepts and functions in an integrated manner.
- Apply fundamental concepts of operations management and operations management tools to solve problems and improve process efficiency.
- Describe and implement quality management tools for continuous improvement of methods and strategies within operations management.
- Describe the theories and concepts of entrepreneurship and compare business ownership models and critically assess the choice of location of an enterprise.
- Consider the need for innovation, identify and assess the commercial potential and viability of new knowledge, technology and markets using various methods and tools.
- Identify opportunities, challenges and risks affiliated with the set-up and financing of new initiatives such as new business ventures.
- Describe the nature and guidelines for preparing a feasibility- and business plan, outline the basic contents and format thereof and develop a feasibility- business plan.
- Identify and examine reasons for business failure including the challenges affiliated with the rapid growth of new business ventures.
- Describe the role of marketing and market research, examine consumer issues, summarise criteria for market segmentation, 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.
- Describe the role of human resources management in an enterprise.
- Demonstrate the ability to identify opportunities, organize and finance viable entrepreneurial initiatives through to fruition.

SC.6.2 FOOD TECHNOLOGY FTN

The entrance requirement for the Advanced Diploma in Food Technology (A2FT7Q) is a Diploma in Food Technology or equivalent qualification.

The Advanced Diploma in Food Technology consists of 8 compulsory modules:

Research Methodology Food Technology (S1)	FTN7X00
Food Components (S1)	FTN7X01
Food Product Development (S1)	FTN7X02
Process Engineering (S1)	FTN7X03

Food Packaging (S2)	FTN7X04
Food Technology (S2)	FTN7X05
Food Safety and Quality Assurance (S2)	FTN7X06
Operations Management and Entrepreneurship (S2)	FTN7X07

Exit Level outcomes

Students should be able to:

- Identify and solve problems encountered in food technology using critical and creative thinking and applying the relevant procedures, methods and techniques.
- Apply scientific principles to perform routine operations and preparations in the laboratory and in production in food technology contexts.
- Communicate effectively with other role players in the food technology sector using oral and/or written and visual modes of communication.
- Collect, analyse, organise and critically evaluate information/data quantitatively and qualitatively.
- Use science and technology effectively and critically, exercising compliance with good laboratory and manufacturing practices to show responsibility towards the environment and health of others.
- Integrate related systems in interpreting and assessing results and identifying problems in the workplace.
- Apply Research Methodology in the design of a research project.

Module Pass requirements
A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (Examination). A final mark (Semester : Final assessment mark weight 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according to the UJ and Faculty of Science regulations.

SC.6.2.1 FOOD TECHNOLOGY LEVEL 7

Module FTN7X00	Research Methodology Food Technology
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	14
Presentation	Semester 1
Prerequisites	-
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 BSc Honours programme requirements.

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

- Discuss the basic concepts of research methodology.
- Define a research problem and formulate research questions, aims and objectives that emphasize what is intended to be accomplished that will address the research outcomes.
- Identify the most important variables in a causal relationship and distinguish them in terms of dependent and independent variables.
- Develop a research proposal.
- Understand and apply appropriate research methodology, including sampling and the development and use of questionnaires to collect data relevant to the research problem.
- Understand and follow the research processes and research methods used in developing an original food and/or biotechnology product, process or quality assurance/control method or strategy, or testing a research hypothesis.
- Explain the difference between descriptive and inferential statistics and apply statistical tests and calculations to analyse and interpret the data.

- Consider ethical considerations to the feasibility of a research project and prepare documentation for ethical approval.
- Make consistent and correct use of a referencing system.
- Distinguish between the different forms of plagiarism and apply knowledge how to avoid plagiarism.

SC.6.2.2 FOOD TECHNOLOGY LEVEL 7

Module FTN7X01	Food Components
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	17
Presentation	Semester 1
Prerequisites	Food Biochemistry 3
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.

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

- Categorize 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 gelatinization as well as the functional role 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 protein 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 the lipids with regards to modification and processing effects and evaluate the role of lipids in the following products: cooking and salad dressings, muscle, cereals and bakery goods.
- Categorize the major classes of enzymes, including immobilized enzymes, and select and evaluate appropriate enzymes for food applications

SC.6.2.3 FOOD TECHNOLOGY LEVEL 7

Module FTN7X02	Food Product Development
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	17
Presentation	Semester 1
Prerequisites	Food Technology 3
Purpose	This module provides an overview of the food product development process including planning a project, product and process development, product costing, identification of suitable packaging, product screening methods. Theoretical learning will be demonstrated through developing a new food product.

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

- Appraise the reasons for food product development and outline the categories of new food, beverage and related products
- Present and demonstrate learning of approaches to food product development and apply the various steps and activities associated with the process of food product development process including essential principles and techniques.
- Apply basic project management skills to the food product development process.
- Communicate the role of marketing in new food product development and the successful launch of new food products.

- 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 materials and/or packaging systems including labelling for new food products.
- Apply basic project management skills to the food product development process.
- Describe the role of intellectual property (IP) in new food product development.
- Demonstrate critical and innovative thinking, problem-solving skills, communication (oral and written), planning and teamwork through planning and developing a new food product applying the principles of new food product development.

SC.6.2.4 FOOD TECHNOLOGY LEVEL 7

Module FTN7X03	Process Engineering
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	14
Presentation	Semester 1
Prerequisites	Process Engineering 1/ Food Process Engineering 1 and 2 or equivalent
Purpose	The purpose of this module is to further interrogate the role of process engineering in the manufacture of foods, beverages and related products and to apply process engineering principles to solve complex problems.

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

- Construct advanced energy balance equations and perform advanced calculations and interpret the results
- Identify and specify the key requirements for pumping/agitation system and review proposed solution
- Demonstrate the sizing and rating of heat transfer equipment and processes
- Describe the role of mass transfer in separation processes
- Describe the operating principles of several technology approaches to solids liquid clarification.
- Describe and define the energy requirements for the provision of utilities
- Describe the mechanism of comminution in various food operation and describe the operating principles of common comminution plants.

SC.6.2.5 FOOD TECHNOLOGY LEVEL 7

Module FTN7X04	Food Packaging
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	10
Presentation	Semester 1
Prerequisites	Food Technology 3
Purpose	The purpose of this module is to provide an overview and understanding of packaging development and packaging systems, including the purpose of packaging and the elements of packaging science and engineering applied to the preservation, distribution and marketing of various food products. On completion of module the student will have a basic knowledge regarding types of food packaging materials and closures and packaging systems/technology in addition to the different procedures and food safety requirements for developing, evaluating and testing of food packages.

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

- Overview the main roles and requirements of food packaging and identify and differentiate between primary, secondary and tertiary packaging.
- Identify and describe different packaging systems including packaging materials, closures and adhesives, packaging technologies and/or equipment involved in packaging of food, beverage and related products.

- Identify packaging needs and select and evaluate appropriate packaging material/s and/or packaging systems for food, beverage and related products.
- Describe package testing for the integrity and shelf-life of food, beverage and related products.
- Identify and describe environmental considerations and the implications of sustainability and waste disposal of food, beverage and related products packaging.
- Develop a packaging prototype including the product label considering the aspects of product requirements and legislation, user requirements, product safety, environmental requirements and supply chain needs.

SC.6.2.6 FOOD TECHNOLOGY LEVEL 7

Module FTN7X05	Food Technology
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	17
Presentation	Semester 2
Prerequisites	Food Technology 3
Purpose	This module aims to prepare the student to interrogate changes that occur in foods during processing as well as to understand and apply knowledge of the chemical, physical and engineering properties of foods and related products. The principles and advanced methods and techniques of qualitative and quantitative food analysis will be described and applied.

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

- Overview chemical and functional properties of food macromolecules (Proteins, lipids and carbohydrate) and their applications in the food systems.
- Overview the current innovation trends in the food industry: The case of functional foods and food applications of nanotechnologies.
- Categorize, 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 and thermal properties of foods.
- Overview and apply advanced sensory evaluation methods and techniques and apply appropriate methods to interpret data.
- Understand and apply the principles and procedures for advanced food analysis including rapid methods.
- Demonstrate mathematical competency to calculations e.g. in the preparation of samples and reagents, and in data analysis including data handling, interpretation, and validation.

SC.6.2.7 FOOD TECHNOLOGY LEVEL 7

Module FTN7X06	Food Safety and Quality Assurance
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	17
Presentation	Semester 2
Prerequisites	Food Quality Assurance 3 and Food Microbiology 3
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.

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

- Articulate the importance of food safety and quality, review global food regulation and control initiatives and identify and apply international and national codes of practice, standards, guidelines, legislation, etc. relevant to food safety, quality and hygiene.

- Source and evaluate reliable food safety and quality information and legislation nationally and internationally and demonstrate the use of concepts, theories and literature as a means of problem-solving to enhance food safety and quality.
- Review and apply aspects of food production technology including programmes, practices and preservation techniques to ensure the production of safe, quality foods throughout the food chain.
- Describe the hazards associated with food safety and quality including biological hazards, chemical hazards, food allergens and foreign bodies and conduct hazard analysis including risk analysis according to international guidelines and best practice.
- Apply the principles of total quality management, identify, review and select appropriate food safety and quality systems for implementation to ensure safe, quality food and related products.
- Develop Prerequisite Programmes (PRP) according to best practice and/or evaluate and improve existing PRP. Communicate the importance of PRPs in the success of food safety and quality management systems.
- Demonstrate learning of HACCP as an example of a food safety management system by developing and implementing new HACCP systems and/or evaluating and improving existing HACCP systems.
- Differentiate between validation and verification of food safety management systems and source, communicate, develop and/or apply product specifications/criteria, sampling and analysis methods and monitoring procedures to ensure safe, quality products.

SC.6.2.8 FOOD TECHNOLOGY LEVEL 7

Module FTN7X07	Operations Management and Entrepreneurship
Programme	Advanced Diploma in Food Technology
NQF-level	7
NQF credits	14
Presentation	Semester 2
Prerequisites	Process Engineering 1
Purpose	The purpose of this module is to develop the student's understanding, skills and competencies in operations management and operations management tools with the emphasis on how these can be applied to entrepreneurship within the biotechnology and food technology environments.

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

- Explain the major concepts in the functional areas of accounting, marketing, finance, and management
- Describe and evaluate the legal, social, and economic environments of business.
- Describe and explain the ethical obligations and responsibilities of business.
- Apply decision-support tools to business decision making.
- Apply knowledge of business concepts and functions in an integrated manner.
- Apply fundamental concepts of operations management and operations management tools to solve problems and improve process efficiency.
- Describe and implement quality management tools for continuous improvement of methods and strategies within operations management.
- Describe the theories and concepts of entrepreneurship and compare business ownership models and critically assess the choice of location of an enterprise.
- Consider the need for innovation, identify and assess the commercial potential and viability of new knowledge, technology and markets using various methods and tools.
- Identify opportunities, challenges and risks affiliated with the set-up and financing of new initiatives such as new business ventures.
- Describe the nature and guidelines for preparing a feasibility- and business plan, outline the basic contents and format thereof and develop a feasibility- business plan.
- Identify and examine reasons for business failure including the challenges affiliated with the rapid growth of new business ventures.
- Describe the role of marketing and market research, examine consumer issues, summarise criteria for market segmentation, 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.
- Describe the role of human resources management in an enterprise.
- Demonstrate the ability to identify opportunities, organize and finance viable entrepreneurial initiatives through to fruition.

SC.6.3	ANALYTICAL CHEMISTRY	CEM

The entrance requirement for the Advanced Diploma in Analytical Chemistry (A2AC7Q) is a Diploma in Analytical Chemistry or equivalent qualification.

The Advanced Diploma in Analytical Chemistry consists of 8 compulsory modules:

Analytical Chemistry Theory	CHM7XT1
Analytical Chemistry Practical	CHM7XP1
Physical Chemistry Theory	CHM7XT2
Physical Chemistry Practical	CHM7XP2
Inorganic Chemistry Theory	CHM7XT3
Inorganic Chemistry Practical	CHM7XP3
Organic Chemistry Theory	CHM7XT4
Organic Chemistry Practical	CHM7XP4

Exit Level outcomes

Students should be able to:

- This qualification provides further specialisation and develops a deep and systematic understanding of current thinking, practice, theory and methodology in the area of Applied Chemistry.
- In addition, this qualification will prepare students for postgraduate study through a deeper knowledge and understanding of research theories, methodologies and practices as well as the development of their ability to formulate, undertake and resolve more complex theoretical and practice-related problems and tasks through the selection and use of appropriate methods and techniques.
- Solve both routine and unfamiliar problems using correct procedures, methods and techniques for Analytical Chemistry, Inorganic Chemistry, Physical Chemistry and Organic Chemistry.
- Evaluate information, theories and ideas associated with Analytical Chemistry
- Present and communicate information effectively and meaningfully using scientific and academic/professional discourse conventions and formats
- Work effectively with others in a team and be able to work independently in a practical environment

Module Pass requirements
A minimum semester mark of 40% is required to gain entrance to the final assessment opportunity (Examination). A final mark (Semester : Final assessment mark weight 50:50) of 50% is required to pass the module. Supplementary final assessment will be granted according to the UJ and Faculty of Science regulations.

SC.6.3.1 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XT1	Analytical Chemistry 4 Theory
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Analytical Chemistry 3 Theory
Purpose	The primary focus of this module is to provide extensive knowledge and understanding of analytical chemistry as required of a chemist. It will enable the student to demonstrate initiative and responsibility in a professional capacity and to engage in postgraduate studies.

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

- Demonstrate an understanding of the principles and applications of different advanced instrumental analysis techniques.
- Use theoretical concepts to solve complex analytical problems.
- Evaluate data to determine analyte characteristics.

SC.6.3.2 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XP1	Analytical Chemistry 4 Practical
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	15
Presentation	Semester 1
Prerequisites	Analytical Chemistry 3 Practical
Purpose	To develop the students' understanding of the laboratory principles and practice of a wide variety of instrumental techniques, and to develop the necessary laboratory and instrumental skills in the application of these techniques in order to perform quantitative and qualitative analyses.

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

- Plan an analytical procedure taking into account what factors will influence the analysis;
- To carry out the analytical procedure;
- To analyze the data using statistics and to write a scientific report for each practical.

SC.6.3.3 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XT2	Inorganic Chemistry 4 Theory
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	22
Presentation	Semester 1
Prerequisites	Inorganic Chemistry 3 Theory
Purpose	To develop students understanding of atomic theory, atomic states, term symbols, electronic spectra, Fajan's rules and radioactivity. To broaden the students' knowledge in the chemistry of inner transition metals, organometallic compounds; and their application in industrial processes used in South Africa.

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

- Discuss and explain the spectral series of hydrogen atoms and state/explain the Bohr postulates.
- Derive the Bohr radii/energy levels and an expression for the Rydberg constant, R.
- Mathematically justify the Schrödinger equation and apply it to a particle in a one-dimensional box.
- State and explain the Pauli Exclusion principle, Hund's rule and Slater's rules.

- Calculate the pairing energy and multiplicity for a particular electronic configuration.
- Describe and explain the four quantum numbers and spin-spin and spin-orbit coupling.
- Determine, from the various microstates the term symbols and the ground state term.
- Describe the application and relaxation of the Laporte and spin selection rules.
- Discuss the splitting of electronic energy levels in octahedral and tetrahedral fields and explain how Orgel and Tanabe-Sugano diagrams used in relation to these.
- Identify and explain Jahn-Teller distortions as well as the affect they have on spectra.
- Apply Fajan's rules to discuss the hydration and hydrolysis of cations, anions and covalent transition metal complexes as well as the formation of aqua complexes.
- Apply knowledge of the electronic structures of the lanthanides and actinides to explain their physical and chemical properties and outline the methods used to separate them.
- Explain the process used to extract platinum group metals from their ores.
- Apply knowledge of the physical and chemical properties of the platinum group metals to explain how to separate these elements.
- Explain the processes used to manufacture different types of glass and give their uses.
- Outline the processes used to manufacture cement and explain how the different additives affect the properties of the cement.
- Differentiate between the different types of radioactive decay and explain when these are likely to happen.
- Explain the terms mass defect, half-life, binding energy, nuclear stability, nuclear fission and nuclear fusion.
- Explain induced nuclear reactions.
- Explain the different methods of preparation of organometallic compounds.
- Discuss and explain the structure and bonding in organometallic compounds
- Discuss the reactions of organometallic structures as catalytic and non-catalytic reagents, and explain the mechanisms.
- Discuss the application of organometallic compounds in industrial processes (Fischer - Tropsch, Wacker, Monsato, Ziegler-Natta…)
- Characterize organometallic compounds using IR or NMR techniques.

SC.6.3.4 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XP2	Inorganic Chemistry 4 Practical
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	14
Presentation	Semester 1
Prerequisites	Inorganic Chemistry 3 Practical
Purpose	The primary focus of this module is to provide extensive knowledge, understanding and practical skills of inorganic chemistry as required of a chemist. It will enable the student to demonstrate initiative and responsibility in a professional capacity and to engage in postgraduate studies.

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

- Show competence in the synthesis and isolation of transition metal complexes.
- Investigate the electronic spectra of complexes by spectrophometry techniques, and determine the degree of splitting of their d orbitals (magnitude of o).
- Arrange the ligands in order of crystal field strength (spectrochemical series) and explain deviations from the established spectrochemical series order.
- Correlate the colour and the o splitting of complexes.

SC.6.3.5 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XT3	Physical Chemistry 4 Theory
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	22
Presentation	Semester 2
Prerequisites	Physical Chemistry 3 Theory
Purpose	The primary focus of this module is to provide extensive knowledge and understanding of physical chemistry as required of a chemist. It will enable the student to demonstrate initiative and responsibility in a professional capacity and to engage in postgraduate studies.

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

- Define key concepts relating to: thermodynamics, kinetics, phase equilibria, electrochemistry, quantum theory, spectroscopy, , the solid state, and surface chemistry.
- Explain the mathematical relationships that exist between various forms of matter and its properties with reference to: thermodynamics, kinetics, 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.6.3.6 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XP4	Physical Chemistry 4 Practical
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	14
Presentation	Semester 2
Prerequisites	Physical Chemistry 3 Practical
Purpose	The primary focus of this module is to provide extensive knowledge, understanding and practical of physical chemistry as required of a chemist. It will enable the student to demonstrate initiative and responsibility in a professional capacity and to engage in postgraduate studies.

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

- Make measurements with instruments and equipment
- Correlate lecture concepts with laboratory experiments
- Do longer experiments/projects requiring some prior research/reading
- Reproduce some publish experimental data in physical chemistry
- Improved numerical/statistical analysis of data
- Improved report writing in preparation for mini projects reports

SC.6.3.7 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XT5	Organic Chemistry 4 Theory
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	14
Presentation	Semester 2
Prerequisites	Organic Chemistry 3 Theory

Purpose	To develop the students' understanding and use of infrared spectroscopy, nuclear magnetic resonance spectroscopy, ultraviolet/visible spectroscopy and mass spectroscopy for organic structure determination. To develop the students understanding of complex organic syntheses, including the importance and use of retrosynthetic analysis, protecting groups and modified reaction conditions in planning an organic synthesis. To develop the students' understanding of the application of Organic Chemistry in an Industrial Environment. To develop the students' appreciation for the biosynthesis and isolation of natural products.

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 organic molecules.
- Be able to predict the likely outcome of selected pericyclic reactions and sigmatropic rearrangements based on FMO theory.
- Demonstrate an understanding of synthesis and properties of synthetic and natural polymers including DNA, proteins and peptides.
- Demonstrate the application of retrosynthetic analysis to some simple organic compounds.
- Understand Nanotechnology, its diverse applications and impact in the real world

SC.6.3.8 ANALYTICAL CHEMISTRY LEVEL 7

Module CHM7XP5	Organic Chemistry 4 Practical
Programme	Advanced Diploma in Analytical Chemistry
NQF-level	7
NQF credits	14
Presentation	Semester 2
Prerequisites	Organic Chemistry 3 Practical
Purpose	The primary focus of this module is to provide extensive knowledge, understanding and practical skills of organic chemistry as required of a chemist. It will enable the student to demonstrate initiative and responsibility in a professional capacity and to engage in postgraduate studies.

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

- Understand the importance of qualitative analysis
- Learn the principles and applications of chromatography
- Understand the physical and chemical differences of acids and bases
- Observe how the manipulation of a reaction environment may influence the type/mechanism/reactivity of a reaction taking place
- Synthesise and correctly identify organic compounds using several structure determination techniques
- See how molecular modelling (theoretical) may be used to enhance chemistry and assist the experimental chemist

PART 7

SC.7 ACADEMIC SUPPORT PROGRAMMES IN THE FACULTY

FOUR-YEAR 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 book.

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.7.1 SKILLS FOR SUCCESS

Module SFS1XY1	Skills for Success (S4S)
Programme	Dip Analytical Chemistry, Biotechnology, Food Technology (4 years)
NQF-level	5
NQF credits	10
Presentation	Year module
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 8

SC.8 LIST OF MODULES AND OUTCOMES PRESENTED BY THE FACULTY OF SCIENCE TO OTHER FACULTIES

SC.8.1 CHEMISTRY	
MODULE CODE	**SC NR**
CETE1A1	8.1.1
CETE1B1	8.1.2
CETM1A1	8.1.3
CETM1B1	8.1.4
CETM2A1	8.1.5
FCHED01	8.1.6
ECMSED1	8.1.7
ECMSED2	8.1.8
CHMMNB1	8.1.9
CET1AT1	8.1.10
CET1AP1	8.1.11
CET1YHT	8.1.12
CET1YHP	8.1.13
CET1H1Y1	8.1.14
CETCHY1	8.1.15
CHB1BB1/CET1DB1	8.1.16
CEM1CA1	8.1.17
CEMH1A1	8.1.18
CHBCEB1	8.1.19
SC.8.2 BIOCHEMISTRY	
BIC01B1	8.2.1
BICH1A1	8.2.2
SC.8.3 GEOLOGY	
MODULE CODE	**SC NR**
GCISCB1	8.3.1
GLGE2A2	8.3.2
GMESCA2	8.3.3
GMESCB2	8.3.4
GLGB2B2	8.3.5
SC.8.4 MATHEMATICS	
MODULE CODE	**SC NR**
MATE1A1	8.4.1
MATHED1	8.4.2
MATM1A1	8.4.3
MATM1B1	8.4.4
MATM2A1	8.4.5
MATE1B1	8.4.6
MATEAD1	8.4.7
MATEBD1	8.4.8
MATYED1	8.4.9
MATYED2	8.4.10
MATE2A2	8.4.11
MAT01A1	8.4.12
SC.8.5 MICROBIOLOGY	
MODULE CODE	**SC NR**
MCBH1Y1	8.5.1
MCB2YMM	8.5.2
MCB01A2	8.5.3

SC.8.6	PHYSICS
MODULE CODE	**SC NR**
APP01Y1	8.6.1
PHYE1A1	8.6.2
PHYE1B1	8.6.3
PHYSCA1	8.6.4
PHYSCB1	8.6.5
FPYED01	8.6.6
PMEDP01	8.6.7
PHADTX1	8.6.8
PHADPX1	8.6.9
PHADTX2	8.6.10
PHADPX2	8.6.11
PHYB1Y1	8.6.12
PHY1AET	8.6.13
PHY1ADP	8.6.14
PHY1ALT	8.6.15
PHY1YFT	8.6.16
PHY1YFP	8.6.17
PHBH1Y1	8.6.18
PHY1YHT	8.6.19
PHY2YHT	8.6.20
PHY1CA1	8.6.21
PHY1DB1	8.6.22
PHB1AA1	8.6.23
PHYCHA1	8.6.24
PHYH1B1	8.6.25
PHYCEA1	8.6.26
SC.8.7	**STATISTICS**
MODULE CODE	**SC NR**
STA1ABF	8.7.1
STAQTA1	8.7.2
STAQTB1	8.7.3
STASCA1	8.7.4
STAE1B1	8.7.5
QTPTRA2	8.7.6
STA7AQT	8.7.7
STA7BQT	8.7.8
SC.8.8	**STATISTICAL METHODS**
SMT01A1	8.8.1

SC.8.1	CHEMISTRY	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.8.1.1 CHEMISTRY LEVEL 5 (First Year)

Module CETE1A1	Engineering Chemistry (Chemical) 1A
Programme	BEng Tech Chemical Engineering (3 year and 4 year), BEng Tech Electrical Engineering (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Purpose	Chemistry is a fundamental science of engineering. This course introduces students to the basic principles of chemistry.

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

- Define atomic structures for various elements and explain how these structures give elements their properties
- Explain the formation and type of bonds for ionic, molecular elements and compounds
- Write balanced chemical reactions and write net ionic equations
- Differentiate between acids and bases and apply the chemistry of acids and basis to solve problems
- Perform calculations on chemical reactions
- Explain properties of solutions
- Define the classification of organic compounds into groups such as alkanes, alcohol, aldehydes, etc., by defining the properties of each group and by predicting various reactions for each group
- Basic general chemistry: atomic structure and periodic table, ionic compounds, molecular elements and compounds, chemical equations and reactions compounds and stoichiometry, acid-base equilibria, reactions rates and equilibrium solutions
- Basic organic chemistry: alkanes and cycloalkanes, unsaturated hydrocarbons, alcohols, phenols and ethers, aldehydes and ketones, carboxylic acids and esters, amines and amides

SC.8.1.2 CHEMISTRY LEVEL 5 (First Year)

Module CETE1B1	Engineering Chemistry (Chemical) 1B
Programme	BEng Tech Chemical Engineering (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 2
Purpose	This course introduces students to some basic concepts in physical chemistry which are commonly used in chemical engineering

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

- Differentiate between ideal and non-ideal gases and perform calculation using the fundamental ideal gas laws
- Define physical properties of liquids and be able to perform calculations involving properties such as viscosity, surface tension and molecular refraction
- Explain the principle of electrochemistry by diagrammatic representation of electrochemical cells and electrode potentials and EMF`s of cells; Define the use of equilibrium relationships in chemical reactions and performs calculations involving equilibrium constants of heterogeneous

reactions; Define the meaning of colligative properties and perform calculations on lowering of vapour pressure using Raoult`s law, boiling point elevation, and freezing point depression

- Explain the concept of reaction kinetics, state how reaction rates are measured and perform calculations on determination of reaction order and molecularity; Define general properties of colloids, suspensions, sols, gets and emulsions.
- Chemical Bonding: describe ionic, covalent, dative covalent and metallic bonding. Radius ratios for close packed structures, Lewis dot structure, resonance, VSEPR theory; Chemical Reactions in aqueous and Non-Aqueous Solutions: define aqueous and non-aqueous solutions, suitability of solvents, effects of hydrogen bonding on solvents, acid-based theory: Bronsted-Lowry, Lewis, Arrhenius; Gases: differentiation between ideal and non-ideal gases, calculations using ideal gas laws, Grahams law of diffusion, etc; Liquids: properties of liquids and determination of physical properties
- Electrochemistry: an introduction to the basic science of electrochemistry and calculations such as determining cells EMF-s; Chemical equilibrium: use of chemical equilibrium relationships in chemical reactions Determination of equilibrium constants and application of Le Chaterlier`s principle; Colligative properties of solutions: explanation and calculation of colligative properties
- Reaction kinetics: general concepts of kinetics Calculations on determination of reaction orders and molecularities; Colloids: differentiation between colloids, suspensions, sols, gels and emulsions

SC.8.1.3 CHEMISTRY LEVEL 5 (First Year)

Module CETM1A1	Engineering Chemistry (Metallurgy) 1A *(phasing out)*
Programme	BEng Tech Extraction Metallurgy (3 year and 4 year), BEng Tech Physical Metallurgy (3 year and 4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Purpose	Chemistry is a fundamental science of engineering. This course introduces students to the basic principles of chemistry.

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

- Define atomic structures for various elements and explain how these structures give elements their properties
- Explain the formation and type of bonds for ionic and molecular elements and compounds
- Differentiate between acids and bases and apply the chemistry of acids and basis to solve problems;
- Write balanced chemical reactions and net ionic equations and perform calculations on chemical reactions
- Identify the functional groups of organic compounds with respect to their properties only.

SC.8.1.4 CHEMISTRY LEVEL 5 (First Year)

Module CETM1B1	Engineering Chemistry (Metallurgy) 1B *(phasing out)*
Programme	BEng Tech Extraction Metallurgy (3 year and 4 year), BEng Tech Physical Metallurgy (3 year and 4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 2
Purpose	Chemistry is a fundamental science of engineering.This course introduces students to the basic principles of chemistry.

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

- Describe ionic, covalent, dative covalent and metallic bonding.
- Use radius-ratio rules to predict the structures of ionic compounds
- Use VSEPR theory to predict the shapes of molecules
- Differentiate between ideal and non-ideal gases and perform calculation using the fundamental ideal gas laws
- Define physical properties of liquids and be able to perform calculations involving properties such as viscosity, surface tension and molecular refraction;

- Explain the principle of electrochemistry by diagrammatic representation of electrochemical cells and electrode potentials and EMF`s of cells
- Define the use of equilibrium relationships in chemical reactions and performs calculations involving equilibrium constants of heterogeneous reactions;
- Explain the concept of reaction kinetics, state how reaction rates are measured and perform calculations on determination of reaction order and molecularity
- Define general properties of colloids, suspensions, sols, gets and emulsions

SC.8.1.5 CHEMISTRY LEVEL 5 (First Year)

Module CETM2A1	Engineering Chemistry (Metallurgy) 2A1
Programme	BEng Tech Extraction Metallurgy (3 year and 4 year), BEng Tech Physical Metallurgy (3 year and 4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Pre-requisite	ECMSED1 (4 year)
Purpose	Chemistry is a fundamental science of engineering.This course introduces students to the basic principles of chemistry.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe ionic, covalent, dative covalent and metallic bonding.
- Use radius-ratio rules to predict the structures of ionic compounds
- Use VSEPR theory to predict the shapes of molecules
- Differentiate between ideal and non-ideal gases and perform calculation using the fundamental ideal gas laws
- Define physical properties of liquids and be able to perform calculations involving properties such as viscosity, surface tension and molecular refraction;
- Explain the principle of electrochemistry by diagrammatic representation of electrochemical cells and electrode potentials and EMF`s of cells
- Define the use of equilibrium relationships in chemical reactions and performs calculations involving equilibrium constants of heterogeneous reactions;
- Explain the concept of reaction kinetics, state how reaction rates are measured and perform calculations on determination of reaction order and molecularity
- Define general properties of colloids, suspensions, sols, gets and emulsions

SC.8.1.6 CHEMISTRY LEVEL 5 (First Year)

Module FCHED01	Foundation Chemistry
Programme	BEng Tech Electrical Engineering (4 year)
NQF-level	5
NQF credits	12
Presentation	Year module
Purpose	This course lays the foundation for tertiary level Chemistry. The course is aimed at ensuring that a good understanding of the basic concepts of chemistry is developed. It also equips students with the necessary skills, knowledge and confidence needed for a career in science and technology, particularly engineering. It also develops problem-solving, critical thinking, analytical and application skills.
Content	Matter; Atomic structure; Chemical bonds and bonding; The Mole concept & Chemical Calculations I; Chemical Reactions & Chemical Calculations II; Chemical Equilibrium; Aqueous Chemistry; Acids and bases, pH, Chemical Calculations and Acid-Base Titrations (VIII); Oxidation and Reduction Reactions; Inorganic Chemistry-The Main Group Elements; Organic Chemistry.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe the microscopic and macroscopic properties of matter

- Locate the different groups of elements in the Periodic Table.
- Distinguish between atoms and ions and know the differences between their names and symbols.

SC.8.1.7 CHEMISTRY LEVEL 5 (First Year)

Module ECMSED1	Chemistry 1X (Theory)
Programme	BEng Tech Extraction Metallurgy (4 year)
NQF-level	5
NQF credits	12
Presentation	Year module

Module learning outcomes: On completion of this learning event, the student should be able to:
- Describe the fundamental ways in which matter is classified
- Describe the electronic structure of an atom
- Explain the concepts of chemical bonding
- Use VSEPR theory to predict the shapes of simple molecules and ions
- Describe the physical properties of liquids
- Perform calculations based on balanced chemical equations

SC.8.1.8 CHEMISTRY LEVEL 5 (First Year)

Module ECMSED2	Chemistry 1X (Practical)
Programme	BEng Tech Extraction Metallurgy (4 year)
NQF-level	5
NQF credits	12
Presentation	Year module

Module learning outcomes: On completion of this learning event, the student should be able to:
- Set up experimental apparatus correctly
- Exercise caution when handling hazardous chemicals
- Record experimental data and observations
- Use scientific terminology to explain experimental results and observations

SC.8.1.9 CHEMISTRY LEVEL 5 (First Year)

Module CHMMNB1	Chemistry for Miners 1B
Programme	B Eng Tech Mining Engineering (3 year)
NQF-level	5
NQF credits	12
Presentation	Semester 2
Purpose	To provide a developed knowledge of chemistry as applicable to Mining Engineering Technology.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Relate basic concepts in Science to the field of Mining Engineering Technology.
- Describe the structure of matter.
- Describe the kinetic theory of matter and relevance to mining gases.
- Calculate reaction rate constants and equilibrium constants
- Describe the relevance of acid-base theory and electrochemistry in Mining Engineering Technology.
- Name and draw basic structural formulae for basic organic compounds.

SC.8.1.10 CHEMISTRY LEVEL 5 (First Year)

Module CET1AT1	Chemistry 1BBF Theory *(phasing out)*
Programme	ND Biomedical 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.8.1.11 CHEMISTRY LEVEL 5 (First Year)

Module CET1AP1	Chemistry 1BBF Practical *(phasing out)*
Programme	ND Biomedical 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.8.1.12 CHEMISTRY LEVEL 5 (First Year)

Module CET1YHT	Chemistry 1CH (Theory) *(phasing out)*
Programme	NDip Chiropractic; NDip Homoeopathy
NQF-level	5
NQF credits	14
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.8.1.13 CHEMISTRY LEVEL 5 (First Year)

Module CET1YHP	Chemistry 1CH (Practical) *(phasing out)*
Programme	NDip Chiropractic; NDip Homoeopathy
NQF-level	5
NQF credits	5
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 analysing solutions.
- Execute basic organic chemistry experiments.
- Execute experiments safely.

SC.8.1.14 CHEMISTRY LEVEL 5 (First Year)

Module CETH1Y1	Chemistry
Programme	Bachelor of Environmental Health
NQF-level	5
NQF credits	12
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 Environmental Health.

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

- Give the macroscopic and microscopic definition of matter
- Describe the three main types of chemical bonding
- Write balanced chemical equations and perform basic chemical calculations
- Describe and give example of water pollution
- Discuss the different methods of water treatment
- Distinguish between acids and bases with respect to their properties and strengths
- Balance redox reactions
- Describe the properties of different classes of organic compound including carbohydrates, lipids and proteins

SC8.1.15 CHEMISTRY LEVEL 5 (First Year)

Module CET1DA1/ CET1DB1	Basic Science: Chemistry
Programme	Diploma and BHS Emergency Medical Care, BHS Podiatry
NQF-level	5
NQF credits	12
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.8.1.16 CHEMISTRY LEVEL 5 (First Year)

Module CEM1CA1	Chemistry 1C
Programme	Bachelor of Optometry
NQF Level	5
Credits	24
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 Optometry.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Distinguish between the different types of matter and their properties.
- Apply the principles of atomic and molecular structure to solve problems related to chemical bonding and molecular shapes.
- Predict the outcome of chemical reactions and write proper chemical equations
- Perform stoichiometric calculations.
- Discuss different acid-base theories and differentiate between weak and strong acids and bases.
- Apply IUPAC rules for nomenclature.
- Use scientific language to explain organic concepts.
- Analyse and solve problems regarding physical and chemical properties of various functional groups.
- Demonstrate the ability to perform laboratory experiments safely and to interpret the results.

SC.8.1.16 CHEMISTRY LEVEL 5 (First Year)

Module CEMH1A1	Chemistry 1A
Programme	BHS Medical Laboratory Sciences
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	The primary purpose of this module is to develop students understanding of general, inorganic and organic chemistry which will serve as a basis for further study in medical laboratory sciences. The module aims to develop students understanding and skills in practical work associated with general, inorganic and organic chemistry.

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

SC.8.1.17 CHEMISTRY LEVEL 5 (First Year)

Module CETCHY1	Chemistry 1
Programme	BHS Chiropractic, BHS Complementary Medicine
NQF-level	5
NQF credits	14
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 Complementary Medicine.

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 problems based on organic chemistry.

SC.8.1.18 CHEMISTRY LEVEL 5 *(Information may be obtained from Department Chemical Sciences)*

Module CHBCEB1	Chemistry 1
Programme	Higher Certificate in Emergency Medical Care
NQF-level	5
NQF credits	6
Presentation	Semester 2
Purpose	

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

SC.8.2 BIOCHEMISTRY BIC

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

Practicals

BIC01B1 = 1 x 3 hours per week
BICH1A1 = 1 x 3 hours per week

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

Practicals

- All practicals have to be attended and practical assignments/reports have to be submitted on or before the indicated dates. Practical classes form an integral part of the module and NO student will be excused from practical classes.
- Practical classes are compulsory and count towards the semester mark. If an assessment opportunity of whatever kind is missed due to illness or death of immediate family, an original medical certificate with a valid medical condition or other applicable certificate plus the Application for Deferred test/final assessment (in the Appendix section of the guide) MUST be completed by a reputable general practitioner or a death certificate must be handed in not later than 3 days after the missed practical or test. Failure to do so will result in a mark of zero being

allocated. The absence from any practical without reason will result in a semester mark of "incomplete". A maximum of 1 practical session may be missed with valid reasons. If more than 1 practical session is missed, even with valid reasons, the student will be given an “incomplete” mark which will result in no exam entrance.

- Absence from a practical session must be motivated by a doctor’s certificate with a valid medical condition. This only excuses the student from the practical session; a report must still be handed in when returning to university - before starting the next practical session. The class test (if there is one) for the missed practical/tutorial class must also be written.
- In addition to weekly practical reports, a practical exam is written at the end of each module. The combined mark for the practical reports and the practical exam must be at least 50% to gain admission to the final theory assessment opportunity.
- The practical mark contributes 50% of the module mark. The calculation of the module mark and the contribution of the practical component thereto, are explained in the respective study guides. If a student fails the final assessment exam, he/she can obtain exemption from repeating the practical component of a module if the combined final mark for the practical reports and practical exam was greater than 50%.

Theory

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

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

SC.8.2.1 BIOCHEMISTRY LEVEL 5 (First Year)

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

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

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

SC.8.2.2 BIOCHEMISTRY LEVEL 5 (First Year)

Module BICH1A1	Biochemistry
Programme	Bachelor of Environmental Health
NQF Level	5
Credits	6
Presentation	Semester 1
Purpose	This module gives learners a broad overview of the fundamentals of the biochemical principles that underlie cellular function.

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

- Understand the basic principles of chemistry as it relates to inorganic and organic molecules and relate the molecular structure of biomolecules to their respective molecular function.
- Justify why the cell can be considered the basic unit of life, distinguish between pro- and eukaryotic cells and relate the molecular structure of cellular organelles and the biological membrane to their function.
- Consider cellular metabolic concepts such as central role of ATP and the central role of aerobic cellular respiration and photosynthesis to life.
- Examine cellular reproduction (meiosis), the fundamental principles of inheritance as well as the flow of genetic information from DNA to RNA to proteins in the cell (replication, transcription, translation).
- Develop the general skills (e.g., observation, problem solving, hypothesis generation and testing) used in science and familiarize themselves with various laboratory techniques.
- Understand the processes by which xenobiotics are transformed, eliminated or stored and how this can affect the different biological processes of a normally functioning organism.

SC.8.3 GEOLOGY GLG

SC.8.3.1 GEOLOGY LEVEL 5 (First Year)

Module GCISCB1	Engineering Geology (Civil)1B
Programme	BEng Tech Civil Engineering (3 year and 4 year)
NQF-level	5
NQF credits	7
Presentation	Semester 2
Purpose	To provide the student with a general understanding of the science of geology including the structure of the earth, and the rocks and minerals that make up the crust of the earth, the interpretation of natural features in the rock formations of the environment, rock mass strengths and how the geology of an area influences the siting of excavations and other construction management and building undertakings.
Pass requirements	The semester mark makes up 50% of the final mark. The exam mark makes up 50% of final mark. A subminimum of 40% is required for the semester mark, for entry to the final assessment.

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

- Demonstrate an understanding of knowledge of the structure of the solid earth.
- Demonstrate an understanding of the knowledge of the global processes that drive the processes of the rock cycle.
- Demonstrate an understanding of the concept and classification of minerals.
- Demonstrate an understanding of knowledge of igneous rocks.
- Demonstrate an understanding of knowledge of sedimentary rocks.
- Demonstrate an understanding of knowledge of metamorphic rocks.
- Demonstrate an understanding of the concepts of erosion and weathering (physical geology)
- Demonstrate an understanding of the concepts and description of folded and fractured rocks (structural geology).

- 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, and
- Demonstrate an understanding of how the geology and rock-mass properties influence the siting of excavations.

SC.8.3.2 GEOLOGY LEVEL 6 (Second Year)

Module GLGE2A2	Engineering Geology (Mining) 2A
Programme	Bachelor of Mine Surveying (3 year), BEng Tech in Mining Engineering (3 year)
NQF-level	6
NQF credits	14
Presentation	Semester 1
Purpose	To provide the students with sufficient introductory geology in the fields of mineralogy, igneous rocks, sedimentary rocks, structural geology and metamorphic rocks, followed by 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 marks are derived from a combination of theory tests and one major practical test; A subminimum of 50% is required for the practical test, while a subminimum of 40% is required for the semester mark, for entry to the final assessment. The semester mark makes up 50% of the final mark. The exam mark makes up 50% of final mark. There is no practical assessment in the final exam.

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

- Demonstrate an understanding of the concept and classification of minerals and the naming of rocks
- Demonstrate an understanding of igneous rocks.
- Demonstrate an understanding of sedimentary rocks.
- Demonstrate an understanding of metamorphic rocks.
- Demonstrate an understanding of the concepts of erosion and weathering (physical geology)
- Demonstrate an understanding of the concepts and description of folded and fractured rocks (structural geology).
- 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.8.3.3 GEOLOGY LEVEL 6 (Second Year)

Module GMESCA2	Engineering Geology (Metallurgy) 2A
Programme	BEng Tech Extraction Metallurgy (3 year and 4 year)
NQF-level	6
NQF credits	14
Presentation	Semester 1
Purpose	To provide the students with sufficient introductory geology in the fields of mineralogy, igneous rocks, sedimentary rocks and metamorphic rocks including 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 an emphasis on the practical identification of rock forming and ore minerals. Following from this a knowledge of rocks and silicate mineral identification using the polarising microscope and practical hand specimens is required.
Pass requirements	Semester mark derived from a combination of theory tests and a practical test on hand specimen identification of minerals. A subminimum of 50% is required for the practical test. The semester mark makes up 50% of the final mark. The exam mark makes up 50% of final mark. A subminimum of 40% is required for the semester mark, for entry to the final assessment.

Module learning outcomes: 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.
    - 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
    - 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.
- 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.8.3.4 GEOLOGY LEVEL 7 (Second Year)

Module GMESCB2	Engineering Geology (Metallurgy) 2B
Programme	BEng Tech Extraction Metallurgy (3 year and 4 year)
NQF-level	7
NQF credits	14
Presentation	Semester 2
Prerequisites	Pass in Engineering Geology (Metallurgy) 2A GMESCA2
Purpose	To develop a knowledge of the methods of mineral separation, identification of ores and their associations with gangue minerals using the reflecting microscope, and knowledge of process mineralogy.
Pass requirements	Semester mark derived from combination of theory and a practical test. A subminimum of 50% is required for the practical test. The semester mark makes up 50% of the final mark. The exam mark makes up 50% of final mark. A subminimum of 40% is required for the semester mark, for entry to the final assessment.

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.8.3.5 GEOLOGY LEVEL 6 (Second Year)

Module GLGB2B2	Engineering Geology (Construction) 2B
Programme	Bachelor of Construction (3 year and 4 year)
NQF-level	6
NQF credits	10
Presentation	Semester 2
Purpose	To provide the student with a general understanding of the science of geology including the structure of the earth, and the rocks and minerals that make up the crust of the earth, the interpretation of natural features in the rock formations of the environment, rock mass strengths and how the geology of an area influences the siting of excavations and other construction management and building undertakings.
Pass requirements	The semester mark makes up 50% of the final mark. The exam mark makes up 50% of final mark. A subminimum of 40% is required for the semester mark, for entry to the final assessment.

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

- Demonstrate an understanding of knowledge of the structure of the solid earth.
- Demonstrate an understanding of the knowledge of the global processes that drive the processes of the rock cycle.
- Demonstrate an understanding of the concept and classification of minerals.
- Demonstrate an understanding of knowledge of igneous rocks.
- Demonstrate an understanding of knowledge of sedimentary rocks.
- Demonstrate an understanding of knowledge of metamorphic rocks.
- Demonstrate an understanding of the concepts of erosion and weathering (physical geology)
- Demonstrate an understanding of the concepts and description of folded and fractured rocks (structural geology).
- 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, and
- Demonstrate an understanding of how the geology and rock-mass properties influence the siting of excavations.

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 FM is 40% - 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%.

ALTERNATIVE SEMESTER MATHEMATICS MODULES
An alternative presentation of first and second year Mathematics

Alternative Semester modules are presented by the Department of Pure and Applied Mathematics, e.g. MATE1A1 is offered in the first semester, while the alternative is offered in the subsequent (second) semester. This presentation is intended to provide students who had failed the original module, with the opportunity to repeat the same module in the following/alternative semester. Students do not have to wait an entire semester to repeat the module. This opportunity is available for the following modules:

MATE1A1, MATEAD1 offered as ASMAV1A
MATE1B1, MATEBD1 offered as ASMAV1B

Pass requirements: At least 50%

For further information contact the Department of Pure and Applied Mathematics
Tel: (011) 559-6007 (office hours)

SC.8.4.1 MATHEMATICS LEVEL 5 (First Year)

Module MATE1A1	Engineering Mathematics V 1A
Programme	Bachelor of Construction (3 year), Bachelor of Mine Surveying (3 year), BEng Tech Chemical Engineering (3 year), BEng Tech Civil Engineering (3 year and 4 year), BEng Tech Electrical Engineering (3 year and 4 year), BEng Tech in Extraction Metallurgy (3 year), BEng Tech Industrial Engineering (3 year and 4 year), BEng Tech Mechanical Engineering (3 year and 4 year), BEng Tech Mining Engineering (3 year), BEng Tech Physical Metallurgy (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Prerequisite	Grade 12 Mathematics min APS 5
Purpose	The purpose of this module is to equip students with application knowledge and skills of Mathematics in Engineering, real life and work environments.

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

- Use the binomial theorem to raise any binomial to any real power and find any specified term in the 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 using Cramer's rule.
- Evaluate, manipulate, draw and simplify problems relating to transcendental functions (exponents and logarithms) and solve them.
- Demonstrate basic understand of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Draw and interpret the sine equations, in terms of period; frequency and phase angles.
- Solve trigonometric equations with one or two functions and one or two angle(s).
- Introduce and explain the complex system and represent it in three forms, namely, rectangular, polar and exponential. Perform algebraic operations with complex numbers in these three forms. Solve problems involving solutions to the complex numbers.
- Use special rules to determine the derivatives of algebraic and transcendental functions, and extend these to higher derivatives.
- Explain and use application of differentiation to determine the maximum and minimum turning points, and point of inflection for polynomial graphs and its application to tangent of curves and practical problems.
- Perform integration of algebraic transcendental functions involving definite and indefinite integrals 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.8.4.2 MATHEMATICS LEVEL 5 (First Year)

Module MATHED1	Mathematics X1
Programme	BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	12
Presentation	Year 1
Prerequisites	Grade 12 Mathematics min APS 4
Purpose	The purpose of this module is to equip students with application knowledge and skills of Mathematics in Engineering, real life and work environments.

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

- Use the binomial theorem to raise any binomial to any real power and find any specified term in the 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 using Cramer's rule.

- Evaluate, manipulate, draw and simplify problems relating to transcendental functions (exponents and logarithms) and solve them.
- Demonstrate basic understanding of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Draw and interpret the sine functions, in terms of period; frequency and phase angles.
- Solve trigonometric equations with one or two functions and one or two angle(s).
- Introduce and explain the complex system and represent it in three forms, namely, rectangular, polar and exponential. Perform algebraic operations with complex numbers in these three forms. Solve problems involving solutions to the complex numbers.
- Use special rules to determine the derivatives of algebraic and transcendental functions and extend these to higher derivatives.
- Explain and use application of differentiation to determine the maximum and minimum turning points, and point of inflection for polynomial graphs and its application to tangent of curves and practical problems.
- Perform integration of algebraic transcendental functions involving definite and indefinite integrals 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.8.4.3 MATHEMATICS LEVEL 5 (First Year)

Module MATM1A1	Measurement Mathematics 1A
Programme	Bachelor of Urban and Regional Planning (3 year)
NQF-level	5
NQF credits	7
Presentation	Semester 1
Prerequisites	Grade 12 Mathematics with a level 4 pass (or equivalent)
Purpose	The purpose of this module is to stimulate intellectual reasoning skills for the solution of real life measurement problems.
Content	Measurement: metric system, measurement instruments, accuracy and precision, unit conversion using a scientific calculator; Statistics: mode, median, mean, basic statistical analysis; Geometry: problems in area, mass, volume, and distance; Computer applications

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

- Distinguish between the metric system and other systems of measurement and the units used therein.
- Use the appropriate instrument to perform a given measurement
- Distinguish between accuracy and precision
- Distinguish between the different types of measurement (distance, area, mass, volume)
- Convert between the different units of measurement.
- Calculate the area and volume of a geometric object, and give the answer using the correct units.

SC.8.4.4 MATHEMATICS LEVEL 5 (First Year)

Module MATM1B1	Measurement Mathematics 1B
Programme	Bachelor of Construction (3 year), BEng Tech Mining Engineering (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 2
Prerequisite	MATM1A1
Purpose	The purpose of this module is to stimulate intellectual reasoning skills for the solution of real life measurement problems and to allow students to solve various geometric problems.
Content	Indices and exponents, logarithms, trigonometric identites and proofs, solving systems of linear and polynomial equations, irrational roots, triangle and circle problems, complex area and volume problems

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

- Use laws of exponents to simplify algebraic expressions and solve equations

- Use laws of logarithms to simplify expressions and solve logarithmic and exponential equations
- Solve systems of linear equations and polynomial equations with rational and irrational roots.
- Solve triangle problems
- Solve problems involving the circle: arc length, area of a segment and area of a sector.
- Solve complex area and volume problems.

SC.8.4.5 MATHEMATICS LEVEL 5 (First Year)

Module MATM2A1	Engineering Mathematics 2A1
Programme	BEng Tech Extraction Metallurgy (4 year), BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Prerequisites	MATHED1
Purpose	The purpose of this module is to further equip students with mathematical knowledge and problem solving ability appropriate for engineering.

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

- Select and use appropriate rules for differentiation to differentiate functions that are both in Cartesian and Parametric form.
- Apply First order and Second Partial differentiation using Leibniz notation consistently.
- Apply partial differentiation to calculate small increments applied to functions of several variables.
- Interpret real world problems and apply partial differentiation to small increments. Calculate percentage errors and rates of change.
- Integrate functions using appropriate techniques of integration.
- Apply integration to determine areas of regions in the plane and volumes of solids of revolution, using the appropriate method (disc and/or shell method), calculate the mean value and RMS value of a given function
- Utilize the geometry and algebra of vectors.
- Apply vectors to mathematically related problems.
- Perform algebraic operations on Matrices and Determinants.
- Use Determinants to find inverses of Matrices.
- Use matrices to solve systems of linear equations.
- Apply Cramer's rule to solve engineering problems.
- Determine the eigenvalues and eigenvectors of a given matrix.
- Use Least Squares Regression to predict and estimate results.

SC.8.4.6 MATHEMATICS LEVEL 5 (First Year)

Module MATE1B1	Engineering Mathematics V 1B
Programme	Bachelor of Mine Surveying (3 year), BEng Tech Chemical Engineering (3 year), BEng Tech Civil Engineering (3 year and 4 year), BEng Tech Electrical Engineering (3 year and 4 year), BEng Tech Extraction Metallurgy (3 year), BEng Tech Industrial Engineering (3 year and 4 year), BEng Tech Mechanical Engineering (3 year and 4 year), BEng Tech Physical Metallurgy (3 year and 4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 2
Prerequisites	MATE1A1
Purpose	The purpose of this module is to further equip students with mathematical knowledge and problem solving ability appropriate for engineering.

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

- Select and use appropriate rules for differentiation to differentiate functions that are both in Cartesian and Parametric form.
- Apply First order and Second Partial differentiation using Leibniz notation consistently.

- Apply partial differentiation to calculate small increments applied to functions of several variables.
- Interpret real world problems and apply partial differentiation to small increments. Calculate percentage errors and rates of change.
- Integrate functions using appropriate techniques of integration.
- Apply integration to determine areas of regions in the plane and volumes of solids of revolution, using the appropriate method (disc and/or shell method), calculate the mean value and RMS value of a given function
- Utilize the geometry and algebra of vectors.
- Apply vectors to mathematically related problems.
- Perform algebraic operations on Matrices and Determinants.
- Use Determinants to find inverses of Matrices.
- Use matrices to solve systems of linear equations.
- Apply Cramer's rule to solve engineering problems.
- Determine the eigenvalues and eigenvectors of a given matrix.
- Use Least Squares Regression to predict and estimate results.

SC.8.4.7 MATHEMATICS LEVEL 5 (First Year)

Module MATEAD1	Engineering Mathematics V1A
Programme	Bachelor of Construction (4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Prerequisites	Grade 12 Mathematics minimum APS 4
Purpose	The purpose of this module is to equip students with application knowledge and skills of Mathematics in Engineering, real life and work environments.

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

- Use the binomial theorem to raise any binomial to any real power and find any specified term in the 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 using Cramer's rule.
- Evaluate, manipulate, draw and simplify problems relating to transcendental functions (exponents and logarithms) and solve them.
- Demonstrate basic understand of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Draw and interpret the sine equations, in terms of period; frequency and phase angles.
- Solve trigonometric equations with one or two functions and one or two angle(s).
- Introduce and explain the complex system and represent it in three forms, namely, rectangular, polar and exponential. Perform algebraic operations with complex numbers in these three forms. Solve problems involving solutions to the complex numbers.
- Use special rules to determine the derivatives of algebraic and transcendental functions and extend these to higher derivatives.
- Explain and use application of differentiation to determine the maximum and minimum turning points, and point of inflection for polynomial graphs and its application to tangent of curves and practical problems.
- Perform integration of algebraic transcendental functions involving definite and indefinite integrals 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.8.4.8 MATHEMATICS LEVEL 5 (First Year)

Module MATEBD1	Engineering Mathematics V1B
Programme	Bachelor of Construction (4 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Prerequisites	MATEAD1
Purpose	The purpose of this module is to further equip students with mathematical knowledge and problem solving ability appropriate for engineering.

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

- Select and use appropriate rules for differentiation to differentiate functions that are both in Cartesian and Parametric form.
- Apply First order and Second Partial differentiation using Leibniz notation consistently.
- Analyse and solve application of partial differentiation in order to calculate small increments applied to functions of several variables, interpret real world problems relating to small increments. Calculate percentage errors and rates of change.
- Integrate functions using appropriate techniques.
- Apply rules of integration to determine areas and volumes. Calculate also the Mean and RMS values.
- Use matrices to solve systems of linear equations.

SC.8.4.9 MATHEMATICS LEVEL 5 (First Year)

Module MATYED1	Engineering Mathematics Y1
Programme	Bachelor of Construction (4 year)
NQF-level	5
NQF credits	14
Presentation	Year
Prerequisites	Grade 12 Mathematics minimum APS 4
Purpose	The purpose of this module is to equip students with application knowledge and skills of Mathematics in Engineering, real life and work environments.

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

- Use the binomial theorem to raise any binomial to any real power and find any specified term in the 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 using Cramer's rule.
- Evaluate, manipulate, draw and simplify problems relating to transcendental functions (exponents and logarithms) and solve them.
- Demonstrate basic understand of trigonometric functions in radians and in degrees and apply these to practical examples involving arcs, segments and sectors.
- Draw and interpret the sine equations, in terms of period; frequency and phase angles.
- Solve trigonometric equations with one or two functions and one or two angle(s).
- Introduce and explain the complex system and represent it in three forms, namely, rectangular, polar and exponential. Perform algebraic operations with complex numbers in these three forms. Solve problems involving solutions to the complex numbers.
- Use special rules to determine the derivatives of algebraic and transcendental functions and extend these to higher derivatives.
- Explain and use application of differentiation to determine the maximum and minimum turning points, and point of inflection for polynomial graphs and its application to tangent of curves and practical problems.
- Perform integration of algebraic transcendental functions involving definite and indefinite integrals 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.8.4.10 MATHEMATICS LEVEL 5 (First Year)

Module MATYED2	Engineering Mathematics Y2
Programme	Bachelor of Construction (4 year)
NQF-level	5
NQF credits	14
Presentation	Year
Prerequisites	MATYED1
Purpose	The purpose of this module is to further equip students with mathematical knowledge and problem solving ability appropriate for engineering.

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

- Select and use appropriate rules for differentiation to differentiate functions that are both in Cartesian and Parametric form.
- Apply First order and Second Partial differentiation using Leibniz notation consistently.
- Analyse and solve application of partial differentiation in order to calculate small increments applied to functions of several variables, interpret real world problems relating to small increments. Calculate percentage errors and rates of change.
- Integrate functions using appropriate techniques.
- Apply rules of integration to determine areas and volumes. Calculate also the Mean and RMS values.
- Use matrices to solve systems of linear equations.

SC.8.4.11 MATHEMATICS LEVEL 6 (Second Year)

Module MATE2A2	Engineering Mathematics V 2A
Programme	BEng Tech Civil Engineering (3 year and 4 year), BEng Tech Electrical Engineering (3 year and 4 year), BEng Tech Industrial Engineering (3 year and 4 year), BEng Tech Mechanical Engineering (3 year and 4 year)
NQF-level	6
NQF credits	14
Presentation	Semester1
Prerequisites	MATE1A1, MATE1B1
Purpose	The purpose of this module is to further equip students with mathematical knowledge and problem solving ability appropriate for engineering.
Content	Differential Equations: solution of first order ODEs, homogeneous and reducible differential equations, Bernoulli's equations, ordinary differential equations (1st and 2nd order), Laplace and inverse Laplace transforms, D-operator methods, Fourier series, applications

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

- Solve first order ordinary differential equations (ODE) using Separation of the variables, Homogeneous, Linear, Bernoulli and Reducible methods.
- Apply analytical methods to solve first order ODEs related to real world and engineering problems.
- Use tables to perform Laplace transforms on constants, trigonometric sine and cosine, hyperbolic sine and cosine, exponential functions and products of these functions.
- Use tables, partial fractions and the method of completing the square to perform inverse Laplace transforms.
- Sketch discontinuous functions and apply the Heaviside notation to perform Laplace transforms and inverse Laplace transforms on step functions and the Dirac-Delta impulse function.
- Apply Laplace Transform methods to solve ODEs involving continuous and discontinuous forcing functions related to real world and engineering problems.
- Define a continuous and discrete time signal and use the shifting, scaling and inversion properties of signals.
- Determine the Fourier coefficients and resulting trigonometric Fourier series of a periodic function.

- Convert the Fourier series of a periodic function to a compact trigonometric Fourier series.
- Use the Fourier spectrum to describe the frequency domain and time domain of a signal.
- Determine an exponential Fourier series of periodic functions.
- Distinguish between even and odd functions and apply these properties to negative frequencies.
- Represent an aperiodic signal as a Fourier integral
- Verify the existence of the Fourier transform with the Dirichlet conditions.
- Understand the Fourier transform as the limit of a Fourier series that can be used to describe non-periodic functions on an infinite interval.
- Calculate the Fourier transform of elementary function by using the definition.
- To apply Fourier transform theory to physical problems relating to periodicity.

SC.8.4.12 MATHEMATICS LEVEL 5 (First Year)

Module MAT01A1	Calculus of one variable functions
Programme	Bachelor in Optometry
NQF Level	5
Credits	15
Presentation	Semester 1
Prerequisites	Grade 12 Mathematics - min APS 5
Purpose	The purpose of this module is to develop a scope of knowledge of the main areas of the theory of differentiation and integration of one variable functions by means of first principles and otherwise, and to include an understanding of the key terms, concepts, facts, principles, rules and theories.

Module learning outcomes: On completion of this learning event, the student should be able to:
- Define absolute values and solve equations containing absolute values.
- Identify different proof techniques and apply them correctly to prove mathematical statements.
- Understand and apply the basic ideas of logic.
- Comprehend the binomial theorem and use it to expand binomial expressions.
- Define complex numbers and use their properties to perform operations on equations containing complex numbers.
- Define limits and use limit laws to evaluate basic limits as well as limits of indeterminate form.
- Express the basic theoretical concepts underlying differentiation and integration.
- Differentiate and integrate basic exponential, logarithmic, trigonometric and hyperbolic functions.

SC.8.5 MICROBIOLOGY MCB

SC.8.5.1 MICROBIOLOGY LEVEL 5 (First Year)

Module MCBH1Y1	Microbiology 1
Programme	Bachelor of Environmental Health
NQF Level	5
NQF credits	20
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:
- 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.8.5.2 MICROBIOLOGY LEVEL 6 (Second Year)

Module MCB2YMM	Medical Microbiology
Programme	ND Chiropractic; ND Homoeopathy
NQF Level	6
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.8.5.3 MICROBIOLOGY LEVEL 6 (Second Year)

Module MCB01A2	Bacteriology and Virology
Programme	Bachelor in Optometry
NQF Level	6
Credits	24
Presentation	Semester 1
Prerequisites	Biology 1A10, Chemistry 1A10/1C10 and 1B10, 1B20/1D10
Purpose	The purpose of the Bacteriology component is to provide learners with a well-rounded and basic knowledge of prokaryotes such as bacteria. Upon completion of this module a learner will be able to discuss and explain the morphology, reproduction and overall importance of bacteria. The learners will have had experience in handling different types of bacteria in a safe manner and perform laboratory investigations without posing a risk to the environment or colleagues. The learner will also be able to explain the uses and roles of bacteria in industrial, medical and environmental contexts. The primary purpose of Virology is to provide learners with a basic knowledge of the viral group and its diseases. Upon completion of this module, a learner should be able to describe the fundamental principles of virology: taxonomy, classification & morphology of the viruses. The learners should also understand viral infection of plant, animal and bacterial tissue, as well as viral identification and cultivation techniques. The learner should be able to recognize certain diseases, its causal factor, symptoms, as well as the mode of transmission, incubation and infection of the host. Learners will be made to understand that viruses cause diseases but have advantages to their existence too (their use in cancer treatment and recombinant DNA technology).

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

- Describe the significance of bacteria
- Summarise the discovery of bacteria and spontaneous generation
- Discuss the morphology & reproduction of the bacterium
- Discuss growth and cultivation of bacteria
- Explain sterility, sterilisation & conditions affecting the action of antimicrobial treatments
- Discuss water quality and the development of bacterial water borne diseases
- Discuss food preservation and the development of bacterial food borne diseases
- Debate the advantages & disadvantages of bacterial flora of the body
- Summarise the cause, symptoms and treatment of sexually transmitted diseases caused by bacteria
- Conduct practical work and experiments and demonstrate safe laboratory techniques
- Use a microscope correctly & present practical results by writing appropriate reports by correctly using appropriate terminology.
- Discuss the classification, morphology and replication of plant & animal viruses, and bacteriophages
- Explain the various isolation, identification and cultivation techniques used by virologists
- Discuss and explain viral disease development and how it influences/triggers the immune system
- Summarise the cause, symptoms, significance and treatment of certain viral diseases
- Demonstrate virtual HHMI ELISA and enzyme tests
- Complete answer sheets regarding prudently selected viral disease videos
- Present results correctly using appropriate terminology.

SC.8.6 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.8.6.1 PHYSICS LEVEL 5 (First Year)

Module: APP01Y1	Applied Physics
Programme	Bachelor of Diagnostic Radiography (B9M01Q), Bachelor of Diagnostic Ultrasound (B9M02Q), Bachelor of Nuclear Medicine Technology (B9M03Q) and Bachelor of Radiation Therapy (B9M04Q)
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 the various disciplines in 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.8.6.2 PHYSICS LEVEL 5 (First Year)

Module PHYE1A1	Engineering Physics X 1A
Programme	Bachelor of Mine Surveying (3 year), BEng Tech Electrical Engineering (3 year and 4 year), BEng Tech Extraction Metallurgy (3 year), BEng Tech Industrial Engineering (3 year), BEng Tech Mechanical Engineering (3 year), BEng Tech Mining Engineering (3 year), BEng Tech Physical Metallurgy (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Purpose	The purpose of this module is to provide knowledge of definitions, methods and principles in physics, and provide a broad background of applying basic physics to problem solving
Content	Vectors, moments of force, kinematics, dynamics, impulse and momentum, energy and power, angular motion

Module learning outcomes: On completion of this learning outcome the student should be able to:
- Understand displacement, velocity and acceleration. Apply these equations to problems with objects moving in horizontal and vertical motion (free fall)
- Understand frictional forces and apply Newton's II Law to problems with objects moving the presence of friction. Understand the basics of motion on inclined plane
- Understand linear momentum and impulse and apply these concepts to solve problems that involve one-and two-dimensional momentum.
- Understand centripetal acceleration and force. Apply the concepts to objects to problems with objects moving in a uniform circular motion
- Understand torque and Newton's II Law for rotational motion. Apply these concepts to problems involving rigid body rotations.

SC.8.6.3 PHYSICS LEVEL 5 (First Year)

Module PHYE1B1	Engineering Physics X 1B
Programme	Bachelor of Mine Surveying (3 year), BEng Tech Extraction Metallurgy (3 year), BEng Tech Mechanical Engineering (3 year), BEng Tech Mining Engineering (3 year), BEng Tech Physical Metallurgy (3 year and 4 year)
NQF-level	5
NQF credits	7
Presentation	Semester 2
Purpose	The purpose of this module is to provide knowledge of definitions, methods and principles in physics, and provide a broad background of applying basic physics to problem solving
Content	Simple machines, electricity and electronics, nuclear physics, heat, light, sound

Module learning outcomes: On completion of this learning outcome the student should be able to:
- Understand simple machines
- Understand electricity and electronics
- The nature and properties of a, b and g – radiations are correctly explained
- The law of radioactive decay is correctly derived. The applications of radioactive decay are accurately solved
- Understanding fusion and fission of nuclei and the energy generated in those processes
- Understand basic laws of heat transfer
- Understanding the laws of Thermodynamics
- Ability to apply fundamental concepts of thermodynamics to engineering applications.

- Understanding the energy transported by waves and interference and superposition. Apply these concepts to simple wave problems
- Understand the basic concepts of sound waves. Apply these concepts to simple sound wave problems

SC.8.6.4 PHYSICS LEVEL 5 (First Year)

Module PHYSCA1	Engineering Physics Chemical 1A
Programme	BEng Tech Chemical Engineering (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 1
Purpose	This course introduces students to the fundamental principles of physics which will contribute to the understanding of engineering science applicable to chemical engineering
Content	The general aim of the Physics course is: to provide the necessary subject knowledge and comprehension; to develop the necessary skills, techniques and methods of physics, such as handiness in handling of delicate apparatus, how to do measurements, etc.; to develop desirable scientific attitudes such as critical thinking, etc.; to introduce the students to scientific explanation of phenomena; to introduce the students to the application of physics in industry and everyday life. Content includes: predicting the movement of a body in a straight line and a flat plane, interpreting the concept called energy, comprehending fluid statics and dynamics; temperature, heat and the first law of thermodynamics; dimensions and vectors, rectilinear motion, Newton`s laws of motion, work and energy, elasticity, fluid statistics, temperature, heat and the first law of thermodynamics, electrostatics, DC electricity; physical and geometrical optics

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

- Explain the terms: scalar, vector, resultant, component of a vector, represent a vector on paper, Add/subtract vectors using the component method and Solve practical problems involving vectors.
- Explain the terms: distance, displacement, speed, velocity, acceleration, Apply the equations of motion to solve 1D motion problems, and Explain the terms: force, mass, weight, the newton, friction, coefficient of friction, State Newton's laws of motion and Apply Newton's laws to solve problems.
- Explain the concepts: work done, the joule, kinetic energy, potential energy, conservation of energy, power, the watt, kilowatt-hour and Solve problems involving the above concepts.
- Explain the concepts density, relative density and apply the above concepts in solving problems on static fluids.
- Explain the terms : potential difference, the volt, electrical current, the ampere, voltmeter, ammeter, Ohm's law, resistance, List the factors affecting the resistance of a conductor and solve related problems, Connect and calculate resistances in series and in parallel, Draw complete circuit diagrams, .Solve problems using Ohm's law, Explain the terms emf and internal resistance and calculate them.
- Distinguish between heat and temperature and compare the two temperature scales used in Physics, Explain the terms linear-, area- and volumetric expansivity for solids, Solve problems relating to the expansion of solids, Explain the terms true expansion and apparent expansion pertaining to liquids, Explain the concepts joulemetry, heat capacity, specific heat capacity, law of heat transfer and Solve problems relating to the concepts listed above.
- Explain the terms : incident ray, reflected ray, incident angle, reflected angle, angle of deviation, magnification, State the laws of reflection and refraction of light, Draw ray diagrams relating to plane mirrors, curved mirrors and lenses, Distinguish between real and virtual images, Use the mirror/ lens formula and sign convention to solve problems, Explain the terms: wave, wavelength, frequency, period, amplitude, superposition, interference, diffraction, diffraction grating and Solve practical problems relating to a diffraction grating.

- Explain the terms : incident ray, reflected ray, incident angle, reflected angle, angle of deviation, magnification, State the laws of reflection and refraction of light, Draw ray diagrams relating to plane mirrors, curved mirrors and lenses, Distinguish between real and virtual images, Use the mirror/ lens formula and sign convention to solve problems, Explain the terms: wave, wavelength, frequency, period, amplitude, superposition, interference, diffraction, diffraction grating and Solve practical problems relating to a diffraction grating.

SC.8.6.5 PHYSICS LEVEL 5 (First Year)

Module PHYSCB1	Engineering Physics Electrical 1B
Programme	BEng Tech Electrical Engineering (3 year and 4 year)
NQF-level	5
NQF credits	14
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.
Content	Electricity: direct and alternating current theory, production and transfer of alternating current electricity, physics of R-, L-, C- and RLC circuits; Hydrodynamics: motion of fluids and problems related to fluid motion; Radioactivity: emission of nuclear radiations by radioactive isotopes, interaction of radiation with matter and living things, radioactive decay; Thermodynamics: specific heat capacities at constant volume and constant pressure by solving problems, isothermal and adiabatic processes, laws of thermodynamics, Carnot's cycle of heat engines, heat transfer.

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

- Define or explain: simple machines, mechanical advantage, load, effort, velocity ratio, mechanical efficiency and their importance.
- Do problems related to: pulley systems, screw jacks, wheel and axle, gear wheels and belt drives.
- Define ohm's law, current strength, potential difference, ohm, volt and the coulomb.
- Draw simple electrical circuits using universal symbols.
- Use ohm's law in circuits containing series and parallel resistors.
- Define the characteristics of diodes and transistors.
- Explain logic gates.
- State the laws of nuclear radiations.
- Explain radioactive decay.
- Define half-life.
- Define the terms: specific heat capacity, heat capacity, latent heat of fusion and vaporization.
- Explain heat exchange in a body system.
- Explain transmission and reflection of sound waves.
- Explain the phenomenon: interference and diffraction of light.

SC.8.6.6 PHYSICS LEVEL 5 (First Year)

Module FPYED01	Foundation Physics
Programme	BEng Tech Civil, Mechanical, Industrial and Electrical Engineering (4 year)
NQF-level	5
NQF credits	14
Presentation	Year module

Purpose	The purpose of this module is to: • develop a good understanding of the basic concepts of Physics, • learn to identify and solve problems in Physics, • collect, analyze, organize and critically evaluate information, • use science and technology effectively, So that you are well equipped with the necessary skills, knowledge and confidence you need for a career in science and technology, and particularly engineering.

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

- Conduct scientific investigation of natural phenomena
- Solve Physics and technological related problems with confidence
- Analyse and interpret information
- Make predictions from observed and analysed phenomenon or given information.
- Evaluate data and communicate findings
- Work effectively with others as a member of a team, group, organization and a community

SC.8.6.7 PHYSICS LEVEL 5 (First Year)

Module PMEDP01	Physics (Mechanics) Practical
Programme	BEng Tech Industrial Engineering (4 year), BEng Tech Mechanical Engineering (4 year)
NQF-level	5
NQF credits	12
Presentation	Semester 1
Purpose	To develop the applied practical and laboratory skills of the students required in the Industrial and Mechanical Engineering field.

Module learning outcomes: On completion of this learning outcome 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.8.6.8 PHYSICS LEVEL 5 (First Year)

Module PHADTX1	Engineering Physics TX1 (Theory)
Programme	BEng Tech Extraction Metallurgy (4 year), BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	14
Presentation	Year Module
Co-requisite	PHADPX1
Purpose	To use both calculus based and non-calculus based methods for providing an introduction to general physics and develop student knowledge and appreciation of introductory concepts in Physics and measurement; Kinetics, Vectors and Dynamics; Energy, Linear Momentum and Collisions; Rotational Dynamics; Angular Momentum and Static Equilibrium; Elasticity of Solids; Universal Gravitation; Fluid Mechanics and Oscillations and Mechanical Waves.

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

- Carry out correct basic measurement in Physics and other scientific subjects.
- Explain important aspects of measurement in physics such as units, standards, dimensions, significant figures and measurement uncertainty, applying these concepts to related problems.

- Describe, explain and apply basic concepts of Kinematics, Vectors and Dynamics such as 1D, 2D and 3D motion, Statics, Vectors, Scalar Product, Static and Dynamic Equilibrium and Newton's laws.
- Explain and apply concepts related to Energy, Linear Momentum and Energy conservation including Isolated vs Non-Isolated Systems, Conservative and Non-conservative forces, Centre of Mass and Gravity, Collisions, Impulse and Power.
- Describe, explain and utilize to solve problems, the basic concepts related to Rotational Dynamics such as Rotational Motion Variables, Vector Product, Conservation of Angular Momentum and Rotational Equilibrium.
- Explain the various moduli used to describe the Elastic Properties of Solids and use them to solve common related problems.
- State and explain Newton's law of Gravitation and Kepler's laws of Planetary Motion and use these laws to solve related problems.
- Describe and explain concepts related to Fluid Mechanics and Dynamics such as pressure, pressure units, pressure-measuring instruments, Archimedes' Principle, the Continuity equation, Bernoulli's equation, Torricelli's Law, Poiseuille's law and Stokes' formula and apply the learnt concepts to related problems.
- Explain the underlying principles surrounding oscillatory motion and mechanical waves and use them to solve related problems and to show an appreciation that wave phenomena are very common in everyday examples.

SC.8.6.9 PHYSICS LEVEL 5 (First Year)

Module PHADPX1	Engineering Physics PX1 (Practical)
Programme	BEng Tech Extraction Metallurgy (4 year), BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	14
Presentation	Year module
Co-requisite	PHADTX1
Purpose	To foster good laboratory practice and good basic measurement skills while reinforcing the concepts covered in theory PHADTX1

Module learning outcomes: On completion of this learning outcome the student should be able to:
- Make proper measurements with appropriate instruments and equipment.
- Correlate lecture concepts with laboratory experiments.
- Do some prior research/reading before experiments are carried out.
- Use graphics calculators for data acquisition and manipulation.

SC.8.6.10 PHYSICS LEVEL 5 (First Year)

Module PHADTX2	Engineering Physics TX2 (Theory)
Programme	BEng Tech Extraction Metallurgy (4 year), BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	14
Presentation	Year Module
Pre-requisite	PHADTX1, PHADPX1
Purpose	To use both calculus based and non-calculus based methods for providing an introduction to general physics and develop student knowledge and appreciation of introductory concepts in Optics; Thermodynamics and Electricity and Magnetism

Module learning outcomes: On completion of this learning outcome the student should be able to:
- Discuss the nature of light and the governing principles for light propagation, reflection, refraction, interference and diffraction and display an appreciation that many phenomena in everyday life depend on the discussed properties of light.
- Describe the relationship between heat energy, temperature and other forms of energy and to utilize the basic physical laws related to these concepts.
- Explain the governing laws and principles surrounding electricity and magnetism and apply the learnt concepts to observations in everyday life.

SC.8.6.11 PHYSICS LEVEL 5 (First Year)

Module PHADPX2	Engineering Physics PX2 (Practical)
Programme	BEng Tech Extraction Metallurgy (4 year), BEng Tech Physical Metallurgy (4 year)
NQF-level	5
NQF credits	14
Presentation	Year module
Co-requisite	PHADTX2
Purpose	To foster good laboratory practice and good basic measurement skills while reinforcing the concepts covered in theory PHADTX2.

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

- Make proper measurements with appropriate instruments and equipment.
- Correlate lecture concepts with laboratory experiments.
- Do some prior research/reading before experiments are carried out.
- Use graphics calculators for data acquisition and manipulation.

SC.8.6.12 PHYSICS LEVEL 5 (First Year)

Module PHYB1Y1	Construction Science
Programme	Bachelor of Construction (4 year)
NQF-level	5
NQF credits	20
Presentation	Year module
Purpose	The purpose of this module is to provide knowledge of definitions, methods and principles in physics, and provide a broad background of applying basic physics to problem solving as needed in Construction Science
Content	Introduction to measurement/calculation, Optics: Reflection, refraction and lenses; Mechanics: Vectors, statics, kinetics, dynamics, work, energy, power, momentum, centroids, framed structures, shear forces and bending moments and the effect of forces on materials; Hydraulics: Density, relative density, pressure, Archimedes' principle and Bernoulli's principle; Heat: Expansion, Joulemetry gas laws and heat transfer in buildings, Photometry: Basic principles and the design of lighting systems in buildings; Sound: Inverse square law, combined effect of sound sources, sound insulation . Practical work in: Optics: Mirrors and lenses: focal length, magnification, Refraction: refractive index, critical angle; Mechanics: Statics: vectors, levers, centre of mass, Kinematics: Motion equations, Force: Newton's laws, friction force, Stress and strain, Hydrostatics: ,Heat: Linear expansivity of solid, apparent expansivity of liquid, Boyle's law, atmospheric pressure, Specific heat capacity and specific latent heat of fusion and vaporisation , Photometry: Inverse square law , Electricity: Current, voltage, resistance, Ohm's law, Resistivity, emf , resistors in series and parallel, internal resistance, Fluid mechanics: Density and R.D of solids and liquids, Archimedes' principle

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

Theory Component

- 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
- Define the moment of a force and solve problems on equilibrium and centroids
- Draw a vector diagram to determine the forces in the members of a framed structure
- Draw shear force and bending moment diagrams
- Solve problems on the effect of forces on rigid materials
- Apply Newton's laws to objects moving in a straight line with and without friction
- Define work, energy, power and momentum and solve problems

- Formulate laws and explain the concepts in hydrostatics and apply these concepts to stationary fluids and fluids in motion
- Discuss and explain the effects of heat transfer such as expansion of solids and liquids and apply the law of conservation of heat in problem solving
- Use the principles of photometry to design suitable lighting systems for buildings
- Solve problems using the inverse square law for sound and the combined effect of a number of sound sources on the human ear
- Apply theoretical concepts studied into relevant practical situations pertaining to the Building industry.

Practical Component
- Apply the Physics laboratory safety rules and regulations
- 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
- Perform all required calculations, vector diagrams and graphs for each experiment.

SC.8.6.13 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.8.6.14 PHYSICS LEVEL 5 (First Year)

Module PHY1ADP	Physics 1 (Practical)
Programme	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.8.6.15 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.8.6.16 PHYSICS LEVEL 5 (First Year)

Module PHY1YFT	Physics 1A *(phasing out)*
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.8.6.17 PHYSICS LEVEL 5 (First Year)

Module PHY1YFP	Physics 1 (Practical) *(phasing out)*
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.8.6.18 PHYSICS LEVEL 5 (First Year)

Module PHBH1Y1	Physics 1
Programme	Bachelor of Environmental Health
NQF-level	5
NQF credits	20
Presentation	Year module
Purpose	To provide a broad understanding of the methods and principles of basic physics. These are essential for a good understanding of current and future scientific and technological developments. Other skills like problem solving, team work and effective communication which are essential for a successful career in Environmental Health are also developed in this module.

Module learning outcomes: On completion of this learning event, the student should have an understanding of o:
- Scientific measurement and calculations: units, scalars and vectors
- Mechanics: kinematics in one and two dimensions, forces and Newton's laws of motion as well as the work-energy theorem
- Hydrostatics: mass density, pressure, Pascal's principle, Archimedes' principle
- Thermodynamics: temperature, thermal expansion, heat

- Waves and sounds: the nature of waves, periodic waves, the nature of sound, the speed of sound and the sound intensity
- Electricity: electric forces and electric fields as well as the electric circuits.

Experimental laboratory work will be conducted to aid delivery of these learning objectives.

SC.8.6.19 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.8.6.20 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.8.6.21 PHYSICS LEVEL 5 (First Year)

Module PHY1CA1	Auxiliary Physics C
Programme	Bachelor in Optometry
NQF Level	5
Credits	24
Presentation	Semester 1
Purpose	Providing the first-year student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in mechanical, kinematics, dynamics, hydrostatics and dynamics, thermal physics as well as material properties. Through these laws the student will discover the application of these laws to their daily environment as a biological scientist/ physics student.

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

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of elementary mechanics, thermodynamics and material properties.
- Derive equations in, explain, interpret and evaluate elementary theoretical models in elementary mechanics, thermodynamics and material properties.
- Integrate basic concepts and theories to solve problems of elementary mechanics.
- Recognize and explain aspects of the application of elementary mechanics, thermodynamics and material properties as applied in biological environment.

SC.8.6.22 PHYSICS LEVEL 5 (First Year)

Module PHY1DA1 / PHY1DB1	Auxiliary Physics D
Programme	Bachelor in Optometry
NQF Level	5
Credits	24
Presentation	Semester 2
Prerequisites	PHY1CA1
Purpose	Providing the first-year student with intellectual and practical skills to analyse, interpret and apply certain elementary laws in electric and magnetic fields and forces, electrical potential, direct current, nerve conduction, magnetic induction, wave motion, geometrical and physical optics, atomic and nuclear physics for biological sciences. Through these laws the student will discover the application of these laws to their daily environment as a biological scientist/ physics student.

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

- Formulate, discuss and explain the basic definitions of physical quantities, the basic principles and the basic laws of elementary electricity and magnetism, wave motion, optics, atomic and nuclear physics in biological sciences.
- Derive equations, explain, interpret and evaluate elementary theoretical models in elementary electricity and magnetism, wave motion, optics, atomic and nuclear physics in biological sciences.
- Integrate basic concepts and theories to solve problems of elementary electricity and magnetism, wave motion, optics, atomic and nuclear physics in biological sciences.
- Recognize and explain aspects of the application of elementary electricity and magnetism, wave motion, optics, atomic and nuclear physics in biological sciences.

SC.8.6.23 PHYSICS LEVEL 5 (First Year)

Module PHB1AA1	Basic Science: Physics
Programme	BHS Emergency Medical Care, BHS 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.8.6.24 PHYSICS LEVEL 5 (First Year)

Module PHYCHA1	Physics 1
Programme	BHS Chiropractic, BHS Complementary Medicine
NQF-level	5
NQF credits	10
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 Chiropractic and Complementary Medicine.

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.8.6.25 PHYSICS LEVEL 5 (First Year)

Module PHYH1B1	Physics
Programme	BHS in Medical Laboratory Science
NQF Level	5
Credits	12
Presentation	Semester 2
Prerequisites	APS 4 for Gr 12 Physical Science
Purpose	To enable students to relate basic concepts and principles of physics, to the proper use and understanding of laboratory instrumentation and to practical applications in laboratory techniques.

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

- Define basic concepts such as force, pressure, heat and light
- Apply correct units for physical quantities
- Perform unit conversations of length, mass, volume, density and light
- Read measuring instruments and scales correctly
- Cite examples of effects of forces (gravity, friction, centrifugal, centripetal, magnetic, electric) and their practical application in laboratory instrumentation
- Explain physical phenomena (thermal, light, sound, etc.) in terms of established laws and principles of physics.
- Relate physical laws and principles to practical applications in the laboratory

SC.8.6.26 PHYSICS LEVEL *(Information to be obtained from Department of Physics)*

Module PHYCEA1	Basic Science: Physics
Programme	Higher Certificate in Emergency Medical Care
NQF-level	5
NQF credits	6
Presentation	Semester 1
Purpose	The purpose of this module is

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

SC.8.7 STATISTICS STA

SC.8.7.1 STATISTICS LEVEL 5 (First Year)

Module STA1ABF	Calculations and Statistics *(phasing out)*
Programme	ND Biomedical 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.8.7.2 STATISTICS LEVEL 5 (First Year)

Module STAQTA1	Quantitative Techniques A
Programme	Dip in Management Services (3 year and 4 year), Dip in Operations Management Services (3 year and 4 year)
NQF level	5
NQF credits	16
Presentation	Semester 1
Purpose	The primary purpose is providing students majoring in Management 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.8.7.3 STATISTICS LEVEL 5 (First Year)

Module STAQTB1	Quantitative Techniques B
Programme	Dip in Management Services (3 year and 4 year), Dip in Operations Management Services (3 year and 4 year)
NQF-level	5
NQF credits	16
Presentation	Semester 2

Purpose	The primary purpose is providing students majoring in Management 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 analyse and project time series.
- Describe and perform calculations involving probabilities and probability distributions.
- Compute and interpret estimates and carry out hypothesis testing.

SC.8.7.4 STATISTICS LEVEL 5 (First Year)

Module STASCA1	Engineering Statistics 1A
Programme	BEng Tech in Civil Engineering (3 year and 4 year)
NQF-level	5
NQF credits	7
Presentation	Semester 1
Prerequisites	
Purpose	The purpose of this module is to provide students with statistical knowledge to processes and analyse data for decision making
Content	Introduction to statistics, frequency distributions and describing a sample graphically, describing a sample numerically, probability, normal and log-normal distributions, mean and standard deviation; with additional topics in: linear regression and correlation, time series and regression analysis.

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.8.7.5 STATISTICS LEVEL 5 (First Year)

Module STAE1B1	Engineering Statistics 1B
Programme	Bachelor of Construction (3 year and 4 year), Bachelor of Mine Surveying (3 year), Bachelor of Urban and Regional Planning (3 year), BEng Tech Industrial Engineering (3 year and 4 year), BEng Tech Mining Engineering (3 year)
NQF-level	5
NQF credits	14
Presentation	Semester 2
Prerequisites	
Purpose	The purpose of this module is to provide students with statistical knowledge to processes and analyse data for decision making.
Content	Introduction to statistics, frequency distributions and describing a sample graphically, describing a sample numerically, probability, normal and log-normal distributions, mean and standard deviation, linear regression and correlation, time series and regression analysis, sampling distributions, sampling and estimation, hypothesis testing

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.8.7.6 STATISTICS LEVEL 7 (BEng Tech)

Module QTPTRA2	Quantitative Techniques
Programme	BEng Tech Urban and Regional Planning (3 year)
NQF-level	5
NQF credits	7
Presentation	Semester 1
Prerequisites	-
Purpose	The purpose of this module is to provide students with statistical knowledge to processes and analyse data for decision making.
Content	Introduction to statistics, frequency distributions and describing a sample graphically, describing a sample numerically, probability, normal and lognormal distributions, mean and standard deviation, linear regression and correlation, time series and regression analysis, sampling distributions, sampling and estimation, hypothesis testing.

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.8.7.7 STATISTICS LEVEL 7 (Advanced Diploma)

Module STA7AQT	Statistical Quality Techniques A
Programme	Advanced Diploma in 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.8.7.8 STATISTICS LEVEL 7 (Advanced Diploma)

Module STA7BQT	Quality Techniques B
Programme	Advanced Diploma in Quality
NQF-level	7
NQF credits	11
Presentation	Semester 2
Prerequisites	Statistical Quality Techniques A (STA7AQT)
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.

SC.8.8 STATISTICAL METHODS SMT

SC.8.8.1 STATISTICAL METHODS LEVEL 5 (First Year)

Module SMT01A1	Statistical Methods 1A
Programme	Bachelor in Optometry, BHS Medical Laboratory Sciences
NQF Level	5
Credits	16
Presentation	Semester 1
Purpose	To provide the student with a perspective of the basics of probability theory and to illustrate its application to the solution of practical problems. The student will also be given a basic perspective of a variety of discrete probability distributions and will be able to apply them to solve problems in various fields of application.

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

- Distinguish between different measurement scales.
- Tabulate data and derive information from frequency distributions.
- Derive and interpret information from graphical representations of data.
- Describe a data set numerically in terms of location and spread.
- Apply various elementary principles of probability theory.
- Use the standardized normal distribution table to find probabilities.
- Apply elementary principles of the sampling distribution of the mean.
- Perform hypothesis testing.
- Measure and model linear relationships between two variables.

PART 9

SC.9 MODULES IN SCIENCE PROGRAMMES OFFERED BY OTHER FACULTIES

For content and outcomes, please refer to the relevant Faculty/College yearbook.

SC.9.1 MODULES FROM THE COLLEGE OF BUSINESS AND ECONOMICS

SC.9.1.1
END-USER COMPUTING (EUC)

SC.9.1.2
ENTREPRENEURIAL SKILLS (CETESA3)

SC.9.1.3
OPERATIONS MANAGEMENT AND ENTREPRENEURSHIP (BTN7X06)
OPERATIONS MANAGEMENT AND ENTREPRENEURSHIP (FTN7X07)

SC.9.1.4
RESEARCH METHODOLOGY BIOTECHNOLOGY (BTN7X00)
RESEARCH METHODOLOGY FOOD TECHNOLOGY (FTN7X00)

SC.9.2 MODULES FROM THE FACULTY OF HUMANITIES

SC.9.2.1
COMMUNICATION SKILLS (CSA1AA1, CSA1BB1)

PART 10

LIST OF QUALIFICATIONS

QUALIFICATION CODE	DESCRIPTION
D2ACXQ	Diploma : Analytical Chemistry (4 years)
D2BTEQ	Diploma : Biotechnology (4 years)
D2FTEQ	Diploma : Food Technology (4 years)
A2AC7Q	Advanced Diploma in Analytical Chemistry
A2BT7Q	Advanced Diploma in Biotechnology
A2FT7Q	Advanced Diploma in Food Technology
H2024Q	BSc Hons Biotechnology
H2025Q	BSc Hons Food Technology
M2006Q	Master of Science in Chemistry
M2004Q	Master of Science in Biotechnology
M2007Q	Master of Science in Food Technology
P2023Q	PhD Biotechnology
P2024Q	PhD Food Technology
P2001Q	PhD Chemistry
516-1	D Tech: Biotechnology
522-1	D Tech: Food Technology
749-1	PhD Chemistry
NDAC1E	National Diploma: Analytical Chemistry (4 years) *(pipeline)*
NDBTE1	National Diploma: Biotechnology (4 years) *(pipeline)*
NDFTE1	National Diploma: Food Technology (4 years) *(pipeline)*
D2ACEQ	Diploma: Analytical Chemistry (4 years) *(pipeline)*
742-1	M Tech: Chemistry *(pipeline)*
515-1	M Tech: Biotechnology *(pipeline)*
521-1	M Tech: Food Technology *(pipeline)*

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