SCHOOL PROSPECTUS 2024

FACULTY OF AGRICULTURE, ENGINEERING & NATURAL SCIENCE

SCHOOL OF SCIENCE

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University of Namibia, Windhoek.

NOTE

Regulations and curricula for 2024 may be amended without prior notice. General regulations and information appear in the General Information and Regulations and Fees Prospectus.

Although the information contained in this faculty prospectus has been compiled as accurately as possible, Council and Senate accept no responsibility for any errors and omissions, which may occur. The University retains the right to amend any regulation or condition without prior notice.

The information is correct up to 31 October 2024.

The fact that particulars of a specific course or field of study have been included in this Faculty Prospectus does not necessarily mean that such programme, subject, or course will be offered in 2024 or any consecutive year.

This School Prospectus must be read in conjunction with the **General Information and Regulations and Fees Prospectus.**

SCHOOL PREAMBLE

The mission of the School of Science is to produce graduates of high caliber who will make a positive contribution to the socioeconomic development of Namibia and beyond, through the application of their knowledge and skills in various fields of science and technology. Given the past history, which did not encourage and promote effective teaching of science and mathematics, especially in the formerly disadvantaged communities, the School particularly aims at promoting student interest in the learning and teaching of science; and producing good quality science graduates, who will help to build a science culture in society. The School's principal objective is to promote the development of science, technology, and environmental studies, and to encourage and facilitate research activities, which address the new demands of the national economy.

All degree programmes in the School of Science, just like all other degree programmes at the University of Namibia, were thoroughly revised to reflect the changing socioeconomic, biophysical and job market environments and the needs of the country. We now offer attractive degree programmes in all the seven Departments of the School. The degree programmes in the School of Science are of exceptional quality. They are designed to develop investigative skills and teach the tools of critical analysis and communication skills which are necessary pre-requisites for lifelong learning. Our programmes offer good employment opportunities and exciting future careers and equip you with a unique blend of generic and discipline-related skills that give you the capacity to tackle problems with initiative and resourcefulness. The School has close links with industry and will thus provide you with opportunities to explore various career options during your studies. Studying science gives you the innovative skills for an ever-changing employment environment and makes you a valuable resource for employers. Therefore, this is a particularly fascinating time to study science at the University of Namibia.

The world today continues to witness major technological advances which are opening up in many new areas. The boundaries between traditional subject areas are blurring as interdisciplinary research leads to rapid progress on a wide range of issues that underpin the future prosperity and quality of life in Namibia and the world at large. Such issues include biodiversity conservation; environmental management; pollution control; sustainable utilization of resources; combating effects of, and adaptation to climate change and desertification; cleaner energy production; genetically modified organisms; molecular and other new genetic advances in health, medicine and food technology; nanotechnology; biotechnology; new computing developments & ICT/IT; and many others. The comprehensive scope of the School of Science allows us to offer courses and conduct research in these areas. By so doing, the School of Science contributes immensely towards meeting the Vision and Mission of the University of Namibia. Through this, we are playing our part in helping Namibia achieve the goals set out in Vision 2030, the National Development Plans and the ETSIP targets.

We are proud of who we are and our achievements so far. We encourage you to join us for an exciting career in science.

ACADEMIC YEAR

FIRST SEMESTER	
11 January	**University Opens**
22 January	Academic staff resumes office duties
22 January	Lectures commence for **CORE SEMESTER – New Curriculum Senior Students** of Professional Programmes (Until 1 March)
29 January	Lectures commence for **CORE SEMESTER – New Curriculum** (Until 1 March)
12 February	Lectures commence for **FIRST SEMESTER – Old Curriculum Students** (Until 15 May)
04 March	Lectures commence for **FIRST SEMESTER – New Curriculum Students** (Until 7 June), and New Curriculum Senior Students of Professional Programmes (Until 11 June)
25 March	**Vacation Schools commence (Until 28 March)**
28 March	FIRST SEMESTER BREAK for students commences (Until 2 April)
03 April	Lectures commence after FIRST SEMESTER BREAK
15 May	Lectures end for FIRST SEMESTER – Old Curriculum Students
22 May	First Opportunity Examinations commence – Old Curriculum Students (Until 10 June)
04 June	Lectures end for FIRST SEMESTER – New Curriculum Students
10 June	First Opportunity Examinations end – Old Curriculum Students
10 June	First Opportunity Examinations commence – New Curriculum Students (Until 21 June)
11 June	Lectures end for FIRST SEMESTER – New Curriculum Senior Students of Professional Programmes
11 June	Second Opportunity Examinations commence – Old Curriculum Students (Until 28 June)
17June	First Opportunity Examinations commence – **New Curriculum Senior Students** of Professional Programmes (Until 28 June)
21 June	First Opportunity Examinations end – New Curriculum Students
24 June	Second Opportunity Examinations commence – New Curriculum Students (Until 5 July)
28 June	First Opportunity Examinations end – New Curriculum Senior Students of Professional Programmes
28 June	Second Opportunity Examinations end – Old Curriculum Students
01 July	Second Opportunity Examinations commence – New Curriculum Senior Students of Professional Programmes (Until 10 July)
05 July	Second Opportunity Examinations end – New Curriculum Students
10 July	Second Opportunity Examinations end – New Curriculum Senior Students of Professional Programmes
12 July	End of FIRST SEMESTER
15 – 19 July	Mid-year recess
21 June	Mid-year Break
SECOND SEMESTER	
22 July	Lectures commence for SECOND SEMESTER – Old curriculum Students (until 13 October)
26 August	Lectures commence for SECOND SEMESTER – New Curriculum Students (until 20 October)
27 August	Second semester BREAK starts for New Curriculum Students (Until 10 September)
28 August	Second semester BREAK starts for Old Curriculum Students (Until 10 September)
02 September	Institutional Holiday
18 October	Lectures resume after second semester break
23 October	Lectures end for SECOND SEMESTER – Old Curriculum Students
25 October	First opportunity examinations commence – Old Curriculum Students (Until 7 November)
30 October	Lectures end for SECOND SEMESTER – New Curriculum students
06 November	First opportunity examinations commence – New Curriculum Students (Until 10 November)
07 November	First Opportunity Examinations end – Old Curriculum Students
11 November	Second Opportunity Examinations commence – Old Curriculum Students (Until 24 November)
12 November	First Opportunity Examinations end – New Curriculum Students
12 November	Second Opportunity Examinations commence – Old Curriculum Students (Until 29 November)
13 November	Second Opportunity Examinations commence – New Curriculum Senior Students of Professional Programmes (Until 22 November)
22 November	Second Opportunity Examinations end – All New Curriculum Students, including Senior Students of Professional Programmes
29 November	Second Opportunity Examinations end – Old Curriculum Students
06 December	End of SECOND SEMESTER
13 December	End of ACADEMIC YEAR
09 January 2025	University opens (2025 academic year)
21 January 2025	Academic staff resumes office duties

DUE DATES FOR THE 2024 ACADEMIC YEAR

DATE	GENERAL DATES
20 January	Last day for registration of senior students – Faculty of Health Sciences and Veterinary Medicine
31 January	Last day for appeals (Semester 2 and Double modules of Regular and Supplementary/Special examinations of November 2022)
03 February	Last day for application of retention of continuous assessment (CA) mark and to sit for Promotional Examinations Last day for late registration of new curriculum students (Late fee payable)
08 February	Last day for schools to approve the retention of continuous assessment (CA) mark and promotional examination applications
10 February	Last day for application of module(s) exemptions – New Curriculum Students
17 February	Last day for registration of senior students (Late fee payable) Last day for application of module(s) exemptions – Senior Students Last day for approval of module(s) and qualification changes – Senior Students
22 February	Promotion Examination
24 February	Last day for approval of module(s) exemptions – New Curriculum Students
10 March	Last day for approval of module(s) exemptions – Senior Students
12 April	Last day to change offering types and examinations centres – distance students
30 April	Last day to submit thesis for the October 2024 graduation
04 August	Last day for appeals (First and second opportunity examinations of the First Semester 2023)
31 August	Last day to submit outstanding documentation
12 September	Last day to change offering types and examinations centres – distance students
31 October	Last day to submit thesis for the April 2024 graduation
DATE	**CANCELLATION DUE DATES**
28 April	Last day to cancel Semester 1 modules
29 September	Last day to cancel Semester 2 modules
29 September	Last day to cancel Double modules (module that extends over one academic year)
DATE	**FINANCE DUE DATES**
6 February	Last day to cancel Core Semester modules with 100% credit
15 February	Last day to cancel Core Semester modules with 50% credit
1 March	Last day to cancel Semester 1 and year modules with 100% credit – Old Curriculum Students
20 March	Last day to cancel Semester 1 and year modules with 100% credit – New Curriculum Students
29 March	Last day to cancel Semester 1 modules with 50% credit – Old Curriculum Students
17 April	Last day to cancel Semester 1 modules with 50% credit – New Curriculum Students
7 July	Last day to cancel year modules with 50% credit – Old and New Curriculum Students
2 August	Last day to cancel Semester 2 modules with 100% credit – Old Curriculum Students
9 August	Last day to cancel Semester 2 modules with 100% credit – New Curriculum Students
1 September	Last day to cancel Second Semester modules with 50% credit – All Students

A. STRUCTURE AND PERSONNEL OF THE FACULTY

A.1. OFFICE OF THE EXECUTIVE DEAN

Prof. NM. Nickanor: Executive Dean

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HEAD OF DEPARTMENT: GEO-SCIENCES

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Matters regarding specific subjects and departments should be addressed to the relevant Head of Department.

A.2 ADMINISTRATIVE STAFF

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Associate Professor:	Prof. P. Kapewangolo: BSc, MSc (UNAM), PhD (University of Pretoria)
Senior Lecturer	Prof. N. P. Kadhila. BSc (China), MSc (UNAM)
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Lecturer:	Dr. M. Nalisa: BSc, MSc (UNAM), PhD (University of Witwatersrand)
Lecturer:	Mr. H. Eiman: BSc (Hons), M.Sc. (UCT)
Lecturer:	Ms. S. Nafuka: BSc, MSc (UNAM) (on Study leave)
Lecturer:	**Vacant (Biochemistry)**
Lecturer :	Ms. M.E Lang. BSc, MSc (UNAM)
Tutor:	Ms. T. Nawinda: BSc, MSc (UNAM)
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Senior Technologist:	Mr. P. Kapolo: BSc (UNAM)
Senior Technologist:	Mr. A. T Mbangu: BSc, MSc (UNAM)
Technologist:	Mr. A. Hijarunguru: BSc (US)
Technologist:	Ms. K. Kaitjizemine: BSc (UNAM)
Lab. Ass. Technician:	Ms. R. Shimwooshili: Med and Lab Science Cert (Limbe Cameroon)

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Lecturer:	**vacant**
Lecturer:	**vacant**
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Associate Professor:	**Vacant (OGONGO CAMPUS)**
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Senior Lecturer	**Vacant (OGONGO CAMPUS)**
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Senior Lecturer:	Ms M.N. Angula, BSc (Unam), MSc (Stellenbosch)
Senior Lecturer:	Dr Eliakim Hamunyela, BSc (Enviro, Biology & Geo, Unam), MSc (GIS, Wageningen University, Netherlands), PHD (Wageningen University, Netherlands)
Senior Lecturer:	Ms Fransiska Kangombe, BSc (UNAM), BSc Hons (University of Pretoria), MSc Plant Ecology (University of Pretoria (Study leave)
Lecturer	Dr J R Kambatuku: B Sc Zoology & Botany (Unam); M Sc Water Resources (Univ Wales); PhD Ecology (Univ Kwazulu-Natal)
Lecturer:	Dr. E. Ndeunyema: National Dip Agric (OAC); B.Sc. Forestry (Wales Univ, Bangor); M.Sc. Agroforestry (Wales Univ, Bangor), PhD Forestry (ethnobotany) (Wales Univ, Bangor)
Lecturer:	Dr L. Hart: BSc Hons. (University of KwaZulu-Natal, R.S.A), PhD (University of KwaZulu-Natal, R.S.A)
Lecturer:	Dr. J Niipele**:** Department Coordinator & (Ogongo Campus) B.A. Tourism (UNAM); M. Sc. Geo-Information Science & Earth Observation Nat Res Mgt (Univ. Twente, The Netherlands) PhD Resources & Environmental Remote Sensing-Earth exploration and information technology (University of Geosciences, China)
Lecturer:	Dr. E Kasiringua: M.Sc. Applied Ecology (Hedmark University College) PhD Environmental Science – Wildlife Management (Univ of KwaZulu-Natal)
Lecturer:	Dr. A Ndeinoma: National Dipl Agric (OAC); B.Sc. Forestry, M.Sc. Environmental Impact Assessment (Stellenbosch); Postgraduate Diploma in Education (UNAM), PhD. Governance of
Lecturer:	Dr. W. C. Nesongano: BSc (UNAM), MSc. (UNAM and Humboldt Universität zu Berlin), PhD (University of Teubingen, Germany)
Lecturer:	Dr F.C. Persendt, BSc Hons (Geol.) (UWC), Dip PC Specialist (Intec), MSc (UKZN), PhD (University of Canterbury, New Zealand)
Lecturer:	Ms. M. A Morkel: BSc. (Humboldt, USA), MSc. (UNAM and Humboldt Universität zu Berlin) (On study leave)
Lecturer:	Mrs. C. Deelie: BSc. (UNAM), BEd Hons (UNISA), PGDE (UNAM); MSc. (UNAM and Humboldt Universität zu Berlin)
Lecturer:	Ms F. Nakanyete, BA (Unam), MA of GIT (Universitat Autonoma de Barcelona) (On study leave)
Lecturer:	Ms. H. Nghiyalwa, BSc (Population Dev and Geography, Unam) MSc (GIS, University of Queensland) (On study leave)
Lecturer:	Mr A. Amukwaya, BSc (Geomatics, Univ. of Gavle, Sweden); MSc (Geo-Informatics, ITC, University of Twente, Netherlands)
Lecturer:	Mr. F Nambuli: National Diploma in Forestry (Ogongo UNAM Campus); B-Tech in Nature conservation (Nelson Mandela Metropolitan University); MSc in Environmental and Resource Management (Brandenbugische Technische Univestat Cottbus)
Lecturer:	**Vacant (OGONGO CAMPUS)**
Lecturer:	Mr J. S. N. Shapopi: BSc Honour in Physics (UNAM) MSc in Physics (UNAM)
Lecturer:	**Vacant**
Tutor	Mr B. Mukuve: BSc Hons (UNAM)
Senior Technologist:	Ms. M.J Johnson: NEEC (NUST), BSc (UNAM), MSc (Christian-Albrechts Universität zu Kiel , Germany) (on study leave)
Technologist:	Mr. A.K. Katunahange: National Diploma (CPUT), B.Tech (CPUT)
Technologist:	Mr. G. Iiputa: BSc (UNAM), BSc (Hons) (University of Pretoria)
Technologist:	Ms. A I Shipanga-Frans: B.Sc. Environmental & Physiological and Molecular Biology (UNAM). MSc (UNAM)
Technologist:	Ms. G. Katjiuongua, National Certificate, B GIT (Polytechnic of Namibia)
Technologist:	Dr. E. Menjono, BA (Unam), MSc. (Portsmouth), PhD (UNAM)
Technologist:	Mr. F Ekondo: National Dip Natural Resource Management (Polytechnic of Namibia); B Tech Agric Management (Polytechnic of Namibia); B. Hons Agric Management (Free State Univ) Technology (Univ Pretoria)
Field Supervisor:	**Vacant (OGONGO CAMPUS)**

DEPARTMENT OF COMPUTING, MATHEMATICAL AND STATISTICAL SCIENCES

Dr. S.M Nuugulu: BSc (UNAM), BSc Hons (Univ Free State) MSc (Univ of Free State), PhD (UWC)
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Head of Department:	Dr. SM Nuugulu: BSc (UNAM), BSc Hons (Univ Free State) MSc (Univ of Free State), PhD (UWC)
Professor	**Vacant (Cyber Security)**
Professor	**Vacant (Data Science/ Artificial Intelligence)**
Professor:	**Vacant (Applied Mathematics)**
Professor:	**Vacant (Applied Statistics)**
Professor:	Prof. R Puente: BSc (University of Havana), MSc(Cuba), PhD (University of Informatics Science, Cuba)
Associate Professor:	**Vacant (Statistics/Population Studies)**
Associate Professor:	**Vacant (Computing)**
Associate Professor:	Prof G Marelli: Laurea (UniMi), Ph.D (SISSA)
Associate Professor:	Prof M M Mugochi: BSc Hons, MPhil (UZ), Ph.D (UNISA)
Associate Professor:	Prof. L Pazvakawambwa: BSc. Hons (Stats) (UZ), MSc. (UZ), PhD (UNAM)
Associate Professor:	Prof. T K Mufeti: BSc (UNAM), BSc Hons (Rhodes), MSc. (Rhodes), PhD (Rhodes)
Associate Professor:	Prof. A Diaz: BSc (University of Las Villas), MSc (University of Las Villas, Cuba), PhD (University of Camaguey, Cuba)
Senior Lecturer:	**Vacant (Pure Mathematics)**
Senior Lecturer:	**Vacant (Applied Mathematics)**
Senior Lecturer:	**Vacant (Data Science/Artificial Intelligence)**
Senior Lecturer:	Dr. SM Nuugulu: BSc (UNAM), BSc Hons (Univ Free State) MSc (Univ of Free State), PhD (UWC)
Senior Lecturer:	Dr. MM Kamga-Pene: BSc, BSc Hons, MSc (UniYao), PGD-MS (AIMS), MSc, Ph.D (Wits)
Senior Lecturer:	Dr. R Gnitchogna: BSc Hons, MSc, Ph.D (Univ of Free State)
Senior Lecturer:	Dr. V Shaumbwa: BSc (UNAM), MSc, PhD (Stellenbosch Uni)
Senior Lecturer:	Dr. O Oyedele: BSc (UNAM), Hons, MSc. (Rhodes), PhD. (UCT)
Senior Lecturer:	Dr. V Hasheela-Mufeti: BSc (UNAM), BSc Hons (Stellenbosch), MSc (Mannheim), DSc (Lappeenranta University of Technology, Finland)
Senior Lecturer:	Dr. N Suresh: BSc (Eng), MTech (India), PhD (UNAM)
Senior Lecturer:	Dr. V Hashiyana: PhD. (St. Petersburg, Russia)
Senior Lecturer:	Dr. PT Iiyambo: BSc (UNAM), BSc Hons, MSc (Univ. Free State), PhD (Univ. Free State)
Senior Lecturer:	Dr. P Haihambo: BSc (UNAM), BSc Hons, MSc (UCT), PhD (NWU)
Senior Lecturer:	Dr. J. Mushanyu: BSc Hons (UZ), MSc (UZ), PhD (UZ)
Senior Lecturer	Mr. Vijayakumar Kandaswamy: BSc, MSc (BDU, India), PGDCS (Central UniHyd)
Senior Lecturer:	Mr. I Shipanga: BEd. (Rhodes) BEd Hons, MSc (UWC), PGD (Univ of London)
Senior Lecturer:	Ms. M N Ntinda: BSc (UNAM), MSc. (Rhodes)
Senior Lecturer:	Mr. T Haiduwa: Dip. IT (Polytechnic of Namibia/NUST), B.IT in Business Computing (NUST), M. Eng. in Software Engineering (WHU)
Lecturer:	**Vacant (Statistics)**
Lecturer:	Mr. T Sikwambi: BSc (UNAM), MSc (China)
Lecturer:	Mr. D Elago: BSc, PGDE (UNAM), BSc Hons, MSc (UWC)
Lecturer:	Ms. C Amakutsi: BSc, PGDE, MSc (UNAM)
Lecturer:	Mr. W Nangolo: BSc, MSc (UNAM)
Lecturer:	Ms. P Nangolo: BSc (UNAM), MSc (University of Botswana)
Lecturer:	Mr. I Kamwi: BSc(UNAM), MSc (UWC)
Lecturer:	Mr. LP Unandapo: BSc(UNAM), BSc Hons, MSc(Wits)
Lecturer:	Mr. K Mutorwa: BSc. (UNAM), BSc Hons. (Wits), MSc (UNAM)
Lecturer:	Ms. T K Mukaya: BSc (UNAM), MSc. (IUM)
Lecturer:	Mrs. H Nahum: BSc (UNAM), MSc. (University of Eastern Finland)
Lecturer:	Mr. J Mutuku: BSc (Hons)(Nairobi), PGDE(UNAM), HDipCs (Wits), MSc (UCT)
Lecturer:	Dr. A Shipepe: BSc. Hons (UNAM), MSc. (NUST), PhD (University of Eastern Finland)
Lecturer:	Ms. HNK Mendonca: BIT. Hons (NUST), MTech (CPUT)
Lecturer:	Mr. S Ndakunda: BSc. (Rhodes), MSc. (Rhodes)
Lecturer:	Mr. P Kautwima: BIT (NUST), BSc Hons (UNAM), MSc. (UNAM), MBA IB (Amity University)
Lecturer:	Ms J Muntuumo, M.Sc.: Comp. Sci. (NUST), B. Hons.: Comp. Sci. and IT (UNAM), Oracle Database SQL Certified Associate
Lecturer:	Ms. M Haimene: BSc, MSc (UNAM)
Lecturer:	Ms E Lazarus: BSc, MSc (UNAM)
Lecturer:	Ms. S R Mwatilifange: BSc (Strayer, USA), BSc Hons (UNAM), MSc (UNAM)
Lecturer:	Mrs. J Nelulu: BSc (Strayer, USA), BSc Hons (UNAM), MSc (UNAM)
Lecturer:	Mr. A Limbo: BSc (UNAM), MSc (NUST)
Lecturer:	Ms AKP Bonge: BSc Hons (UNAM)
Assistant Lecturer:	Mrs. A K Nkandi-Hauwanga: BSc (Boumerdes, Algeria), BSc Hons (UNAM)
Assistant Lecturer:	Mr. M Simbenda: BSc (UNAM), BSc Honours (UCT)
Staff Development Fellow:	Mr. T. Shinyemba: BSc Hons (UNAM), MSc (UNAM), on study leave.
Tutor:	**Vacant (Quantitative Finance)**
Tutor:	Mr. N Ndahangwapo: BSc (UNAM), MSc (AIMS)
Tutor:	Mr. S S Amukugo: BSc (Cuba), MSc (University of Botswana)
Tutor:	Ms. B B Nambahu: BSc, MSc (UNAM)
Tutor:	Mr. L Komomungondo: BSc (UNAM)
Tutor:	Mr. J Lichela: BSc (UNAM), on study leave.
Technologist:	Mr. J M Mutonga: BSc (UNAM), MCSE, CCNA1, CNEM Certificate

B. REGULATIONS

The regulations of the School of Science should be read in conjunction with and subject to the General regulations of the University of Namibia contained in the **General Information and Regulations Prospectus.**

B.1. QUALIFICATIONS OFFERED BY THE SCHOOL

The School of Science may award the following Undergraduate and Postgraduate degrees:

B.1.1. UNDERGRADUATE PROGRAMMES AND POSTGRADUATE PROGRAMMES

B.1.2	BIOCHEMISTRY, MICROBIOLOGY, & BIOTECHNOLOGY DEPARTMENT	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33BSBY	Bachelor of Science in Biochemistry	3 years full-time
33BSMB	Bachelor of Science in Microbiology Honours	3 years full-time

B.1.3	DEPARTMENT OF ENVIRONMENTAL SCIENCES CODE	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33BSEB	Bachelor of Science in Ecology and Biodiversity Conservation	3 years full-time
33BEGS	Bachelor of Science in Environmental and Geographical Science	3 years full-time
33BSFR	Bachelor of Science in Forestry and Rangeland Management **(OGONGO)**	3 years full-time

B.1.3	PHYSICS, CHEMISTRY & MATERIAL SCIENCE DEPARTMENT	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33BPHY	Bachelor of Science in Physics	3 years full-time
33BCHM	Bachelor of Science in Chemistry	3 years full-time

B.1.4	COMPUTING, MATHEMATICAL & STATISTICAL SCIENCES	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33DSST	Diploma in Applied Statistics	3 years full-time
33DCMP	Diploma in Computing **(OSHAKATI CAMPUS)**	3 years full-time
33BSST	Bachelor of Science in Statistics	3 years full-time
33BSPO	Bachelor of Science in Population Studies	3 years full-time
33BSMM	Bachelor of Science in Mathematics	3 years full-time
33BSQF	Bachelor of Science in Quantitative Finance	3 years full-time
33BSDS	Bachelor of Science in Data Science	3 years full-time
33BCMP	Bachelor of Science in Computing	3 years full-time

B.1.5	GEO-SCIENCES DEPARTMENT	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33BSGY	Bachelor of Science in Geology	3 years full-time
11BSGA	Bachelor of Science in Geology Honours	1 year full-time

B.1.6	WILDLIFE MANAGEMENT AND ECOTOURISM STUDIES	
CODE	**DIPLOMA/DEGREE**	**MINIMUM DURATION**
33BSWM	Bachelor of Sciences in Wildlife and Tourism Management	years full-time

B.1.7.	POSTGRADUATE PROGRAMME IN THE SCHOOL	
33PARM	Postgraduate Diploma in Applied Research Methods (Level 8)	1 years full-time
11MSCM	Master of Science Mathematics	2 years full-time
11MSSB	Master of Science in Biostatistics	2 years full-time
11MSST	Master of Science in Applied Statistics and Demography	2 years full-time
11MSIB	Master of Science in Industrial Biochemistry	2 years full-time
11MMBL	Master of Science Microbiology	2 years full-time
11MSGL	Master of Science in Applied Geology	2 years full-time
11MSPG	Master of Science in Petroleum Geology	2 years full-time
11MSPH	Master of Science in Physics	2 years full-time
11MSCC	Master of Science in Chemistry	2 years full-time
11MSRM	Master of Science in Renewable Energy Materials Science	2 years full-time
11MSRP	Master of Science in Renewable Energy Photovoltaics	2 years full-time
11MSNU	Master of Science in Nuclear Science **(not on offer in 2023)**	2 years full-time
11MMBL	Master of Science in Microbiology	2 years full-time
17MSWM	Master of Science in Wildlife & Tourism Management **(by Thesis only)**	2 years full-time
22MSCI	Master of Science Information Technology **(by Coursework)**	2 years full-time

The school may award the degree in **11MASC Master of Science (MSc) by THESIS** for 2 years full-time and **11DPSC Doctor of Philosophy (PhD)** for 3 years full-time in the above disciplines, subject to the general regulations for Postgraduate Programmes studies (cf. **9. Regulations and Guidelines for Postgraduate Programmes** in the **General Information and Regulations Yearbook**).

Programme Co-ordinator: Cf. relevant head of department.

C. GENERAL REGULATION PERTAINING TO UNDERGRADUATE STUDIES

C.1. DURATION OF STUDY

All Bachelor of Science degree programmes cannot be completed in less than four (4) years. All Bachelor of Science (Honours) degrees must be completed within six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

C.2. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions, but the exemptions shall not exceed 50% of the programme of the Bachelor of Science degree. See the General Information & Regulations Prospectus and Fees Prospectus.

C.3. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least **80%** of the lectures and to complete the required elements that make up the continuous assessment mark. Refer to the **General Information and Regulations Prospectus**.

C.4. PRACTICALS

Attendance of practical sessions is compulsory.

C.5. CURRICULUM

C.5.1. COURSES, CREDITS AND CONTACT HOURS

One contact hour is equivalent to one **(1)** lecture period on the timetable of the Faculty of Science.
A **full semester course** carries **16** credits and is taught at four **(4)** contact hours per week over one semester, i.e. **56** contact hours per semester.
A **half –course** carries **8** credits and is taught at two **(2)** contact hours per week over one semester, i.e. 28 contact hours per semester.
A **double-course** carries **32** credits and extends over one academic year at four **(4)** periods per week and terminates in an examination at the end of the year. (For the composition of a curriculum a double module is regarded as equal to two courses)
Refer to the relevant programmes (to determine the credits and contact hours of any particular course).

C.5.2. CURRICULUM COMPILATION

To be awarded a Bachelor's degree by the School, a student must pass all the courses prescribed for each curriculum combination. In the BSc Honours degree programme a student maybe required to select the courses offered by a specific department, in accordance with School and department regulations.

C.6. STUDENT REGISTRATION

C.6.1. UNIVERSITY CORE CURRICULUM

All students register for the following courses:

YEAR	CODE	COURSE NAME
1	U34O3FS	Skills portfolio
1	U3583AL	Academic Literacy **I**
1	U3420CN	National and Global Citizenship
1	U3583DD	Digital Literacy
1	U3420EM	Ethics and morality
1	U3520LP	Leadership Skills
2	U3420PJ	Project management
2	U3683AL	Academic Literacy **II**
2	U3420RT	Entrepreneurship
2	U3420SE	Sustainability and Environmental Awareness
2	U3520TH	Critical Thinking
2	U3683AL	Academic Literacy
2	W3600MG	CWIE Preparation
3	W337001C	Workplace Attachment

C.6.2. UNIVERSITY CORE CURRICULUM COURSE DESCRIPTIONS

U3403FS	Skills Portfolio
Course title:	Skills Portfolio
Code:	U3403FS
NQF Level:	4
Contact hours:	4 lecture periods per week for 14 weeks and one three hour practical session per week
Credits:	NCB
Course assessment:	Continuous assessment (**40%**): Theory (not less than 2 tests and 1 assignment); Practicals (not less than 10 marked assignments).
Examination	**60%**: 1 x 3 hour theory paper Reflective journal/ portfolio
Prerequisites:	**None**
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: This module covers; Attitude and Motivation, Academic Planning and Goal Setting, Learning styles, Study Methods and Skills, Time Management, Assessment Preparation, Mental well-being, Interpersonal Communication, Financial matters and management, Student Violence, and Career Planning and Development.

U3583AL	Academic Literacy I
Course title:	Academic Literacy I
Code:	U3583AL
NQF Level:	5
Contact hours:	4 lecture hours per week for one semester
Credits:	8
Compulsory/Elective	Compulsory
Course Assessment:	Assessment will be based on Continuous Assessment.
Pre-requisites:	None

Course description: Module Content: The module will cover study skills, reading, listening, speaking and writing, referencing, language usage and text organisation.

U3420CN	National & Global Citizenship
Course title:	National & Global Citizenship
Code:	U3420CN
NQF Level:	4
Contact hours:	1 lecture hours per week for one semester
Credits:	8
Compulsory/Elective	Compulsory
Course Assessment:	
Pre-requisites:	None

Course description: UNIT 1: Constitution and its Importance: What is a constitution; Functions of a constitution; What it contains; Constitution and democracy. **UNIT 2: Global Citizenship:** The meaning of global citizenship; Importance of global awareness; World issues of concern to global citizens. **UNIT 3: Civic Engagement:** What do we mean by civic engagement; Dimensions of civic engagement; Indicators of civic engagement; Promoting civic engagement. **UNIT 4: Globalization:** Understanding globalization; Cultural construction of neoliberal globalization; Major players; Major domains; Major Issues; Futures of Globalization. **UNIT 5: Intercultural Communication:** Dealing with difference; Levels of culture; Stereotypes and generalizations; Intercultural communication Processes. **UNIT 6: Sustainable Development Goals and individual action:** Introduction to SDGs; Contributing to achievement of SDGs through action. **Student Assessment Strategies:** Assessment will be based on Continuous Assessment.

U3420SE	Sustainability & Environmental Awareness
Course title:	**Sustainability & Environmental Awareness**
Code:	U3420SE
NQF Level:	4
Contact hours:	2 lecture hours per week for one semester whereby the first 3 weeks is followed by Mini-Project for the remainder of the semester (total of 10 hours on this aspect)
Credits:	2
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: Sustainability: finite nature of elements constituting the Earthly environment, resilience and fragility of the natural environment; three distinct perspectives on sustainability: sustained yield of resources, sustained abundance and diversity of species and ecosystems, sustained economic and social development key themes in defining sustainability: (i) the human perspective, (ii) considerations of fairness and (ii) issues of scale concepts of inter- and intra-generational equity (fair and just distribution of resources), sustainable community. Natural resources: role of soil, water, and minerals in supporting life on Earth; health and interdependence of ecosystems within the biosphere; dependence of human beings on natural resources for sustenance and livelihoods; Solutions to environmental sustainability challenges: simple inexpensive interventions aimed at reducing wastage of resources and generation of wastes through exhaustive use, reuse, recycling and refurbishing of products. **Student Assessment Strategies:** The module will be evaluated using **100% continuous assessment**. Student will be assessed based on class discussions and debates on striking a balance between socio-economic development and environmental sustainability citing real life major national projects. Students will be placed in groups based on a logical criterion that ensures mixing interspersing of students from academic discipline and programmes in each group. Groups will be expected to take on a particular environmental issue plaguing their immediate surroundings to highlight and champion. Each group will tackle one issue through either clean-up campaigns, awareness raising campaigns, community education campaigns, advocacy or devising a simple solution to the problem. **A minimum pass mark for the module is 50%.**

U3583DD	Digital Literacy
Course title:	**Digital Literacy**
Code:	U3583DD
NQF Level:	5
Contact hours:	4 Lecture hours per week for one semester.
Credits:	8
Course Assessment:	Assignment: information literacy assignment; Test x 2: **Practical:** Digital proficiency, Data and Media literacy
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: Digital Proficiency: ICT-based devices (laptops, tablets, smartphones, desktop computers, digital instruments and equipment); a mouse, keyboard, touch screen, voice control and other forms of input; screens, audio headsets and other forms of output; digital capture devices; University digital learning systems and a range of personal digital services such as social media, cloud storage services, sharing sites. **Digital Productivity:** Basic productivity software (text editing, presentation, spreadsheets, image editing); email and other digital communication services; Internet or cloud or institutional shared spaces for Organising, managing and backing up digital files; software/apps and services suitable for learning-related tasks; digital tools fit learning and managing learning time. **Information Literacy:** search engines, indexes or tag clouds; wikis, blog posts, scholarly journals, e-books and the open web; file spaces and folders, bookmarks, reference management software and tagging; copyright, and digital citizenship issues **Data and Media Literacy:** Digital data using spreadsheets and other media; data security and privacy; digital media messages – text, graphics, video, animation, audio and multimedia. **Digital Creation and Innovation:** digital materials (video, audio, stories, presentations, infographics); new digital tools for learning in digital settings. **Digital Communication, Collaboration and Participation**: digital communication; differences between media, norms of communicating in different spaces; false or damaging digital communications; collaborative tools and online environments; online networks **Digital Learning and Development:** digital learning opportunities; digital learning resources; digital tools/materials for organising, planning and reflecting on learning (mind-mapping, note-taking, e-portfolio/ learning journal/ blog). **Digital Identity and Wellbeing:** online profiles for different networks (personal, professional, academic); digital reputation; managing personal data and privacy; digital CV or portfolio of work; digital technologies for personal development; online etiquette; wellbeing and safety online; internet addiction; cyberbullying and other damaging online behaviour. **Individual assessment tasks:** Assignment: information literacy assignment; Test x 2: **Practical:** Digital proficiency, Data and Media literacy: **No written examination**

U3683AL	Academic Literacy II
Course title:	**Academic Literacy II**
Code:	U3683AL
NQF Level:	6
Contact hours:	4 Lecture hours per week for one semester.
Credits:	8
Course Assessment:	Assignment: information literacy assignment; Test x 2: **Practical:** Digital proficiency, Data and Media literacy
Compulsory/Elective	Compulsory
Pre-requisites:	U3583AL

Course description: The module is designed for students enrolled in a bachelor's degree, which requires them to do basic research, read and listen to specific academic material, produce specific written texts and give academic presentations. The module thus, focuses on enhancing academic reading, academic vocabulary, writing, listening and speaking. **Student assessment strategies:** The module will be continuous assessment based. Assessment will include written tests, individual and group assignments, portfolio assessments and oral presentations.

U3520PJ	Project Management Skills
Course title:	**Project Management Skills**
Code:	U3420PJ
NQF Level:	5
Credits:	2
Contact hours:	2 lecture hours per week for the first two weeks and field-based practical for the remaining four weeks.
Mode of Delivery:	Blended: face-to-face and online
Learning Requirements:	The field-based practical to be undertaken in the immediate environment of the student.
Course Assessment:	Assessment will be **100% CA** based on weekly project progress reports (50%) & the final project report (50%).
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: This module consist of two components: ***The first component*** is a two weeks theory covering the **concepts** (project vs programme) and the **phases of project life cycle (project initiation and planning:** work breakdown, development of SMART indicators, estimation of activity duration, efforts, and costs, scheduling of activities, identification of critical path, setting of milestones, stakeholder identification and categorization, stakeholder engagement, initial risk identification, and development of the initial project plan; **project implementation & management:** forming the project team, managing people, resources allocation, responsibilities allocation, quality assurance, leadership style and project liaison; **project monitoring and control:** progress reporting and communication, quality control, time management, budget and cost management, risk management and mitigation; **project closure and evaluation:** project evaluation, project auditing process and the closure process, and final project report). ***The second component*** is a four-week **field-based practical** where students participate in a real-life project in their immediate environment. Students are strictly required to apply the project management approach during the field-based practical.

U3520TH	Critical Thinking
Course title:	**Critical Thinking**
Code:	U3520TH
NQF Level:	5
Credits:	2
Contact hours:	1 lecture hours practical session per week interfaced with limited online engagement.
Mode of Delivery:	Blended: Face-to-Face and Online
Learning Requirements:	None
Course Assessment:	Assessment will be **100% CA** based on 1 reflective learning essay, 1 problem solving activity.
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: The module will cover: **Definition of critical thinking**: striving for understanding; to have an inquisitive yet open-minded and flexible approach to exploring ideas, the ability to evaluate information and draw clear conclusions based on the evidence at hand. **Core critical thinking skills**: explain, infer, analyse, evaluate, problem solving, self-reflect. **deductive and inductive reasoning:** inductive reasoning- move from the specific to the general, deductive reasoning-moving from the general to specific. **Construction of argument**: construct statements that combine reasoning with evidence to support an assertion or argument. **Problem analysis**: define problem, determine the root causes of problem, develop alternative solutions to problem, implement solution, evaluate outcome. **Reflective learning**: asking open questions, reflect on answers, writing reflective learning essays, thinking about other's answers, asking 'why" questions. **Understanding fallacies:** what is a fallacy? description of various fallacies, identifying a fallacy in an argument, explaining a fallacy to an opponent in an argument.

U3420RT	Entrepreneurship Skills
Course title:	**Entrepreneurship Skills**
Code:	U3420RT
NQF Level:	5
Credits:	2
Contact hours:	2 lecture hours per week for one semester
Mode of Delivery:	Blended: Face-to-Face and Online
Learning Requirements:	None
Course Assessment:	Assessment will be **100%** Continuous Assessment.
Compulsory/Elective	Compulsory
Pre-requisites:	None

Course description: **Definition and scope of entrepreneurship and entrepreneur**; Entrepreneur's environment; Characteristics of entrepreneurs; Basic concepts of entrepreneurship; Forms of entrepreneurship; **The role of entrepreneurship**; The entrepreneurial process; **The entrepreneurial mind set**; Decision-making skills; Creativity, innovation and entrepreneurship; Critical thinking skills; Problem solving skills; Business and personal goal-setting skills; Negotiation skills, Communication skills, Assertiveness skills, Interpersonal skills, Cognitive skills; **Transferable skills**, Practical application of entrepreneurial skills; Starting a new business; Managing a business start-up; Growing an entrepreneurial venture; Marketing skills; Managing people;
Record keeping; networking skills; Time management skills; Change management skills; Entrepreneurship success stories in the global context.

T3602NS	CWIE Preparations
Course title:	**CWIE Preparations**
Module Code:	T3602NS
NQF Level:	6
NQF Credits:	8
Contact Hours:	Up to 2 lectures per week for one semester.
Pre-requisites:	None
Course Assessment:	CA (100% of the final mark) consisting of a combination of tests and quizzes, assignments, and a CWIE portfolio. A final mark of 50% is required to pass this course.

Course description: Professional behaviour, work-readiness, diligence & work ethics. Active searching for a CWIE situation with the aid of UNAM and the School.

YEAR 3

W3700IC	CWIE
Module Title:	**CWIE**
Module Code:	W3700IC
NQF Level:	7
Contact hours:	Six (6) weeks in June/July break, 40 hours per week practical sessions = 240 hours
NQF Credits:	24
Prerequisite:	None
Course Assessment:	**100% CA** made up of 10%; Lecturer Assessment 10%; Daily Logbook (30%); Final Report 25%, Presentation 25%.

Course Description: Laboratories, research institutions and industries in order to gain hands-on experience. Students can choose any time during the year to do their Workplace Attachment, if it does not interfere with their classes or practicals. During the Workplace Attachment period students will be attached to different relevant scientific institutions in Namibia, in the SADC region as well as identified institutions in other African countries. Students will have to participate in projects and programs which are carried out at the respective institutions. Attached students are also obliged to attend scheduled events such as seminars, tours and lectures at the institutions. Although the department will identify some relevant institutions, the students may suggest institutions of their choice if they agree with the department. The type of skills to be learned through the Workplace Attachment will be decided by the students themselves based on their interests.

C.6.3.3. FACULTY CORE CURRICULUM

All students must register for the following **two (2)** full courses **(32 credits)**:
MAT3511 Basic Mathematics
MAT3512 Precalculus

C.6.3.4. MODULE STRUCTURE AND CODING

Modules are coded with three alpha codes denoting the field of study as well as the Department under which a module is offered, for example: BLG (Biology), CHM (Chemistry), MAT (Mathematics, PHY (Physics), CMP (Computer Science), POP (Population Studies), STS (Statistics) and GLY (Geology).

The three alpha codes are followed by four numeric codes denoting the following:

1st numeric code:	Qualification type.
2nd numeric code:	NQF level.
3rd numeric code:	Module size (module type).
4th numeric code:	Semester in which the module is offered.

D. DEPARTMENT OF BIOCHEMISTRY, MICROBIOLOGY AND BIOTECHNOLOGY

D.1. DEPARTMENTAL REGULATIONS

D.1.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of these qualifications is to provide students with an all-round view between the disciplines of Biochemistry, Microbiology and other related fields. The Bachelor of Science in Biochemistry (Honours) with Biomedical Applications and the Bachelor of Science in Microbiology (Honours) are pure academic/science programs and our graduates are not limited to a specific profession. Graduates of these degrees have indefinite employment opportunities in various industries in Namibia and beyond. Outstandingly, employers value the scientific, analytical, and problem-solving skills possessed by our biochemistry and microbiology graduates.

Biochemistry, sometimes called biological chemistry, is the study of the structure, composition, and chemical reactions of substances in living systems. It is a branch of science that covers the application of Chemical techniques and knowledge in living organisms. It provides a bridge between chemistry and various scientific disciplines including genetics, microbiology, forensics, plant sciences and medicine. The understanding of chemical processes at molecular level (metabolic processes) is achieved through Biochemistry. The advances in the field of Biochemistry over the past 100 years have been staggering. It is through Biochemistry that molecular targets of diseases are identified and potential drug agents are developed. Understanding how diseases affect the metabolic function in living organisms, value addition of natural and synthetic products for applications in health, food, and cosmetics industries. Topics include how living things obtain energy from food, the chemical basis of heredity, industrial application of biochemistry, drug design and development, biotechnology, micro-and nanotechnology and what fundamental changes occur in disease. Students will get the opportunity to apply biochemistry knowledge in food science, pharmacology, physiology, microbiology, and clinical chemistry. Enzymes and their kinetics and mechanisms are covered in detail. Metabolic pathways are examined from thermodynamic and regulatory perspectives.

Microbiology is useful in health, agriculture, food, soil, water, environmental, industrial, pharmaceutical, and biotechnological sectors. In Namibia, as in many other countries worldwide, Microbiology graduates work at the cutting-edge of national programmes and tipping point of international efforts to prevent and control diseases, increase food crop and livestock production, augment soil fertility, provide clean drinking water, remedy environmental pollution, and synthesize metabolites with industrial, food, pharmaceutical and biotechnological applications, and value. Topics covered are such as bioenergetics, molecular biology, industrial application of microbiology, biotechnology, immunology, and epidemiology. Students will get the opportunity to apply microbiology knowledge to health, food science, and biotechnology, and agriculture, industrial and environmental microbiology**. The department** seeks to facilitate students' progression towards fulfilling and exciting careers in academia, industry, and/or government and also to develop their skills as future leaders in science and society. Successful candidates can be successful entrepreneurs or take employment in the education, public or private sectors especially in fields like, food and beverage Industries, forensics, agriculture, environmental, academic institutions, scientific research institutions , etc., where a balanced Biochemistry/Microbiology knowledge is important.

D.1.1.1. BACHELOR OF SCIENCE IN BIOCHEMISTRY (NQF LEVEL 7) 33BSBY

D.1.1.2. ADMISSION REQUIREMENTS

Refer to the General Admission Criteria for Undergraduate Programmes in the General Information and Regulations Yearbook. Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses and programmes and is awarded based on merit.

To be admitted into this programme a candidate must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with EITHER a pass in five (5) different subject combinations:

Two (2) subjects of which Biology and Chemistry must be included on NSSCAS level with an average of d or higher grade/s:

- ★ Three (3) of which Mathematics must be included subjects on NSSCO level with an average of C or higher grade/s
- ★ English must be at minimum C grade on NSSCO level.

OR

A pass in five different subjects as follows:

- ★ Three (3) subjects of which Biology and Chemistry must be included on NSSCAS level with an average of d or higher grade/s
- ★ (2) subjects of which Mathematics must be included on NSSCO level with an average of C or higher grade/s
- ★ English must be at minimum C grade on NSSCO level.

Candidates that lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an Extended Programme that will take one year longer.

D.1.1.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued prior to 2021 (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme:

EITHER a pass in five (5) different subjects with two (2) subjects on NSSCH with 4 or higher,

- ★ three (3) subjects on NSSCO with **C** or higher, and
- ★ additionally, English, Biology and Chemistry must be at minimum a **C** on NSSCO. OR
- ★ a pass in five (5) different subjects with three (3) subjects on NSSCH with 4 or higher,
- ★ two (2) subjects on NSSCO with **C** or higher, and
- ★ additionally, English, Biology and Chemistry must be at minimum a **C** on NSSCO.

D.1.1.4. MATURE AGE ENTRY (MAE)

In addition to the above, Mature Age Entry (MAE) and Prior Learning Recognition (RPL) may server as alternative entry pathways subject to meeting requirements. **To qualify for Mature Age Entry applicants should:**

- ★ Be at least 25 years old on the 1st day of the academic year in which admission is sought:
- ★ Have at least five years of work experience in biochemistry related areas.
- ★ Be in possession of a senior secondary education certificate.
- ★ Pass all four (4) MAE papers covering topics of English Proficiency, General knowledge, Biology and Chemistry ability with an overall average of 60% with no paper below 50%

D.1.1.5. RECOGNITION OF PRIOR LEARNING (RPL)

- Another way of entering the programme is **RPL** according to the UNAM RPL policy.
- Depending on the content of the qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

D.1.1.6. ADDITIONAL SELECTION CRITERIA

In cases of the demand exceeding capacity, preference shall be given to the students with the higher number of points as calculated from the UNAM point scale in five (5) different subjects guided by to matters of equity as outlined by the National Policies.

D.1.2. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply:

For modules with Continuous Assessment (CA) and Examination.

- A combination of continuous assessment (50%) and an examination **(50%)** will be used to assess each of the modules and details on what constitutes assessments are specified under respective modules.
- The minimum CA mark that will allow entrance into the examination is **40%** and the minimum final mark of **50%** is required for a pass.
- Notwithstanding the result of the mark above, a subminimum of at least **40%** in the exam is required.
- To qualify for supplementary examination, a student needs a final mark of **45-49%**, subject to a subminimum of 40% in the examination.
- Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, oral examinations, and seminar presentations

In cases where modules are assessed by continuous assessment only:

- The final mark will be constituted of 100% CA mark.
- A final aggregate mark of 50% shall be required to pass the module.

D.1.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

D.1.3.1. NORMAL ENROLMENT

To be re-admitted to the School of Science for a particular year of registration, a student must have passed the minimum number of courses required as indicated below:

- 66 credits (of which 24 must be non-core) by the end of the first year of registration.
- 161 credits (of which 92 must be non-core) by the end of the second year of registration.
- 295 credits by the end of the third year of registration.
- 356 credits by the end of the fourth year of registration.

The programme must be completed after a maximum of 5 years of registration.

D.1.3.2. EXTENDED ENROLMENT

- 66 credits (of which 24 must be non-core) by the end of the first year of registration
- 161 credits (of which 28 must be non-core) by the end of the second year of registration
- 295 credits by the end of the third year of registration
- 356 credits by the end of the fourth year of registration
- 380 credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration 32.

D.1.4. ADVANCEMENT AND PROGRESSION RULES

D.1.4.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- Year 1 to Year 2: At least **87** credits.
- Year 2 to Year 3: All first-year credits (131 credits) in addition to at least **54** second year credits

D.1.4.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- Year 1 to Year 2: At least 60 credits
- Year 2 to Year 3: All first-year credits in addition to at least 64 second year credits
- Year 3 to Year 4: All second-year credits and at least 54 third year credits

A student who fulfilled the re-admission requirements but could not advance to the next academic year **must first register for all failed modules.** Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

D.1.5. ARTICULATION OPTIONS

The BSc Biochemistry may serve as entry point to an honour's degree in biochemistry, or related postgraduate degrees and diplomas.

D.1.6. REQUIREMENTS FOR QUALIFICATION AWARD

The BSc in Biochemistry qualification will be awarded to candidates credited with a minimum of **391 credits** and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

D.1.7. BACHELOR OF SCIENCE IN BIOCHEMISTRY (NQF LEVEL 7) 33BSBY

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
U3403FS	Skills Portfolio	5	0	None	**C**
U3583AL	Academic Literacy 1B	5	8	None	**C**
U3583DD	Digital Literacy	5	8	None	**C**
S3420BL	Laboratory Safety and Report Writing	4	2	None	**C**
U3420CN	National Global Citizenship	4	2	None	**C**
U3420SE	Sustainability & Environmental Awareness	4	2	None	**C**
U3420EM	Ethics & Morality	4	2		**C**
Year 1 Semester 1					
S3511BB	Foundations of Biochemistry & Biology	5	14	None	**C**
S3531CG	Introductory Physical & Inorganic Chemistry	5	14	None	**C**
S3511MC	Calculus I	5	12	None	**C**
S3511SF	Fundamentals of Statistics	5	12	None	**C**
Year 1 Semester 2					
S3532CP	Laboratory Techniques & Skills	5	14	None	**C**
S3532CG	Introductory Analytical & Organic Chemistry	5	14	None	**C**
S3512ED	Diversity of Life	5	14	None	**C**
S3502TM	Introduction to genetics	5	7	None	**C**
S3522TM	Origins of Microbiology	5	6	None	**C**
Total credits			**131**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
U3583AL	Academic Literacy II	6	8	None	**C**
U3520LP	Leadership	5	2	None	**C**
U3420PJ	Project Management	4	2	None	**C**
U3420RT	Entrepreneurship	4	2	None	**C**
U3520TH	Critical Thinking	5	2		**C**
S3620BC	Contemporary Issues & Science Diplomacy	6	8		**C**
Year 2 Semester 1					
S3631CO	Organic Chemistry I	6	16	S3531C & S3532CG	**C**
S3611BB	Structural Biochemistry	6	14	S3511BB	**C**
S3601TB	Biostatistics for Biochemistry & Microbiology	6	8	**Pre:** STS3521	**C**
S3631CA	Analytical Chemistry I	6	16	S3531CG **&** S3532CG	**E**
S3631BB	Biochemical Signaling	6	16	S3511BB	**E**
Year 2 Semester 2					
S3612BB	Bioenergetics and Enzyme Catalysis	6	14	None	**C**
S3632BB	Biochemical Techniques	6	16	None	**C**
S3632CP	Physical Chemistry I	6	16	None	**E**
S3612TM	Cell Molecular Biology and Genetics	6	16	None	**E**
S3602BC	CWIE Preparation	6	8	None	**C**
Total credits			**132**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory Elective
W3700IC	Workplace Attachment	7	24	None	**E**
W3700BC	Community Engagement	7	24		**E**
S3700BP	Project-based learning	7	24		**E**
Year 3 Semester 1					
S3711BB	Biochemical pathways	7	17	S3611BB & (S3612BB)	**C**
S3751BB	Biochemical Basis of Diseases	7	17	(S3711BB)	**C**
S3731CO	Organic Chemistry II	7	18	S3631CO	**E**
S3731BP	Plant Genomics	7	18	(S3612TM)	**E**
Year 3 Semester 2					
S3712BB	Biotechnology & Biosafety	7	17	None	**C**
S3752BB	Toxicology	7	9	None	**C**
S3702BI	Innovation and Bioentrepreneurship	7	8	None	**C**
S3732CA	Analytical Chemistry II	7	18	S3631CA	**E**
S3732BB	Molecular and Structural Genetics	7	18	S3612TM	**E**
Total credits			**128/391**		

D.1.7.1. EXTENDED ENROLMENT BSC IN BIOCHEMISTRY (33BSBE)

NSSCAS Biology, NSSCAS Mathematics & NSSCO Chemistry

This option caters for students that have the required NSSCAS Biology and NSSCAS Mathematics, **but Chemistry on NSSCO.** Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended two (2) modules:

1. **S3431TM Chemistry Support I &**
2. **S3432TM Chemistry Support II**.

D.1.7.2. BIOLOGY, NSSCAS CHEMISTRY & NSSCO MATHEMATICS

This option caters for students that has the required NSSCAS Biology and NSSCAS Chemistry, but **Mathematics on NSSCO.** Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended two (2) modules:

1. **S3411MS Mathematics Support I &**
2. **S3412ms Mathematics Support II**.

D.1.7.3. NSSCAS BIOLOGY BUT NSSCO CHEMISTRY & NSSCO MATHEMATICS

This option caters for students that has the required NSSCAS Biology, **but Chemistry and Mathematics on NSSCO**. Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended four (4) modules:

1. **S3431TM Chemistry Support I,**
2. **S3432TM Chemistry Support II,**
3. **S3411MS Mathematics Support I &**
4. **S3412ms Mathematics Support II**.

D.2. BACHELOR OF SCIENCE IN MICROBIOLOGY (NQF LEVEL 7) 33BSMB

D.2.1. ADMISSION REQUIREMENTS

Refer to the General Admission Criteria for Undergraduate Programmes in the General Information and Regulations Yearbook. Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses and programmes and is awarded based on merit.

To be admitted into this programme a candidate must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with EITHER a pass in five (5) different subject combinations:

- Two (**2**) subjects of which **Biology and Chemistry** must be included on NSSCAS level with an average of **d** or higher grade/s
- Three (**3**) of which **Mathematics** must be included subjects on NSSCO level with an average of **C or higher grade/s**
- **English** must be at minimum C grade on NSSCO level

OR

A pass in five different subjects as follows:

- Three (**3**) subjects of which **Biology and Chemistry** must be included on NSSCAS level with an average of **d or higher grade/s**
- Two (**2**) subjects of which **Mathematics** must be included on NSSCO level with an average of **C** or higher grade/s
- **English** must be at minimum C grade on NSSCO level

Candidates that lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an Extended Programme that will take one year longer.

D.2.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **prior to 2021** (only) and has a pass in 5 different subjects, as outlined below, can enrol in the **EXTENDED MODE** of this programme:
EITHER a pass in five (5) different subjects with:

- two (2) subjects on NSSCH with 4 or higher,
- three (3) subjects on NSSCO with C or higher, and additionally,
- **English, Biology and Chemistry** must be at minimum a C on NSSCO.

OR a pass in five (5) different subjects with

- three (3) subjects on NSSCH with 4 or higher,
- two (2) subjects on NSSCO with **C** or higher, and additionally,
- **English, Biology and Chemistry** must be at minimum a **C** on NSSCO.

D.2.1.2. MATURE AGE ENTRY (MAE)

In addition to the above, Mature Age Entry (MAE) and Prior Learning Recognition (RPL) may server as alternative entry pathways subject to meeting requirements.

To qualify for Mature Age Entry applicants should:

- be at least 25 years old on the 1st day of the academic year in which admission is sough
- At least have five years of work experience in microbiology related areas
- be in possession of a senior secondary education certificate
- pass all four (4) MAE papers covering topics of English Proficiency, General knowledge, Biology and Chemistry/Physical Science ability with an overall average of 60% with no paper below 50%

D.2.1.3. RECOGNITION OF PRIOR LEARNING:

- Another way of entering the programme is RPL according to the UNAM RPL policy.
- Depending on the content of the qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

D.2.1.4. ADDITIONAL SELECTION CRITERIA

In cases of the demand exceeding capacity, preference shall be given to the students with the higher number of points as calculated from the **UNAM point scale in five (5)** different subjects guided by to matters of equity as outlined by the National Policies.

D.2.2. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply:

For modules with Continuous Assessment (CA) and Examination.

- A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the modules and details on what constitutes assessments are specified under respective modules.
- The minimum CA mark that will allow entrance into the examination is 40% and the minimum final mark of 50% is required for a pass.
- Notwithstanding the result of the mark above, a subminimum of at least 40% in the exam is required.
- To qualify for supplementary examination, a student needs a final mark of 45-49%, subject to a subminimum of 40% in the examination.
- Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, oral examinations, and seminar presentations.
-

In cases where modules are assessed by continuous assessment only:

- The final mark will be constituted of 100% CA mark.
- A final aggregate mark of 50% shall be required to pass the module.

D.2.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

D.2.3.1. NORMAL ENROLMENT

To be re-admitted to the School of Science for a particular year of registration, a student must have passed the minimum number of courses required as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration
- ★ 124 credits (of which 92 must be non-core) by the end of the second year of registration
- ★ 214 credits by the end of the third year of registration
- ★ 264 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration.

D.2.3.2. EXTENDED ENROLMENT

- ★ 28 number of credits (of which 12 must be non-core) by the end of the first year of registration
- ★ 92 number of credits (of which 28 must be non-core) by the end of the second year of registration
- ★ 170 number of credits by the end of the third year of registration
- ★ 230 number of credits by the end of the fourth year of registration
- ★ 298 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration.

D.2.4. ADVANCEMENT AND PROGRESSION RULES

D.2.4.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ From year 1 to year 2: At least 88 **credits.**
- ★ From year 2 to year 3: All first-year modules (131 credits) in addition to at least **54** third year credits

D.2.4.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least 60 credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 64 second year credits
- ★ Year 3 to Year 4: All second-year credits and at least 54 third year credits

A student who fulfilled the re-admission requirements but could not advance to the next academic year **must first register for all failed modules.** Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

D.2.5. ARTICULATION OPTIONS

This qualification may serve as an entry point to an honour's degree in Microbiology, or related postgraduate degrees and diplomas.

D.2.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **397 credits**, and who have met all the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

D.2.7. BACHELOR OF SCIENCE IN MICROBIOLOGY (NQF LEVEL 7) 33BSMB

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
U3403FS	Skills Portfolio	5	0	None	**C**
U3583AL	Academic Literacy 1B	5	8	None	**C**
U3583DD	Digital Literacy	5	8	None	**C**
S3420BL	Laboratory Safety and Report Writing	4	2	None	**C**
U3420CN	National Global Citizenship	4	2	None	**C**
U3420SE	Sustainability & Environmental Awareness	4	2	None	**C**
U3420EM	Ethics & Morality	4	2		**C**
Year 1 Semester 1					
S3511SF	Fundamentals of Statistics	5	12	None	**C**
S3531CG	Introductory Physical & Inorganic Chemistry	5	14	None	**C**
S3511MC	Calculus I	5	12	None	**C**
S3511BB	Foundations of Biochemistry and biology	5	14	None	**C**
Year 1 Semester 2					
S3532CP	Laboratory Techniques & Skills	5	14	None	**C**
S3532CG	Introductory Analytical & Organic Chemistry	5	14	None	**C**
S3512ED	Diversity of Life	5	14	None	**C**
S3502TM	Introduction to genetics	5	7	None	**C**
S3522TM	Origins of Microbiology	5	6	None	**C**
Total credits			**131**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
U3583AL	Academic Literacy II	6	8	None	**C**
U3520LP	Leadership	5	2	None	**C**
U3420PJ	Project Management	4	2	None	**C**
U3420RT	Entrepreneurship	4	2	None	**C**
U3520TH	Critical Thinking	5	2		**C**
S3620BC	Contemporary Issues & Science Diplomacy	6	8		**C**
Year 2 Semester 1					
S3611TM	Principles of Microbiology I	6	16	S3522TM & S3512ED	C
S3631TM	Microbial Systematics	6	16	S3512ED	C
S3651TM	Microbial Physiology and Ecology	6	16	S3512ED	C
S3601TB	Biostatistics for Biochemistry & Microbiology	6	8	S3511SF	C
Year 2 Semester 2					
S3612M	Cell Molecular Biology and genetics	6	16	S3502TM	C
S3632TM	Immunology and Epidemiology	6	16	None	C
S3652TM	Principles of Microbiology II		16	S3522TM, S3512ED **and** (S3651TM)	C
S3602BC	CWIE Prep	6	8	None	C
Total credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
W3700IC	Workplace Attachment	7	24	None	**E**
W3700BC	Community Engagement	7	24	None	**E**
S3700BP	Project-based learning	7	24	None	**E**
Year 3 Semester 1					
S3711TM	Microbial Methods and Techniques I	7	18	S3651TM & S3652TM	C
S3731TM	Microbial Diseases	7	18	S3632TM	C
S3701TM	Bioprospecting	7	9	None	C
S3721TM	Phytopathology	7	9	None	C
Year 3 Semester 2					
S3712TM	Microbial Methods and Techniques II	7	18	S3651TM & S3652TM	C
S3732TM	Genetic Manipulation of Microorganisms	7	18	S3612TM	C
S3702BI	Innovation and Bioentrepreneurship	7	8	None	C
S3722TM	Research Methods	7	8	S3671TM	C
Total credits			**130/397**		

D.2.7.1. EXTENDED ENROLMENT BSC IN MICROBIOLOGY (33BSME)

This option caters for students that have the required NSSCAS Biology and NSSCAS Mathematics, but **Chemistry on NSSCO.** Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended two (2) modules:

1. **S3431TM Chemistry Support I &**
2. **S3432TM Chemistry Support II**.

D.2.7.2. NSSCAS BIOLOGY, NSSCAS CHEMISTRY & NSSCO MATHEMATICS

This option caters for students that has the required NSSCAS Biology and NSSCAS Chemistry, but **Mathematics on NSSCO.** Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended two (2) modules:

1. **S3411MS Mathematics Support I &**
2. **S3412ms Mathematics Support II**.

D.2.7.3. NSSCAS BIOLOGY BUT NSSCO CHEMISTRY & NSSCO MATHEMATICS

This option caters for students that has the required NSSCAS Biology, **but Chemistry and Mathematics on NSSCO**. Thus, in additions to normal enrolment modules, these students will enrol for following extra/extended four (4) modules:

1. **S3431TM Chemistry Support I,**
2. **S3432TM Chemistry Support II,**
3. **S3411MS Mathematics Support I &**
4. **S3412ms Mathematics Support II**.

D.2.7.4. MODULE EQUIVALENT

D.14.6. DEPARTMENT OF BIOCHEMISTRY, MICROBIOLOGY & BIOTECHNOLOGY DURING TRANSITION PHASE

Module Code	Old Module (Implemented from 2012)	LEVEL	CREDITS	Module Code	New / Revised Module	LEVEL	CREDITS
BLG3511	Introduction to Biology	5	16		None - To be offered again		
BLG3512	Diversity of Life	5	16	S3512ED	Diversity of Life	5	14
Year 2							
MBL3632	Introduction to Microbiology	6	16		**None - To be offered again**		
MBL3631	Cell Molecular Biology & Genetics	6	16				
MIC3631	Microbial Systematics	6	16	S3631TM	Microbial Systematics	6	16
CHM3602	Analytical Chemistry I	6	8		**None - To be offered again**		
CHM3612	Organic Chemistry I	6	16				
CHM3611	Inorganic Chemistry I	6	16				
CHB3632	Biomolecules and Catalysis	6	16				
BLG3611	Biometrics I	6	8	S3601TB	Biostatistics for Biochemistry & Microbiology	6	8
BLG3611	Animal Form & Function	6	16		**None - To be offered again**		
BLG3612	Plant Form & Function	6	16				
BLG3622	Biometrics II	6	8				
CHB3632	Biomolecules& Catalysis	6	16				
Year 3							
BLG3702	Research Methodology	7	16	S3722TM	Research Methods	7	8
CHB3731	Bioenergetics & Metabolism	7	16		**None - To be offered again**		
CHB3731	Bioenergetics and Metabolism	7	16				
CHB3741	Biochemical Analysis	7	8				
CHB3742	Innovation and Entrepreneurship	7	8	S3702BI	Innovation & Bioentrepreneurs	7	8
CHB3722	Transmission of Genetic Information	7	16	S3732BB	Molecular & Structural Genetics	7	18
MIC3800	Internship	8		S3780BI S3780BP	Workplace Attachment **or** Project Based Learning **or** Community Engagement	7	24
MBG3711	Microbial Genetics	7	16		**None - To be offered again**		
CHM3711	Organic Chemistry II	7	16				
CHM3721	Analytical Chemistry II	7	8				
CHM3702	Instrumental Analysis I	7	8				
CHM3702	Instrumental Analysis I	7	8				
CHP3721	Drug discovery and Development	7	8				
CHP3741	Medicinal Chemistry 1	7	8				
CHP3701	Water Analysis	7	8				
CHP3711	Environmental Chemistry I	7	16				
BLG3701	Microbial Ecology	7	8				
MBL3771	Physiology	7	16				
MBG3711	Microbial Genetics	7	16				
MBL3701	Recombinant DNA Technology	7	8				
MBL3712	Biotechnology	7	16				
MBL3732	Genetics	7	16				

Modules will be offered only two times, and should a module be repeated twice, then students need to transfer into the new programme.

S3420BL **Laboratory Safety and Report Writing**

NQF Level: 4
NQF Credits: 2
Contact Hours: 1 contact lecture period per week for one semester
Course Assessment: The module will be evaluated using **100% continuous assessment** (role playing, reflective journals, forum discussions and report). A minimum pass mark for the module is 50%.

COURSE DESCRIPTION: **Preparation for Lab:** laboratory safety manual, proper labelling of containers, focus and awareness of lab surroundings, participation in safety exercises. **First Aid Issues and Emergency Procedures:** fire extinguisher, spill kit, first aid supplies, emergencies showers, emergency evacuation plan, emergencies and chemical spills, illnesses, and injuries. **Protective Personal Equipment (PPE) and Proper Lab Attire**: lab coat, gloves, eye protection, and appropriate attire. **Good Hygiene:** washing hands, keeping personal items separate from lab work, personal make up, wounds or open sores. **Laboratory safety and Hazards:** Safety Data Sheets, hazard signs and symbols, handling of chemicals and biospecimens, decontamination, waste disposal, glassware, sharp tools and objects, fire, bio-hazardous material. **Report Writing**: data recording and proper record keeping, use of correct unit for measured values, write a laboratory report, discuss experimental results.

S3511BB **Foundation of Biochemistry & Biology**

NQF Level: 5
NQF Credits: 14
Contact Hours: 4 contact lecture period per week for one semester
Course Assessment: Continuous assessment will make up **50%** of the module grade consisting of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination: 1 x 3h examination at the end of the semester that counts 50% towards the final mark.

COURSE DESCRIPTION: The following topics will be covered: **The scientific method and basic methods in Biology and Biochemistry:** Microscopy, scientific drawings, scientific method and writing of scientific reports; **Cellular foundation**: cells as functional units of living organisms, source of energy and biosynthetic precursors, eukaryotes versus prokaryotes, cell communication, membrane receptors, intracellular receptors, local and long distance signaling; **Chemical foundation**: electron configuration, biomolecules; configuration and conformation; interaction between biomolecules; **Physical foundation**: thermodynamics of living organisms; **Early development of organisms and Evolution foundation:** Homology and analogy, body symmetry, cephalization, body cavities, germ layers, protostome and deuterostome development, phylogeny, natural selection, early theories of evolution; **Genetics foundation:** Cell cycle, cell division, genes, chromosomes, genomes, formation of gametes, different life cycles. Mendelian genetics, extensions of mendelian genetics, chromosome theory of inheritance, mutations, linked genes, sex linkages, monohybrid and dihybrid crosses, Aneuploidy and non-disjunction, epistasis, environmental effects on gene expressions, genotypes and phenotypes, gene therapy. **Foundations of Microbiology:** the importance of microorganisms, impacts of microorganisms on humans, microscopy and microbial cell morphology, microbial cell membranes and cell walls, microbial growth requirements, culture media, laboratory culture of microorganisms, bacterial growth in media, measuring microbial growth.

S3502TM **Introduction to Genetics**

NQF Level: **5**
NQF Credits: **7**
Contact Hours: **2** hours lectures per week for **12 weeks** & one **3hours practical session** every two weeks for the semester
Course Assessment: CA will make up **50%** of consisting of a combination of Tests, Assignments, Tutorials, and Practical reports.
Examination: 1 x 2h examination at the end of the semester that counts **50%** towards the final mark.

COURSE DESCRIPTION: This course starts with the discovery of the gene and later explores the nature of multiple alleles, genes as mutable units, experimental elucidation of DNA as the genetic material, and the chemical structures of DNA, RNA, and proteins. The topology of nucleic acids, isolation of the gene, and sequencing of DNA will be discussed. Other important topics examined in this module are DNA replication; prokaryotic transcription and translation; control of prokaryotic gene expression including control of initiation (RNA polymerase-promoter interactions), operons, termination, anti-termination, and phage strategies for lytic cascades and lysogenic repression. Horizontal gene transfer mechanisms (Transformation, conjugation via plasmid-mediated transfer, and transduction) as vehicles of genetic variation in bacteria will be analyzed. The course ends with a concise consideration of microbial genomics and its applications in nature and disease.

S3522TM **Origins of Microbiology**

NQF Level: **5**
NQF Credits: **6**
Contact Hours: **2** hours lectures per week for 12 weeks for the semester
Course Assessment: CA will make up **50%** consisting of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination: 1 x 2h examination at the end of the semester that counts 50% towards the final mark.

COURSE DESCRIPTION: **Definition of Microbiology** – Archaea – actinomycetes, Eubacteria - bacteria, Eukarya - algae, fungi, and protozoa, Viruses. **The Scope and Relevance of Microbes** - L. Pasteur "The role of the infinitely small in nature is infinitely large", Fundamental to the ecosystem. **Early History of Microbiology** – Discovery of microorganisms - A. Leeuwenhoek (1676), C. Chamberland (1884), Loeffler (1898), M. Beijerinck (1898-1900), S. Prusiner (1982). **Spontaneous Generation Theory** – definition, Contributions of F. Redi (1688), R. Needham (1748), L. Spallanzani (1776), L. Pasteur (1861). **The Germ Theory of Disease** - Contributions of Lucretius (B.C.) and Fracastoro (1546), A. Bassi (1835), J. Lister (1867), R. Koch (1876/1884) - Koch's postulates. **Vaccination and Prevention of Disease** – Contributions of E, L. Pasteur (1885), von Behring and Kitasato (1890). **Discovering the Effect of Microbes on Organic and Inorganic Matter** – Contributions of L. Pasteur (1856) - lactic acid fermentation; contributions to wine industry, S. Winogradsky and M. Beijerinck (1887-1900) - soil microbes and their role in the biochemical cycles of sulfur, carbon, nitrogen. **Recent History of Microbiology** – the 20th century – **A.** Infectious diseases, **B.** Chemotherapy, **C.** Immunology **D.** Physiology and biochemistry - using microbes as a model, many physiological and biochemical processes, **E.** Genetics – bacteria as models in molecular genetics (Beadle and Tatum – 1941), Luria and Delbruck (1943) – mutations are spontaneous in nature, Avery, MacLeod, and McCarty (1944) – DNA as the genetic material, Jacob and Monod (1961) – the operon and gene regulation; **F.** Molecular biology - Restriction enzymes discovered (1970), Insulin synthesized using recombinant techniques (1979), Gene therapy trials (1990), The nucleotide sequence of the first free-living organism (Haemophilus influenzea) (1995). **Branches of Microbiology** - medical microbiology, public health and epidemiology, immunology, agricultural microbiology, microbial ecology, food microbiology, biotechnology.

S3620BC	Contemporary Issues & Science Diplomacy
NQF Level:	**5**
NQF Credits:	**8**
Contact Hours:	**2** contact lecture periods per week for one semester
Course Assessment:	The module will be evaluated using **100% continuous assessment** (reflective journals, forum discussions, group projects). A minimum pass mark for the module is 50%.
Prerequisite:	**None**

COURSE DESCRIPTION: Contemporary science: This innovative and flexible module lets you tailor your study by choosing from a list of topics across biotechnological sciences including science in society (e.g., vaccines and health), genetic modification, climate change, etc. **The potential of contemporary science to influence and impact wider society**. **History of Science Diplomacy**: diplomacy for science, science diplomacy and science in diplomacy; **Science diplomacy:** Introduction to responsible research practices in biotechnological sciences; potential value of science diplomacy for addressing global challenges, realization of SDGs (SDG3, 7, 13, and 15), and improving social uptake of biotechnological innovations **Learning and Teaching Strategies/Activities**

S3611BB	Structural Biochemistry
NQF Level:	**6**
NQF Credits:	**14**
Contact Hours:	**4** hours lectures per week for 12 weeks for the semester.
Course Assessment:	CA will make up **50% of the module grade** consisting of a combination of Tests, Assignments, and Practical reports.
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Water as a medium of life: weak interactions in aqueous system; ionization of water, weak acids, and weak bases; buffering against pH changes in biological systems; water as a reactant. **Amino acids, peptides, and proteins:** structural features, classification, and functions of amino acids; peptides and proteins; primary, secondary, tertiary, and quaternary structures of proteins; protein denaturation and folding; protein function. **Carbohydrates and glycobiology:** monosaccharides and disaccharides; polysaccharides; glycoconjugates; carbohydrates as information molecules. **Nucleic acids:** nucleotides functions and as basic units; nucleic acid structure; nucleic acid chemistry. **Lipids:** classes of lipids; lipids as signals, cofactors, and pigments. **Biological membranes and transport:** composition and architecture of membranes; membrane dynamics; transport across membranes.

S3611TM	Principles of Microbiology I
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** lecture periods per week and one 3-hour practical per week for one semester
Course Assessment:	CA will make up **50% of the module grade** consisting of i.e., assessed practical, tests and assignments/quizzes will make up the CA
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: The topics will include principles of microbiology, with emphasis to bacteria, archaea, and viruses. Nomenclature, importance and impacts, classification and diversity and evolution of viruses, archaea, and bacteria. **Microbial Cell Structure and Function:** (discovering cell structure, size and morphology: microscopy, the cytoplasmic membrane and transport, cell walls, cell surface structures and inclusions of bacteria and archaea, microbial locomotion) **Microbial Metabolism and Diversity:** laboratory culture of bacteria and archaea, bioenergetics, energy classes of bacteria, catalysis and enzymes, electron donors and acceptors, **Microbial Growth and Control:** bacterial cell division, microbial population growth and cycle, continuous culture, measuring microbial growth, effect of temperature, water, pH, oxygen, on microbial growth, control of microbial growth by heat, radiation, filtration and chemicals. **Metabolic Regulation:** (sensing and signal transduction, regulation of chemotaxis and quorum sensing, regulation of development in model bacteria*:* sporulation in *Bacillus* and differentiation in *Caulobacter.* The nature, structures, genome, life cycles and diversity of viruses (DNA viruses, uniquely replicating DNA viruses, RNA viruses, retroviruses, subviral agents; viroids and prions). Bacteriophage: (life cycles, genome, replication, temperate and lysogeny bacteriophages), viral ecology: (an overview of archaea viruses, animal viruses, plant virus).

S3631BB	Biochemistry Signaling
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** hours lectures per week for 12 weeks for the semester.
Course Assessment:	Continuous assessment will make up **50% of the module grade** consisting of a combination of Tests, Assignments and Presentations.
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark.

COURSE DESCRIPTION: This course is designed to study the chemically mediated interactions between species ranging from plants, animals, and microorganisms. It looks at the behavior and responses of species to the environment and other species that involves biochemical signals. **Content: General features of signal transduction**. **Receptors:** G protein-coupled receptors and second messengers; receptor tyrosine kinases; receptor guanylyl cyclase's, cGMP, and protein kinase G, gated ion channels; bidirectional cell adhesion receptors (integrins). **Regulation of transcription by nuclear hormone receptors. Signaling in microorganisms and plants. Regulation of the cell cycle by protein kinases. Oncogenes, tumor suppressor genes, and programmed cell death. Plant communication and defence**: Plant responses to attacks and activation of defence pathways with focus on jasmonic acid and salicylic acid pathways. Role of volatile organic compounds in plant defence and inter and intra species communications. **Animal and insect communications:** Role of pheromones in communication including attraction of mates, warning, and other behavioural responses. Role pheromones in insects and in primates. Pheromones and human reproductive behaviours. **Microbial interactions:** cell signaling and quorum sensing, bioluminescence, toxicity, swarming behavior.

S3601TB	Biostatistics for Biochemistry & Microbiology
NQF Level:	**6**
NQF Credits:	**8**
Contact Hours:	**2 lecture periods** and one **3h practical** every other week for one semester
Course Assessment:	CA will make up **50%** of the module grade consisting of a combination of Tests, worksheet Assignments/Quizzes and Practical reports.
Examination:	1 x 2h examination at the end of the semester that counts 50% towards the final mark.

COURSE DESCRIPTION: **Introduction** (universality of biological variation, the need for statistics). **Control of random variation** (randomization, replication, use of a control). **Probability and non-probability sampling approaches** (types, advantages and when to use the approaches). **The normal distribution. Hypothesis testing** (testing hypothesis about the population mean, null and alternative hypotheses, calculating z-scores, significance testing, Type I and Type II errors, testing for normality of data, confidence intervals). **Experimental designs** (Completely Randomized Design, Randomized Block Design, Factorial experiments). **Non-parametric tests** (Mann-Whitney U Test, The Wilcoxon Signed Rank Test, The Kruskal-Wallis Test, Spearman Rank Correlation, Chi-square Tests). **Parametric tests** (Student's t-test, One-way ANOVA, Two-Way ANOVA, Pearson Product Moment Correlation, Simple Linear Regression Analysis). **Computers and statistical analysis of data** (use of various statistical packages such as Statistical Package for the Social Sciences (SPSS) and/or STATISTICA and/or R to analyze biological data).

S3631TM	Microbial Systematics
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	Continuous assessment will make up 50% of the Module grade (i.e., assessed practicals, tests, and assignments/quizzes)
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark

COURSE DESCRIPTION: Origin of cellular life, Microbial diversification, endosymbiotic origin of Eukaryotes. Microbial evolution: the evolutionary process, evolutionary analysis (theoretical aspects and analytical methods), microbial phylogeny, application of SSU rRNA phylogenetic methods. Microbial systematics, with emphasis on domains bacteria and archaebacteria: Phenotypic analysis, genotypic analysis, phylogenetic analysis, the species concept in microbiology, classification, and nomenclature. The proteobacteria: Phylogenetic overview of bacteria, purple phototrophic bacteria, the nitrifying bacteria, sulphur and iron-oxidizing bacteria, hydrogen-oxidizing bacteria, methanotrophs and methylotrophs. Aerobic and facultatively aerobic chemoorganotrophic proteobacteria: Pseudomonas and Pseudomonads, acetic acid bacteria, free-living aerobic and nitrogen-fixing bacteria, Neisseria, Chromobacterium and relatives, enteric bacteria, Vibrio, Aliivibrio and Photobacterium, Rickettsia. Morphologically unusual proteobacteria: Spirilla, Sheathed proteobacteria (Sphaerotilus and Leptothrix), Budding and prosthecate/stalked bacteria. Delta and epsilon-proteobacteria: Gliding myxobacteria, sulphate and sulphur-reducing proteobacteria, the epsilonproteobacteria. The practicals will include identification of bacteria based on morphological, physio-biochemical properties that enables classifications of bacterial phyla.

S3651TM	Microbial Ecology and Physiology
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3-hour practical per week for one semester
Course Assessment:	Continuous assessment will make up 50% of the Module grade (i.e., assessed practicals, tests, and assignments/quizzes)
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: **Main themes include** Principles of microbial ecology/Ecological concepts, microbial ecosystems and biogeochemical cycling, Microbial habitats, Fresh water, soil, and plant microbial ecosystems, Marine microbial ecosystems. Nutrients cycles: Carbon cycle, Nitrogen cycle, Phosphorus cycle, Sulfur cycle, Iron cycle. Microbial bioremediation, Animal/ microbial symbioses, Plant microbial symbioses. Extremophiles: Definition of an extreme environment; thermophiles (hydrothermal vents, cold seeps, and deserts); acidophiles and alkaliphiles (micro flora in the gut; peats and bogs), Microbiological and molecular techniques in Microbial Ecology: Quantitative ecology (numbers, biomass, metabolic activity); method for species identification; Metagenomic analysis of communities. Development of microbial communities, Interaction between microorganisms and plants, Microbial interaction with animals, Abiotic limitation to microbial growth and environmental determinants

S3652TM	Principles of Microbiology II
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	CA will make up 50% of the Module grade (i.e., assessed practicals, tests, and assignments/quizzes)
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: This module will focus on diversity of eukaryotic microorganisms (fungi and protists). **Topics on fungi include classification and phylogeny** (Chytridiomycota, Zygomycetes and Glomeromycetes, Ascomycetes, Mushrooms and Other Basidiomycetes), importance, physiology, metabolism structure, and symbioses, reproduction).

Microalgae and Protists: (Diplomonads and Parabasalids, Euglenozoans, Alveolates, Stramenopiles, Cercozoans and Radiolarians, Amoebozoa) will be studied based on reproduction, host specificity, structure, physiology, and behavior. There will be a substantial basic introduction to endoparasites, ectoparasites, obligate parasites, facultative parasites as well as host-parasite interaction aspects such as symbiosis, commensalisms, and mutualism. The module will also cover **integrated pest management**. The practical content will include identification and isolation of endo-parasites using Glucose Flotation Method/Sedimentation. **Microscopic preparation** and examination of blood parasites. Identification of ectoparasites based on morphological characteristics.

S3612BB **Bioenergetics & Enzyme Catalysis**

NQF Level:	**6**
NQF Credits:	**14**
Contact Hours:	**4** hours lectures per week for 12 weeks for the semester
Course Assessment:	Continuous assessment will make up 50% of the module grade consisting of a combination of Tests, Assignments, Group discussions, and Practical reports.
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: The following topics are covered: **Bioenergetics and thermodynamics**. **Biochemical reactions**. **Phosphoryl group transfers and ATP**: ATP synthesis; regulation of oxidative phosphorylation; ATP synthesis by phosphorylation. **Biological oxidation-reduction reactions:** the flow of electrons (electron-transfer reactions in mitochondria); oxidation-reductions as half-reactions; biological oxidations; reduction potentials; cellular oxidation of glucose; coenzymes and proteins as universal electron carriers. **Properties of enzymes; Classification of enzymes; Enzyme kinetics:** Michaelis-Menten kinetics, Lineweaver-Burk plots, Enzyme inhibition**; Catalysis:** Catalytic mechanism, the role of cofactors in enzyme catalysis, effect of temperature and pH on enzyme-catalyzed reactions, detailed mechanisms of enzyme catalysis**; Enzyme regulation:** genetic control, covalent modification, allosteric regulation, compartmentation.

S3632BB **Biochemical Techniques**

NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**2 hours lectures** per week for 12 weeks and one **3 hours practical session** every week for the semester.
Course Assessment:	CA will make up **100%** of the module grade consisting of a combination of Tests, Assignments, and Practical reports. To pass this course the student must obtain a minimum final mark of **50% CA** based.
Prerequisite:	**None**

COURSE DESCRIPTION: Review of Amino Acids, Peptides and Proteins; **Separation Methods:** Principles of Separation techniques, Methods based on: polarity, ionic nature, size and shape; Chromatography and Spectroscopy; **Immunological Methods:** Antigen-Antibody reactions, precipitation reaction, immunoassay: **Enzymes:** enzyme assay methods; **Carbohydrates:** chemical and enzymatic methods; identification of carbohydrate mixtures; **Amino Acids:** n-terminal analysis, reactions and separation of amino acids, amino acid analyser; **Proteins:** methods of extraction, separation and quantification; **Lipids:** Sample preparation and handling, separation and quantitation; **Nucleic Acids:** Isolation and purification, analysis, vectors and sequencing, matrix-assisted laser desorption-ionization mass spectroscopy MALDI-MS, (MALDI-TOF).

S3612TM **Cell Molecular Biology & Genetics**

NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4 lecture** periods per week and one **3-hour practical** per week for one semester.
Course Assessment:	CA will make up **50%** of the module grade consisting of a combination of Tests, Case studies, and Practical reports.
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: The module will mainly focus on the chemical basis of life, including: water, essential and trace elements, bonds; macromolecules: proteins, carbohydrates, and nucleic acids; lipids and fats; cell structure and function; properties and function of enzymes, and models for binding; cell membrane; cell communication; cell cycle and DNA replication; cellular respiration: glycolysis, transition reaction, Krebs cycle, electron transport chain; and gene expression: transcription and translation. Students will examine the basic properties of cells and cell organelles, in addition to the properties of differentiated cell systems and tissues.

S3632TM **Immunology and Epidemiology**

NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	CA of **50%** of the Module grade (i.e., assessed practicals, tests, and assignments/quizzes)
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: The first part on immunology will focus on cells and molecules which constitute the immune system. Antibodies: Structure and function. Organs of the immune system, antibody genes and generation of diversity, antigen processing and presentation. The functional organization of the immune system. How the immune system recognizes and then destroys pathogens? The concept of immunological memory and how vaccination works. How the immune system can itself sometimes cause diseases – immunopathology. How antibodies and other components of the immune system can be utilized for diagnosis, therapy, and research. Complement system (classical pathway, alternative pathway, lectin pathway), major histocompatibility complex. Cancer and the immune system. The epidemiology part of the Module provides a foundation of topics in epidemiology through examining infectious disease, chronic diseases, and general health. Students will learn from real world health problems and demonstrate how epidemiology is used to better understand, prevent, and treat these "health states" among the population.

S3602BC **CWIE Prep**

NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	Up to **2 lectures per week** for one semester.
Course Assessment:	CA of **100% of the final mark** consisting of a combination of tests and quizzes, assignments, and a CWIE portfolio. A final mark of **50% is required to pass** this course.
Prerequisite:	**None**

COURSE DESCRIPTION: Professional behavior, work-readiness, diligence & work ethics. Active searching for a CWIE situation with the aid of UNAM and the School.

W3700BC	Community Engagement
NQF Level:	**7**
NQF Credits:	**14**
Contact Hours:	**6 weeks**
Course Assessment:	The endorsed CWIE portfolio shall be evaluated according to a rubric and the CWIE shall be noted as completed or not.

COURSE DESCRIPTION: Engage in Cooperative Work Integrated Education through a community project/engagement or a community outreach activity.

W3700IC	Workplace Attachment
NQF Level:	**7**
NQF Credits:	**14**
Contact Hours:	**5 weeks (8-10 weeks in industry)**
Course Assessment:	**Continuous assessment (100%)**. Students will be graded based on comprehensive reports which they must submit upon the completion of the Workplace Attachment. In addition, a report based on a standard format designed by the department will be submitted by the supervisors of the student during the Workplace Attachment. To pass this module, the student must obtain a minimum continuous assessment mark of **50%.**

COURSE DESCRIPTION: Laboratories, research institutions and industries in order to gain hands-on experience. Students can choose any time during the year to do their Workplace Attachment if it does not interfere with their classes or practicals. During the Workplace Attachment period students will be attached to different relevant scientific institutions in Namibia, in the SADC region as well as identified institutions in other African countries. Students will have to participate in projects and programs which are carried out at the respective institutions. Attached students are also obliged to attend scheduled events such as seminars, tours, and lectures at the institutions. Although the department will identify some relevant institutions, the students may suggest institutions of their choice if they agree with the department. The type of skills to be learned through the Workplace Attachment will be decided by the students themselves based on their interests.

S3700BP	Project-Based Learning
NQF Level:	**7**
NQF Credits:	**14**
Contact Hours:	**6 weeks**
Course Assessment:	Continuous assessment will make up **100% of the module grade** consisting of a combination of Project report, Oral presentation, or Poster presentation. Students will be assigned supervisor(s) for the Project for guidance and monitoring of progress and performance throughout the Project cycle. Students will be assessed through submission of a written Project Report, an Oral Presentation to a selected audience, Poster presentation and/or also a written Brief where appropriate (depending on the nature of the Project, e.g., Extension Brief, Policy Brief, etc.).

COURSE DESCRIPTION: Students will spend the entirety of Semester 0 of that year doing a project intended to solve a real-world problem in biochemistry. They may do this project at the University or at an identified institution which offers appropriate laboratory facilities. Students are expected to learn various project-based skills and knowledge such as teamwork and collaboration, problem solving, creativity, in-depth understanding (of scientific approaches, concepts, research skills, etc.), self-confidence, critical thinking (students will learn to look at problems with an open and critical thinking lens), project management (students will learn how to manage projects and assignments more efficiently, including time management and meeting set deadlines).

S3702BI	Innovation & Bioentrepreneurship
NQF Level:	**7**
NQF Credits:	**8**
Contact Hours:	**2 hours lectures** per week for 5 weeks
Course Assessment:	Continuous assessment will make up **100% of the module grade** consisting of a combination of Tests, Innovative Project and Report, and Oral Presentations. To pass this course the student must obtain a minimum final mark of **50%.**

COURSE DESCRIPTION: **Introduction to innovation and entrepreneurship**; **Entrepreneurship in biotechnology** (Context specific); **Organizational Structures**; **Outsourcing Registrations/Permissions**; **Markets and Factors:** Products and Services, Funding innovation in biotechnology companies; **Resources Research and Development:** product life cycle, R&D cycle and organizational life cycle; Biology, Medicine, and Genetics, Pre-clinical and Clinical Development, Intellectual assets in biotechnology firms; managing IP in biotechnology firms; biotechnology value chain; Biotechnology industry and firm structures; Product development and innovation diffusion. **Intellectual Property Rights**.

S3711BB	Biochemical Pathways
NQF Level:	**7**
NQF Credits:	**17**
Contact Hours:	**4 hours lectures per week** for **14 weeks** and one **3hours practical every other second week** for the semester.
Course Assessment:	Continuous assessment will make up **50% of the module grade** consisting of a combination of Tests, Assignments and Mini-Project.
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark

COURSE DESCRIPTION: **Introduction to Metabolism:** Purpose of metabolism; Source of carbon and nitrogen for metabolism; Energy relationship between catabolism and anabolism; Principles of metabolism and metabolic pathways; General regulation of metabolic pathways. **Carbohydrate metabolism:** Introduction to carbohydrate metabolism; Glycolysis; Gluconeogenesis, Glycogen metabolism; Hexose monophosphate pathway; Biosynthesis of oligosaccharides. **Aerobic metabolism:** Citric acid cycle; Glyoxylate cycle; Electron transport and oxidative phosphorylation. **Lipid metabolism:** Digestion, mobilization, and transport of fats; fatty acids oxidation and ketone bodies; Biosynthesis of fatty acids; Eicosanoids synthesis; Biosynthesis of triacylglycerols; Biosynthesis of membrane phospholipids; Biosynthesis and transport of cholesterol. **Amino acids metabolism:** digestion of dietary proteins; transport of amino acids into cells; Amino acids catabolism; urea cycle; biosynthesis of non-essential amino acids.

S3731BP	Plant Genomics
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4 hours lectures per week** for 14 weeks and one **3hours practical** every week for the semester.
Course Assessment:	Continuous assessment will make up **50%** of the module grade consisting of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Impact of Biotechnology on Plants: Cultivation of genetically modified crops and impacts on environment. **Mendelian Genetics and Plant reproduction**: Mendelian genetics and biotechnology. **Plant Breeding**: central concepts in plant breeding including methods of plant breeding. **Molecular Genetics and Gene Expression**: Gene expression in context of plants and regulation. **Recombinant DNA, Vector Design, and Construction in plants**. **Genes and Traits of interests**: Traits for plant resistance (herbicide resistance, insect resistance and pathogen resistance) and traits for improved products and food quality. **Transgenic Plant Production**: methods and basic components for successful gene transfer to plant cells. **Intellectual Property in Agricultural Biotechnology**: intellectual property and patents in agricultural biotechnology.

S3751BB	Biochemical Basis of Diseases
NQF Level:	**7**
NQF Credits:	**17**
Contact Hours:	2 hours lectures per week for 14 weeks and one **3hours practical** every other week for the semester.
Course Assessment:	CA will make up **50%** of the module grade consisting of a combination of Tests, Case studies with presentations, Quizzes and Practical reports.
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Biochemistry of Hormones: Blood & Transport proteins, Homeostasis & Thrombosis. **Oxidative metabolism**. **Anaerobic Metabolism of Glucose in the Red Cell**. **Carbohydrate Storage**: Synthesis in Liver & Muscles; Obesity. **Biosynthesis of Cholesterol in Liver**. **Glucose Homeostasis & Fuel Metabolism**. **Free radicals, Oxidative stress & Antioxidants**. **Water, Electrolytes, and Acid Base Balance**. **Calcium & Bone Osteoporosis**. **Neurochemistry**: Neurons &Neurotransmitters. **Immunity** (innate & adaptive, HIV), Current advances in HIV testing, diagnosis and treatment, Oncology (Cell Cycle, Programmed Cell Death & Cancer). **Gene therapy, Assay systems, gene knockout; Genotyping**: personalized medicine.
Introduction to plant pathology: concepts of disease. **Plant disease**: physiological or abiotic plant diseases, agents of plant disease, disease assessments and impacts. **Diagnosis of plant pathogens:** diagnosis of plant pathogens (fungi, eubacteria, atypical procaryotes, nematodes, viruses, and parasitic plants) and the diseases they cause. **Epidemics**: epidemiology and measurement of plant disease severity. **Host-pathogen interactions**: how pathogens attack plants; how plants defend themselves against pathogens; physiology of plant disease (disease development and cycle). **Disease Management**: biological and chemical control plant disease.

S3712BB	Biotechnology & Biosafety
NQF Level:	**7**
NQF Credits:	**17**
Contact Hours:	**4 hours lectures per week for 14 weeks** and one **3hours practical** every other week for the semester
Course Assessment:	CA will make up **50%** of the module grade consisting of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to "omics"; **Genomics**: techniques-genomic libraries and analysis, southern blots, applications. **Proteomics:** definitions, concepts of protein expression and analysis, Techniques-SDS PAGE gels, Western blots, applications. **Transcriptomics:** definitions, Techniques- cDNA libraries and analysis, Northern blots, applications. **Metabolomics:** Techniques-metabolic pathways and analysis. **Cytomics**: Biochemical processes at the cellular; **Agricultural Biotechnology:** Technology Studies: Pesticide producing crops; Herbicide-tolerant transgenic crops; Insect-resistance transgenic crops. **Micro- and Nanotechnologies for Medicine**: Scope, principles, and techniques of nanotechnology; preparation of nano particles and their properties, application of nanotechnology in biotechnology: Oligonucleotide microarray, 'lab-on-a-chip' nanocomposites; Cellular Cloning; Tissue Engineering (Organ Cultivation); **Food Biotechnology:** Enzyme application in food and feed; probiotics - prebiotics and nutraceuticals.

S3732BB	Molecular & Structural Genetics
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	4 hours lectures per week for 14 weeks and one 3hours practical every week for the semester
Course Assessment:	Continuous assessment will make up **50%** of the module grade consisting of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: This module is designed to teach the students the expression and transmission of genetic information. The following topics are covered: **Nucleotide metabolism**: synthesis of purine ribonucleotides; synthesis of pyrimidine ribonucleotides; formation of deoxyribonucleotides; nucleotide degradation; biosynthesis of nucleotide Coenzyme; **DNA Metabolism**: DNA Replication, Recombination and Repair; **RNA Metabolism**: Transcription and RNA Processing; **Protein Metabolism**: Translation and Posttranslational Modification; Genes and Chromosomes, Regulation of Gene Expression; Recombinant DNA technology; DNA Fingerprinting. **Cloning:** Use of plasmids as cloning vectors**;** Recombinant DNA plasmids; Bacteriophage λ as a cloning vector; Cosmids; Yeast artificial chromosomes (YACs); Genomic DNA Libraries; **Polymerase Chain Reaction (PCR):** procedures and applications of PCR**; Genetically Modified Organisms:** Production of GMOs; Transgenic Plants and GM Crops, GM Microbes; GM Animals; Genetic Engineering vs Traditional engineering; Applications of GMOs; Pros and Cons of GMOs.

S3702BB	Toxicology
NQF Level:	**7**
NQF Credits:	**9**
Contact Hours:	2 hours lectures per week for 14 weeks and one 3hours practical every second week for the semester
Course Assessment:	CA will make up **50%** of the module grade, a combination of Tests, Assignments, Case studies with Presentations, and Mini project.
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: This module is designed to study the interactions between environmental contaminants and plants. It looks at the effects that chemical xenobiotics can cause on biological processes of plants. **Content: Chemical Xenobiotics**: Classification and behaviours. **Bioaccumulation and biomagnification of xenobiotics**: the effects of chemicals and toxins on ecological systems and the environment; the fate and impact of synthetic and natural molecules in the environment. **Behaviour of xenobiotics into living organisms**: absorption, distribution, biotransformation, toxic effects, and elimination. Important pollutants will be used as case studies to illustrate the principles. **Principles of toxicology**: chemical and biochemical mechanisms; pesticide toxicity. **Risk assessment:** analysis of specific health and environmental impact of hazardous waste.

S3711TM	Microbial Methods and Techniques I
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	4 lecture periods per week and one 3-hour practical per week for one semester
Course Assessment:	Continuous assessment will make up **100%** of the module grade consisting of a combination of Tests, Assignments, Practical reports, and Presentations.
Prerequisite:	**None**

COURSE DESCRIPTION: The Module covers topics such as laboratory safety and aseptic techniques; sampling and culture (field techniques; sample collection: air, water, soil; culture: solid and liquid medium; fermentation and secondary metabolite isolation and characterization); culture characterization (morphological: shape, colour, growth pattern; biochemical methods); water quality testing (chemical + microbiological water quality; water purification); microscopy (Gram staining; fluorescent in situ hybridization (FISH); scanning electron microscopy (SEM); transmission electron microscopy (TEM); phase contrast; light microscope; cell count + blood count (hemocytometer).

S3731TM	Microbial Diseases
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	CA will make up **50%**: tests; graded practical reports, assignment, Weekly quizzes
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: **Introduction - Mechanisms of Bacterial Pathogenesis**: entry into the human body; adhesion, colonization & invasion; pathogenic actions of bacteria (tissue destruction, toxins, immunopathogenesis); mechanisms for escaping host defenses, **The Gram-Positive Cocci** - *Staphylococcus aureus* (cutaneous infections, endocarditis, toxic shock syndrome, etc.), *Staphylococcus epidermidis* (endocarditis, catheter & shunt infections, etc.), *Enterococcus* (urinary infections, septicemia, etc.), *Streptococcus pyogenes* (pharyngitis, impetigo, erysipelas, rheumatic fever, etc.), *Streptococcus pneumoniae* (pneumococcal pneumonia, otitis media, sinusitis, meningitis, etc.), *Streptococcus agalactiae* (neonatal diseases, other infections). **The Gram-Positive Bacilli**: *Bacillus anthracis* (anthrax), *Listeria monocytogenes* (neonatal diseases, etc.), *Corynebacterium diphtheriae* (diphtheria), *Clostridium perfringens* (gas gangrene, food poisoning, etc.), *Clostridium tetani* (tetanus), *Clostridium botulinum* (botulism), *Clostridium difficile* (gastroenteritis), *Erysipelothrix rhizopathies* (erysipeloid). **The Gram-Negative Cocci & Anaerobic Bacilli**: *Neisseria gonorrhoeae* (gonorrhea, PID, etc.), *Neisseria meningitidis* (meningitis, etc.), *Escherichia coli* (gastroenteritis), *Salmonella* (gastroenteritis, enteric fevers, etc.), *Shigella* (shigellosis), *Yersinia* (bubonic plague, enterocolitis), *Vibrio* (cholera, gastroenteritis, etc.), *Campylobacter* (gastroenteritis), *Helicobacter* (gastritis, gastric & duodenal ulcers). **The Gram-Negative Aerobic Bacilli:** *Pseudomonas aeruginosa* (pulmonary, skin & urinary infections, etc.), *Haemophilus* (meningitis, otitis, chancroid, arthritis, etc.), *Legionella pneumophila* (Legionnaires' Disease, Pontiac fever) Anaerobes, Actinomyces, Mycobacteria & Mycoplasmas: Actinomyces (endogenous infections), Propionibacterium (acne), anaerobic Gram-negative bacilli (chronic sinusitis & otitis, brain abscesses, skin & tissue infections, etc.), Nocardia (pulmonary & cutaneous infections), Mycobacterium (tuberculosis, leprosy, etc.), Mycoplasma (atypical pneumonia, etc.). **Zoonosis: one health concept.**

S3721TM	Phytopathology
NQF Level:	**7**
NQF Credits:	**9**
Contact Hours:	2 lecture periods for 12 weeks; one 3-hour practical session every two weeks per semester.
Course Assessment:	Continuous assessment will make up **50%**: tests; graded practical reports, assignment, Weekly quizzes
Examination:	1 x 2h examination at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to Phytopathology; principles of plant pathology; plant-microbe interactions; concepts of disease; stages in the development of disease (disease cycle); economic impact of plant diseases; basic notions of epidemiology of plant diseases; how pathogens attack plants; vectors of plant pathogens; epidemiology, forecasting and mathematical modelling of plant diseases; ecology of selected plant pathogens; symptoms, detection and diagnosis of phytopathogens including molecular and serological techniques for analysing viruses and viroids that attack plants; plants defence mechanisms; general features of plant pathogens; some diseases of field crops: fungi as plant pathogens; phytopathogenic bacteria and pathogenicity factors; viruses as plant pathogens; nematodes as plant pathogens; principles of integrated plant disease management; control of plant diseases and plant protection; resistance of plants to pathogens: pathogen perception; signals and molecules involved in plant resistance; defence reactions; systemic acquired resistance and induced systemic resistance; basic principles of breeding plants for resistance to pathogens; transgenic plants; seed health technology; post-harvest diseases; plant quarantine; climate change and plant microbial diseases.

S3701TM	Bioprospecting
NQF Level:	**7**
NQF Credits:	**9**
Contact Hours:	2 lecture periods per week and a 3h practical every other week for one semester
Course Assessment:	Continuous assessment will make up **50%**: tests; graded practical reports, assignment, Weekly quizzes
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: **Bioprospecting**: Definition, Introduction, Current practices in Bioprospecting for conservation of Biodiversity and Genetic resources. **Bioprospecting Act**: Introduction, Phases of Bioprospecting, Exemption to Act. Fields of Bioprospecting. **Microbial Bioprospecting**: Bioprospecting for Microbial Endophytes metabolites and their bioactivity. Endophytic microbial products as Antibiotics, Microbial culture collection. **Marine ecosystems Bioprospecting**: Sources of marine planktons and their Bioprospecting, Isolation, and cultivation of Marine bioresources, Isolation of Marine Yeast and its industrial applications, Bioactive chemicals from Seaweeds and their applications. Bioprospecting activities in the deep seabed

S3712TM	Microbial Methods and Techniques II
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	Continuous assessment will make up **50%**: tests; graded practical reports, assignment, Weekly quizzes
Examination:	1 x 3h examination at the end of the semester that counts 50% towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: The module covers topics in molecular methods (DNA isolation, PCR: qPCR, conventional PCR, gel electrophoresis; sequencing, metagenomics); restriction enzyme digests (Random Amplification of Polymorphic DNA (RAPD); restriction fragment length polymorphism (RFLP); denaturing gradient gel electrophoresis (DGGE); transformation: electroporation, heat shock; cloning; plasmid purification); proteins (sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE); southern blot; western blot; mass spectrometry); spectrometry (flow cytometry, photometry, gas chromatography mass spectrometry (GCMS); liquid chromatography mass spectrometry (LCMS) transfection (shot gun; microinjection); cell lines (growth of cell lines; passaging cells; ELISA; fluorochromes (DNA staining).

S3702BI	Innovation and Bioentrepreneurship
NQF Level:	**7**
NQF Credits:	**8**
Contact Hours:	2 lecture periods per week for one semester
Course Assessment:	Continuous assessment will make up **100%** of the module grade consisting of a combination of Tests, Innovative Project and Report, and Oral Presentations.
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction and definitions; attitudes, values, characteristics, behaviours, and processes associated with a bio entrepreneurial mindset; creativity, innovation and invention in the biosciences; knowledge and technology transfer; researching, protecting (intellectual property regimes), communicating and funding ideas; perception of opportunity, management of risks, organization of resources and value-addition; business plans for implementing bankable and ethical bio entrepreneurial ventures/ role of the business plans in start-up of a bioscience business; funding your ideas; financial, marketing, legal, human resource, operations, and general management skills that are necessary to successfully launch and operate a successful new bio entrepreneurial venture; regulatory and ethical regimes in bioscience businesses; case studies of bio entrepreneurial start-ups and operations; bioprospecting and access and benefit sharing; and a critical evaluation of important local and international case studies.

S3732TM	Genetic Manipulations of Microorganisms
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	CA will make up (**50%** of the final mark) consisting of assessed practicals, tests, and assignments/quizzes
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: **Introduction to DNA cloning and genetic engineering:** Essentials of molecular/gene/DNA cloning genetic engineering. **Tools and techniques used in DNA cloning:** Tool enzymes (Nucleases, DNA ligase, Polymerases, Reverse transcriptase, Polynucleotide kinase, Terminal transferase, Alkaline phosphatase) nucleic acid hybridization, polymerase chain reaction (PCR), cloning vectors (plasmid, bacteriophage, Cosmids, BAC, YAC, shuttle vectors and expression vectors), hosts for cloning, expressing mammalian genes in bacteria. **Identification of transformants and recombinants:** Methods of introducing rDNA into hosts, Identification of transformants and recombinants using variety of vectors and hosts, Gene fusions and reporter genes**. DNA sequencing:** Conventional first-generation sequencing technology (Sanger Sequencing) to high throughput second (Pyrosequencing & Illumina) and third sequencing technologies (Nanopore, SMRT sequencing). **Molecular methods for mutagenesis:** Random mutagenesis, Site-directed mutagenesis, Combinatorial mutagenesis, Insertional mutagenesis, Homologous recombination, CRISPR, Gene synthesis**. Construction of the genomic and cDNA library:** Genomic library construction, determining titter of library, Screening library, how to select a vector, Applications (Hierarchical sequencing, Genome-wide association studies), cDNA Library Construction, mRNA extraction, cDNA Library uses, cDNA Library vs. Genomic DNA Library, Cloning of cDNA. **Examples of products from genetically engineered microorganisms:** Somatotropin and other mammalian proteins, transgenic organisms in agriculture and aquaculture, genetically engineered vaccines, engineering metabolic pathways, synthetic biology.

S3722TM	Research Methods
NQF Level:	**7**
NQF Credits:	**8**
Contact Hours:	2 lecture periods per week for one semester
Course Assessment:	CA will make up **100%** of the module grade consisting of a combination of Tests, Written Scientific Report, and Oral Presentations.
Examination:	1 x 3h examination at the end of the semester that counts **50%** towards the final mark
Prerequisite:	**None**

COURSE DESCRIPTION: The following topics will be covered: Ethics of research. The scientific method: logic and the scientific, natural observations, asking questions and formulation of hypothesis, predictions. Types of hypotheses; null, alternative, research. Biological variation, populations, and sampling. Statistical significance. Experimental (research study /project) design. Data collection & keeping / documenting research data and other records. Scientific writing, Plagiarism, Finding and using literature references, Citation of references. Writing a literature review. Writing a research proposal. Report writing. Presenting results in an oral presentation. Presenting results as posters.

Please contact Prof Ezekiel Kwembeya (ekwembeya@unam.na) for issues about the following descriptors:

S3512ED	Diversity of Life
NQF Level:	**5**
NQF Credits:	**14**
Contact Hours:	4 lecture periods and one 3-hour practical per week for one semester
Course Assessment:	Continuous assessment will make up **50%** of the Module grade (i.e., at least 8 assessed practicals **(40%], 3 tests [40%]** and **2 assignments**, assessed as written **[10%]** and seminar presentation **[10%].**
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Phylogeny and the tree of life: Prokaryotes and Protists, Domains Bacteria: Archaea and Eukarya, The Evolution of Plant and Fungal Diversity. **Non-vascular and Vascular Plants:** Non-vascular plant phyla: Haptophyte, Anthocerophyta and Bryophyta. Vascular seedless plant phyla: Lyctophyta and Pterophyta. Vascular seed plant (gymnosperms and angiosperms). Gymnosperms phyla: Gingkophyta, Cycadophyta, Gnetophyta and Confirophyta. Angiosperm's phylum: Anthophyta. **The Evolution of Invertebrate Diversity:** Basal Animals, phylum: Cnidaria, Deuterostomate phyla: Echinodermata (Subphyla: Urochordata, Cephalochordata), protostomate phyla: Lophophorates, Rotifera, Mollusca, Anellida, Nematoda, and Arthropoda. **The Evolution of Vertebrate Diversity:** Vertebrate Evolution and Diversity key shared derived traits of the chordates and the chordate Subgroups. **Animal Diversity**: Characteristics of following vertebrate groups: hagfishes, lampreys, chondrichthyans, ray-finned fishes, lobe-finned fishes, amphibians, reptiles, birds, and mammals. **Primate Diversity. Hominin Evolution.**

D.3. BSC IN BIOCHEMISTRY (HONOURS) 11BSAB & 11BMBA BSC IN MICROBIOLOGY (HONOURS) PROGRAMMES

D.3.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of this qualification is to provide an opportunity for holders of level 7 NQA degrees in Biochemistry/Microbiology or pre-NQF BSc degree in Biochemistry/Microbiology to upgrade to NQA level 8 honours degree. This programme will provide students with knowledge, skills, and competence in the science of Biochemistry/Microbiology at BSc NQF Level 8 in order to develop Namibia's own human resources and capacity in Biochemistry/Microbiology.

For Biochemistry students, this program will facilitate students' progression towards fulfilling and exciting careers in academia, industry (food, beverage, and diagnostic), and/or government and also to develop their skills as future leaders in science and society. Microbiology graduates from this Programme will be well trained and will be able to fit into various employment sectors namely, biomedical, human health, biotechnological, scientific research, agricultural, genetics, and environment sectors.

The programme is in line with UNAM's mission "To provide quality higher education through teaching, research and advisory services to our customers with the view to produce productive and competitive human resources capable of driving public and private institutions towards a knowledge-based economy, economic growth and improved quality of life."

D.3.2. ADMISSION REQUIREMENTS

The applicant must be in a possession of either.

a) a BSc degree in Biochemistry/Microbiology at NQL level 7. **OR**
b) Pre-NQF BSc degree in Biochemistry/Microbiology or any equivalent qualification from a recognized institution.
c) Students who have completed a double major BSc degree may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

D.3.3. ASSESSMENT CRITERIA

A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the typical modules in this program and details are further specified under respective modules. The minimum CA mark that will allow entrance into the examination is 50% and the minimum final mark of 50% is required for a pass. Assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, research reports, oral examinations, and seminar presentations. Attendance of lectures and practical classes is compulsory (at least 80%).

D.3.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

To be re-admitted to the Faculty of Science for a second year of registration, a student must have passed a minimum of 64 credits by the end of the first year.

D.3.5. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year programme.

D.3.6. DURATION OF STUDY

The minimum duration of the study is one year, and the maximum is two years for full-time students and three (3) years for part-time students. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

D.3.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates who have cleared all prescribed modules as indicated in the curriculum framework.

D.3.8. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions, but the exemptions shall not exceed 50% of the programme in line with the General Information and Regulations Prospectus.

D.3.9. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred percent attendances of practical classes are required.

D.3.10. BACHELOR OF SCIENCE MICROBIOLOGY HONOURS: 11BMBA

TABLE FOR ALL MODUELS IN BSC IN MICROBILOGY - 11BMBL (PAGE)

CODE	Module name	NQF	Credits	Contact Time	*(Co-Prequisite)
Semester 1					
MIC3831	Environmental & Industrial Microbiology	8	16	4L 1P	MBL3701
MIC3811	Mycology	8	16	4L 1P	None
MBL3801	Bioinformatics	8	8	2L1P/T (once fortnight)	MBL3732
Semester 2					
MOL3822	Applied Genetics	8	8	2L1P/T (once fortnight)	MBG3711
MIC3852	Parasitology	8	16	4L 1P	None
MIC3872	Developmental Biology	8	16	4L 1P	MBL3732, or MBE 3771
MIC3862 **OR**	Medical Bacteriology **OR**	8	8	2L1P/T (once fortnight) **OR**	MBG3711 **OR**
MIC3842	Virology	8	8	2L1P/T (once fortnight)	MBG3711
MIC3800	Internship	8	8		BLG3702
BLG3880	Research Methodology &Project	8	38		BLG3702
Total Credits Full Year Modules Semester 1 & 2			**46**	**TOTAL CREDITS FOR THE PROGRAMME**	**134**

***All co- and pre-requisites as indicated in the module descriptors in this programme are superseded by the admission requirements indicated under point 16.**

D.3.11. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS: 11BSAB

TABLE FOR ALL MODUELS IN BSC IN BIOCHEMISTRY - 11BCAC (PAGE)

Students opting for the 1 Year BIOCHEMISTRY HONOURS programme must take all of the following courses:

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHB3831	Bioinformatics for Biochemistry	8	16	CHB3711, MBL3631	none
CHB3880	Research Methodology & Project	8	38	CHM3722	
CHP3811	Wastewater Treatment	8	8	CHP3701, CHP3711	None
CHM3821	Natural Product Chemistry I	8	8	CHM3752, HM3702	none
CHC3821	Clinical Biochemistry		8	CHP3731, CHB3731	none
CHB3842	Biotechnology, Micro Nanotechnology	8	8	CHB3722	none
CHB3862	Industrial Pharmaceutical Biotechnology	8	8	CHB3722, CHP3721	none
CHN3842	Health and Nutritional Biochemistry	8	8	CHB3731	none
CHC3832	Chemical Xenobiotics & Toxicology	8	16	CHP3711, CHP3701	none
CHM3822	Natural Product Chemistry II	8	8	CHM3752	CHM3801
Total credits			**134**		

D.4. MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY (11MSIB)

D.4.1. ADMISSION REQUIREMENTS

The MSc programme in Industrial Biochemistry is open to all BSc graduates with Biochemistry or other related majors. The admission to the MSc programme of the holders of the B.Sc. Biochemistry degree is not automatic. The applicants will be accepted on the basis of their undergraduate record. An average mark of **60%** is required. The course normally extends over a minimum period of two years for full-time students.

D.4.2. DURATION OF STUDY

The duration of the MSc in Biochemistry is two (2) years for full-time students and three (3) years for part-time students. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

D.4.3. CURRICULUM COMPILATION

The curriculum for the MSc in Biochemistry consists of coursework and the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations & Fees.

D.4.4. ASSESSMENT CRITERIA

The curriculum for the MSc programme consists of coursework and research leading to a thesis. Coursework components in the first year will be assessed through written tests, laboratory work, seminar presentation and final examination. Each course assessment is based on a continuous assessment mark **(50%)** and examination mark **(50%)**. Continuous assessment mark is computed as **60%** test and **40%** practical mark. In order to pass a course, a student must obtain a final mark of at least **50%**. Refer to specific courses for detailed assessment criteria.

D.4.5. MSC THESIS IN THE SECOND YEAR

A candidate must first successfully complete the coursework examinations before commencing thesis work. The thesis must be drafted in the English language and submitted to the supervisor. It must be in a university approved format. The thesis will be evaluated by UNAM approved internal and external examiners. The UNAM grading system will be used for the evaluation. Each student will defend the thesis in a viva voce examination. Refer to the General Information and Regulations Prospectus and Postgraduate Prospectus for detailed information.

D.4.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 264 credits, and who have met all the requirements of the degree programme.

D.4.7. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions, but the exemptions shall not exceed 50% of the programme in line with the General Information and Regulations Prospectus.

D.4.8. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred percent attendance of practical classes are required.

D.4.8.1. MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY (11MSIB)

TABLE FOR ALL COURSES IN MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE	CO-REQUISITE
UAE5819	Academic Writing for Post Graduate Students	9	24	None	None
CHM5911	Advanced Analytical & Instrumental Methods	9	24	None	None
CHM5921	Research Methodology and Project Proposal	9	12	None	None
CHB5921	Enzymology and Enzyme Technology	9	12	None	None
CHB5941	Nutrition, Metabolism and Cell Signaling	9	12	None	None
CHB5961	Neurobiochemistry and Clinical Biochemistry	9	12	None	None
CHM5962	Instrumental Methods & Techniques in Biochemical analysis	9	12	CHM5911	None
CHB5942	Biochemistry Seminars	9	12	CHM5921	None
CHB5962	Strategic Resource Management	9	12	CHM5921	None
CHB5902	Bioinformatics and Industrial Biotechnology	9	12	CHB5921	None
CHC5942	Environmental Toxicology and Management	9	12	CHB5941	None
CHN5942	Natural products & Pharmaceutical Production	9	12	CHB5961	None
Total Credits			**168**		
2nd yr CHB5900	M.Sc. Thesis	9	120	**Pass in all year 1 courses**	None
Total Credits			120		

D.4.8.2. MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY (11MSIB)

CHM5911	Advanced Analytical & Instrumental Methods
NQF Level:	9
Contact Hours:	4 lectures per week for one semester and 36h Practical or mini project
Credits:	**24**
Course Assessment:	**CA** two tests which counts **80%**; Laboratory work (or mini project) **20%** towards.
Examination:	1X 3hr examination **Final Mark: 50%** CA mark and **50%** Examination mark
Prerequisites:	None

Course Description: (Selected topics of the following will be covered)**:** Electro-analytical chemistry: Ion selective electrodes, potentiometry, polarography, coulometry and electro-gravimetry. Advanced techniques in electro-analytical chemistry; solution electrode interface, Buttler-Volmer relationships, Chromatography - Theory of chromatography, High Performance Liquid Chromatography (HPLC), ion chromatography, supercritical fluid chromatography. Mass Spectrometry: (GC-MS) and Liquid Chromatography – Mass Spectrometry (LC-MS). Advanced mass spectrometry, basic instrumentation, ionization techniques, analyzers and detectors, vacuum technology, detailed ion fragmentation patterns and the practical application of electron impact, chemical ionization and other auxiliary mass spectrometry techniques, e.g. FABMS and electro spray MS, to the structure elucidation of both small and large organic molecules. X-ray analysis methods: Theory of X-ray Spectra. Conventional X-ray fluorescence analysis. Methods and instrumentation for excitation, dispersion detection and interpretation. Matrix effects and their avoidance. Energy dispersive X-ray analysis. Alternative X-ray analysers. Electron microprobe analyser. Single crystal X-ray analysis. Crystallography (theoretical principles, theory of crystals, X-rays, crystallographic techniques, structure determinations. NMR-Practical application of 1D and 2D Fourier transform NMR techniques. ^{1}H NMR and ^{13}C NMR. Non-first order spectra, basic experiments in DEPT, J-Mod. NOE diff. 2D homo-nuclear NMR- COSY, NOESY, TOCSY; hetero-nuclear direct (1J)- HECTOR, HMQC,HSQC; hetero-nuclear long range HMBC, LR HECTOR and COLOC.; selective 1D experiments: SEL TOCSY and SEL NOESY. Application of Analytical techniques to food science, pesticide analysis, forensic analysis, bio-analytical chemistry as well as other topics that are of interest.

CHB5921	Enzymology & Enzyme Technology
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts **60%**, Laboratory Mark (or mini project) counts **40%**.
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Prerequisite	None

Course Descriptor: Amino Acids and Peptides; Introduction to amino acids, peptides and proteins; Structures and properties of peptides; enzymes; Analysis of peptides and proteins; End group analysis of peptides; Solution phase peptide synthesis; Enzymes and Enzyme Inhibitors; Inhibition of hydrolases and peptidases, ACE inhibitors, Enzyme Technology - Large scale production of enzymes, enzyme reactors, immobilization of enzymes by chemical and physical methods, Effect of partition on kinetics and on changes in pH and hydrophobicity. Applications: synthetic organic chemistry, industry, food technology, medicines. Synzymes, enzyme electrodes and biosensors, Enzyme Engineering.

CHM5921	Research Methodology & Project Proposal
NQF Level	9
Contact Hours	2 lectures per week and 2h consultation per week for one semester
NQF Credits	12
Continuous Assessment	Research proposal counts **80%** and Statistics assessed by a test, assignment or report count **20%**. **Final Mark: 100% CA** from which **20%** is statistics component.
Prerequisite	None

Course Descriptor: The lecturers will present some chemostatistics topics i.e., handling experimental data, processing, and reporting, e.g., significance tests. Analysis of variance (ANOVA), regression analysis methods, validation experimental data (quality control) and experimental design and optimization of parameters. The student will write a comprehensive research proposal for his/her MSc research work in a particular field of national interest, under the supervision of an academic researcher. The evaluation will be done in accordance with UNAM Post-graduate School guidelines.

CHB5961	Neurobiochemistry & Clinical Biochemistry
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 60%, Laboratory Mark (or mini project) counts 40%,
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Prerequisite	None

Course Descriptor: Muscle Biochemistry – Skeletal muscle structure. Actin, myosin, tropomyosin, troponin. Molecular mechanism of contraction. Functional classification of skeletal muscle fibers. Twitch. The motor unit. Role of calmodulin. Neuromorphology – Organisation of neuron, dendrites and axons. Glial cells – astrocytes, oligodendrocytes, ependymal cells, Schwan cells. Nerve fiber types and functions. Neurophysiology – Generation and conduction of monophasic action potential, saltatory conduction. Synaptic transmission, Neurotransmitters and their action. Blood Brain CSF barrier – Characteristics. Transport across membranes – Types of transport (simple diffusion, passive-facilitated diffusion), active transport – primary and secondary group translocation, transport ATPases, transport by vesicle formation. **Neurological dis**or**ders** – Headache, facial pain, migraine, epilepsy, multiple sclerosis, Myasthenia Gravis. Electrolytes and acid-base balance – Regulation of electrolyte content of body fluids and maintenance of pH, reabsorption of electrolytes. **Diagnostic Enzymes** – Enzymes in health and diseases. Biochemical diagnosis of diseases by enzyme assays – SGOT, SGPT, CPK, cholinesterase, LDH. **Abn**or**malities in Nitrogen Metabolism** – Uremia, hyperuricemia, porphyria and factors affecting nitrogen balance. Blood Clotting – Disturbances in blood clotting mechanism – hemorrhagic disorders – hemophilia, von Willebrand's disease, purpura, Rendu-Osler-Werber disease, thrombotic thrombocytopenic purpura, disseminated intravascular coagulation, acquired prothrombin complex disorders, circulating anticoagulants. Cancer – Cellular differentiation, carcinogens and cancer therapy

CHM5962	Instrumental Methods & Techniques in Biochemical Analysis
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 50%, Laboratory Mark (Mini project) counts 50%,
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Co-requisite	CHM5911

Course Descriptor: Extraction of Or**ganic Analytes**: Sampling; Proximate Analysis of the Major Food Components; **Partition:** Gas/Liquid Partition (GLP), Liquid/Liquid Partition (LLP); Solid/Liquid Partition (SLP); **Solvation:** Solvent Extraction; Matrix Solid-phase Dispersion; Sub-critical Fluid Extractions; Supercritical Fluid Extraction; Distillation Steam Distillation; Organic Solvent Distillation–Extraction; Adsorption. **Solid-phase Extraction:** application of HPLC, GC, FTIR, AA, AFS, MS and NMR to food analysis. **TRACE METAL DETERMINATIONS IN BIOLOGICAL SAMPLES:** Bioavailability; Methods for Assessing Folate and Vitamins Bioavailability; Physicochemical Analytical Techniques for Vitamins. **Recombinant DNA methods** –Construction and analysis of c-DNA and genomic libraries - Protocols and strategies for c-DNA cloning, preparation of radio-labeled DNA and RNA probes, synthetic oligonucleotide probes, expression of cloned genes in cultured cells, screening expression with antibodies and oligonucleotides, DNA sequencing. **Application of recombinant technology:** production of insulin, drugs, vaccines, diagnostic probe of genetic diseases, Gene therapy. **Cell Culture and Antibody Technology:** production, maintenance and applications of animal cell cultures and antibodies (both monoclonal and polyclonal), and the use of immunochemical techniques (e.g. ELISA, Western blotting and immunocytochemistry) for analysis and therapy, investigate the use of cellular systems for the study of mechanisms of toxicity and cell signalling pathways. Electrophoretic techniques, Electron microscopy.

CHB5962	Strategic Resource Management
NQF Level	9
Contact Hours	2 lectures per week for one semester
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 80%, Laboratory Mark (or mini project) counts 20%,
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Co-requisite	CHM5921

Course Descriptor: Plant breeders' rights, the impact of genetically modified organisms and environmental monitoring, Biological safety conventions, environmental risk assessments and management; Definitions and classifications of projects. Objectives in project management - time, costs, quality; Resources and resource management; Critical Path Methods and resource scheduling; Performance measurement and costs; Project lifecycles; Project teams and leadership in project management; Managing risk in projects; Analysis of project successes and failures; Case studies in project management; Project Management software. Examine innovation from an industrial perspective, showing how innovations of product, process and organisational structure can create and destroy markets. Focus on innovation from an organisational perspective, showing how innovation can create and sustain a powerful competitive advantage. Highlight the managerial perspective, illustrating the skills and systems required to maintain innovation within different organisations and markets. Consumer's attitudes and risk assessment: Risk assessment and avoidance: general principles; Assessing the impact of genetically modified crops;

CHB5902	Bioinformatics & Industrial Biotechnology
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 60%, Laboratory Mark (or mini project) counts 40%, **Examination**: 1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Co-requisite	CHB5921

Course Descriptor**: Genomics, Transcriptomics, Proteomics:** Introduction to Programming using Java; Theory and Algorithms in Bioinformatics; Genomes to Systems; Biocomputing; structure-based drug design. Conventional and non-conventional techniques of plant hybridisation, Agrobacterium-induced transformation using wild-type and engineered strains of A. tumefaciens and A. rhizogenes; **Tissue culture,** micropropagation and protoplast fusion; DNA isolation for RAPD analysis and confirmation of hybridity; Evaluation of RAPD fragments patterns for **phylogeny analysis**; Analysis of transgenic plants and GMO testing. Direct DNA uptake into protoplasts; flow cytometric analysis for ploidy. **plant products f**or **non-food uses**, toxicology of natural pharmacologically active constituents and the use of transgenic plant technology for medical purposes. **molecular approaches to varietal profiling**, seed quality testing, transformation technology for modifying plant metabolism and modern breeding perspectives and strategies in a commercial context. comparisons of mutant with wild-type of model plant and crop species Arabidopsis and Maize lines, bioinformatics analysis of the genes involved in these phenotypes is undertaken. **Fermentation technology** – Fermenters, general design of fermenter, fermentation processes, production of alcohols, antibiotics, steroids and enzymes; biotransformation, biomass & production of single cell protein. **Hybridoma technology** – Monoclonal antibodies, selection of hybrids, hybridomas, purification and application of monoclonal antibodies. **Ma**jor **Products of Industrial Microbiology:** Antibiotics, Penicillin, Streptomycin, Amino Acids, Organic Acids, Biopolymers, Biosurfactants; Bioconversion Processes.

CHB5942	Biochemistry Seminars
NQF Level	9
Contact Hours	2 lectures per week for one semester
NQF Credits	12
Continuous Assessment	Presentations are graded by all the programme lecturers & count toward the CA mark. **Final Mark: 100%** CA mark
Co-requisite	CHM5921

Course Descriptor**:** The main component of this course involves the application of presentation skills through seminars, review of scientific literature and communication of recent developments in biochemistry.

CHN5942	Natural Products & Pharmaceutical Production
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 60%, Laboratory Mark (or Mini project) counts 40%,
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Co-requisite	CHB5961

Course Descriptor**: Gene Pharming** (Animals and Plants) Vitamins, Amino Acids, Proteins Antibiotics, Biocatalysis. **Natural Compounds** Recovery/(Bio-Processing, Chemical–Biotechnological Syntheses, Gene Therapy. **Vect**or**s/Systems Production:** Safety, Efficacy, Consistency, and Specificity Registration. Terpenes, occurrence, nomenclature and classification; Biosynthesis and structure of the steroids; Fatty acids and cell wall structures; The prostaglandins; The alkaloids. Cell wall structure and peptidoglycan targets b-Lactam antibiotics: action and b-lactamase chemistry, Sulfonamides, **Metabolic targets:** pyridoxal dependent groups, Gastric acid secretion as a target for chemotherapy, Chemical regulation of acid secretion.

CHC5942	Environmental Toxicology & Management
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	12
Continuous Assessment	A minimum of two tests which counts 60%, Laboratory Mark (or mini project) counts 40%,
Examination:	1x2hr examination. **Final Mark: 50%** CA mark and **50%** Examination mark
Co-requisite	CHB5941

Course Descriptor**:** Microbial Growth in Complex Environments: Biodegradation Using Natural Microbial Communities; Changing Environmental Conditions to Stimulate Biodegradation; **Subsurface Engineered Bi**or**emediation** System; Stimulating Hydrocarbon Degradation in Waters and Soils; Phytoremediation; Stimulation of Metal Bioleaching from Minerals; **Biosens**or**s:** Detection of pollution, and microbial contamination of water. Fermentation analysis and control Monitoring of industrial gases and liquids Measurement of toxic gas in mining industries Direct biological measurement of flavors, essences, and pheromones; **Biopesticides; Xenobiotic metabolism** – Biodegradation, detoxification of xenobiotics by micro-organisms, biodegradation of hydrocarbons, pesticides, surfactants, polyaromatic hydrocarbons, dyes; role of cytochrome P450 in detoxification.

CHB5900/ CHM5900/ MRE 5900 MSC THESIS	
NQF Level	9
Contact Hours	Face to face consultations with supervisor(s) on regular bases
NQF Credits	120
Continuous Assessment	**Final Mark: 100%** CA mark
Prerequisite	Pass in all year 1 courses is required before a student can start with the research project.
Course Assessment:	A candidate must first successfully complete the coursework examinations before commencing thesis work. The thesis must be drafted in English language and submitted to the supervisor. It must be in a format given by the coordinators. The thesis will be evaluated by the supervisor and another examiner within one month after submission. The UNAM grading system will be used for the evaluation. Each student will defend the thesis in a viva voce examination. Refer to the General Information and Regulations Prospectus for detailed information.

Course Descriptor: Students will present their findings in the form of a written thesis. Poster and seminar presentations are encouraged. This course tests a student's ability to design and implement a research programme and communicate the findings to an informed audience in a comprehensive thesis, written in an appropriate scientific style. The timing of assessments and assessment deadlines have been planned to ensure that the volume of work is balanced throughout the programme. These do not only enable students to acquire in-depth practical training under the supervision of experienced research staff, but they also help to develop their capacity for independent investigation and report writing. Most projects are laboratory-based although some data review, computer-based projects may be available. Research projects are carried out for a minimum period of 1 year for full time students or 2 years for part time students.

D.5. MASTER OF SCIENCE IN MICROBIOLOGY (11MMBL)

D.5.1. DEPARTMENTAL REGULATIONS

D.5.1.1. ADMISSION REQUIREMENTS

Applicants who have obtained a Bachelor of Science (Hons) degree in Microbiology, Biochemistry, Molecular Biology, Biotechnology, Food Science, and Veterinary Sciences at NQF level 8 are eligible to apply. The applicants will be accepted on the basis of their undergraduate records with an average mark of at least 60%. Applicants who graduated from UNAM with a 4-year BSc degree and an average of at least 60% may also be admitted if they passed Research Methodology and had a Research component in Microbiology or Molecular Biology as part of their undergraduate degree. The department will evaluate such applications. Admission is competitive and a maximum of 20 students will initially be allowed into the programme.

D.5.2. DURATION OF STUDY

The Master of Microbiology is offered through coursework and thesis, extending over two years of full-time study. The coursework is conducted during the first academic year of study and is followed by a supervised original research project extending over the second year.

D.5.3. CURRICULUM COMPILATION

The curriculum for the MSc Microbiology consists of coursework and the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations& Fees.

D.5.4. EXAMINATION REGULATIONS

Formal examination will take place at the end of each semester. Examinations will be subject to external assessment. In addition to course-specific regulations, attendance of at least 80% in a particular course is a requirement for examination admission. Students must pass all courses for them to proceed to the master thesis. A mixture of assessment modes will be used: written, oral or practical examinations, reports, and presentations.

D.5.5. FORMAT AND EVALUATION OF THESIS WORK

Before a candidate can proceed to the thesis, he/she must first successfully complete the coursework examinations. Each student will submit a Master Thesis/Dissertation during the second year. The thesis must be drafted in English language. The thesis must follow the format as prescribed in the guide for post-graduate studies at UNAM. The thesis will be evaluated by internal and external examiner within one month after submission. The UNAM grading system will be used for the evaluation.

D.5.6. PRACTICALS

Attendance of practical classes and field trips is compulsory.

CODE	COURSE	NQF	PRE-REQUISITE	CREDIT	COM/ ELECT	C/REQUISITE
All students in this programme will take all the following courses						
MMB5921	Computing Techniques &Bioinformatics	**9**	Admission requirements	12	Compulsory	none
UAE5819	Academic Writing for Post Graduate Students	**9**	Must be a registered postgraduate student	NCB	Compulsory	none
MMB5922	Microbial Evolution	**9**	Admission requirements	12	Compulsory	none
MMB5941	Research Methodology & Project Proposal Writing	**9**	Admission requirements	12	Compulsory	none
MMB5942	Bio prospecting & Entrepreneurship in Microbiology	**9**	Admission requirements	12	Compulsory	none
Students in the Food Microbiology stream will take all of the following courses						
MMF5911	Food Microbiology	**9**	Admission requirements	24	Compulsory	none
MMF5921	Food safety	**9**	Admission requirements	12	Compulsory	none
MMF5912	Food Biotechnology	**9**	Admission requirements	24	Compulsory	none
MMF5922	Climate Change & Food Security	**9**	Admission requirements	12	Compulsory	none
MME5912	Microbiology of wastewater	**9**	Admission requirements	24	Compulsory	none
Students in the Biomedical Microbiology stream will take all of the following courses						
MMM5931	Clinical Microbiology & Diagnostics	**9**	Admission requirements	24	Compulsory	none
MMM5911	Microbial Principles & Processes	**9**	Admission requirements	24	Compulsory	none
MMM5912	Molecular Microbiology & Biotechnology	**9**	Admission requirements	24	Compulsory	none
MMM5932	Climate Change & emerging diseases	**9**	Admission requirements	24	Compulsory	none
Students in the Environmental Microbiology stream will take all of the following courses						
MME5911	Environmental Biotechnology	**9**	Admission requirements	24	Compulsory	none
MME5921	Geo-Microbiology & biogeochemistry	**9**	Admission requirements	12	Compulsory	none
MME5912	Microbiology of wastewater	**9**	Admission requirements	24	Compulsory	none
MME5922	Extremophiles	**9**	Admission requirements	12	Compulsory	none
MME5932	Climate change & Microbial Biodiversity	**9**	Admission requirements	24	Compulsory	none
Total Credits				**144**		

CODE	COURSE NAME	NQF	PRE-REQUISITES	CREDIT	COM/ ELECT	C/REQUISITE
MMB5900	**Thesis**	**9**	**Pass all year 1 courses**	**120**	**Compulsory**	**None**
Total Credits				**120**		

D.5.7. MASTER OF SCIENCE IN MICROBIOLOGY (11MMBL) MODULE DESCRIPTIONS

UAE5819 Academic Writing for Post Graduate Students

NQF Level: 9
Contact hours: 42
Credits: NCB
Course Assessment: **CA**: Students will submit written assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%**, Examination **60%** (1 x 3-hour paper)
Prerequisites: Must be a registered postgraduate student
Content: This course is a post-graduate course designed to empower students with skills and knowledge to access and critique academic sources and to synthesize information from these sources to assist them in the substantiation and development of their own claims when writing an academic paper in their respective fields of specialization. Additionally, this course will empower students with the capacity to undertake the challenges of academic writing by exposing them to the different rhetorical and stylistic elements typical of academic texts. Finally, students will be introduced to the American Psychological Association (APA) writing style and will be equipped with the necessary skills to format an academic paper in APA style.

MMB5941 Research Methodology and Project Proposal writing

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit written assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: In this course the following content will be covered: Research design; project planning, Proposal writing; problem analysis; Research questions formulation; quantitative and qualitative Bio statistical methods of data analysis in Microbiology, research ethics and responsibilities.

MMB5921 Computing Techniques and Bioinformatics

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit independent practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: Genome sequence acquisition and analysis, genomes sequence answers to specific questions, genome variations, DNA microarrays, proteomics, Protein 3D structures, Whole genome perspectives, genomic circuits in single genes, integrating single gene circuits, complex gene circuits, modeling whole genome circuits, genomics, and medical case studies

MMB5922 Microbial Evolution

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%,**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: The content for this course will include formation and early history of earth; origin of cellular life, microbial diversification; endosymbiotic origin of eukaryotes, the evolutionary process, theoretical aspects of evolutionary analysis; analytical methods of evolutionary analysis, microbial phylogeny, various phylogenetic methods, microbial classification, and nomenclature

MMB5942 Bio prospecting & Entrepreneurship in Microbiology

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: The content of this course will deal with: Definitions and theory-practice of bioprospecting; a critique of bioprospecting; bioprospecting as post-modern ecological capitalism; Bioprospecting for genetic resources; Bioprospecting for Microbes; Bioprospecting of medicinal plants and drug natural products , Bioprospecting for natural food products and nutraceuticals; Bioprospecting for new species of microbes, plants, and animals; Bioprospecting of desert, soil, marine and other environments; Policies, laws, regulations, and conventions that guide bioprospecting; Case studies of bioprospecting programmes; Valuation of bioprospecting samples. In addition, this course focuses on the realities of working in the field of microbiology and biotechnology. It includes aspects such as entrepreneurship development, economic implications and financing, intellectual property and patents, bioethics, biotechnology, and public understanding thereof. Knowledge and insights gained from this course will be assessed by means of a simulated grant application for the development of a hypothetical microbiological/biotechnological venture.

MMF5912 **Food Biotechnology**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practical
Credits: 24
Course Assessment: Continuous assessment will be composed of the graded reports during laboratory presentation as well as 2 assignments that will be presented orally and 1 written assignment. Continuous assessment **50%,**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: Theme 1: Techniques in Food industries (breweries, dairies, wines etc.): Fermentation Technology; Yeast based products; Bacteria based fermented products; Mold based products and other microbial based products such as sweeteners, flavours, amino acids, vitamins.
Theme 2: Safety evaluation of novel food products and food fortification
Theme 3: Bio engineering: Genetically modified foods; New Frontiers for Food Processing; Advances in Lactic Acid Bacteria for Novel applications
Theme 4: Food industrial wastes
Theme 5: Functional foods; Prebiotics and probiotics ingredients
Theme 6: Indigenous food technology
Practical aspects and skills that will be addressed during the teaching of the various themes include.

- ★ Isolation, purification and maintenance of yeast and bacterial cultures.
- ★ Aerobic and anaerobic fermentation.
- ★ Production of various fermented food products
- ★ Identification of microorganisms (molecular methods)
- ★ Production of metabolites and enzymes: detection of enzymes and bacteriocins

MMF5911 **Food Microbiology**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practical
Credits: 24
Course Assessment: Continuous assessment will be composed of the graded reports during laboratory presentation as well as 2 assignments that will be presented orally and 1 written assignment. Continuous assessment **50%**.
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: Theme 1: Growth conditions for bacteria.
Theme 2: Microbes in foods: Sources of Microorganisms in Foods; Food spoilage; pathogens; Beneficial Bacteria; Characteristics of Predominant Microorganisms in Food; Food Ingredients and Enzymes of Microbial Origin; Food Standards and Food Environment
Theme 3: Food Biopreservatives of Microbial Origin
Theme 4: Microbiology of Fermented food: Microorganisms Used in Food Fermentation
Theme 5: Prebiotics and probiotics
Practical aspects and skills that will be addressed during the teaching of the various themes include.

- ★ Microbial techniques (spoilage organisms, pathogens, fermented foods)
- ★ Detection and Enumeration of micro-organism in food samples
- ★ Isolation and enrichment of microorganisms
- ★ Identification of microorganisms (biochemical methods)
- ★ Use of automated rapid and conventional methods for microbial toxins, metabolites, inhibitory substances, pathogens, and bacteriophages through HPLC and GC.

MMF5921 **Food Safety**

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%**,
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: The content for this course will include topics such as: Transfer of pathogens from environment to food, the HACCP system, ISO standards, preservation techniques, quality control, food processing, radiation, water quality control, From harvesting or farms to consumer: chemical, microbiological and technological aspects of food; Microbial indicators in Food; Foodborne pathogens and illnesses; New and Emerging Foodborne Pathogens; Food toxicology (Microbiological toxins, Intolerance and allergy to food); Adverse Effects of Food and Nutrition; Risk analysis in relation to food and its components; Food protection and defense: bioterrorism and genetically modified organisms and potential dangers in packaging and labeling of food products; Food safety regulations in Namibia and elsewhere in the World (globally) – International Food laws and regulations.

MMF5922 **Climate Change & Food Security**

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%**.
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: The content for this courses will include topics such as: Evidence analysis and predictions on overall negative or positive effects microorganism changes on agricultural production as a result of climate change, effects of Climate on pests and pathogens affecting agricultural crops; crop–pest/pathogen models in prediction of changes in pest/pathogen dynamics, design sound plant health management practices, climate change and increase risk to food and feed contaminated by mycotoxin-producing fungi. Use of transgene(s) enhanced adaptation to abiotic stresses that are exacerbated by climate change. Relationship of microbes,

Climate change and declining nutritional quality of food crops. The use of high throughput phenomics platforms to relationships of microbe's measure plant growth and development and analyze nutritional traits, development of climate resilience production systems; Sustaining food quality by manipulating soil microbial Diversity Increased use of agro biodiversity and generation of agro biodiversity to coping with adverse impacts climate change.

MME5912	**Microbiology of Wastewater**
NQF Level:	9
Contact hours:	56 hours lectures and 42 hours practical
Credits:	24
Course Assessment:	Continuous assessment will be composed of the graded report during laboratory presentation as well as 2 assignments that will be presented orally and 1 written assignment. Continuous assessment **50%.**
Examination:	1 x 3-hour paper, weighing **50%.**

Prerequisites: Must be a registered postgraduate student
Content: Theme 1: Sources and typical characteristics of Wastewater: Domestic wastewater, industrial wastewater (food and beverage industry, chemical industry, tanneries, textile industry etc.), agricultural run-off. **Theme 2:** Environmental consequences of not treating wastewater: eutrophication in surface water, groundwater contamination, pollution with pathogens, toxic chemicals in water, presence of endocrine disrupting chemicals. The use of indicator organisms to determine water quality using culturing techniques and selective media as well as molecular techniques. **Theme 3:** Overview of a sewage treatment plant: description of typical aerobic and anaerobic processes and a detailed study of the biology of microorganisms involved in these processes, including nitrification, carbon removal, denitrification, and phosphate removal. Detailed study of the biology and importance of microorganisms in clarifiers and those that can be utilized in post-treatment of sludge. Microbial processes in waste stabilization ponds. **Theme 4:** Operational procedures and their importance to microbial processes, such as the sludge retention time, hydraulic retention time, sludge loading rate, Feed ratios and the importance and processes of on-line monitoring in wastewater treatment plants. **Theme 5:** Necessary adaptations of a sewage treatment plant for the treatment of various industrial wastewaters, focusing on the microbiological processes in such plants such as the use of microorganisms for toxicity testing. **Theme 6**: Reclamation of wastewater for drinking water production and microbial aspects and processes in drinking water treatment and distribution. Theme 7: Water and Public Health.

MMM5911	**Microbial Principles & Processes**
NQF Level:	9
Contact hours:	56 hours lectures and 42 hours practical
Credits:	24
Course Assessment:	Students will submit written practical assignments and one case study presentation and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination:	1 x 3-hour paper, weighing **50%.**

Prerequisites: Must be a registered postgraduate student
Content: Theme Poverty related diseases in Namibia; including neglected tropical and zoonotic diseases; Etiology and pathogenesis; host innate and adaptive immunity; Epidemiology and ecology; Treatment in humans and animals, including livestock and companion animals

MMM5932	**Climate Change & Emerging Diseases**
NQF Level:	9
Contact hours:	56 hours lectures and 42 hours practical
Credits:	24
Course Assessment:	Students will submit written practical assignments and one case study presentation and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%**.
Examination:	1 x 3-hour paper, weighing **50%.**

Prerequisites: Must be a registered postgraduate student
Content: Theme Emerging and re-emerging infectious diseases and occurrence; transmission cycles for infectious diseases; historical evidence for climate change and the link between climatic conditions and infectious diseases; the phenomenon of global warming; observed and predicted impacts of long-term climate change.

MMM5912	**Molecular Microbiology & Biotechnology**
NQF Level:	9
Contact hours:	56 hours lectures and 42 hours practical
Credits:	24
Course Assessment:	Students will submit written practical assignments and one case study presentation and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination:	1 x 3-hour paper, weighing **50%.**

Prerequisites: Must be a registered postgraduate student
Content: Theme Drug development, bioprospecting, Vaccine development (Viral vaccines: conventional: killed/attenuated; DNA; peptide; recombinant protein Sterilization techniques: biohazard hoods; containment facilities) Bacterial and viral vectors, Biological warfare agents, insulin production, molecular techniques, beneficial microbes and their potential use, biomedicines, Mode of action of antibiotics and antivirals: molecular mechanism of drug resistance (MDR), indigenous practices, climate change and emerging diseases, Gene therapy-concept, vectors, gene targeting and tissue-specific expression, Ethics and human genetics (Social- genetic discrimination: human cloning, feticide, sex determination, Ethical: somatic and germ line gene therapy, clinical trials, the right to information, ethics committee function), pharmacogenomics and toxicogenomic, Cellular therapy; Stem cells, Recombinant therapy, Immunotherapy, Patenting and Intellectual property rights.

MMM5931 **Clinical Microbiology & Diagnostics**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practical
Credits: 24
Course Assessment: Students will submit written practical assignments and undertake written tests during the semester; this will form part of continuous assessment. Weighting: Continuous assessment **50%**.
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: The course will be organized into four themes:

- ★ Organization and function of the clinical microbiology laboratory.
- ★ Managing clinical specimens for microbiological studies.
- ★ Aetiological agents recovered from clinical material; and
- ★ Methods for identification of aetiological agents of infectious and non-infectious diseases.

MME5911 **Environmental Biotechnology**

QF Level: 9
Contact hours: 56 hours lectures and 42 hours practical
Credits: 24
Course Assessment: Students will submit written practical assignments and undertake written tests during the semester; this will form part of continuous assessment. Weighting: Continuous assessment **50%.**
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: THEME1: **MICROBIAL INTERACTIONS AND THEIR ROLE IN THE ENVIRONMENT:**
Mobilization and immobilization of carbon with rhizosphere; mechanism of biological nitrogen fixation, ammonification, nitrification, denitrification, and microorganisms involved in such processes; Biofertilizer for sustainable agriculture *Rhizobium Azospirillium, Azotobacter, Azolla*, applications methods of biofertilizers - significance of biofertilizers.
THEME2: POLLUTION, ITS MONITORING AND CONTROL: Sources, major pollutants, adverse effect on living organisms; acid rain and its impact on ecosystem-gaseous emission; Droplet nuclei –Aerosol; Assessment of air quality; Airborne diseases, their symptoms, and preventive measures; Types of wastes, characterization of solid and liquid waste; Brief account on bioterrorism.
THEME3: BIOREMEDIATION: Use of Biotechnology and commercial blends of Microorganism and Enzymes in wastewater treatment; Solid waste treatment
THEME 4: BIODEGRADATION OF POLLUTANTS AND RECALCITRANT COMPOUNDS: Principles of Bioremediation: Phytoremediation of xenobiotics and bioaccumulation of metals using plants; Biodegradation of petroleum constituents and associated heavy metals; • Phytoremediation of soil contaminated with toxic metals and radionuclides; • Entrapped microbial cultures and their utility in environmental biodegradation process.; Application of Recombinant DNA technology in waste treatment; Application of genetically engineered microbes; Microbial leaching and mining; Biosensors in Detection of Environment Pollutants; Biopesticides and Biofertilizers
THEME 6: Biodiversity and Biotechnology: Cellular and molecular aspects of Biotechnology; Reforestation through micro-propagation; Biotechnology in preservation of biodiversity; In situ and ex situ conservation through gene banks; Genetically modified plants and the environment.
THEME 7: BIOENERGETICS.

MME5921 **Geo-Microbiology & Biogeochemistry**

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practical
Credits: 12
Course Assessment: **CA 50%** will be composed of the graded report during laboratory presentation as well as 1 written assignment and 1 assignment that will be in the form of an oral presentation.
Examination: 1 x 3-hour paper, weighing **50%.**
Prerequisites: Must be a registered postgraduate student
Content: Theme 1: Thermodynamics of microbial processes (free energy, electrode potentials, energy conservation such as phosphorylation) and redox cascades in sediments which affect microbial metabolism. **Theme 2:** Measurement and calculation of fluxes between water, sediment, and microorganisms. **Theme 3:** Geomicrobiological methods: Use of stable isotopes and biomarkers, microsensors, RT-PCR, DGGE, FISH, CARD-FISH, flow cytometry etc. **Theme 4:** The role of microorganisms in geochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles, iron, and manganese. **Theme 5:** Role of microorganisms in geological processes: Microbial dolomite precipitation, Acid Mine Biogeochemistry, Anaerobic oxidation of methane, Geomicrobiology of fossil fuels.

MME5932 **Climate change & Microbial Biodiversity**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practical
Credits: 24
Course Assessment: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 50%,
Examination: 1 x 3-hour paper, weighing **50%.**
Content: Theme 1: Role of microorganisms in controlling the climate via the carbon, nitrogen, and sulfur cycles e.g., contribution of microbial processes in ruminants to methane in the atmosphere, the role of nitrogen fixing bacteria in the oceans and soils etc. Climate change versus climate variability. **Theme 2:** Climate change and health – the effect of climate change on the pathology and spread of diseases such as malaria. **Theme 3:** Effect of climate change on the diversity, distribution, and abundance of microorganisms and on microbial processes. **Theme 4:** the role of microorganisms in climate change adaptation and mitigation e.g., the production of alternative biofuels; Climate change impact on Marine, soil, and Terrestrial Biodiversity in relation to microorganism changes.

MME5922	Extremophiles
NQF Level:	9
Contact hours:	28 hours lectures and 21 hours practical
Credits:	12
Course Assessment:	**CA 50%** will be composed of the graded report during laboratory presentation as well as 1 assignment that will be presented orally and 1 written assignment. Continuous assessment **50%.**
Examination:	1 x 3-hour paper, weighting **50%.**

Prerequisites: Must be a registered postgraduate student

Content: Theme 1: Thermophiles: Biotopes; Isolation and physiology of thermophiles; Biochemical basis of thermophily; Biotechnological perspective; Enzymes in thermophilic microorganisms and other adaptations that allow them to survive in high temperature environments. **Deserts:** Classification, hyper thermophilic habitats, and ecological aspects; Extremely Thermophilic Archaebacteria, Thermophily, commercial aspects of thermophiles; Applications of thermozymes; Methanogens: Classification, Habitats, applications. **Hydrothermal vents:** Examples of hydrothermal vents and the processes that lead to their formation, Conditions at hydrothermal vents, primary production through chemosynthesis at hydrothermal vents and the role of microorganisms in support in vent ecosystems; Strategies for survival at hydrothermal vents; Diversity and physiology of microorganisms at hydrothermal vents including processes of sulfide and methane oxidation.

Theme 2: Halophiles and Barophiles: Hyper-saline environment; Taxonomic distribution and isolation of halophiles Physiology of extreme halophiles and barophiles; Barophiles: Classification, high-pressure habitats, life under pressure, barophily, death under pressure.

Theme 3: Acidophiles and Alkaliphiles: Occurrence of life at low and high pH; Isolation and enumeration of acidophiles and alkaliphiles; Physiology of microbial adaptation to extreme pH; Bioleaching and bio-beneficiation of mineral-ores

Theme 4: Oxygen-free environments: Oxygen minimum zones in the environment and the redox potentials existing as well as the diversity of microorganisms in such anaerobic conditions, Anaerobic microbial processes in anoxic environments: methanogenesis, sulfate reduction, anaerobic oxidation of methane, denitrification, anaerobic oxidation of ammonium (ANNAMOX)

Theme 5: Psychrophiles: Enzymes of psychrophiles; Distribution and isolation; Mechanisms and molecular aspects of psychrophiles

MMB5900	Thesis
NQF Level:	9
Contact hours:	Face to face consultations with supervisors on a regular basis
Credits:	120
Course Assessment:	The written thesis makes up 100% of the final thesis mark.

Content: The content and nature for the thesis will depend on the topic of research selected by the student. Students will engage in independent research within industries, laboratories, and the field through attachments.

E. DEPARTMENT OF ENVIRONMENTAL SCIENCE

E.1. DEPARTMENTAL REGULATIONS

E.1.1. BACHELOR OF SCIENCE IN ECOLOGY & BIODIVERSITY CONSERVATION - 33BSEB

E.1.2. ADMISSION REQUIREMENTS

The University of Namibia General Regulations governing admission of students to first year undergraduate degree programmes shall apply. The general admission and entry requirements to undergraduate BSc in Ecology and Biodiversity Conservation programme shall be:

E.1.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must be in possession of a valid Namibian Senior Certificate (NSSC) with EITHER a pass in five different subjects as follows

- ★ Two (2) subjects on NSSCAS level with an average (d) or higher grade/s; one of which must be Biology.
- ★ Three (3) subjects on NSSCO level with a C or higher; one of which must be Mathematics and Physical Science (or equivalent).
- ★ English must be at minimum C grade on NSSCO level.

OR a pass in five different subjects as follows.

- ★ Three (3) subjects on NSSCAS level with an average of (d) or higher one of which must be Biology.
- ★ Two (2) subjects on NSSCO level with a D or higher; one of which must be Mathematics and Physical Science (or equivalent).
- ★ English must be at minimum C grade on NSSCO level.

E.1.4. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued PRIOR TO 2021 (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme:

EITHER a pass in five (5) different subjects as follows:

- ★ two (2) subjects on NSSCH with 4 or higher,
- ★ three (3) subjects on NSSCO with C or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a C on NSSCO.

OR a pass in five (5) different subjects with

- ★ three (3) subjects on NSSCH with 4 or higher,
- ★ two (2) subjects on NSSCO with C or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a C on NSSCO.

E.1.5. ALTERNATE PATHWAYS TO ADMISSION

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which will cover the following topics:
English Proficiency; General Knowledge; Biology, Mathematical Ability, and Physical Science.
A 60% average of all the papers is required, with no paper below 50%.

E.1.6. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

E.1.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

E.1.7.1. NORMAL ENROLMENT

- ★ 40 credits of which four modules (equivalent to 24 credits) must be non-core, by the end of the first year of registration.
- ★ 124 credits (of which ten modules (equivalent to 92 credits) must be non-core), by the end of the second year of registration.
- ★ 214 credits by the end of the third year of registration.
- ★ 264 credits by the end of the fourth year of registration

The programme must be completed after a maximum of five (5) years of registration.

E.1.7.2. EXTENDED ENROLMENT

The following re-admission regulations will apply to students enrolled for the extended programme:
To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 28 number of credits (of which 12 must be non-core) by the end of the first year of registration.
- ★ 92 number of credits (of which 28 must be non-core) by the end of the second year of registration.
- ★ 170 number of credits by the end of the third year of registration
- ★ 230 number of credits by the end of the fourth year of registration
- ★ 298 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of six (6) years of registration.

E.1.8. ADVANCEMENT AND PROGRESSION RULES

E.1.8.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **87** credits.
- ★ Year 2 to Year 3: All first-year credits in addition to at least **84** second-year credits

E.1.8.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least **60** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least **64** second year credits
- ★ Year 3 to Year 4: All second-year credits and at least **54** third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than **20%.**

E.1.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be **awarded to candidates credited** with a minimum of **402 credits, who have passed all core modules** and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

E.1.10. MODULE EQUIVALENTS DURING TRANSITION PHASE

Modules from older curricula with no equivalents will be offered again until either phased out, or for a maximum of 2 times only. The Department reserves the right to offer these in whatever mode logistics allow (blended or online).

E.1.11. BACHELOR OF SCIENCE IN ECOLOGY & BIODIVERSITY CONSERVATION (NQF LEVEL 7) 33BSEB

YEAR 1

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 1 Core Semester 1					
U3583DD	Digital Literacy	5	8	None	**C**
S3420EL	Laboratory and Field Safety	5	2	None	**C**
U3420EM	Ethics and Morality	4	2	None	**C**
U3420CN	National and Global Citizenship	4	2	None	**C**
U3520LP	Leadership	5	2	None	**C**
U3583DD	Digital Literacy	5	8	None	**C**
S3420EL	Laboratory and Field Safety	5	2	None	**C**
Year 1 Semester 1					
S3511VD	Introduction to GIS and Remote Sensing	5	14	None	**C**
S3511BB	Foundations of Biochemistry and Biology	5	14	None	**C**
S3511SF	Fundamentals of Statistics	5	12	None	**C**
S3511EE	Introduction to Ecology	5	14	None	**C**
Year 1 Semester 2					
S3512ED	Diversity of Life	5	14	None	**C**
S3501TG	Introduction to Genetics	5	7	None	**C**
S3502EW	Water Resource Management	5	7	None	**C**
S3532EF	Fundamentals of Conservation Biology	5	14	None	**C**
S3552EP	Practical Skills in Biology	5	14	None	**C**
Total credits			**134**		

YEAR 2

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 2 Core Semester 1					
U3683AL	Academic Literacy II	6	8	None	C
U3420PJ	Project Management	4	2	None	C
U3420RT	Entrepreneurship	4	2	None	C
U3520TH	Critical thinking	5	2	None	C
U3420SE	Sustainability and environmental awareness	4	2	None	C
S3600EM	Marine Ecology	6	8	None	C
Year 2 Semester 1					
S3611EA	Animal Form and Function	6	16	S3511BB & 3512ED	C
S3611EB	Biostatistics	6	16	S3511SF	C
S3601EF	Freshwater Ecology	6	8	S3511EE	C
S3611ET	Ecological Field Techniques	6	16	S3511EE & S3512ED	C
Year 2 Semester 2					
S3612EP	Plant Form and Function	6	16	S3511BB & S3512ED	C
S3632EE	Ecosystem Ecology	6	16	S3611ET	C
S3632EC	Conservation Biology and Biodiversity	6	16	S3611ET	C
S3602EV	CWIE PREP	6	8	None	C
Total credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 3 Core Semester 1					
W3700IC	Workplace Attachment	7	24		E
S3710EC	Community engagement	7	24		E
S3710EP	Project- based learning	7	24		E
Year 3 Semester 1					
S3711ER	Research methods	7	18	S3611EB	C
S3731ES	Taxonomy and Systematics	7	18	S3611EA & S3612EP	C
S3751EB	Conservation Biogeography	7	18	S3632EC	C
Year 3 Semester 2					
S3712EC	Ecosystems & Climate Change	7	18	S3511EE	C
S3752EE	Ecophysiology	7	18	S3611EA & S3612EP	C
S3772EP	Population & Community Ecology	7	18	S3632EE	C
Total credits			**132**		

E.11.2. EXTENDED ENROLMENT

This option caters **for students without the required Biology on NSSCAS level** but meets all other requirements. Thus, in additions to normal enrolment modules, these students will enrol for the following extra/ extended two – 2- modules:

1. **S3411TM** Biology Support
2. **S3512ED** Diversity to Life

E.2. BACHELOR OF SCIENCE IN ENVIRONMENTAL AND GEOGRAPHICAL SCIENCES - 33BEGS

E.2.1. ADMISSION REQUIREMENTS

The University of Namibia General Regulations governing admission of students to first year undergraduate degree programmes shall apply. The general admission and entry requirements to undergraduate BSc in Environmental and Geographical Sciences programme shall be:

E.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with EITHER a pass in five (5) different subjects with:

- ★ two (2) subjects on NSSCAS level with a **"d"** average or higher, specifically Biology or Geography,
- ★ three (3) subjects on NSSCO at level **C** or higher, two of which should be Mathematics and Chemistry, and
- ★ English that must be at minimum **C** at NSSCO level.

OR A pass in five (5) different subjects With

- ★ three (3) subjects on NSSCAS level with a **"d"** average or higher, specifically Biology & Geography, preferably, also Mathematics,
- ★ two (2) subjects on NSSCO at level **D** or higher, one of which should be Mathematics if it wasn't taken on AS, and
- ★ English that must be at minimum **C**' at NSSCO level.

Candidates that qualify for admission to the University but lack the appropriate subjects or grades on NSSCAS as outlined above for admission to the programme, can opt to rather enrol for the Extended Enrolment of this programme that will take one year longer.

E.2.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued PRIOR TO 2021 (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme:

EITHER a pass in five (5) different subjects as follows:

- ★ two (2) subjects on NSSCH with **4** or higher,
- ★ three (3) subjects on NSSCO with **C** or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a **C** on NSSCO.

OR a pass in five (5) different subjects with

- ★ three (3) subjects on NSSCH with **4** or higher,
- ★ two (2) subjects on NSSCO with **C** or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a **C** on NSSCO.

E.2.4. ALTERNATE PATHWAYS TO ADMISSION

E.2.4.1. MATURE AGE ENTRY SCHEME (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of: English Proficiency, General Knowledge, Mathematical Ability, and Environmental Science.
A 60% average in all the papers is required, with no paper being scored below 50%.

E.2.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **RECOGNITION OF PRIOR LEARNING (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme. **Marginalised Group Scheme students** who do not qualify for this programme will be enrolled in in diploma programmes that they qualify for which are not necessarily offered in the Department of Environmental Science.

E.2.5. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference will be given to students with the higher aggregate mark calculated from Biology, Mathematics, Geography, Physics and Chemistry at NSSCAS. However, consideration will be made to ensure equity in terms of gender, marginalized groups and regional representation.

E.2.6. ASSESSMENT CRITERIA

The assessment criteria are module specific. Some modules carry a component of Continuous Assessment (CA) and Examination while others are assessed on the basis of **100%** Continuous Assessment.

1. The CA will comprise a combination of the following: written tests, assignments, field studies, laboratory practicals, reports, mini-projects, and seminar presentations as specified under the respective Module descriptors.
2. A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination, unless otherwise stated in the individual module descriptor.
3. Duration of examinations will be for 3 hours for full Modules (14 credits for Year 1, 16 credits for Year 2 and 18 credits for Year 3) and 2 hours for half Modules (7 credits for Year 1, 8 credits for Year 2 and 9 credits for Year 3).
4. In order to pass a module, a minimum final mark of 50% is required, unless otherwise stated in the individual module descriptor.
5. **For modules assessed with Continuous Assessment (CA) and Examination,**

- ★ a minimum CA mark of 40% is required to gain entrance into the relevant module examination,
- ★ the final mark for each module shall be calculated using a ratio of *CA mark: Exam Mark* of **50%:50%,** and
- ★ to pass such a module, a minimum final mark of **50%** shall be required.

6. To qualify for a Supplementary Exam a final mark of **45—49%** is required, subject to a subminimum of 40% in the Exam.
7. For 100% Continuous Assessment modules, a final aggregate mark of **50%** shall be required to pass.

Notwithstanding the above, a sub-minimum of at least 40% will apply to the Exam Mark, unless otherwise stated in the individual module descriptor.

E.2.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted to the School of Science, terms and conditions as set by the School shall apply. To be re-admitted to the into Bachelor of Science in Environmental and Geographical Science programme, however, a student must have successfully completed the following minimum number of credits as indicated below:

E.2.8.1. NORMAL ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 64 number of credits (of which 40 must be non-core) by the end of the first year of registration.
- ★ 128 number of credits (of which 80 must be non-core) by the end of the second year of registration.
- ★ 192 number of credits by the end of the third year of registration
- ★ 256 number of credits by the end of the fourth year of registration

The programme must be completed after a maximum of five (5) years of registration.

E.2.8.2. EXTENDED ENROLMENT

The following re-admission regulations will apply to students enrolled for the extended programme:

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 38 number of credits (of which 26 must be non-core) by the end of the first year of registration.
- ★ 96 number of credits (of which 44 must be non-core) by the end of the second year of registration.
- ★ 134 number of credits by the end of the third year of registration
- ★ 196 number of credits by the end of the fourth year of registration
- ★ 290 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of six (6) years of registration.

E.2.9. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least two thirds of the courses of the curriculum for a specific year have been passed. If a student passed only one third of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases, prerequisites for courses have to be passed before a student can proceed to register for courses that require prerequisites. A student must have passed the minimum number of credits as indicated below to be admitted to register for modules on the next (subsequent) year level.

E.2.9.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **102** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 84 second year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

E.2.9.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least **60** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least **64** second year credits
- ★ Year 3 to Year 4: All second-year credits and at least **54** third year credits

E.2.10. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **396 credits**, who have completed all compulsory modules and core modules under this programme and have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

E.2.11. ARTICULATION ROUTES

This qualification may serve as an entry point to an honour's degree in environmental management, Geospatial Science, Forestry, Rangeland Management, Ecological Restoration, Ecology and Biodiversity Conservation, or related postgraduate degrees and diplomas.

E.2.12. BACHELOR OF SCIENCE IN ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE (NQF LEVEL 7) – 33BEGS

This option caters for students that have the required NSSCAS Mathematics and NSSCAS Biology/Geography

YEAR 1

CODES	COURSE NAMES	NAF	CREDITS	CO/PRE-REQUISITES	Comp-C/Elect-E
Core Semester 1					
U3403FS	Skills Portfolio	4	NCB	None	**C**
U3583AL	Academic Literacy I	5	8	None	**C**
U3583DD	Digital Literacy	5	8	None	**C**
S3420EL	Laboratory and Field Safety	4	2	None	**C**
U3420CN	National and Global Citizenship	4	2	None	**C**
U3420EM	Ethics and Morality	4	2	None	**C**
U3420SE	Sustainability and environmental awareness	4	2		**C**
Year 1 Semester 1					
S3531VA	Introduction to Environmental Science	5	12	None	**C**
S3511SF	Fundamentals of Statistics	5	12	None	**C**
S3511EE	Introduction to Ecology	5	14	None	**C**
S3511VD	Introduction to GIS and Remote Sensing	5	14	None	**C**
Year 1 Semester 2 [Electives: choose between S3512ED & S3512VH; & choose either S3512EC & S3532VH]					
S3512ED	Diversity of Life	5	14	None	**E**
S3512VH	Human Environment	5	14	None	**E**
S3572VM	Mathematics for Environmental Sciences	5	12	None	**C**
S3532CL	Chemistry for Life Sciences	5	14	None	**C**
S3512EC	Climatology	5	14	None	**E**
S3512VG	Geomorphology	5	14	None	**E**
S3532VH	Hydrology	5	14	None	**E**
Total credits			**130**		

YEAR 2

CODES	COURSE NAMES	NAF	CREDITS	CO/PRE-REQUISITES	Comp-C/Elect-E
Core Semester					
U3683AL	Academic Literacy II	6	8	Academic Literacy I	
U3420PJ	Project Management Skills	4	2		
U3420RT	Entrepreneurial Skills	4	2		
U3520TH	Critical thinking	5	2		
U3520LP	Leadership Skills	5	2		
S3620VE	Environmental Justice and Ethics	6	8		
Year 2 Semester 1: [Electives: choose one elective]					
S3621VS	Soil Science	6	8	S3531VA & S3532CL	E
S3661VS	Social & Cultural Geography	6	8	S3512VB	E
S3621VP	Population Geography and Demography	6	8	S3512VB	E
S3611EB	Biostatistics	6	16	S3511SF	
S3611VP	Introduction to Programming with Python	6	16	None	C
S3611ET	Ecological Field Techniques	6	16	S3511IE	C
Year 2 Semester 2 [Electives: choose any two from the electives]					
S3632EE	Ecosystem Ecology	6	16	S3611ET	E
S3612VR	Regional Development	6	16	S3512VB	E
S3672VC	Climate Change, Mitigation and Adaptation	6	16	S3512EC	E
S3632VE	Environmental Pollution and Control	6	16	S3532CL	E
S3652VG	Geo-scripting	6	16	S3611VP	C
W3630EC	Cooperative and Work Integrated Education	6	8		C
Total credits			**136**		

YEAR 3

CODES	COURSE NAMES	NAF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Core Semester					
W3700IC	Workplace Attachment	7	24	W3630EC	E
W3750EP	Project -based learning	7	24	W3630EC	E
W3710EC	Community engagement	7	24	W3630EC	E
Year 3 Semester 1: [Electives: choose one elective]					
S3711ER	Research methods	7	18	S3611EB	C
S3731VE	Environmental Policy, Law, and Planning	7	16	None	C
S3751VS	Spatial Analysis and Cartography	7	18	S3511VD	C
Year 3 Semester 2 [Electives: choose any two from the electives]					
S3732VE	Environmental Impacts Assessment	7	18	None	C
S3752VD	Disaster Risk Assessment & Management	7	18	None	E
S3772VE	Environmental Health & Safety	7	18	None	E
S3712VD	Spatial Database Management	7	18	S3652VG	C
S3712VG	Geopolitics	7	18	None	E
Total credits			**130**		

E.2.12.1. EXTENDED ENROLMENT

OPTION ONE: NSSCAS Biology & NSSCO Mathematics

This option caters **for students with the required Biology on NSSCAS level** but ***have NSSCO Mathematics &*** meets all other requirements. Thus, in additions to normal enrolment modules, these students will enrol for the following extra/ extended two – 2-modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II

E.2.12.2. OPTION TWO: NSSCAS Geography & NSSCO Mathematics

OPTION TWO: NSSCAS Geography, but have NSSCO Mathematics

This option caters **for students with the required Geography on NSSCAS level** but ***have NSSCO Mathematics &*** meets all other requirements. Thus, in additions to normal enrolment modules, these students will enrol for the following extra/ extended four (4) modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II
3. **S3411TM** Biology Support
4. **S3512ED** Diversity of Life

E.3. BACHELOR OF SCIENCE IN FORESTRY AND RANGELAND MANAGEMENT - 33BSFR

E.3.1. ADMISSION REQUIREMENTS

The University of Namibia General Regulations governing admission of students to first year undergraduate degree programmes shall apply. The general admission and entry requirements to undergraduate **BSc in Ecology & Biodiversity Conservation** programme shall be:

E.3.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

The candidate must be in the possession of a valid Namibian Senior Secondary Certificate (NSSC) with:

Five different subjects as follows:

- ★ 2 subjects on NSSCAS level with an average **"d"** or higher one of which must either be **Biology or Mathematics**.
- ★ 3 subjects on NSSCO level with a **"C"** or higher, one of which must either be Mathematics or Biology or Geography or Chemistry.
- ★ English must be at minimum **"C"** at NSSCO level

OR A total of at least 27 POINTS on the UNAM Scale obtained in five different subjects as follows:

- ★ 3 subjects on NSSCAS level with an average **"d"** or higher, two of which must be Biology and Mathematics, or Biology and Geography)
- ★ 2 subjects on NSSCO level with an average **"D"** or higher including any of these subjects Biology, Chemistry, Geography, Mathematics, Development Studies, Agricultural Science.
- ★ English must be at minimum **C** at NSSCO level.

Preference will be given to candidates that met the above criteria and who have subject combination constituting Biology, Mathematics, Agricultural Sciences, Chemistry, Development Studies, and Geography.

E.3.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme:

EITHER a pass in five (5) different subjects as follows:

- ★ two (2) subjects on NSSCH with **4** or higher,
- ★ three (3) subjects on NSSCO with **C** or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a **C** on NSSCO.

OR a pass in five (5) different subjects with

- ★ three (3) subjects on NSSCH with **4** or higher,
- ★ two (2) subjects on NSSCO with **C** or higher, and additionally,
- ★ English, Mathematics and Physical Science must be at minimum a **C** on NSSCO.

E.3.4. ALTERNATE PATHWAYS TO ADMISSION

E.3.4.1. MATURE AGE ENTRY SCHEME (MAE)

MATURE AGE ENTRY SCHEME (MAE) under the following conditions: Candidates should

- ★ Be at least 25 years old on the 1st day of the academic year in which admission is sought, have at least completed senior secondary education, and
- ★ Have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for three (3) Mature Age Entry Examination papers, which will cover the following topics: English Proficiency, General Knowledge, Biology and Work experience related questions.[1]

A pass mark of 50% or above is required for a candidate to be admitted. Preference will be given to candidates with high marks.

E.3.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **RECOGNITION OF PRIOR LEARNING (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

E.3.5. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference will be given to students with the higher aggregate mark calculated from Biology, Mathematics, Geography, Physics and Chemistry at NSSCAS. However, consideration will be made to ensure equity in terms of gender, marginalized groups and regional representation.

E.3.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

E.3.6.1. NORMAL ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 54 of credits (of which 24 credits be non-core) by the end of the first year of registration
- ★ 162 of credits (of which 36 must be non-core) by the end of the second year of registration.
- ★ 214 credits by the end of the third year of registration
- ★ 260 credits by the end of the fourth year of registration

The programme must be completed after a maximum of five (5) years of registration.

[1] *The Physical Science paper will consist of a Physics part and a Chemistry part.*

E.3.6.2. EXTENDED ENROLMENT

The following re-admission regulations will apply to students enrolled for the extended programme:
To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 number of credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 92 number of credits (of which 28 must be non-core) by the end of the second year of registration.
- ★ 170 number of credits by the end of the third year of registration
- ★ 230 number of credits by the end of the fourth year of registration
- ★ 298 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of six (6) years of registration.

E.3.7. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least two thirds (2/3) of the courses of the curriculum for a specific year have been passed. If a student passed only one third (1/3) of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases prerequisites for courses have to be passed before a student can proceed to register for courses that require prerequisites. A student must have passed the minimum number of credits as indicated below to be admitted to register for modules on the next (subsequent) year level.

E.3.7.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: 2/3rd (equivalent to **7 modules or 88 credits**)
- ★ Year 2 to Year 3: 2/3rd (equivalent to **14 modules or 175 credits)**

E.3.7.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least 60 credits
- ★ Year 2 to Year 3: At least 120 credits
- ★ Year 3 to Year 4: At least 174 credits

E.3.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **396 credits** and have passed all core modules and completed all compulsory modules under this programme and have met the requirements of all electives.

E.3.9. MODULE EQUIVALENTS DURING TRANSITION PHASE

The new curriculum will be implemented on a year-by-year basis starting in 2023, being fully implemented in 2025.
The **Bachelor of Science in Forestry and Rangeland Management** is a transformationof the former **Bachelor of Science in Integrated Environmental Sciences (BSc IES)** previously offered at **Ogongo Campus**. The equivalents presented here are therefore extracted mainly from year 1-3 of the previous BSc IES.

E.3.10. BACHELOR OF SCIENCE IN FORESTRY AND RANGELAND MANAGEMENT (NQF LEVEL 7) 33BSFR

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
U3403FS	Skills portfolio	5	0	None	**C**
U3583AL	Academic Literacy I	5	8	None	**C**
U3583DD	Digital Literacy	5	8	None	**C**
U3420CN	National and Global Citizenship	5	2	None	**C**
U3420CN	Ethics and Morality	5	2	None	**C**
S3420EL	Laboratory and Field Safety	4	2	None	**C**
U3420SE	Sustainable Environmental Awareness	5	2	None	**C**
Year 1 Semester 1					
S3511SF	Fundamentals of Statistics	5	12		
S3511BB	Foundations of Biochemistry & Biology	5	14		
S3511VD	Introduction to GIS and Remote Sensing	5	14		
S3511EE	Introduction to Ecology	5	14		
Year 1 Semester 2					
S3512EC	Climatology	5	14		
S3572VM	Mathematics for Environmental Science	5	12		
S3532CL	Chemistry for Life Science	5	14		
S3501TG	Introduction to Genetics	5	7		
S3502EW	Water Resource Management	5	7		
Total credits			**132**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
U3683AL	Academic Literacy II	6	8	None	**C**
U3420PJ	Project Management	6	2	None	**C**
U3420RT	Entrepreneurship	6	2	None	**C**
U3520TH	Critical thinking	6	2	None	**C**
U3520LP	Leadership	6	2	None	**C**
S3620VE	Environmental Justice and Ethics	6	8	None	**C**
Year 1 Semester 1					
S3621VS	Soil Science	6	8		**C**
S3611EB	Biostatistics	6	16		**C**
S3611VP	Introduction to programming with Python	6	16		**C**
S3611EF	Forest and Rangeland Flora	6	16		**C**
Year 1 Semester 2					
S3612EA	Angiosperm Physiology	6	16	BCY 3511	**C**
S3612EF	Forest and Rangeland Field Study Methods	6	16	EBC 3531	**C**
S3612ES	Silvicultural Practices	6	16	none	**E**
S3612EW	Wildlife Management in Rangeland & Forests	6	16	none	**E**
W3780ZE	CWIE preparation	6	8		**C**
Total credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
W3730EN	Internship	5	24		
S3710EC	Community Engagement	5	24		
W3750EP	Project/ Product Based Learning	5	24		
Year 1 Semester 1					
S3751VS	Spatial Analysis and Cartography	7	18	EGS 3511	**C**
S3711EN	Natural Resource Economics	7	18	None	**E**
S3711EB	Community-based Management of Forest and Rangeland Resources	7	18	None	**E**
S3711ER	Research methods	7	18	None	**C**
Year 1 Semester 2					
S3712EG	Natural Resource Governance	7	16		**C**
S3712EF	Forest and Rangeland Protection	7	16		**C**
S3702EA	Agroforestry for Drylands	7	9		**C**
S3702ES	Sustainable Management of Forest and Rangelands	7	9		**C**
Total credits			**128**		

E.3.10.1. EXTENDED PROGRAMME

Option 1: Students obtained Biology at NCC-AS who need support with NCC-AS Mathematics

This option caters **for students with the required Biology on NSSCAS level** but ***have NSSCO Mathematics &*** meets all other requirements. Thus, in additions to normal enrolment modules, these students will enrol for the following extra/ extended two (2) modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II

E.3.10.2. OPTION 2: STUDENTS OBTAINED NCC-AS MATHEMATICS WHO NEED SUPPORT WITH NCC-AS BIOLOGY

OPTION TWO: NSSCAS Mathematics, but have NSSCO Biology

This option caters **for students with the required Geography on NSSCAS level** but ***have NSSCO Mathematics &*** meets all other requirements. Thus, in additions to normal enrolment modules, these students will enrol for the following extra/ extended two (2) modules:

1. **S3411TM** Biology Support
2. **S3512ED** Diversity of Life

E.3.10.3. MODULE EQUIVALENTS

The Bachelor of Science in Environmental and Geographical Science replaces the first 3 years of Bachelor of Science in Geoinformation Science Honours previously offered in the former Department of Geography, History, Environmental Studies, Main Campus, and the Bachelor of Science in Integrated Environmental Science Honours previously offered in the former Department of Integrated Environmental Science, Ogongo Campus. Geography modules in the former Department of Geography, History, Environmental Studies are also replaced by modules under the Bachelor of Science in Environmental and Geographical Science. The equivalents presented here are therefore only for the first 3 years of the former degrees. The fourth years of the Bachelor of Science in Geoinformation Science Honours and Bachelor of Science in Integrated Environmental Science Honours will be replaced by 1-year honours (level 8) programmes.

E.3.10.1. MODULE EQUIVALENTS

Module Code	Old Module	CREDITS	LEVEL	New Module	CODE	CRDITS	CREDTS
			33BSEB				
EBL3631	Introduction to Ecology	16	6	*To be offered*	S3511EE		
BLG3621	Biometrics I	8	6	*To be offered*			
BLG3622	Biometrics II	8	16	*To be offered*			
BLG 3611	Animal Form & Function	16	6	Animal Form & Function	S3611EA	16	**6**
EBL3632	Ecological Field Techniques	16	6	**Ecological Field Techniques (Now 100% formative assessment)**	S3611ET	16	**6**
BLG3612	Plant Form & Function	16	6	Plant Form & Function	S3612EP	16	**6**
EBL3712	Ecosystem Ecology	16	7	*To be offered*	S3632EE		
EBL3771	Conservation Biology & Biodiversity	16	7	*To be offered*	S3632Ec		
BLG3702	Research Methodology	8	7	*To be offered*			
EBL3721	Biosystematics I	8	7	*To be offered*			
EBL3722	Biosystematics II	8	7	*To be offered*			
EBL3751	Aquatic Ecology	16	7	*To be offered*			
EBL3741	Ecological Systems & Climate Change			*To be offered*			
EBL3752	Ecophysiology	16	7	Ecophysiology	**S3752EE**	18	**7**
			33BEGS				
GIS3532	Introduction to GIS	5	16	No equivalent- module is to be offered again			
GRS3531	Geo-Scripting I			No equivalent- module is to be offered again			
GRS3552	Geo-Scripting II	5	16	No equivalent- module is to be offered again			
GHE3581	Fundamentals of Physical Geography	5	12	Intro to Environ. Science	S3531VA	5	**12**
GHE3582	Fundamentals of Human Geography	5	12	Human Environment	**S3512VH**	5	**12**
GRS3611	Remote Sensing, I	6	16	No equivalent- module is to be offered again			
GRS3652	Remote Sensing II	6	16	No equivalent-module is to be offered again			
GGS3611	Spatial Statistics	6	16	No equivalent- module is to be offered again			
GLS3612	Land Administration & GIS	6	16	No equivalent- module is to be offered again			
GIS3671	System Thinking	6	16	No equivalent- module is to be offered again			
GCS3612	Web GIS Development	6	16	No equivalent- module is to be offered again			
GHE3601	Geomorphology	6	8	No equivalent- module is to be offered again			
GHE3621	Climatology	6	8	No equivalent- module is to be offered again			
GRS3652	Remote Sensing II	6	16	No equivalent- module is to be offered again			
GGS3611	Spatial Statistics	6	16	No equivalent- module is to be offered again			
GLS3612	Land Administration & GIS	6	16	No equivalent- module is to be offered again			
GIS3671	System Thinking	6	16	No equivalent- module is to be offered again			
GCS3612	Web GIS Development	6	16	No equivalent- module is to be offered again			
GHE3601	Geomorphology	6	8	No equivalent- module is to be offered again			
GHE3621	Climatology	6	8	No equivalent- module is to be offered again			
GHE3661	Economic Geography	6	8	No equivalent- module is to be offered again			
GHE3641	Settlement Geography	6	8	No equivalent- module is to be offered again			
GHE3682	Social Geography	6	8	Social & Cultural Geograph	**S3661VS**	6	**8**
GHE3642	Biogeography	6	8	No equivalent- module is to be offered again			
GHE3662	Pedology	6	8	Soil Science	**S3621VS**	6	**8**

GPE3622	Hydrology	6	8	No equivalent- module is to be offered again			
IES3691	Environmental Science	6	12	No equivalent- module is to be offered again			
IES3622	Climatology & Hydrology	6	8	No equivalent- module is to be offered again			
GRS3751	Photogrammetry	7	16	No equivalent- module is to be offered again			
GSM3712	Spatial Modelling & Simulation	7	16	No equivalent- module is to be offered again			
GDM3712	Geodatabase Management	7	16	Spatial Database Managt	**S3712VD**	7	**18**
GIS3772	Advanced spatial analysis & Applications	7	16	No equivalent- module is to be offered again			
GRS3702	Research Methodology in Geo-information Science	7	8	Research methods	**S3711ER**	7	**18**
GCM3711	Cartography and Mapping	7	16	No equivalent- module is to be offered again			
GHE3711	Environmental Studies	7	16	No equivalent- module is to be offered again			
GHE3731	General Methods & Techniques in Geography	7	16	No equivalent- module is to be offered again			
GHE3752	Regional Geography	7	16	No equivalent- module is to be offered again			
GIS3711	Geographic Analysis & Techniques	7	16	No equivalent- module is to be offered again			
GIS3732	Geographical Information Systems	7	16	No equivalent- module is to be offered again			
GES3799	Excursion*[2]	7	*	No equivalent- module is to be offered again			
GES3791	Geo – informatics	7	12	No equivalent- module is to be offered again			
IED3781	Dryland Plants	7	12	No equivalent- module is to be offered again			
IEP3781	Principles of Wildlife Management	7	12	No equivalent- module is to be offered again			
IEA3781	Agroforestry	7	12	No equivalent- module is to be offered again			
IEN3782	Natural Resource Governance	7	12	No equivalent- module is to be offered again			

E.3.10.2. DEPARTMENT OF ENVIRONMENTAL SCIENCE COURSE DESCRIPTIONS

E. 11.4.1. FIRST YEAR COURSES

S3420EL **Laboratory & Field Safety**

NQF Level: 4
NQF Credits: 2
Contact Hours: 1 contact lecture period per week for one semester
Course Assessment: The module will be evaluated using **100% continuous assessment** (role playing, reflective journals, forum discussions and report). A minimum pass mark for the module is **50%.**

COURSE DESCRIPTION: Trip Preparation; Emergency Action Plan, Logistics, Gear list, Menu Planning, Knot Tying, Expedition Behavior. **Leave No Trace;** 1. Plan Ahead and Prepare, Dispose of Waste Properly, Leave What You Find, Minimize Campfire Impacts, Respect Wildlife, Be Considerate of Other Visitors, First **Aid Issues and Emergency Procedures;** First Aid Supplies, Emergency Action Plan, Illnesses and Injuries. **Equipment;** Clothing, Footwear, Tents and Shelters, Backpacks, Hydration systems, Stoves, fuel and cooking set. **Camping Skills;** Packing gear, Backpacking, Identifying and preparation of camp site, Tent set up, Cooking. **Using Maps and GPS;** Scale and Colors, Orientation, Contour Lines, Bearings and GPS Units. **Laboratory safety;** Chemicals and specimens of special interest, glassware, sharp tools and objects, environmental hazards, electrocution hazards, fire, bio-hazardous material, personal protective equipment, special laboratory procedures.

S3511EE **INTRODUCTION TO ECOLOGY**

NQF Level: **5**
NQF Credits: **14**
Contact Hours: **4 lecture periods per week** and one **3-hour practical per week** for one semester.
Course Assessment: Continuous assessment will make up **50% of the Course grade** (i.e., at least 8 assessed practicals (40%], at least **2 tests [50%]** and **1 assignment, assessed as written [10%]**.
Examination: **1 x 3h examination** at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: Introduction: definitions, history, the levels of biological organization and the part thereof that constitutes the scope of ecology, application of ecology and components of the environment. **Conditions and Resources:** Environmental conditions, animals and their resources, plants and their resources. **Population Ecology**: Characteristics of populations- birth, death, movement, size, age structure, and sex ratios, density, dispersion, demographics, factors and processes influencing, densitydependent and independent factors, survivorship curves, life tables, life history strategies. **Community and Ecosystem Ecology**: measuring biodiversity, biotic interactions, biotic and abiotic influence on community structure, the flux of matter and trophic structures, food chains and food webs. **Aquatic Ecology**: introduction to the ecology of different aquatic systems (streams, lakes, oceans, coasts, estuaries). **Behavioral ecology**: introduce the role of behavior in understanding the ecology of organisms.

S3532CL **CHEMISTRY FOR LIFE SCIENCES**

NQF Level: **5**
NQF Credits: **14**
Contact Hours: 4 lecture periods per week and 1 practical session per week.
Course Assessment: Continuous assessment **Tests:** A minimum of three tests which **counts 70 %** towards the CA mark. **Laboratory Mark:** Laboratory work is graded and the average **counts 20 %** towards the CA mark. **Tutorials:** Each tutorial assessment is graded and **counts 10%** towards the CA mark.
Examination: **1 x 3h examination** at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: Review concepts: Significant figures; The factor-label method; Temperature scales; Density calculations. **Structure of the atom:** Nuclear atomic structure; Periodic table; Isotopes; Molecules and ions; Molecular and empirical Formulas; Naming Compounds. **The mole concept:** Molar mass; Avogadro's number; Percentage composition of compounds; Experimental determination of empirical and molecular formulas. **Chemical reactions and stoichiometry:** Chemical reactions and equations;

[2] To be offered two times only

Types of chemical reactions; Reaction stoichiometry; Limiting and excess Reagents; Reaction yield. **Chemical bonding:** Ionic; covalent and polar-covalent bonds; Lewis structures (octet rule, resonance and formal charges). **Reactions in Aqueous Solution:** General properties of aqueous solution; Precipitation reactions; Solubility of compounds; Molecular and ionic equations; Solution concentration and units; Dilution, Solution stoichiometry; Acid-Base Reactions; Conjugate acid-base pairs; Acid-Base titrations; Chemical equilibrium; Acid-base equilibrium; pH Scale; buffers. **Introduction to Redox Reactions:** Writing half-reactions; Assigning oxidation numbers; Balancing redox equations. **Organic Chemistry:** Introduction to hydrocarbons; Nomenclature and writing structure of organic compounds; Structural functional groups: alcohols; aldehydes; ketone; carboxylic acids; esters and ethers; Reactions of functional groups. **Carbohydrates, proteins and lipids:** Classification; reactions and qualitative analysis. **Enzymes:** Terminology; classification; and factors affecting enzyme activity. **Macronutrients and micronutrients:** Source; functions and chemical analyses.

S3512EC	**CLIMATOLOGY**
NQF Level:	**6**
NQF Credits:	**14**
Contact Hours:	3 hours lectures per week, 2 hours class practical per week for one semester 14
Course Assessment:	Continuous assessment **Tests:** A minimum of three tests which **counts 70 %** towards the CA mark. **Laboratory Mark:** Laboratory work is graded and the average **counts 20 %** towards the CA mark. **Tutorials:** Each tutorial assessment is graded and **counts 10%** towards the CA mark.
Examination:	**1 x 3h examination** at the end of the semester and counts **50%** towards the final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: **Definition:** weather, climate, difference between weather and climate. Diurnal variation of weather phenomenon (wind, air temperature, cloud cover, humidity) to long-term climatic variation (global cooling and warming, ice ages, snowball Earth hypothesis). **Components:** five components of Earth climate system (atmosphere, hydrosphere, lithosphere, biosphere, cryosphere) and their characteristics. **Energy input** from the Sun into the Earth's atmosphere, re-radiation of solar energy by Earth's surfaces back to atmosphere, trapping and return of infrared radiation to Earth surfaces by atmospheric greenhouse gases, differential heating of Earth surfaces. Radiative balance. Energy exchange and transformation. **Energy and heat transfer:** advection, convection and conduction, spatial variation in global pattern of heat distribution, resultant imbalance and air circulation patterns; surface air circulation, upper atmospheric circulation; global, regional and local winds. Air pressure and its variation with vertical elevation and from locality to locality on Earth. **Atmospheric processes:** climatological and meteorological processes in atmosphere. Heating and rise of air along with atmospheric stability and instability. Adiabatic lapse rate and cooling/heating of a rising/descending air column. Evaporation, atmospheric moisture flux, condensation, cloud formation, precipitation.

S3502EW	**WATER RESOURCE MANAGEMENT**
NQF Level:	**5**
NQF Credits:	**7**
Contact Hours:	2 hours lectures per week for one semester; 2 hours practical per week for one semester 7
Course Assessment:	CA will be **least 2 written assignments**, 1 written **field-based practical report**; **2 written tests.**
Examination:	**1 x 3h examination** at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: **Principles of hydrology:** hydrological cycle, interception of precipitation by vegetation canopies, interception capacity, interception loss, evapotranspiration, stemflow and throughfall; overland Hortonian flow, runoff, surface storage, infiltration, soil water, percolation, groundwater recharge; effects of forestry, agriculture, impoundments, industries and urban areas on surface water flows and aquifer recharge. **Accessing water:** exploration, development and exploitation of surface and groundwater sources. **Water supply:** distribution, allocation to and use of water by different sectors; water demand, chasing water demand, water demand management, water pricing strategies, balancing social, economic and ecological needs in water allocation, water balance calculations. **Water demand and supply situation in Namibia**: major water sources, uneven distribution of sources and population dispersal, national water master plans and supply schemes, water governance, water sector policy and regulatory framework, current and predicted future sectorial water consumption, capacity of water sources and sufficiency water, implications on economic growth, virtual water trade. Strategies for efficient water management in some sectors, domestic, agriculture, mining- water harvesting, conservation agriculture, efficient irrigation systems, water efficient appliances, water recycling. **Watershed management:** basin management committees, operation and management of major reservoirs. **Transboundary** shared water resources and conflicts over water. **Climate change** and its implications on water availability and management

S3512ED	**Diversity of Life**
NQF Level:	**5**
NQF Credits:	**14**
Contact Hours:	4 lecture periods and one 3-hour practical per week for one semester
Course Assessment:	Continuous assessment will make up **50%** of the Module grade (i.e., at least 8 assessed practicals **(40%], 3 tests [40%]** and **2 assignments**, assessed as written **[10%]** and seminar presentation **[10%].**
Examination:	**1 x 3h examination** at the end of the semester that counts **50%** towards the final mark.

COURSE DESCRIPTION: **Phylogeny and the tree of life:** Prokaryotes and Protists, Domains Bacteria: Archae and Eukarya, The Evolution of Plant and Fungal Diversity. **Non-vascular and Vascular Plants:** Non-vascular plant phyla: Hepatophyta, Anthocerophyta and Bryophyta. Vascular seedless plant phyla: Lyctophyta and Pterophyta. Vascular seed plant (gymnosperms and angiosperms). Gymnosperms phyla: Gingkophyta, Cycadophyta, Gnetophyta and Confirophyta. Angiosperm's phylum: Anthophyta. **The Evolution of Invertebrate Diversity:** Basal Animals, phylum: Cnidaria, Deuterostomate phyla: Echinodermata (Subphyla: Urochordata, Cephalochordata), protostomate phyla: Lophophorates, Rotifera, Mollusca, Anellida, Nematoda, and Anthropoda. **The Evolution of Vertebrate Diversity:** Vertebrate Evolution and Diversity key shared derived traits of the chordates and the chordate Subgroups. **Animal Diversity**: Characteristics of following vertebrate groups: hagfishes, lampreys, chondrichthyans, ray-finned fishes, lobe-finned fishes, amphibians, reptiles, birds, and mammals. **Primate Diversity. Hominin Evolution.**

S3632EC	Conservation Biology & Biodiversity
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	4 lecture periods and one 3-hour practical per week for one semester
Course Assessment:	The CA will be compiled in a **70:30 ratio** from **three written class tests** (summative assessment) and fortnightly tutorial tests.
Examination:	**1 x 3h examination** at the end of the semester and counts **50%** towards the final mark.
Prerequisite:	S3532EF Fundamentals of Conservation Biology

COURSE DESCRIPTION: Sets and their combinations: Sets, equality of sets, intersection, union, relative complement, de Morgan's laws and other laws of algebra of sets, proving simple tautologies, the power set, cardinality. Intervals: Introduction, combinations, types of linear inequalities, absolute value, quadratic. **Matrix calculus**: Definition, matrix operations, (square) matrix algebras and the laws – associativity, distributivity, invertible matrices. Linear systems and their (augmented) matrices, homogeneous and inhomogeneous systems, Gaussian row and column operations, echelon form, rank of a matrix. **Theory of functions:** What is a function? Injective, surjective, bijective functions, odd or even real-functions, piecewise defined functions, function graph transformations. **Differentiation:** discussion of a function graph, local extrema, points of inflection, asymptotic behavior. **Integration of real valued functions:** Revision of definite and indefinite integrals, integration by parts, convergence criteria for improper integrals. Applications of integration in biology.

S3511VG	Geography Support
NQF Level:	4
NQF Credits:	2
Contact Hours:	4 contact lecture periods per week for one semester; 2-hour practical session per week for one semester NCB
Course Assessment:	CA will make up **50%** of the course grade and a summative assessment.
Examination	1x 3 hours examination paper will contribute **50%**. A minimum pass mark for the module is **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction of essential foundations of Physical Geography: Key concepts and terminologies; principles and mechanisms of climate and weather; the nature and distribution of tectonic plates, and their processes and landforms at global and regional scales. **Fundamentals**: concepts physical principles important in the functioning of the atmospheric, lithospheric (endo- and exogenic), hydrologic and biogeographic processes. **Physical geography:** structures, processes and distributional patterns inherent in phenomena of "natural" environments, relating to climate, geomorphology, hydrology, soils and vegetation. **Basic application**: scientific methods as utilized in the subdiscipline of physical geography and the mapping of physical phenomena.

S3511TM	Biology Support
NQF Level:	4
NQF Credits:	2
Contact Hours:	4 lectures and one 3-hour practical session per week for the semester
Course Assessment:	CA will make up **50%** of the course grade and a summative assessment will contribute 50%.
Examination	1x 3 hours examination paper will contribute **50%**. A minimum pass mark for the module is **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: This is an introductory biology module that is designed to allow students to acquire a strong foundation into the biological sciences. **The following topics will be covered:** The 5 common themes of life (*biological organization, genetic information, energy and matter, interactions with organisms and their physical environment and evolutionary adaptation*). **Introduction to systems of classification** (systematics, including hierarchical, artificial, phenetic and phylogenetic classification); **Basic techniques in biology such as microscopy**: biological drawing, the scientific method and writing of scientific reports will be covered; **Chemical basis of life**: water, carbon, carbohydrates, proteins, nucleic acids, lipids and fats ; **Cell biology**: prokaryotic and eukaryotic cells, ultra-structure of plant and animal cells, cytoskeleton. Membrane structure and function, **Cellular communication**: Signalling molecules, signal reception, transduction and response. **Mitosis and meiosis**: cell cycle and stages of each process. **Mendelian genetics**: Genes, chromosomes, genomes, introduction to Mendelian genetics, chromosome theory of inheritance.

S3620VE	Environmental Justice & Ethics
NQF Level:	6
NQF Credits:	8
Contact Hours:	4 contact lecture periods per week for one semester.
Course Assessment:	CA will be evaluated using **100%** continuous assessment (at least four tests and four assignments). A minimum pass mark for the module is 50%.
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to environmental ethics: Definition and history of environmental ethics, **Ethical Theories:** anthropocentrism, bio-centrism, eco-centrism, virtue ethics: Aristotle; Deontology: Kant and Ross; Utilitarianism: Act and rule utilitarianism; Moral relativism; Individual relativism (subjectivism); Cultural relativism (conventionalism). **Environmental ethics and world views**: social ecology, social just conservation; Ethical Theories and Global Perspectives on the Environment: Western religious perspective (Judaism, Christianity, Islam, American Indian), Eastern religious perspectives (Buddhism; Hinduism); Anthropocentrism/species-ism: (Holism: the land ethic, Deep ecology, Eco-feminism). **Application of Ethical Theories to Global Environmental Issues**: Animal rights from a global perspective; Vegetarianism; Hunting for sport, furs, and zoos; Animal experimentation, environmental justice, climate justice, food security, fishing, water rights, consumer ethics, food ethics. **Preservation of global resources**: Wilderness, Species, Sustainability, Biodiversity; World population, poverty, and world hunger. **Environmental Justice**: history of environmental justice movement, environmental quality and environmental justice, environmental injustice, climate justice, Environmental rights for citizens

S3531VA **Introduction to Environmental Science**

NQF Level: **5**
NQF Credits: **12**
Contact Hours: 4 contact lecture periods per week for one semester.
Course Assessment: CA will make up **50%** of the course grade and a summative assessment will contribute 50%.
Examination 1x 3 hours examination paper will contribute **50%.** A minimum pass mark for the module is **50%.**

COURSE DESCRIPTION: **Definition of Earth systems**: land, water, sea and atmosphere and how these function collectively, to support life on Earth. **Concepts of**: environment, natural resources, demography and land use. **Biodiversity:** carrying capacity and sustainability and their role in establishing a viable human society within the Earth's systems. **Causes:** physical and social causes of environmental problems, and strategies to mitigate or manage these issues. **Major environmental concerns**: pollution, soil erosion and land degradation, desertification, climate change, plastic pollution. Means of controlling and averting, lessening, ameliorating and mitigating impacts of environmental problems on society, economy and ecosystems.

S3511VD **Introduction to GIS & Remote Sensing**

NQF Level: **5**
NQF Credits: **14**
Contact Hours: 4 contact lecture periods per week for one semester; 2-hour practical session per week for one semester.
Course Assessment: CA will make up **50%** of the course grade and a summative assessment will contribute 50%.
Examination 1x 3 hours examination paper will contribute **50%.** A minimum pass mark for the module is **50%.**

COURSE DESCRIPTION: Spatial data models and their structure; projections and coordinate systems; GPS; data sources, entry and editing; spatial data query, selection and classification; data output and presentation; map design and visualization; non-cartographic output. **Remote Sensing**: principles of RS; RS regions; image acquisition, sensors and platform; RS data sources, image pre-processing; basics of colour composite and creation; layer stacking, mosaicking, masking. Use of GIS and Remote Sensing software such as ArcGIS, ENVI, ILWIS and QGIS.

S3572VM **Mathematics for Environmental Sciences**

NQF Level: **5**
NQF Credits: **12**
Contact Hours: 4 lecture hours and 2 tutorial hours per week for one semester.
Course Assessment: CA will make up **50%** of the course grade and a summative assessment will contribute 50%.
Examination 1x 3 hours examination paper will contribute **50%.** A minimum pass mark for the module is **50%.**

COURSE DESCRIPTION: **Module content Sets and their combinations**: Sets, equality of sets, intersection, union, relative complement, de Morgan's laws and other laws of algebra of sets, proving simple tautologies, the power set, cardinality. Intervals: Introduction, combinations, types of linear inequalities, absolute value, quadratic. **Matrix calculus**: Definition, matrix operations, (square) matrix algebras and the laws – associativity, distributivity, invertible matrices. Linear systems and their (augmented) matrices, homogeneous and inhomogeneous systems, Gaussian row and column operations, echelon form, rank of a matrix. **Theory of functions:** What is a function? Injective, surjective, bijective functions, odd or even real-functions, piecewise defined functions, function graph transformations. **Differentiation:** discussion of a function graph, local extrema, points of inflection, asymptotic behaviour. **Integration of real valued functions:** Revision of definite and indefinite integrals, integration by parts, convergence criteria for improper integrals. Applications of integration in biology.

S3512VH **Human Environment**

NQF Level: **5**
NQF Credits: **14**
Contact Hours: 4 contact lecture periods per week for one semester; 2-hour practical session per week for one semester.
Course Assessment: CA will make up **50%** of the course grade and a summative assessment will contribute 50%.
Examination 1x 3 hours examination paper will contribute **50%.** A minimum pass mark for the module is **50%.**

Introduction to the human environment - Geography and other subjects, careers in human geography, basic concepts: possibilism & determinism, man and his environment, behaviour and perception. **Methods in human geography -** Site & situation, spatial analysis, regions, theories and models. **Population geography -** Population distribution, population density and population capacity, the population system, population change: fertility, mortality and migration, the Demographic Transition Model (DTM), population structures. **Migration -** Types of migration, brain drain & brain gain, migration explanations: economic & behavioural approaches, migration laws: Ravenstein's laws of migration, social and economic migration impacts. **Human settlements -** Origin and types of settlements, factors affecting the location of settlements, the interaction between rural and urban settlements, settlement form and function, settlement hierarchy, land-use zones, urbanization: definitions, history, trends, challenges and possible solutions to challenges. **Agricultural geography -** Definitions of farming systems, Determinants of farming systems, classification of farming systems, factors affecting agricultural systems over time, challenges to agricultural transformation, the Green Revolution: development, implementation, challenges and successes. **Industrial geography –** Definitions and concepts, types of industries, industrial location factors, the role of multinational companies, globalization and industrial development. **Geography of tourism -** Definition of leisure, recreation and tourism, factors influencing the growth of tourism, tourism demand: travel motivations, factors affecting the attractiveness of a tourism destination, impacts of tourism on destination areas, the vulnerability of the tourism industry, sustainable development and eco-tourism.

U3420PJ **Project Management Skills**

Course Title: **Project Management Skills**
Course Code: U3420PJ
NQF Level: **5**
NQF Credits: **8**
Contact Hours: 2-hour lecture per week for the first two weeks *and* field-based practical for the remaining four weeks.
Course Assessment: **100% continuous assessments.**

COURSE DESCRIPTION: This module consist of two components: ***The first component*** is a two week theory covering the **concepts (**project vs programme) and the **phases of project life cycle (project initiation and planning:** work breakdown, development of SMART indicators, estimation of activity duration, efforts, and costs, scheduling of activities, identification of critical path, setting of milestones, stakeholder identification and categorization, stakeholder engagement, initial risk identification, and development of the initial project plan; **project implementation & management:** forming the project team, managing people, resources allocation, responsibilities allocation, quality assurance, leadership style and project liaison; **project monitoring and control:** progress reporting

and communication, quality control, time management, budget and cost management, risk management and mitigation; **project closure and evaluation**: project evaluation, project auditing process and the closure process, and final project report). ***The second component*** is a four-week **field-based practical** where students participate in a real-life project in their immediate environment. Students are strictly required to apply the project management approach during the field-based practical.

S3661VS	**Social & Cultural Geography**
NQF Level:	**6**
NQF Credits:	**8**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester.
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: **Introduction** to social and cultural geography**; Theoretical foundations and approaches** to social and cultural geography**; Society and space**: defining society, the relationship between society and space, Other and Otherness, differentiation and struggle for power and resources. **The body, culture and identity**: The body and socio-cultural differentiation, Theories of 'race', Ethnicity & Multiculturaism, Integration/segregation. **Gender, sexuality and everyday life:** essentialist view of the body, constructionist view of the body, Radical perspectives on gender and sexuality. **Disability and its political, economic and cultural production**: disability theories, Disability and Capitalism, Stares and stairs - Social and cultural reproduction of disability. **Types and geographies of communities**: Gemeinschaft vs. Gensellschaft, social exclusion, Gated communities, Communities in cyberspaces. **Inequalities, poverty, crime, space and inequalities:** Explanations of poverty - personal and community perspectives, poverty and social oppression, unemployment, homelessness, crime and violence, policing the streets and dangerous 'others', fear of crime. **The geography of diseases:** infectious diseases and globalisation, epidemiological transition, diseases and the poor. **Places of Leisure:** Leisure and identity of place, leisure as time, leisure as activity and leisure as experience or state of mind.

S3611VP	**Introduction to Programming with Python**
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: The course covers environment setup(**Python Installation and Configuration**), saving of codes as scripts, **implementation of basic syntax** (addition, multiplication, division), apply **concepts** such as a variable (local and global), a loop (for and while), **control flow statements** (if, if else, break and stop), **data types** (e.g. numeric, integer, logical, string) and **operators**, **data structures** (turple, list, array, dictionary), **"function" concept in programming**, and writing and implementing of functions, and use of built-in functions; classes and methods; **installation of packages**, importation of packages, **reading external data**(tabular, vector and raster), plot the data, and write data to disk, saving codes as scripts, best programming practices. Throughout the course, students will be exposed to the best approaches for finding programming related answers to their programming issues that may arise, from online resources (e.g Stack flow).

S3632EE	**Ecosystem Ecology**
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: **Essential processes of ecological systems:** e.g. photosynthesis and decomposition. Nature of ecosystem energetics. **Primary production:** environmental factors facilitating and / or limiting primary production. **Secondary production:** environmental factors facilitating and limiting; models of energy flow in ecosystems; Application of food web / chain ecology: food chains and poisons in the environment. **Physical (vertical and horizontal) and biological structure:** latitudinal taxonomic diversity gradients; factors that may account for geographic patterns of species diversity. **Ecological disturbance:** Characteristics of ecological disturbance (intensity, frequency and scale), causes of disturbance, impacts of disturbance on nutrient cycling, responses of animals to disturbance, disturbance and community stability. **Process of ecological community succession:** types of succession; primary and secondary succession. Causes of succession; models of succession, climax succession state; climax community, theories of climax succession, fluctuations in climax communities, changes in ecosystem attributes, time and direction of succession, succession and biodiversity, degradative succession. **Microbial ecosystems and biogeochemical cycling:** Microbial habitats, soil, and plant microbial ecosystems. **Extremophiles:** definition of an extreme environment; thermophiles (hydrothermal vents, cold seeps and deserts); acidophiles and alkalophiles (micro flora in the gut; peats and bogs). **Definition and classification of biomes of the world. Environmental degradation:** different types of environmental degradation, especially those relevant to Namibia, including definition of desertification, causes of desertification, manifestations of desertification, action to combat desertification. Definition, causes of deforestation, effects of deforestation; deforestation in Namibia, possible solutions to deforestation.

S3612VR	**Regional Development**
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1X3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: **Development of Regions:** Definition and Foundation; Global Climatic Regions; Regional Development and Globalization. **Africa:** population, resources and development; Regional Economic Communities. **The Geography of Asia:** the "Middle East", Central Asia, East Asia South Asia and South East Asia. The Geopolitics and Oil Factors of North Africa and Middle East

Oil. **Europe**: European Politics and the European Union; European Cities and Immigration Issues; East Europe. The impact of Soviet Union (U.S.S.R) on Eurasia. **United State of America and Canada:** landforms, historic settlements, Economy and manufacturing, environmental challenges. The Development of Latin America and the Caribbean: Early Civilization, Social Movements in Economic Development. Oceania: Australia, New Zealand and the Pacific Islands.

S3612VG	**Geomorphology**
NQF Level:	**5**
NQF Credits:	**14**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: Conceptual basis of geomorphology. Weathering and mass wasting. Tectonic construction of landscapes. Eroding, transporting and depositing of material through aeolian, fluvial and hillslope systems. Landscapes at the coastal/marine interface. Relationships between properties of earth materials and the forces applied to them by gravity, wind, ice, water, waves and humans. Landscape evolution. Landscapes from Namibia and southern Africa.

S3672VC	**Climate Change, Mitigation & Adaptation**
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: **Introduction to climate science**: weather and climate change, global warming, greenhouse effects and its consequences on the climate. **International and national legal framework for climate change:** (UNFCC, Kyoto Protocol, Paris Agreement, and Namibia Climate Change Policy). **Impacts of climate change on natural resources**: (water resources, wildlife, agriculture, fisheries, and tourism) Mitigation measures to counter effect of climate change. **Climate change vulnerability, adaptation and mitigation** strategies (Conservation Agriculture, renewable energy, gender and climate change). **Climate change modelling and forecasting** (early warning system). Climate change awareness, vulnerabilities and its effects on communities including gender aspects.

S3532VH	**Hydrology**
NQF Level:	**5**
NQF Credits:	**14**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: **Hydrological processes**: evaporation, transpiration, precipitation, infiltration, percolation, groundwater, runoff, runoff generation. **Essentials of environmental hydrology:** with physical processes of water movement such as precipitation interception, overland (Hortonian) flow, stream runoff, subsurface flow. Movement, storage and supply of groundwater in aquifers. Water in saturated and unsaturated zones. Hydrologic cycle. Hydrological parameters and their measurement. Measurements and analysis of these processes as integral components of environmental hydrology. Gauging, computation, estimation and modelling of mean aerial precipitation, surface runoff, stream flow, discharge volume, flow velocity, flood return period, peak discharge, evaporation, precipitation, groundwater recharge, aquifer yield. Unit hydrograph and its components. Water quality parameters: pH, dissolved oxygen, temperature, turbidity, biological parameters. Types of aquifers, aquifer characteristic, and groundwater flow in aquifers. Factors that influence the spatial and temporal distribution of water resources. Contemporary issues pertaining to water resources management, particularly in arid environments.

S3612VS	**Soil Science**
NQF Level:	**6**
NQF Credits:	**8**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: **Definition and importance of soil:** mineral fraction, organic matter, soil water and air. Soil formation: types of rocks as parent material; processes of physical, chemical and biological weathering, fluvial and aeolian soil deposition. **Soil genesis:** Soil physical and chemical properties: texture, density, porosity, soil aeration and temperature, structure, compaction, profile, water holding capacity, cation exchange capacity. **Biological properties of soils**: microbial communities, microflora, macroplants and macrofauna. Soil classification based on soil chemical, physical and biological properties. Spatial variability of soil types. Soil types in Namibia, agro-ecological zones (AEZ) of Namibia. **Soil nutrients for plant growth**: nutrient content and nutrient availability. **Soil water and soil moistur**e: infiltration, storage, movement (horizontal and vertical) and availability. **Soil conditions**: acidity, alkalinity, salinity. Processes of soil salinization and soil degradation. Soil and conservation. Movements, retardation and decomposition of pollutants in soils. Use of soil data and information in land use and management planning.

S3621VP	Population Geography & Demography
NQF Level:	**6**
NQF Credits:	**8**
Contact Hours:	2 contact lecture periods per week for one semester. 2-hour practical session per week for one semester.
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction: Defining major concepts, population indicators, sources of population and demographic data. **Population structure and characteristics** – Age and sex structure; Impact of population processes on age and sex structure; dynamics of age-sex structures. **Population growth and change –** Defining population growth, causes of population growth, consequences of population growth. **Fertility as a component of change** – Defining fertility; biological & social components of fertility; measuring fertility; period and cohort measures; and, factors affecting fertility, explanations of high and low fertility. **Mortality as a component of change** – Mortality definition, lifespan & longevity; measuring mortality; differentials in mortality; causes of mortality decline. **Population movements** – definitions and classifications, causes of population movements, consequences of population movements, migration laws and policies. **Population and resources** – Relationship between population and resources, Malthus and Boserup theories, nature and use of resources, population and food supply. **Population and development** – The Demographic Transition Model: Origins, assumptions of the model, processes, effects, critique of the model, applicability of the model to contemporary population trends. **Human ageing and longevity** – contesting definitions, cause of ageing, global ageing trends, population ageing and population growth, advantages and disadvantages of ageing, major ageing issues in the developed world. **Population policies** – defining population policies, population variables and importance to policies, case studies of countries with different population policies.

S3652VG	Geo-scripting
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: The course assumes that students already have good working knowledge of programming, and are familiar with different types of spatial data (vector and raster). In the first part of the course, the focus will be on **vector data analysis**. In particular, students will learn how to read/write vector data, assign coordinate systems, and reproject spatial data to new coordinate systems, spatial data selection and subsetting based on attributes, overlay analysis (e.g. cropping, erasing, spatial differences), proximity analysis, spatial and attribute join, with an emphasis on one-to-one, one-to-many and many-to-one relationships. The second part of the course will focus on **raster data analysis**. Students will learn how to process raster data (e.g. satellite image). In particular they will learn how to assign, and re-project the raster data to a new coordinate system, and how to perform image enhancement and image subsetting, apply arithmetic operators to raster data, image classification (supervised and unsupervised classification), regression analysis using raster data; change detection (bitemporal change detection approaches). Challenges and opportunities related to handling and processing large raster datasets will be discussed. In the third part of this course, students will learn how to combine vector and raster data to perform spatial analysis.

S3611EB	Biostatistics
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** lecture periods per week and one 3 hour practical session per week for one semester
Course Assessment:	Continuous assessment (CA) will contribute 50% of the final mark and will consist of Practical (at least 8 assessed practical (25%), Theory (3 tests (15%), Worksheet assignment (5%), and Quizzes (5%).
Examination:	1 x 3 hr Theory paper. Pass mark for the module is **50%.**
Prerequisite:	**STS 3531** Descriptive Statistics

COURSE DESCRIPTION: the course will cover the following contents, Introduction (universality of biological variation, the need for statistics); Control of random variation (randomization, replication, use of a control); Probability and non-probability sampling approaches (types, advantages and when to use the approaches), the normal distribution; Hypothesis testing (testing hypothesis about the population mean, null and alternative hypotheses, calculating zscores, significance testing, Type I and Type II errors, testing for normality of data, confidence intervals); Experimental designs (Completely Randomized Design, Randomised Block Design, Factorial experiments); Non-parametric tests (Mann-Whitney U Test, The Wilcoxon Signed Rank Test, The Kruskal-Wallis Test, Spearman Rank Correlation, Chi-square Tests); Parametric tests (Student's t-test, One-way ANOVA, Two-Way ANOVA, Pearson Product Moment Correlation, Simple Linear Regression Analysis); Computers and statistical analysis of data (use of various statistical packages such as Statistical Package for the Social Sciences (SPSS) and/or STATISTICA and/or R to analyze biological data).

S3611ET	Ecological Field Techniques
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: Considerations in field sampling: objectives of sampling, type and behaviour of organisms, habitat considerations, equipment requirements, selection of appropriate methods, sampling design and strategy, random sampling, sample size, data recording and storage. **Quality assurance criteria during field work**: replication, blanks, repetitions; Formulation of scientific questions and hypotheses in the field and formulation of appropriate field data sheets. **Safety during field sampling**. **Ecological Field Sampling**: methods of sampling terrestrial vascular plants, surveying fungi and lichens (basic vegetation measures, plot-based and plotless techniques); methods of sampling aquatic macrophytes and algae; methods of sampling invertebrates in the field; methods of inventorying small mammals; methods of surveying large mammals; methods of sampling reptiles; methods of sampling birds and bats; methods of sampling fish and other aquatic animals. All the discussions on methods must include their applicability, advantages and disadvantages. Preserving organisms for natural history collections: killing jars and their uses,

herbarium specimens, 'spirit' collections, dry mounts, various agents of preservation and their advantages and disadvantages. **Introduction to GPS:** projection and distortions, basic and practical GIS concepts will be introduced.

S3772VE	**Environmental Health & Safety**
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**

COURSE DESCRIPTION: Introduction to environmental health and safety: basic safety, health and environmental issues, safety organization in mines and industries, personal protective equipment, causes of mine accidents, occupational health related accidents. **Industrial hygiene**, analysis of health and safety problems in the Namibian mining industry, exposure to toxic chemicals, biohazards, chemical hazards, air, water and noise control. **Mine environment**: mine dust, mine gases, mine fires, mine water, noise, illumination, acid mine drainage, mine tailings, radioactive and toxic substances, basic first aid. **Health, safety and environmental issues at workplaces** e.g in the mining of radioactive substances such as uranium. Health issues: different occupational diseases associated with mining and other industrial activities. **Legal aspects of occupational health and safety e.g mining legislation**: (Minerals Prospecting and Mining Act, Policy on Mining and Prospecting etc Health and Safety Management Systems, hazardous materials management, Public and Environmental Health Act (Act 1 of 2015), compliance issues to legislations and penalties. **Monitoring and assessment for compliance and reporting**: Occupational health and safety audit, WHMIS, environmental monitoring devices, personal protective equipment, and emergency response Protocols will be examined. Environmental Identification and Monitoring Systems, evacuation

S3712VG	**Geopolitics**
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction: Key political concepts, states, nations, nation-states, territoriality, citizenship, democracy, defining geopolitics, the nature of geopolitics, evolution of geo-political thought, a framework for understanding geopolitics: three schools of geopolitics (Sea power school, Landpower school, Airpower school), capability analysis. **Geopolitical agency**: concept of geopolitical codes, components of geopolitical codes, operation of geopolitical codes: allies, enemies, threats & justifications, justifying geopolitical agency, embedding geopolitics within national identity. **Cold war geo-politics**: history of cold war, US-Soviet relations, essence of cold war political order, impact on global order, peace and conflict, politics after the cold war.**Contemporary geopolitics**: what is it and where are we, key players, key concerns and areas of conflict (potential and real), relationships between major powers, major power dynamics, development, inequality. **Geographies of conflict:** nationalism and ethnic conflict, civil wars and external intervention, the Arab Spring – turbulence or winds of change? Terrorism and the threat to democracy. **Regional geo-political dynamics**: SADC, formation, aims, objectives, mandate, instruments, challenges, successes. **Geo-political world order**: rethinking dynamics of the world order, emerging giants, hotspots, diplomacy, force and deception, imperialism, colonialism, decolonization and neo-imperialism, international law, United Nations – history, mandate, operations, challenges and successes, The African Union – history, formation, challenges and successes.

S3732VE	**Environmental Impacts Assessment**
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to the EIA Process: Terminologies and defining the EIA process and relates it to the overall adaptive approach to environmental management. **Regulatory Frameworks**: Explore adaptive environment management framework, regulatory, policy and aspects of governance motivations and the actual drivers behind the EIA process from project scale to international level. **The EIA Process**: This lecture takes students through the environmental impact assessment process in detail including its link to the development of ensuing environmental monitoring and assessment programs. Examines how the risk assessment can be a core element of the EIA process and it can provide main outputs. Use a real-life case for a practical experience and or use case study to practice the process. **Social Impact Assessment**: Explain how EIA links to SIA, in terms of the social & cultural impact. Explain how the assessment methods SIA, that contributes to EIA and to better use of resources and better sustainable development. Of the projects' economic assessment from an application perspective and how they may be used to support planning & management beyond the EIA. **Statistics and the use of a Systems Approach & Modelling in the EIA:** Explain the current and emerging methods in statistics that are used within current EIA practices for assessment & monitoring design. Explores the fundamentals and range of systems approaches to environmental impact assessment, the usefulness of these tools within the EIA process and its design. **Stakeholder Engagement & EIA Reporting**: Analyse how stakeholder engagement is a key element of the EIA process and how the design and reporting of the EIA outcomes should be.

S3632VE	Environmental Pollution & Control
NQF Level:	**6**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Environment: spheres comprising living environment; environment as a source of resources and sink of wastes; environmental assimilative capacity; anthropogenic waste production and release in environment. **Definitions and terms:** contaminant, pollutant, ambient environmental conditions, environmental exposure, acute exposure, adverse [health] effects, toxicity, threshold, inversion. **Classifications of pollutants:** biodegradable and non-biodegradable, solid, liquid, gaseous wastes and pollutants without weight; air, soil, water and noise pollution. Concept of pollution and degradation of environmental quality. Effects of pollution: impair human health, soils and water toxicity, injurious to fauna and flora as well as ecosystems. **Atmospheric (air pollution)**: atmospheric chemistry, types of air pollutants, causes of air pollution, ozone depletion, greenhouse effect, ambient pollution and indoor pollution; meteorology and air pollution, measurement of air pollution. **Water pollution:** chemistry of water, types of water pollutants, sources of water pollution; pollutants in aquatic ecosystems, eutrophication, marine pollution; wastewater disposal, treatment, reclamation and purification; water quality testing; effluent discharge, water quality standards and guidelines; groundwater pollution. **Soil/land pollution:** soil chemistry, types of soil pollutants, sources of soil pollutants, effects of soil pollution on human health and the environment, fate of environmental pollutants in the soil; determining soil pollution, effects of soil pollution; phytoremediation of polluted soils. Environmental toxicology: **Concept of eco-toxicology:** substance and degree/nature of harmful effects; routes of exposure to environmental pollutants, level of exposure and response; types of toxicity, testing toxicity; effects of toxins: bioaccumulation, bio-magnification, bio-availability, bio-transformation, excretion; environmental risk analyses and assessment, criteria for a risk factor, determining acceptable exposure levels, addressing uncertainty, doseresponse curve relationships; precautionary principle. State of pollution in Namibia. Pollution control strategies: assimilative capacity concept and principle of control concept; **water pollutants:** settle, coagulate to a precipitates or subjected bacterial treatment; air pollutants: concentration, dispersion or movement; pathways of airborne pollutants. **Prevention, control and remediation of air pollution:** settling chambers, cyclone collectors, filters, scrubbers and activated charcoal. Use of technology and AI in monitoring and detection of ambient air quality, air pollution levels against standards and automated alerts.

S3751VS	Spatial Analysis & Cartography
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Vector data analysis: buffering; overlay, pattern analysis; raster data analysis: local operations, neighbourhood operations, zonal operations, map algebra; spatial interpolation, slope and aspect; viewshed and shaded relief. **Satellite image classification**. **Weighted overlay**. **Data output:** map scale; data symbols, classification methods, map generalization, map production.

S3712VD	Spatial Database Management
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester.
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: The principles of data management; relational database concepts and theory, database design; **SQL statements**: data insertion and manipulation (adding records to a table updating existing records, deleting records); **building PostgreSQL/PostGIS database** (installation and configuration -including setting access privileges); **introduction to spatial queries**; PostGIS geometry types, viewing data in QGIS, working with Views, spatial references, management functions, geometry constructors, geometry accessors, geometry editors, spatial relationship and measurement functions; **introduction to the Enterprise Geodatabase.**

S3731VE	Environmental Policy, Law & Planning
NQF Level:	**7**
NQF Credits:	**16**
Contact Hours:	**4** contact lecture periods per week for one semester.
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Definition (and differences between): policies, laws, regulations and rules. **Terminologies:** principal legislation, subsidiary legislation, Act, policy, law, work plan, principles. **Tenets of international environmental law**. History, origin and evolution of international environmental law. International law and the environment. Contemporary key environmental concerns covered by international law. Policy formulation process: aims and goals of environmental policies, framing of policy statement and policy instruments. Objectives and strategies of an environmental policy. Implementation, enforcement, evaluation and revision of policies. **International environmental agreements**, conventions, protocols, treaties and standards. Environmental policy integration. Source of environmental laws in Namibia. **Provisions of environmental and natural resource policies**, laws, proclamations, ordinances, regulations and international conventions. Environmental policies, politics and political ideology: case studies. Indigenous laws of Namibia related to environmental conservation. Fundamentals of land evaluation and physical planning.

S3711ER	Research Methods
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for 1 semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to scientific research; Definition, types and characteristic activities to qualify as research. **The scientific method**: logic and the scientific method, inductive and deductive reasoning, natural observations, asking questions and formulation of hypothesis, predictions. Types of hypotheses; null, alternative, research. Formulating aims and objectives of research study; developing conceptual / theoretical basis of research. Biological variation, populations and sampling. Sampling strategies, Statistical significance. **Experimental** (research study /project) **design**. Different types of experimental design; data collection & keeping / documenting research data and other records. **Data analysis and presentation.** Qualitative and quantitative data and analysis, Analytical techniques, hypothesis testing and presentation of outcomes of statistical tests, interpreting data. **Scientific writing**. Components of scientific writing, finding and using literature references. Critical review of literature. Writing a literature review, writing a research proposal. Presenting results and writing scientific report. Citation of references, **Oral presentation:** Components of oral scientific presentations, preparing and presenting oral presentations. Presenting results as posters. **Ethics of research**: scientific misconduct; fabrication, falsification, plagiarism; scientific ethical issues at different stages of the scientific method, ethical clearance and research permits.

S3752VD	Disaster Risk Assessment & Management
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	**4** contact lecture periods per week for one semester. 2-hour practical session per week for one semester
Course Assessment:	**CA** assessments will make up **50%** of the course grade.
Examination:	**1x 3 hours** examination paper will contribute **50%.**
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to disaster risk assessment and management: Basic key concepts and terminologies; disaster risk situations around the world and a brief overview of disaster risk management. **Disaster Risk Identification, Assessment and Risk Reduction**: Introduction to disaster risk management processes, hazard, vulnerability, capacity and risk assessment; disaster risk mitigation frameworks (internationally and Namibian); disaster and development. **Disaster Preparedness Planning Process**: Concepts and structures of preparedness planning processes; achieving agreement on preparedness arrangements; documenting preparedness arrangements; conducting preparedness training; testing preparedness arrangements. **Emergency Response Disaster Recovery**: Emergency response management principles and concepts; key response implementation considerations; damage and loss estimation in recovery planning; disaster recovery and reconstruction: concepts, practice, and guidelines. **Making Disaster Management Work**: Cross-cutting considerations; policy, legal and institutional frameworks; risk assessment outputs.

W3700IC	Workplace Attachment
NQF Level:	**8**
NQF Credits:	**24**
Contact Hours:	**6 Weeks**
Course Assessment:	CA is **100%**. Students will be graded based on **comprehensive reports** which they must submit upon the completion of the internship. In addition, a report based on a standard format designed by the department will be submitted by the **supervisors** of the student during the internship.
Prerequisite:	**None**

COURSE DESCRIPTION: This Module will provide opportunities for students to spend at least 6 weeks at various, research and conservation institutions and industries in order to gain hands-on experience. During the internship period students will be attached to different relevant scientific institutions in Namibia, in the SADC region as well as identified institutions in other African countries as appropriate. Students will have to participate in projects and programmes which are carried out at the respective institutions. Attached students are also obliged to attend scheduled events such as seminars, tours and lectures at the institutions. Although the department will identify some relevant institutions, the students may suggest institutions of their choice as long as they are in agreement with the department. The type of skills to be learned through the internship will be decided by the students themselves based on their interests and the core business of the institution where they will be attached.

W3780EC	Community Engagement
NQF Level:	**8**
NQF Credits:	**24**
Contact Hours:	**6 Weeks**
Course Assessment:	CA is **100%**. Assessments of at least **three (3)** critically reflective pieces of work: an assignment, an oral presentation to a wider audience to reflect on community engagement or outreach programme and a written report.
Prerequisite:	**None**

COURSE DESCRIPTION: This module will expose students to practical experience in a community engaged setting. Students will be exposed to the **theory and practices of community engagement** before starting volunteering in a not-for profit community identified project or activities. **Theoretical aspects:** definition of community and community engagement, significance to environmental planning and management, community structures, institutions, power and cultural dynamics, level of community participation, level of community engagement, community engagement strategies. The module will make students to **reflect on and enhance** their practical experience in community-engaged setting. Students are to **design a program of effective community engagement**, participate or engage in a community outreach project, assist communities in developing strategies for their programmes, as well as part-take in the implementations of community outreach activities.

W3780EP	Project-Based Learning
NQF Level:	**8**
NQF Credits:	**24**
Contact Hours:	**6 Weeks**
Course Assessment:	CA is **100%**. Students will be assessed through submission of a written Project Report, an Oral Presentation to a selected audience, Poster presentation and/or also a written Brief where appropriate (depending on the nature of the Project, e.g. Extension Brief, Policy Brief, etc.).
Prerequisite:	**None**

COURSE DESCRIPTION: Students will spend the entirety of Core Semester 1 of that year doing a project intended to solve a real-world problem in environmental science. They may do this Project at the University or at an identified institution which offers the best environment and/or facilities for such. Students are expected to learn various projectbased skills and knowledge such as **team-work and collaboration** (as they may work in teams), **problem solving** (even learning from failure and possibly starting over), **creativity** (students to apply creative thinking skills to innovate new ways of doing things or even new product designs), in-depth understanding (of scientific approaches, concepts, research skills, etc.), **self-confidence** (students will find their voices and take pride in their work), **critical thinking** (students will learn to look at problems with an open and critical thinking lens - asking questions and coming up with possible solutions), **project management** (students will learn how to manage projects and assignments more efficiently, including time management and meeting set deadlines).

S3420EL	Forest and Rangeland Flora
NQF Level:	4
NQF Credits:	2
Contact Hours:	4 hours lectures per week + 3 hours practical for one semester
Course Assessment:	CA will constitute of at least three assessments and they will weight **50%** toward final mark
Examination:	1 x 2 hr examination paper and this will weigh 50% toward final mark.

COURSE DESCRIPTION: Introduction to plant taxonomy: scope, objectives, species concepts, classification, nomenclature, plant description & identification and herbarium practice. **Basis of variation in plants:** genetic, developmental and environmental variation. **Taxonomy, botanical characteristics, ecology and uses of key indigenous plant species in Namibia's forests, woodlands and rangelands, belonging to the following families:** *Mimosaceae, Caesalpiniaceae*, *Papilionaceae*, *Euphorbiaceae Combretaceae* and *Poaceae*. **Other key indigenous and exotic plant species found in Namibia used for:** timber, poles, fuel-wood, fruit trees, wild tubers, fodder shrubs and trees, indigenous perfume and medicinal plants. **Plant product development:** exploration, characterization, utilization (harvesting, processing and marketing), domestication. **Case studies – Example:** Exploitation of *Sclerocarya birrea* and *Ximenia amaricana*.

S3612EF	Forest and Rangeland Field Study Methods
NQF Level:	6
NQF Credits:	14
Contact Hours:	4 hours lectures per week + 3 hours practical for one semester
Course Assessment:	CA will constitute of at least two assessments and they will weight **50%** toward final mark
Examination:	1 x 3 hour examination paper and this will weigh **50%** toward final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Concepts in vegetation assessments: bias, accuracy, precision, consistency, scales of measurement, **Measurement of tree parameters:** diameter, height, biomass, canopy diameter. **Measuring vegetation parameters at community level:** vegetation cover, species composition, species diversity, seed banks, species frequency, species relative frequency, range carrying capacity/stocking, density, biomass, and production. **Monitoring the value of vegetation:** range evaluation and monitoring, seedling regeneration, population status and dynamics; Evaluation and monitoring of rangeland condition relative to livestock forage (carrying capacity), wildlife habitat, biodiversity conservation, watershed functions and other rangeland values. **Vegetation sampling methods and techniques:** simple random, stratified, systematic, clustered methods. **Quantification of forest wood products**: timber, poles, and firewood.

S3612ES	Silvicultural Practices
NQF Level:	6
NQF Credits:	16
Contact Hours:	4 hours lectures per week + 3 hours practical for one semester
Course Assessment:	CA will make up **50%** of the Course grade (i.e., at least 5 assessed practical's **(50%],** 3 tests **[30%]** and 2 assignments, assessed as written [**10%**]) and seminar presentation [**10%**]).
Examination:	1 x 3 hour examination paper and this will weigh **50%** toward final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: Introduction to silviculture: definitions and concepts, importance of establishing and tending of trees. **Tree nurseries**: Importance and types of forest nurseries: permanent, temporary, satellite and flying nurseries. Selection of nursery site. **Nursery growing media**: Selection, mixing and preparation of growing media, compost making, and seedling plant pots. **Seed technology**: history of seed production, forecasting seed yield, seed collection and extraction, seed testing, computation of seeds requirements and seed storage. **Producing seedlings from seed**: Seed pre-treatment, sowing, calculation of germination and emergency rate, pricking out and transplanting. **Vegetative propagation**: definition, types and techniques of vegetative propagation including tissue culture. **Nursery tending operation**: Water supply and irrigation methods; weeding, root-pruning and seedling protection. Nursery records. **Nursery planning and administration**: Nursery production calendar, record keeping, work organization and administration. **Preparation and planting of seedling in the field**: Seedlings selection, hardening-off, transportation, planting of seedlings, protection and tending operation including planting hole preparation, transplanting, watering, fertilizer application and weeding.

S3612EW	Wildlife Management in Rangeland and Forests
NQF Level:	6
NQF Credits:	16
Contact Hours:	4 hours lectures per week + 3 hours practical for one semester
Course Assessment:	CA will make up **50%** (At least three assessments);
Examination:	**1** x 3 hour examination paper and this will weigh **50%** toward final mark.
Prerequisite:	**None**

COURSE DESCRIPTION: An introduction to basic principles used in wildlife management in rangelands and forests. General concepts in: ecological processes; population dynamics and structure; sampling in wildlife; life history patterns, biotic and abiotic factors structuring wildlife populations and endangered species. **Home range and territoriality**; coloniality; mating systems; hierarchy. Response of wildlife to humans. Plant-herbivore system. Herbivore - carnivore system. Predation of domestic animals by wild animals. **Nutritional ecology** (anatomy and physiology; feeding ecology; diet composition and analysis; nutritional value of plants; plant chemicals and toxins; management of toxic plants and affected game; grazing and browsing capacity; mineral deficiencies and supplementary feeding; nutrition in captivity). Animals and their characteristics. Management techniques of wildlife. Rangelands and Forests management. Genetic management. Wildlife management and rural development. This course also recognizes the value of wildlife in forests and rangelands to human existence, analyse influence of biophysical and human factors in shaping wildlife populations, estimate wildlife numbers using standard scientific methods and procedures, assess rangeland conditions, initiate and utilize range condition monitoring practices in routine range management and evaluate range management practices.

S3612EA	Angiosperm Physiology
NQF Level:	6
NQF Credits:	16
Contact Hours:	4 hours lectures per week + 3 hours practical for one semester
Course Assessment:	CA will make up **50%** of the Course grade (i.e., at least 5 assessed practical's **(50%],** 3 tests **[30%]** and 2 assignments, assessed as written [**10%**]) and seminar presentation [**10%**]).
Examination:	1 x 3-hour examination paper and this will weigh **50%** toward final mark.
Prerequisite:	None

COURSE DESCRIPTION: Anatomy and function of angiosperm: root, stem, and leaf. **Growth and development in angiosperms:** meristems of shoots, roots and leaves; bark formation and function; flower, fruit, and seed development, plant growth regulators. **Photosynthesis and respiration. Water:** importance, uptake and transpiration. **Nutrient uptake and transportation**. **Stress physiology:** drought, salinity, environmental pollution. **Factors influencing plant growth, distribution and productivity.**

S3780ZE	Cooperative & Work Integrated Education
NQF Level:	**7**
NQF Credits:	**8**
Contact Hours:	2-hour lecture period per week for one semester
Course Assessment:	CA will make up 100% of the Module grade (i.e., at least 2 tests [40%] and 4 assignments, assessed as written reports [10%]) and presentations [20%].
Prerequisite:	None

COURSE DESCRIPTION: Definition of Cooperative and Work Integrated Education (CWIE): Definition of what constitutes a CWIE activity and the value CWIE activities add to a training programme, CWIE opportunities in the field of Environmental Science. **Preparation prior to undertaking a CWIE activity:** UNAM CWIE Policy, Identification of a suitable CWIE activity, CWIE Placement Agreement, funding, indemnity and insurance issues. **Carrying out a CWIE Activity:** Workplace skills and ethics, expected performance standards, supervision, methods of recording training (e.g. logbooks) and evaluation. **Problems at workplace and remedies or outcomes:** Indiscipline issues, failure to perform to the required standards, working environment posing potential danger, health and injury risk, host organization unable to maintain a placement or any other serious issue.

S3700WC	Workplace Attachment
NQF Level:	**7**
NQF Credits:	**24**
Contact Hours:	2-hour lecture period per week for one semester
Course Assessment:	(100%). Students will be graded based on comprehensive reports which they must submit upon the completion of the internship.
Prerequisite:	None

COURSE DESCRIPTION: This Module will provide opportunities for students to spend at least 6 weeks at various, research and conservation institutions and industries in order to gain **hands-on experience**. During the internship period students will be attached to different relevant scientific institutions in Namibia, in the SADC region as well as identified institutions in other African countries as appropriate. Students will have to participate in projects and programmes which are carried out at the respective institutions. Attached students are also obliged to attend scheduled events such as **seminars, tours and lectures** at the institutions. Although the department will identify some relevant institutions, the students may suggest institutions of their choice as long as they are in agreement with the department. The type of skills to be learned through the internship will be decided by the students themselves based on their interests and the core business of the institution where they will be attached.

S3710EC	Community Engagement
NQF Level:	**7**
NQF Credits:	**24**
Contact Hours:	2-hour lecture period per week for one semester
Course Assessment:	**100%** of at least three (3) critically reflective pieces of work: an assignment, an oral presentation to a wider audience to reflect on community engagement or outreach programme and a written report.
Prerequisite:	None

COURSE DESCRIPTION: This module will expose students to practical experience in a community engaged setting. Students will be exposed to the Theory and practices of community engagement before starting volunteering in a notfor profit community identified project or activities. **Theoretical aspects**: definition of community and community engagement, significance to environmental

planning and management, **Community structures**: institutions, power and cultural dynamics. **Levels of community participation:** levels of community engagement, community engagement strategies. **Reflection on community engagement**: the module will make students to reflect on and enhance their practical experience in communityengaged setting. **Community engagement project**: Students are to design a program of effective community engagement, participate or engage in a community outreach project, assist communities in developing strategies for their programmes, as well as part-take in the implementations of community outreach activities.

S3710EC	**Project-Based Learning**
NQF Level:	**7**
NQF Credits:	**24**
Contact Hours:	2-hour lecture period per week for one semester
Course Assessment:	CA will make up 100% of the Module grade. Students will be assessed through submission of a written Project Report, an Oral Presentation to a selected audience, Poster presentation and/or also a written Brief where appropriate (depending on the nature of the Project, e.g. Extension Brief, Policy Brief, etc.).

COURSE DESCRIPTION: Students will spend the entirety of Semester 0 of that year doing a project intended to solve a real-world problem in environmental science. They may do this Project at the University or at an identified institution which offers the best environment and/or facilities for such. Students are expected to learn various project-based skills and knowledge such as **team-work and collaboration** (as they may work in teams), **problem solving** (even learning from failure and possibly starting over), creativity (students to apply creative thinking skills to innovate new ways of doing things or even new product designs), indepth understanding (of scientific approaches, concepts, research skills, etc.), **self-confidence** (students will find their voices and take pride in their work), **critical thinking** (students will learn to look at problems with an open and critical thinking lens - asking questions and coming up with possible solutions), project management (students will learn how to manage projects and assignments more efficiently, including time management and meeting set deadlines).

W3730EN	**Internship**
NQF Level:	**7**
NQF Credits:	**24**
Contact Hours:	6 weeks
Course Assessment:	Continuous assessment (100%). Students will be graded based on comprehensive reports which they must submit upon the completion of the internship. **Examination: No exams.**
Prerequisite:	**Pass all second-year modules plus at least 96 credits prescribed for year 3.**

COURSE DESCRIPTION: The purpose of this module is to provide students with opportunity to acquire practical skills in environmental Science with special focus on work experience through attachment to a relevant industry or research institution.

S3711EB	**Community-based Management of Forest & Rangeland Resources**
NQF Level:	**7**
NQF Credits:	**18**
Contact Hours:	Lectures: 4hrs/week for 12 weeks (24hrs); Practicals:3hrs/fortnightly for 12 weeks (18hrs).
Course Assessment:	**50%,** at least three assessments.
Examination:	**50%** (1 x 2 hr paper)

COURSE DESCRIPTION: **Introduction to CBNRM and its origin:** History and evolution of CBNRM in Southern Africa and Namibia; CBNRM initiatives in Namibia (conservancies and Community forests) and SADC regions (e.g CAMPFIRE in Zimbabwe); International conventions relevant to CBNRM, Legal framework for CBNRM in Namibia. **Common pool resources and property rights concepts**: Principles of common pool resources and their practical application to CBNRM, concept of tragedy of the commons and its implications to CPR. **CBNRM and rural development**: Rural development and livelihood strategies, Link between CBNRM and rural development, CBNRM contribution to National Development Plans (NDPs). **Natural resource monitoring under CBNRM arrangements**: Event-book monitoring systems in conservancies, Application of adaptive management to NRM, monitoring of wildlife, rangeland and forest resources, sustainable utilization of NRs in conservancies and community forests, wildlife quota settings in conservancies, determination for harvesting quota for forest and rangeland resources. **Nature-based enterprise development and benefit sharing**: Types of nature-based enterprises in conservancies and community-forests, benefit distribution and sharing. **Governance and community participation in NRM under CBNRM arrangements**: Governance in conservancies and community forests and its associated challenges, constitution and roles and responsibilities of members and committees, MET SoPs for conservancies, AGM and its role in promoting good governance. **Indigenous Knowledge Systems in NRM**: Role of indigenous knowledge in NR Management **Gender and NRM in CBNRM**: The role of gender in CBNRM. **Management of conflicts over natural resources**: Types and sources of natural resources conflicts, mechanisms for NRM conflict resolution. **Human-wildlife conflicts as the biggest challenge to CBNRM**: Types of HWC, causes of HWC, consequences, HWC management as per the HWC policy). **Wildlife crime and illegal harvesting of forest products**: WC and illegal harvesting/trade of products and its impacts on CBNRM, role of conservancies and community forests in combating WC and illegal harvesting of forest products.

S3711EB	**Natural Resource Economics**
NQF Level:	**7**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3 hour tutorial per week for one semester
Course Assessment:	**CA** will make up 50% of the Course grade (i.e., at least 8 assessed practical (40%], 3 tests [40%] and 2 assignments, assessed as written [10%]) and seminar presentation [10%]).
Examination:	**50%** (1x 3 hours theory paper).

COURSE DESCRIPTION: **Introduction to natural resource economics**: Definitions and concepts, classification of natural resources, renewable and non-renewable resources; natural- and man-made capita. **Resource scarcity and population growth**: Ecocentric vs. anthropocentric approach; Relate production possibility frontier curve to forestry and rangeland resource use, opportunity cost and environmental cost. **Resource use:** the precautionary use of user-pay principle; Economic growth and sustainable development. Brundtland report. **Market failures**: public goods, externalities. **Valuing natural resources**: Natural resource values. Non-market estimates of natural resource values: surrogate market techniques, travel time and hedonic price method. **Capital in relation to natural resources**: Interest rates, inflation, real and nominal values, risk and uncertainty. Rate of return pricing. **Techniques of appraising natural resource-based investments**: Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR).

S3702EA	Agroforestry for Drylands
NQF Level:	**7**
NQF Credits:	**12**
Contact Hours:	4 contact lecture periods per week for one semester. 3-hour practical session per week for 1semester.
Course Assessment:	**50%** (At least three assessments).
Examination:	**50%** (1 x 2 hr. paper).

COURSE DESCRIPTION: **Introduction**: definitions and terminologies in Agroforestry, agroforestry systems, components, landuse systems and practices, agroforestry technologies. Land management and livelihoods challenges in Namibia requiring agroforestry interventions. Importance and characteristics of drylands; land degradation in dryland forest areas, Agroforestry in dryland Africa. Agroforestry technologies in drylands; challenges and opportunities in developing dryland agroforestry. Agroforestry systems and practices applicable to Namibia: **Indigenous fruit trees:** value addition and marketing of products in the drylands, Agroforestry for fodder production and drought coping strategies, Agroforestry for environmental conservation, Beekeeping; society, production and health. **Design and implementation of an agroforestry project.**

S3712EF	Forest and Rangeland Protection
Course Title:	**Forest and Rangeland Protection**
Course Code:	**S3712EF**
NQF Level:	**7**
NQF Credits:	**16**
Contact Hours:	4 lecture periods per week and one 3 hour practical per week for one semester
Course Assessment:	**CA** will make up **50%** of the Course grade (i.e., at least 8 assessed practical (40%], 3 tests [40%] and 2 assignments, assessed as written [10%]) and seminar presentation [10%])
Examination:	**50%** (1x 3 hours theory paper).

COURSE DESCRIPTION: **Introduction to forest and rangeland protection:** with special reference to: pathogens, Insect pests, alien invasive plants and forest and rangeland fires. **Concept of disease**, biotic and abiotic causes of plant diseases; plant pathogenic organisms: Forest pathogens, Principles of plant infection, disease establishment and spread. **Pathogens**: Major plant pathogens in Southern Africa, their ecology and control measures (cultural, chemical and biological); Plant quarantine procedures in Southern Africa. **Plant Entomology**: Biology, ecology and control (cultural, chemical and biological) of major forest insect pests, Useful forest insects. **Alien invasive/invader plants**: Common alien invasive plants in Southern Africa (specifically in Namibia) and their ecology; Factors contributing to the introduction of alien invasive species. Factors influencing the growth and spread of alien invasive species. Effects of alien invasive species on the environment. Common and management measures of alien invasive species (Mechanical, Chemical, Cultural, Biological, Integrated control). **Useful forest and rangeland insects**: Biology and ecology of useful forest insects and their benefits. **Forest and rangeland fire management**: Wild fire and the environment (causes, effects, and fire behavior), monitoring and detection, prevention strategies, protection plan and suppression strategies applicable to Namibia forests and rangelands.

S3712EG	Natural Resource Governance
NQF Level:	**7**
NQF Credits:	**16**
Contact Hours:	4 hours theory lessons and 3 hours of practical for one semester
Course Assessment:	**CA** will constitute at least four assignments taking a form of group presentation and or submission of essays on case studies; two tests and final examination. The test & assignments will constitute **50%** toward final mark.
Examination:	**50%** (1x 3 hours theory paper).

COURSE DESCRIPTION: **Categories of policy approaches**: command and control, property rights-based policies, market-based policies, voluntary approaches/certification. **Environmental governance**: actors in policy making and implementation, levels of governance, modes of governance, principles/criteria of governance. **Process of policy development at national level**: problem identification, agenda setting, decision making, policy implementation, policy review. **Principles and foundations of national policies:** National Land Policy, National resettlement policy, Water Supply and Sanitation Policy, Human Wildlife Policy, Forest Development Policy, regulations on bush thinning and use of arboricides etc. **Internationa Environmental Agreements development**: simple signature, definite signature, ratification, accession, reservations. **Implementations of multilateral environmental agreements:** biological diversity, climate change, land degradation and desertification, trade of endangered species of fauna and flora, wetlands etc.

S3702ES	Sustainable Management of Forest and Rangeland
NQF Level:	**7**
NQF Credits:	**9**
Contact Hours:	2 lecture periods per week and one 2 hour practical per week for one semester
Course Assessment:	will make up **50%** of the Course grade (including at least 4 assessed practical (40%); 2 tests (40%); 2 assignments (10%) and seminar presentation (10%).
Examination:	**50%** (1x 3 hours theory paper).

COURSE DESCRIPTION: **Sustainable forest management**: Estimation of growth and yield, Estimation of charcoal yields. Theory and practice of normal forest and sustainable yield (allowable cut). Sustained yield. Types of rotation., allowable cut, cutting cycle. Sustainable exploitation of woodlands (community forests, concession areas, private woodlands (private farms). **Themes of sustainable forest management**: forest inventory, forest protection against fire and illegal harvesting, institutional framework, reforestation and afforestation etc. **Sustainable rangeland management**: rangeland resilience, underground water dynamics, rangeland biodiversity, rangeland recovery period, drought reserves, grass palatability to livestock and wildlife. **Safety in harvesting forest and range resources:** transportation of wood materials, ergonomics and work safety, safety in charcoal industry. **Management plans for forest and rangelands:** development of management plans; development, implementation, monitoring and evaluation. **Forest organization in Namibia:** Administration of forest enterprises; records, personnel management, programs of work.

E.4. HONOURS 11BEBA PROGRAMME REGULATIONS

E.4.1 PURPOSE AND RATIONALE OF THE QUALIFICATION

The purpose of this qualification is to provide an opportunity for holders of a level 7 degree in Environmental Biology or a pre-NQF degree in Environmental Biology to upgrade to a level 8 honours degree. The purpose of this qualification is to assist our old alumni in terms of improved job placement and promotion prospects in addition to feeding our post-graduate programmes that now require NQF level 8 degrees as minimum entry. This programme will provide prospective students with the necessary technical skills, scientific knowledge and exposure to allow the students to be able to solve practical problems of scientific nature in Namibia and beyond. In addition, this programme gives students sufficient background to be able to take up postgraduate training at tertiary institutions. For Environmental Biology, the main goal of this programme is to produce graduates that are well trained to be able to fit into various employment sectors namely, agricultural sector, human health, biological industries, scientific research institutes, environment sectors. Microbiology graduates from this Programme will be well trained and will be able to fit into various employment sectors namely, biomedical, human health, biotechnological, scientific research, agricultural, genetics, and environment sectors.

E.4.2. ADMISSION REQUIREMENTS

Applicant must be in possession of either.

- ★ a BSc degree in Environmental Biology / or equivalent at NQF level 7. OR
- ★ a pre-NQF BSc degree in Environmental Biology / Microbiology or equivalent qualification from a recognised institution.
- ★ Students who have completed a double major Bachelor degree may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

E.4.3. ASSESSMENT CRITERIA

A combination of continuous assessment (40%) and an examination (60%) will be used to assess each of the typical modules in this programme and details are further specified under respective module descriptors. Assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, field reports, or seminar presentations, as may be stated under each Module descriptor below. A minimum of 80% attendance of lectures is required; practical sessions are all compulsory.

E.4.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted to the Faculty of Science for a second year of registration, a student must have passed a minimum of 64 credits by the end of the first year.

E.4.5. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

F.4.6. DURATION OF STUDY

The minimum duration of the study is one year and the maximum duration is two years

E.12.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates who passed all prescribed modules in the curriculum framework.

E.4.8. EXEMPTIONS

Unam will give exemptions for equivalent courses taken at other tertiary institutions but the exemptions shall not exceed 50% of the programme in line with the general Information and Regulations Prospectus.

E.4.9 CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred % attendance of practicals classes are required.

E.4.10. BACHELOR OF SCIENCE ENVIRONMENTAL BIOLOGY HONOURS 11BEBA

TABLE FOR ALL MODUELS IN BSC IN MICROBILOGY - 11BMBL (PAGE)

CODE	COURSE NAME	NQF	CREDITS	Contact Time	*CO/P-REQUISITES
Semester 1					
EBL3841	Integrated Natural Resources Management I	8	8	2L 1P/T (once fortnightly)	EBL3871 / EBL3712, EBL3771
EBL3871	Population Ecology	8	16	4L 1P	EBL3712, EBL3771
EBL3851	Biogeography	8	16	4L 1P	EBL3712
Semester 2					
EBL3852	Integrated Natural Resources Management II	8	16	4L 1P	EBL3871 / EBL3712, EBL3771
EBL3812	Behavioral Ecology	8	16	4L 1P	EBL3712 OR EBE 3772
EBL3822	Entomology	8	8	1P/T (once fortnightly)	EBL 3722
Full Year Modules Semester 1 & 2					
EBL3800	Field Ecology	8	16	4 weeks field trip (2 weeks / semester)	EBL3841 , EBL3871 / EBL3712, EBL3771, EBL 3752
BLG3880	Research Methodology & Project	8	38		BLG 3702
Total Credits Full Year Modules Semester 1 & 2			**54**		
TOTAL CREDITS FOR THE PROGRAMME			**134**		

All co- and pre-requisites as indicated in the module descriptors in this programme are superseded by the admission requirements *indicated under point 16.

E.5. MASTER OF SCIENCE IN BIODIVERSITY MANAGEMENT (11MSCE)

E.5.1. DEPARTMENTAL REGULATIONS

E.5.2. ADMISSION REQUIREMENTS

The MSc in Biodiversity Management program in the Department of Environmental Science is open to applicants with at least a Bachelor's degree at NQF level 8 or equivalent with Biology or related majors. The applicants will be accepted on the basis of their undergraduate records with an average mark of at least 60%.

E.5.3. DURATION OF STUDY

The Master in Biodiversity Management is offered through coursework and thesis, extending over two years of full-time study. The coursework is conducted during the first academic year of study and is followed by a supervised original research project extending over the second year.

E.5.4. CURRICULUM COMPILATION

The curriculum for the Biodiversity Management consists of coursework and the writing of a research thesis, mini thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations & Fees.

E.5.5. EXAMINATION REGULATIONS

Formal examination will take place at the end of each semester. Examinations will be subject to external moderation. In addition to module-specific regulations, attendance of at least 80% in a particular module is a requirement for examination admission. Students must pass all modules for them to proceed to the master thesis. A mixture of assessment modes will be used: written, oral or practical examinations, reports and presentations.

E.5.6. FORMAT AND EVALUATION OF THESIS WORK

Before a candidate can proceed to the thesis, he/she must first successfully complete the coursework examinations. Each student will submit a Master mini thesis during the second year. The mini thesis must be drafted in English language. The mini thesis must follow the format given by the Higher Degrees Policy. Procedures, Rules and regulations as outlined in the Prospectus for Postgraduate Studies. The mini thesis will be evaluated by two examiners within two months after submission. The UNAM grading system will be used for the evaluation.

E.5.7. PRACTICALS

Attendance of practical classes and field trips are compulsory.

E.5.7.1. QUALIFICATION: MASTER OF SCIENCE BIODIVERSITY MANAGEMENT (11MSCE)

YEAR 1

CODE	MODULE	SEMESTER	CREDIT	COMPULSORY/ ELECTIVE	PRE-REQUISITE
EBM5921	Biostatistics, Scientific Presentation & Publication	1	12	Compulsory	None
UAE5819	Academic Writing for Post Graduate Students	1	NCB	Compulsory	None
EBM5931	Assessing Biodiversity	1	24	Compulsory	None
EBL5931	Integrated Water and Land use and Biodiversity Management	1	24	Compulsory	None
EBL5962 **OR** EBL5942	Natural Resource Economics **OR** Environmental Law	2 2	12 12	Elective Elective	None None
EBL5952 **OR** EBM5922 **OR** EBB5922	GIS and Remote sensing **OR** Management of Natural History Collections **AND** Applied Biogeography	2 **OR** 2 **OR** 2	24 12 12	Elective Elective Elective	None None None
EBB5972 **OR** EBB5952	Functional Biodiversity of Terrestrial Ecosystems **OR** Functional Biodiversity of Aquatic Ecosystems	2 **OR** 2	24 24	Elective Elective	None None
Total Number of Credits for Year 1			**120**		

YEAR 2

CODE	MODULE NAME	SEMESTER	CREDIT	COMPULSORY/ELECTIVE	PRE-REQUISITE
EBL5900	Thesis	1 & 2	120	Compulsory	Pass all first Year modules unless stipulated otherwise in the general regulations
Total Number of Credits for Year 2			**120**		
Total Number of Credits for the Programme			**240**		

E.5.7.2. SERVICE COURSES FOR EDUCATION STUDENTS ONLY

MBE3771	Cell Molecular Biology, Microbiology & Genetics for Educators
NQF level:	7
Contact hours:	4 lecture periods / week for one semester and **1x3hour practical session** per week for one semester.
Credits:	16
Course assessment:	**CA 40%** (minimum of 2 tests and 2Assignments) Examination **60%** (1 x 3hour examination paper)
Prerequisites:	**BLG3612** Plant Form and Function, **BLG3611** Animal Form and Function

Course description: This is a broad based course that will start with an introduction to the chemical basis of cellular processes, an overview of mitosis and meiosis, Mendelian & non-Mendelian Genetics: monohybrid crosses, dihydrid cross, test crosses, chromosomal theory of inheritance, sex determination & sex-linked genes, basic genetic linkage and chromosome mapping, and the genetic code; structure and function of eukaryotic chromosomes and mutations as the basis for genetic variations and their effects and natural selection. Macromolecules: proteins, carbohydrates fatty acids and nucleic acids and their roles in cellular organization; the structure of DNA and genome sizes and complexity; DNA replication; Eukaryotic transcription and RNA processing. The course will include principles of microbiology, importance of microorganisms, microbial cell structure, physiological diversity of microorganisms, prokaryotic diversity, microscopy and cell morphology, microbial cell membranes and cell walls, surface structures and inclusions, endospores, microbial motility and bacterial taxis, staining techniques, microbial nutrition and metabolism, culture media, laboratory culture of microorganisms, enrichment and isolation, isolation of pure cultures, bacterial cell division, growth of bacterial populations, measuring microbial growth, environmental effects on microbial growth, control of microbial growth, Identification of bacteria; Microbial genetics and genetic engineering: conjugation, transformation and transduction; Mutations, causes and uses of mutations; DNA Isolation; molecular cloning, genetic recombination, detection of variation in proteins and DNA. Genetically Modified Organisms: examples, risks and benefits.

EBE3772	Environmental Biology for Educators
NQF Level:	7
Contact hours:	4 lecture periods / week for one semester and 1x3hour practical session per week for one semester.
Credits:	16
Course Assessment:	Continuous assessment **40%**: Practicals (at least 10 assessed practicals), Theory (2 tests)
Examination	1x3 hour theory paper weighing **60%**.
Prerequisite:	**BLG3611** Animal Form and Function, **BLG3612** Plant Form and Function

Course description: This course is designed to equip students with the necessary understanding of various topics in environmental studies. The focus of this course is to enhance understanding of relationships of organisms with one another and with their environment including the human dimension. The following will be covered in this course: Ecology and environment: Definitions. Basic components of ecological systems, essential processes of ecological systems: photosynthesis and decomposition. Primary and secondary production, energy flow and flux of matter and trophic structures, food chains and food webs, trophic levels and ecological pyramids, Food chains and poisons in the environment. Biogeochemical cycles (water-, carbon and nitrogen-cycles) and human influence on these cycles. Population Ecology: characteristics of populations- birth, death, immigration, emigration, size, age structure, and sex ratios. Population density, dispersion, mortality, natality and survivorship, population growth, parasitism. Population regulation (mechanisms of population regulation, intra-specific competition, dispersal, social interactions). Ecosystems and Biomes: definitions, classification, and characteristics of various biomes of the world. Biomes of Namibia. Climate change: definition, causes, mitigation, and adaptations. Desertification: definitions, causes of desertification (proximate or immediate and ultimate or underlying causes), manifestations of desertification, action to combat desertification. Deforestation: causes (proximate or immediate and ultimate or underlying causes) and effects of deforestation, deforestation in Namibia and possible solutions to deforestation. Conservation ecology: definitions, global patterns, distribution, and measurement of biodiversity. Sustainable development. Threats to biological diversity (including habitat destruction, habitat fragmentation, habitat degradation and pollution, global climate change, overexploitation, invasive and alien species, and disease). Human influences on ecosystems; damage to the environment, urbanization.

EBE3801	Environmental Education
NQF Level:	8
Contact hours:	2 lecture periods / week for one semester and 1x3hour practical session every second week for one semester. However, this course is taught as a block during the second half of the first semester.
Credits:	8
Course Assessment:	Continuous assessment 40%: Practicals (at least 10 assessed practicals), Theory (2 tests)
Examination	60%: 1x3 hour theory paper
Prerequisite:	None

Course description: The course will expose education students to environmental education. Most of the content is practical and the following will be covered: Definitions: Education for sustainable development; Environmental Education; Sustainability; Biodiversity; Extinction; Endangered species; Conservation. Environmental issues/problems and how culture impact on the environment: Climate change; deforestation; desertification; greenhouse effect; pollution; Solutions and alternatives to environmental issues/problems Environmental protocols; conventions, treaties; charters and agendas Development of learning materials to aid environmental education in the classroom including how to take learning activities to the outdoors and the integration of environmental education into various subjects.

E.5.7.3. 11MSCE – MASTER OF SCIENCE IN BIODIVERSITY MANAGEMENT: MODULE DESCRIPTORS

UAE5819 ACADEMIC WRITING FOR POST GRADUATE STUDENTS

NQF Level: 9
Contact hours: 42
Credits: NCB
Module Assessment: Continuous Assessment. Weighting: **40%**
Examination 1 x 3-hour paper, weighting: **60%**
Prerequisites: Must be a registered postgraduate student

Content: This module is a post-graduate course designed to empower students with skills and knowledge to access and critique academic sources and to synthesize information from these sources to assist them in the substantiation and development of their own claims when writing an academic paper in their respective fields of specialization. Additionally, this course will empower students with the capacity to undertake the challenges of academic writing by exposing them to the different rhetorical and stylistic elements typical of academic texts. Finally, students will be introduced to the American Psychological Association (APA) writing style and will be equipped with the necessary skills to format an academic paper in APA style.

EBM5931 ASSESSING BIODIVERSITY

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practicals. Some of the practicals are conducted during field trips.
Credits: 24
Module Assessment: Continuous Assessment. Weighting: **40%**
Examination 1 x 3-hour paper, weighting: **60%**
Prerequisites: None

Content: A general overview about the history of biodiversity research; important definitions for biodiversity research; introduction to the significance and vulnerability of biodiversity; rational for biodiversity assessment, levels at which biodiversity may be assessed; genetic, species, ecosystem, biome and global scale; latitudinal diversity gradients, global versus regional diversity, ecological processes and habitat heterogeneity, biodiversity indices, introduction into various methodological approaches for assessment of biodiversity (biodiversity assessment methods; Gap analysis, conservation biodiversity workshops, National Conservation review, All Taxa Biodiversity Inventory [ATBI], Rapid Biodiversity Assessment, Rapid Assessment Programme, rapid biodiversity appraisal versus long-term ecological monitoring, line transects versus plot design, spatial and temporal organisation of organisms, species, populations); the concept of bioindicators; functional zoodiversity; scaling, tracking and monitoring procedures; the role of habitat (diversity, abundance and habitat use); ecological niches and inter-specific occurrence (contractors versus empires); radio-telemetry; delineation of research; selected examples of data collection and description; spatial orientation and time (seasonality); behavioural studies for biodiversity research; formulation of hypotheses; testing of hypothesis; designing and need for adaptation of monitoring programs, communities, ecosystems and biomes; humans and the biosphere (human population dynamics, shrinking of resources); scientific nature conservation; IUCN Red List; bioprospecting; buffer zones and migration corridors; working with landowners and local communities; making results available for conservation authorities.

EBM5921 BIOSTATISTICS, SCIENTIFIC PRESENTATION & PUBLICATION

NQF Level: 9
Contact hours: 28 hours lectures and 42 hours practicals
Credits: 12
Module Assessment: Continuous Assessment. Weighting: **40%**
Examination 1 x 3-hour paper, weighting: **60%**
Prerequisites: None

Content: Revision of Descriptive Statistics (measures of location and spread as well as graphical presentation of data). Statistical Inference: Parametric as well as Nonparametric methods. Agricultural Experimentation: Principles of experimental design for on-station and adaptive field research trails, Repeated measurements; Analysis of data from balanced designs. Some basic designs: Latin squares, Randomized Complete Block Designs, Completely randomised designs, Split-plot designs – applications to field experiments and trails. Methods of analysing multiple experiments, data management. Multivariate analysis: Introduction to the nature of multivariate data; techniques available for exploring and analysing multivariate data sets; multiple regression analysis; multivariate analysis of variance (MANOVA); Ecological classification - Definition and aims of ecological classification; Introduction to Cluster Analysis; types and uses of different Cluster Analysis techniques (Divisive, Agglomerative, Hierarchical, Non-hierarchical), Selected practical examples in the use of Clustering methods available cluster statistics (e.g. average linkage, single linkage, etc.) using various computer software (e.g. TWINSPAN, SPSS, MINITAB, PRIMER) and interpretation of cluster dendrograms; Gradient analysis - Introduction to gradient analysis and ordination techniques, types and assumptions of ordination techniques, indirect gradient analysis (indirect ordination) concept and purpose (e.g. Principal Components Analysis, Detrended Correspondence Analysis, etc.), direct gradient analysis (direct/canonical ordination, e.g. Canonical Correspondence Analysis; etc.), Selected practical examples in the use of gradient analysis methods using various computer software (e.g. CANOCO, PRIMER, DECORANA, etc.) and interpretation of ordination plots. Definition of and reasons for communication and presentation. Modes of communication and presentation. Is there difference between communication and presentation? Why scientific communication and presentation? The Scientific method, communication and presentation. What is research? Ethics of scientific research, Overview of the scientific method.Graphical presentation of research data, Distinction between data analysis and presentation; Graphs, pie charts, tables, figures, photographs, cartoons etc. Oral scientific presentation; Oral presentation, Use of power point. Written scientific communication: Generic components of scientific writing;Title, abstract, introduction, literature review, aims and objectives, hypotheses (null, alternative, research), key questions, materials and methods, results (graphical presentation of research data, citing statistical test outcomes, description of trends of research data), discussion of research results, drawing conclusions based on research results, summary of results, recommendations, references, appendices / annexes; Practical (research) report; Review articles (literature review), Writing the thesis. Preparation of a scientific poster. Posting Information on the Web.

EBB5922	APPLIED BIOGEOGRAPHY
NQF Level:	9
Contact hours:	28 hours lectures and 21 hours practicals
Credits:	12
Module Assessment:	Continuous Assessment. Weighting: **40%**
Examination	1 x 2-hour paper, weighting: **60%**
Prerequisites:	None

Content: Patterns of distribution of plants, animals and communities: distribution on different scales from local to global, distribution maps, general explanation of distribution patterns: environmental factors, species interactions, geographical barriers, plate tectonics and the distribution of organisms, endemism, disjunctions and cosmopolitanism. From species to ecosystems, relations of ecosystems to climate and soils, climate zones and ecoregions: global and African perspectives, environmental gradients, ecotones and ecoclines, forest lines. Biodiversity: aggregation of observations and explanation. Global, regional and local patterns of diversity and explanatory theories. Dynamics: special problems. Species: evolution and extinction, seasonal variations, migration with examples from Namibia. Communities: dispersal, alien invasions and extinctions, disturbance regimes, habitat fragmentation and global change. Humans and the biosphere: special problems. Human geography and biogeography, human habitat alteration, human use of biodiversity. Conservation: red lists, island biogeography and design of nature reserves, ecological landscape design. Bioindication: assessment of the state of natural resources. Environmental impact assessment, environmental monitoring; deforestation, desertification. Climate change: causes and evidence of climate change, climate change adaptation and mitigation, effects of climate change on distribution of organisms and various levels of biological diversity, challenges of climate change in Namibia, Africa and elsewhere.

EBL5931	INTEGRATED WATER AND LAND USE & BIODIVERSITY MANAGEMENT
NQF Level:	9
Contact hours:	56 hours lectures
Credits:	24
Module Assessment:	Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or reports, during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%,**
Examination:	1 x 3-hour paper, weighing **60%.**
Prerequisites:	None

Content: Biodiversity and Agriculture; Eco zones and agriculture, Agriculture and biodiversity: reasons and example for negative and positive impacts on biodiversity. Sustainable land use systems, like Organic Farming, Low-Input-Sustainable Agriculture, Agro-forest systems, Management of biodiversity in agricultural production systems, like crop rotation and integrated pest management. Holistic land use planning – example planning of a biodiversity based agricultural eco system. Resource management; Definitions: Resource management; Resource development; biodiversity; sustainable development; Pre-cautionary approach; Objectives of resource management, Global development and the environment. History of conservation in Namibia and present conservation approaches – The Namibian National Biodiversity Programme and Strategy and Action plan. Key elements on which a manager needs information to achieve sustainable exploitation of resources. Social and economic dimensions in resource management. Conflicts that exist between different user groups. Management of wildlife, enhancing productivity without resource degradation. The ecosystem approach for resource management. Adaptive management.Definitions, History and Evolution of Integrated water resources management (IWRM). Sectoral approach versus Cooperative approach and Integrated approach. The integrated approach and key principles of integrated water resource management. IWRM plan for Namibia and case studies and integrated coastal zone management.

EBL5962	NATURAL RESOURCE ECONOMICS
NQF Level:	9
Contact hours:	28 hours lectures
Credits:	12
Module Assessment:	Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or reports, at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%,**
Examination:	1 x 2-hour paper, weighing **60%.**

Content: Spatial development and management on the local and regional level. Factors and principles of population and economic growth: population development (natural, migration), population pyramid, Malthusian hypothesis, environmental constraints, demographic transition. Economic change in the development process: sectors of the economy, three sector hypothesis, reasons for sectoral change, sector-specific differences between industrial and developing countries. Land use forms: Thünen's land use theory, bid-price curves, modifications to the theory, role of transportation costs. Economic activities in space and their spatial patterns: locational decision-making, footloose industries, central place theory, ranges of goods, locational patterns of services. Locational systems in time: Vance's model, rank size rule, neoclassical models, polarisation models, polarisation-reversal hypothesis, long wave theory, product life cycle theory. Regional multiplier effects: forward, backward and service linkages, external and internal agglomeration effects, spread and backwash effects, agglomeration advantages and disadvantages. Instruments and strategies of regional economic development: targets, basic decisions, instruments, spatial strategies. Spatial development and management on the global level. Global disparities: GDP/GNP, per capita income, economic and social indicators, Human Development Index, ecological indicators. Spatial effects of globalization: globalisation and regionalisation, supranational integration spaces, import substitution and export diversification, institutional framework of globalisation, trade (reasons, global patterns), comparative cost advantages, term of trade, foreign direct investments (positive and negative effects, global patterns). Commodity chains: producer-driven commodity chains, consumer-driven commodity chains, governance and spatial consequences. Agricultural Value Chains and the proliferation of global standards. Rural Development in the context of globalisation with a special focus on African small scale farmers. Globalisation and the environment: global diversity, environmental hazards, fresh water, pollution shares, economics of biodiversity.

EBL5942 **ENVIRONMENTAL LAW**

NQF Level: 9
Contact hours: 28 hours lectures
Credits: 12
Module Assessment: Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written assignments that will form part of continuous assessment. Weighting: **CA 40%,**
Examination: 1 x 2-hour paper, weighing **60%.**
Content: Concept and Scope of the Environment and its law, Foundations and Functions of International Environmental Law, Sources of international and national Environmental Law,
International institutions, Principles of International Environmental Law, Compliance and dispute settlement, Criminal aspects of Environmental Law, Sectoral and trans-sectoral regulation (national, regional and international)

EBL5952 **GIS & REMOTE SENSING**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practicals
Credits: 24
Module Assessment: Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or reports, at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%.**
Examination: 1 x 3-hour paper, weighting **60%.**
Content: **Application and benefits of GIS**, Elements of GIS, Basic Geographic Concepts, Cartographic concept of the real world, Scale of Measurement, Spatial location and reference, Projections and coordinate systems. **GIS Data Models**, Relational database management system, Graphic representation of entities, Vector GIS, Raster GIS. **Data Input, Storage and Editing**, Primary and Secondary data input devices, GPS, Digitizing, Scanning, Data conversions, Remote Sensing data. **Data Analysis, Data Query**, Classification, Buffers, Neighborhood functions, Comparison of variables among maps. **Data Output and Presentation,** The designing process, Map design controls, Non-cartographic output. What is meant by remote sensing? Electromagnetic radiation; Platforms and sensors – Remote Sensed data sources, Image processing and analysis, Thematic applications. Display and manipulation of image files; image pre-processing: radiometric and spectral enhancement; geometric corrections; remote sensing for land use/land cover identification; remote sensing for vegetation monitoring. Remote Sensing for hydrosphere. Map composition and GIS integration (raster/vector)

EBM5922 **MANAGEMENT OF NATURAL HISTORY COLLECTIONS**

NQF Level: 9
Contact hours: 28 hours lectures and 21 hours practicals
Credits: 12
Module Assessment: Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or reports, at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%.**
Examination: 1 x 2-hour paper, weighing **60%.**
Content: Purpose of collections (introduction, definition of collections, ethics, operational planning); specimen acquisition (field preservation, preservation fluids and fixatives, specimen labelling, microscope preparation, vertebrate preparation, botanical preparation, skeletal reconstruction, gene and tissue banks); collection management (infrastructure management, record keeping, specimen management, information extraction, information management, digital information capture, electronic information processing, collection development planning); information dissemination (exhibitions and education, practical display techniques, practical education techniques); specimen identification (character sets, paper based identification media, morphometric identification media, electronic identification media, building character sets for identification keys, constructing keys) . Overview of herbaria and museums, their functions and importance: Definition, objectives and importance of herbaria and museums; use of collections in research, exhibits and educational programs, and how collections can be used to help educators meet science education goals; Types of herbaria: National, Private, University and combinations of these; Types of collections: Type specimens, Main collection, Carpological collection, Bulky specimens, Xylarium, Bryophytes & Lichens, Macrofungi, Fossils, Spirit collection, Illustrations, Photographs & Copies of specimens, Microscope slides. Herbarium and museum curation: Collection management procedures and preservation techniques including acquisitions and accessions, specimen preparation, exchanges, loans, access and use, documentation, storage, conservation, pest control, profiling, cataloging, digitization, and administration. Database use and management: Types of databases used, practices and procedures of information capture, entry and retrieval; importance of back-ups; uses of the data on the system. Challenges faced by herbaria and museums, and opportunities to be explored to enhance their functions.

EBB5972 **FUNCTIONAL BIODIVERSITY OF TERRESTRIAL ECOSYSTEMS**

NQF Level: 9
Contact hours: 56 hours lectures and 42 hours practicals. Some of the practicals will be conducted during field trips
Credits: 24
Module Assessment: Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or field trip reports, at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%.**
Examination: 1 x 3-hour paper, weighing **60%.**
Content: **Ecology and management of tropical savanna ecosystems**: Introduction to savanna ecosystems of southern Africa and elsewhere (Definition, extent and distribution, major types of savannas, etc.); Overall species diversity, richness and endemism; Characteristics of savanna ecosystems of southern Africa (structure, tree-grass interactions, etc.; Determinants of tropical savannas (primary, secondary); management of savannas for biodiversity conservation; Modeling savanna dynamics for biodiversity conservation and restoration. **Ecology and management of forest ecosystems**: Overview of forest ecosystems of the world (definition, types of forests; distribution and extent, etc.); characteristics and biodiversity and of tropical forests; Overall species diversity, richness and endemism in tropical forest ecosystems; Causes of biodiversity loss in forests (fragmentation and deforestation, logging; hunting, invasives, etc.); Impacts of climate change on forest diversity (potential and actual impacts); Forest gap and edge

dynamics. **Ecology and management of desert ecosystems**: Introduction to the distribution, origin, types and characteristics of desert ecosystems of Namibia and elsewhere; Overall species diversity, richness and endemism in desert ecosystems; Ecophysiology in conditions of water limitation, food limitation, and heat: sources, limitations, time-space windows. Desert Ecology: life history patterns, community and population processes, food-webs, autecology, Biodiversity in deserts: source-sink effects, patchiness, speciation processes and local extinction/persistenceAdaptations of plants to the desert environment (physiological, anatomical, physical, etc.); Adaptations of animals to the desert environment (physiological, anatomical, physical, behavioural, etc.); Desertification: causes, occurrence, criteria for indicators, possibilities of combating, Impacts of humans on desert biodiversity (mining, off-road driving, harvesting, etc.), Ecological Restoration in a desert environment (biological engineering of ecosystem function, integration of ecological knowledge, designing restoration research, managing restoration in practice, monitoring of indicators, ecological restoration for sustainable development).
Biodiversity and Ecosystem function in terrestrial Ecosystems: Consequences of changing biodiversity on ecosystem functioning; Models on Biodiversity and Ecosystem function.

EBB5952	**FUNCTIONAL BIODIVERSITY OF AQUATIC ECOSYSTEMS**
Module Title:	**Functional Biodiversity of Aquatic Ecosystems**
Code:	**EBB5952**
NQF Level:	9
Contact hours:	56 hours lectures and 42 hours practicals. Some of the practicals can be conducted during field trips
Credits:	24
Module Assessment:	Students will be assessed through a wide range of assessments methods which will include but not be limited to seminar presentations, written practical assignments or field trip reports, at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment **40%.**
Examination:	1 x 3-hour paper, weighing **60%.**

Content: Life in fluid medium, Physical and chemical properties of freshwater and marine ecosystems (Light, Temperature, Pressure, Salinity, Nutrients, Dissolved gases, Circulation – currents; deep circulation; upwelling)**. The Pelagic environment** – conditions (structure), niches (distribution of species in multi-dimensionsional niche space), plankton both frehswater and marine (patchy distribution of plankton, density dynamics of plankton and the role of upwelling, biological production and its assessment, Harmful algal blooms, zooplankton, density dynamics, Diel vertical migrations); Nekton; organisms and processes in the open ocean; pelagic food webs. **The Benthic environment:** Organisms inhabiting soft substrates and hard substrates, The intertidal zone environment (sandy and rocky shores, exposed and sheletered shores), The rocky intertidal zone as a model system for community ecology research **(lecture/excursion),** Benthic communities in Estuaries as dynamic environments, mangroves, marshes, coral reefs Deep sea bed (focus on feeding and reproductive ecology). The profundal zone in freshwater systems**. Top predators** and their ecological role in aquatic food webs, effects of loosing top predators in aquatic ecosystems. **Microbial loop in aquatic systems**

EBL5900	**THESIS**
NQF Level:	9
Contact hours:	280
Credits:	120
Module Assessment:	**100%** The written thesis is assessed and make up 100% of the final mark.
Prerequisites:	Student must pass all year 1 modules
Content:	The content & nature of research for the thesis will depend on the topic of research selected by the student.

F. DEPARTMENT OF PHYSICS, CHEMISTRY & MATERIAL SCIENCE

F.1. DEPARTMENTAL REGULATIONS

To register for a Bachelor of Science in Physics and Chemistry, a candidate needs to have obtained qualifying secondary school certificates as outlined in Section below. Obtaining the minimum qualifying requirements, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded based on merit.

The School reserves the right to subject candidates to additional selection procedures before admission. Admission can also be considered for persons who qualify through the Mature Age Entry Scheme upon successful completion of the relevant examinations as set out in the General Regulations (in the General Information and Regulations Yearbook). A special application form is available for this purpose. Such candidates may also be required to pass a School entry test before admission is considered.

F.1.2. BACHELOR OF SCIENCE IN PHYSICS – 33BPHY

F.2.1. ADMISSION REQUIREMENTS

F.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with EITHER

- ★ A pass in five (5) different subjects with
  - Two (2) subjects on NSSCAS level with a **"d"** symbol or higher,
    - These two (2) subjects on NSSCAS must be Mathematics & Physics
  - Three (3) subjects on NSSCO level a **"C"** symbol or higher.
    - Two (2) of these subjects on NSSCO must be Chemistry and English.
    - The remaining subject is selected from Computer Studies or Biology or Geography

OR

- ★ A pass in five (5) different subjects with
  - Three (3) subjects on NSSCAS level with a **"d"** symbol or higher. r.
    - T wo (2) of these three (3) subjects must be Mathematics & Physics and the third, must be either Chemistry or Computer Science.
  - Two (2) subjects on NSSCO level with a **"C"** symbol or higher.
    - One of these subjects on NSSCO must be Chemistry if it wasn't taken on NSSCAS. If Chemistry was taken on NSSCAS, this subject is selected from Computer Studies or Biology or Geography.
  - The remaining subject must be English.

Candidates that have **Chemistry on AS** with a "**d"** symbol, will be able to directly take advantage of the **Chemistry electives** in the 1st year.

F.2.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **prior to 2021** (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Normal mode of this programme: **EITHER:**

- ★ A pass in five (5) different subjects with
  - Two (2) subjects on NSSCH with **4** or higher, specifically Mathematics & Physical Science,
  - three (3) subjects on NSSCO with a **"C"** symbol or higher, and
  - English must be at minimum a **"C"** on NSSCO.

OR

- ★ A pass in five (5) different subjects with
  - Three (3) subjects on NSSCH with **4** or higher, specifically Mathematics & Physical Science,
  - two (2) subjects on NSSCO with a **"D"** symbol or higher, and
  - English at minimum a **C** symbol on NSSCO.

F.2.4. ALTERNATE PATHWAYS TO ADMISSION

F.2.4.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought,
- ★ have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of:
(i) English Proficiency, **(ii)** General Knowledge, **(iii)**Mathematical Ability, and **(iv)**Physical Science.[3]
A 60% average of all the papers is required, with no paper below 50%.

F.2.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Recognition of Prior Learning (RPL) according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

F.2.4.3. EXTENDED ENROLMENT

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above in section F.2.2, can opt for the *Extended enrolment* mode of this programme that will take one year longer.
Candidates that qualify for admission based upon an NSSC issued prior to 2021, as outlined in section F.2.3, must enrol for the ***Extended enrolment*** mode of this programme which will take one year longer.

[3] *The Physical Science paper will consist of a Physics part and a Chemistry part.*

F.2.4.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

F.5. ARTICULATION OPTIONS

This qualification may serve as an entry point to an honour's degree in physics, or related postgraduate degrees and diplomas.

F.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

F.6.1. NORMAL ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 124 credits (of which 92 must be non-core) by the end of the second year of registration.
- ★ 214 credits by the end of the third year of registration
- ★ 264 credits by the end of the fourth year of registration
- ★ The programme must be completed after a maximum of 5 years of registration.

F.6.2. EXTENDED ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 28 number of credits (of which 12 must be non-core) by the end of the first year of registration.
- ★ 92 number of credits (of which 28 must be non-core) by the end of the second year of registration.
- ★ 170 number of credits by the end of the third year of registration
- ★ 230 number of credits by the end of the fourth year of registration
- ★ 298 number of credits by the end of the fifth year of registration
- ★ The programme must be completed after a maximum of 6 years of registration.

F.7. ADVANCEMENT AND PROGRESSION RULES

F.6.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least 87 credits including the entire core.
- ★ Year 2 to Year 3: All first-year credits in addition to at least 84 second-year credits

F.6.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least 60 credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 64 second year credits
- ★ Year 3 to Year 4: All second-year credits and at least 54 third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

F.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a **minimum of 388 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

F.2. BACHELOR OF SCIENCE IN PHYSICS - 33BPHY

YEAR 1

CODE	COURSE	NQF	CREDIT	CO/PRE-REQUISITES	Compulsory-C/ Elective-E
Year 1 Core Semester 1					
U3403FS	Skills portfolio	4	NCB		C
U3583AL	Academic Literacy I	5	8		C
U3583DD	Digital Literacy	5	8		C
U3420EM	Ethics and Morality	4	2		C
U3420SE	Sustainability & Environmental Awareness	4	2		C
U3420CN	National and Global Citizenship	4	2		C
S3520PY	Python Primer	5	2		C
Year 1 Semester 1					
S3511MC	Calculus I	5	12		C
S3511ML	Linear Algebra I	5	12		C
S3511PG	General Physics I	5	14		C
S3531DP	Programming Fundamentals I, OR	5	14		E
S3531CG	Introductory Physical & Inorganic Chemistry				E
Year 1 Semester 2					
S3512MC	Calculus II	5	12		C
S3512PS	Statistical & Numerical Methods in Physics	5	14		C
S3512PG	General Physics II	5	14		C
S3532DF	Programming Fundamentals II , OR	5	14		E
S3532CG	Introductory Analytical & Organic Chemistry				E
Total Credits			**130**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/ Elective-E
Core Semester 1					
U3683LA	Academic Literacy II	6	8	None	**C**
U3420RT	Entrepreneurial Skills	4	2	None	**C**
U3420PJ	Project Management Skills	4	2	None	**C**
U3520LP	Leadership Skills	5	2	None	**C**
U3520TH	Critical Thinking	5	2		**C**
S3680MZ	Mathematical Problem Solving	6	8		**C**
Year 2 Semester 1					
S3611MC	Calculus III	6	14	S3511MC or S3512MC	**C**
S3611PW	Waves & Optics	6	16	S3511PG, S3512PG	**C**
S3611PE	Electronics	6	16	S3512PG	**C**
S3601PC	Computer Methods	6	8	S3520PY, S3512PC	**C**
Year 2 Semester 2					
S3612ML	Linear Algebra II	6	14	S3511ML	**C**
S3612MA	Mathematical Analysis I	6	14	S3512MC	**C**
S3612PD	Dynamics	6	16	S3511PG, S3512MC	**C**
S3602ZC	CWIE prep	6	8		**C**
Total credits			**130**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/ Elective-E
Year 3 Core Semester 3					
W3700IC	Workplace Attachment	7	24	S3602ZP: CWIE prep	**E**
S3700PC	Community Engagement	7	24	S3602ZP: CWIE prep	**E**
S3700PP	Project- or Product-based Learning	7	24	S3602ZP: CWIE prep	**E**
S3700PS	Simulation	7	24	S3602ZP: CWIE prep	**E**
Year 3 Semester 1					
S3711MA	Mathematical Analysis II	7	16	S3612MA	C
S3711PE	Electrodynamics	7	18	S3611MC	C
S3711PM	Modern Physics	7	18	S3611MC	C
Year 3 Semester 2					
S3712MP	Partial Differential Equations	7	16	S3611MC	**C**
S3712PC	Computational Physics	7	18	S3601PC	**C**
S3702PT	Thermal Physics	7	9		**C**
S3702PR	Aspects of Renewable Energy Physics	7	9	S3611PE	**E**
S3702PA	Introduction to Astronomy	7	9		**E**
Total credits			**128**		

F.2.1.1. EXTENDED ENROLMENT: NSSCAS MATHEMATICS, NSSCAS PHYSICS & NSSCO CHEMISTRY

Applicants that lack the appropriate grades as outlined in the normal enrolment requirements, can opt for the Extended enrolment that will take one year longer. Candidates must have obtained at least **27 points in five (5) different subjects** with the following combination.

F.2.1.1.1. NSSCAS Physics & Mathematics & NSSCO Chemistry

This option caters for students that have NSSCAS Physics and NSSCAS Mathematics, but not **Chemistry.** However, they wish to pursue a career in **Physics** with chemistry electives in the 1st year. Thus, these students will enrol for the following modules on the extended mode:

1. **S3431CS** Chemistry Support I
2. **S3432CS** Chemistry Support II

F.3. BACHELOR OF SCIENCE IN CHEMISTRY - 33BCHM

F.3.1. ADMISSION REQUIREMENTS

F.3.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

F.3.1.2. NORMAL ENROLMENT

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC). Additionally, the following requirements must be satisfied:

- ★ A pass in 5 different subjects as follows:
  - Two (2) subjects on NSSCAS level with a **"d"** symbol or higher. These subjects must be Chemistry and Mathematics
  - Three (3) subjects on NSSCO level with **"C"** symbol or higher.
    - Two of these subjects must be English and either Physics or Biology.
    - The remaining subject is selected from Physics or Biology or Computer Studies or Geography.

OR

- ★ A pass in 5 different subjects as follows:
  - Three (3) subjects on NSSCAS level with a **"d"** symbol or higher.
    - Two (2) of these three (3) subjects must be Chemistry & Mathematics and the third, should be Physics or Biology or Computer Science
  - Two (2) subjects on NSSCO level with **"C"** symbol or higher.
    - One of these subjects on NSSCO must be either Physics or Biology, if it wasn't taken on NSSCAS. If Physics or Biology was taken on NSSCAS, this subject is selected from Computer Studies and Geography
    - The remaining subject must be English.

Candidates that have Physics, Biology or Computer Science on **AS** with a **"d"** symbol, will be able to directly take advantage of the corresponding electives in the 1st year.

F.3.1.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021 (EXTENDED ENROLMENT)

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) **issued prior to 2021 (only)** and have a pass in 5 different subjects as outlined below, can enrol in the ***normal mode*** of this programme.

A pass in five (5) different subjects with

- two (2) subjects on NSSCH with **4** or higher, specifically Mathematics & Physical Science,
- three (3) subjects on NSSCO with **"C"** or higher, and additionally,
- English must be at minimum a **"C"** on NSSCO.

OR A pass in five (5) different subjects with

- three (3) subjects on NSSCH with **4** or higher, two of which are Mathematics & Physical Science,
- two (2) subjects on NSSCO with **"D"** or higher, and additionally,
- English must be at minimum a **"C"** on NSSCO.

F.3.1.4. ALTERNATE PATHWAYS TO ADMISSION

F.3.1.4.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions:

Candidates should

- be at least 25 years old on the 1st day of the academic year in which admission is sought,
- have at least completed senior secondary education, and
- have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of:
(i) English Proficiency, **(ii)** General Knowledge, **(iii)** Mathematical Ability, and **(iv)** Physical Science
A 60% average of all the papers is required, with no paper below 50%.

F.3.1.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through Recognition of Prior Learning (RPL) according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

F.3.1.4.3. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher aggregate mark calculated from Chemistry and Mathematics at NSSCAS level, guided by matters of equity as outlined by National Policies.

F.3.2. ARTICULATION OPTIONS

This qualification may serve as an entry point to an honour's degree in physics, or related postgraduate degrees and diplomas.

F.3.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

F.3.3.1. NORMAL ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 128 credits (of which 96 must be non-core) by the end of the second year of registration.
- ★ 218 credits by the end of the third year of registration
- ★ 270 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration.

F.3.3.2. EXTENDED ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 28 number of credits (of which 12 must be non-core) by the end of the first year of registration.
- ★ 70 number of credits (of which 28 must be non-core) by the end of the second year of registration.
- ★ 152 number of credits by the end of the third year of registration
- ★ 235 number of credits by the end of the fourth year of registration
- ★ 307 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration.

F.3.4. ADVANCEMENT AND PROGRESSION RULES

F.3.4.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: An equivalent of **98 credits** prescribed for year 1.
- ★ Year 2 to Year 3: All first-year courses plus at least **99 credits** prescribed for year 2.

F.3.4.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least **46** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least **48** second year credits
- ★ Year 3 to Year 4: All second-year credits and at least **58** third year credits

A student who fulfilled the **re-admission regulations** but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than **20%.**

F.3.5. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum **of 399 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

F.3.6. BACHELOR OF SCIENCE IN CHEMISTRY - 33BCHM

YEAR 1

CODE	COURSE	NQF	CREDIT	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Year 1 Core Semester 1					
U3403FS	Skills portfolio	4	NCB		C
U3583AL	Academic Literacy I	5	8		C
U3583DD	Digital Literacy	5	8		C
S3520CZ	Chemistry in Focus	5	2		C
U3420EM	Ethics and Morality	4	2		C
U3420CN	National & global citizenship	4	2		C
U3520LP	Leadership Skills	5	2		C
Year 1 Semester 1					
S3531CG	Introductory Physical & Inorganic Chemistry	5	14		C
S3511MC	Calculus I	5	12		C
S3511SF	Fundamentals of Statistics	5	12		C
S3511PG	General Physics I, **or**	5	14		E
S3511BB	Foundations of Biochemistry & Biology, **or**				E
S3531DP	Programming Fundamentals I				E
Year 1 Semester 2					
S3532CG	Introductory Analytical & Organic Chemistry	5	14		C
S3532CP	Laboratory Techniques & Skills	5	14		C
S3512SC	Fundamentals of Statistical Computing	5	14		C
S3512PG	General Physics II, **or**	5	14		E
S3512ED	Diversity of Life, **or**				E
S3532DF	Programming Fundamentals II				E
Total Credits			**132**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1					
U3683AL	Academic Literacy II	6	8	None	C
U3420SE	Sustainable Environment awareness	4	2	None	C
U3420PJ	Project management	4	2	None	C
U3420RT	Entrepreneurship	4	2	None	C
U3520TH	Critical thinking	5	2	None	C
S3620CZ	Materials and the Environment	6	8	None	C
Year 2 Semester 1					
S3631CA	Analytical Chemistry I	6	16	S3531CG & S3532CG	C
S3631CO	Organic Chemistry I	6	16	S3531CG & S3532CG	C
S3631CN	Nano-chemistry	6	16	S3531CG & S3532CG	C
S3621CS	Introduction to research	6	7	None	C
Year 2 Semester 2					
S3632CP	Physical Chemistry I	6	16	S3531CG, S3532CG **&** S3511MC	C
S3632CI	Inorganic Chemistry I	6	16	S3531CG **&** S3532CG	C
S3632CR	Radioactivity **or**	6	16	S3531CG **&** S3532CG	E
S3632CM	Material Chemistry I			S3531CG **&** S3532CG	E
S3602ZC	CWIE prep	6	8		C
Total credits			**135**		

Year 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Year 3 Core Semester 3					
W3700IC	CWIE	7	24		C
Year 3 Semester 1					
S3731CO	Organic Chemistry II	7	18	S3631CO	C
S3731CP	Physical Chemistry II	7	18	S3632CP	C
S3731CE	Polymer Chemistry	7	18	None	C
Year 3 Semester 2					
S3732CA	Analytical Chemistry II	7	18	S3631CA	C
S3732CI	Inorganic Chemistry II	7	18	S3632CI	C
S3732CY	Industrial Chemistry **or**	7	18	None	E
S3732CM	Material Chemistry II			S3632CM	E
Total credits			**132**		

F.3.6.1. EXTENDED ENROLMENT

Applicants that lack the appropriate grades as outlined in the normal enrolment requirements, can opt for the **Extended enrolment** that will take one year longer. Candidates must have obtained at least **27 points in five (5) different subjects** with the following combinations:

F.3.6.1.1. NSSCAS Chemistry, NSSCAS Physics/Biology/Computer Science & NSSCO Mathematics

This option caters for students that have **NSSCAS Chemistry and NSSCAS Physics or Biology or Computer Science**, but not **Mathematics.** However, they wish to pursue a career in **Chemistry** because they meet all other requirements. Thus, these students will enrol for the following modules on the extended mode:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II

F.3.6.1.2. NSSCAS Chemistry, NSSCAS Mathematics & NSSCO Physics or Biology

This option caters for students that have NSSCAS Chemistry and Mathematics, but not Physics or Biology. However, they wish to pursue a career in **Chemistry** because they meet all other requirements. Thus, these students will enrol for the following modules on the extended mode:

1. **S3431CS or S3411TM** Physics Support I or Biology Support
2. **S3432CS or S3512ED** Physics Support II or Diversity of Life

F.3.6.1.3. NSSCAS Chemistry & NSSCO Mathematics & Physics or Biology

This option caters for students that have NSSCAS Chemistry, but not Mathematics, and Physics or Biology. However, they wish to pursue a career in **Chemistry** because they meet all other requirements. Thus, these students will enrol for the following modules on the extended mode:

1. **S3431CS or S3411TM** Physics Support I or Biology Support
2. **S3432CS or S3512ED** Physics Support II or Diversity of Life
3. **S3411MS** Mathematics Support I
4. **S3412MS** Mathematics Support II

F.3.6.2. PHYSICS & CHEMISTRY NEW CURRICULA MODULE EQUIVALENTS

The programme will take 3 years to fully implement using a staggered approach on a year-by-year basis. The first intake will be in 2022 with implementation being completed by the end of 2024. Modules from older curricula with no equivalents will be offered again until either phased out, or for a maximum of 2 times only. Thereafter, straggling students must transfer into one of the new programmes with all that that will entail. The Department reserves the right to offer these in whatever mode logistics allow (blended or online). For old programme module repeaters, the following approximate equivalents are to be used: **LIST OF CHEMISTRY EQUIVALENT COURSES DURING IMPLEMENTATION STAGE:**

Old Course	Level	Credit	New Course	Level	Credit
CHM3511 Chemistry IA	5	16	None - To be offered again until phased out		
CHM3512 Chemistry IB	5	16	None - To be offered again until phased out		
CHM3602 Analytical Chemistry I	6	8	None - To be offered again until phased out		
CHM3611 Inorganic Chemistry I	6	16	None - To be offered again until phased out		
CHM3631 Physical Chemistry I	6	16	None - To be offered again until phased out		
CHM3651 Organic Chemistry I	6	16	None - To be offered again until phased out		
CHP3621 Radiochemistry	6	8	None - To be offered again until phased out		
GLC3712 Chemical Metallurgy	7	16	None - To be offered again until phased out		
CHM3721 Analytical chemistry II	7	8	None - To be offered again until phased out		
CHM3751 Inorganic Chemistry II	7	16	None - To be offered again until phased out		
CHM3752 Organic Chemistry II	7	16	None - To be offered again until phased out		
CHM3761 Industrial Chemistry I	7	8	None - To be offered again until phased out		
CHM3702 Instrumental Analysis I	7	8	None - To be offered again until phased out		
CHM3712 Physical Chemistry II	7	16	None - To be offered again until phased out		
CHM3722 Research Methodology	7	8	None - To be offered again until phased out		
CHP3701 Water Analysis	7	8	None - To be offered again until phased out		
CHP3711 Environmental Chemistry I	7	16	None - To be offered again until phased out		
CHP3741 Medicinal Chemistry I	7	8	None - To be offered again until phased out		
CHP3721 Drug discovery and development	7	8	None - To be offered again until phased out		

LIST OF PHYSICS EQUIVALENT COURSES DURING IMPLEMENTATION STAGE:

Old course	Level	Credit	New course	Level	Credit
PHYSICS EQUIVALENTS					
PHY3511: Physics for Physical Sciences I	5	16	S3511PG: General Physics I	5	14
PHY3512: Physics for Physical Sciences II	5	16	S3512PG: General Physics II	5	14
PHY3651: Mechanics & Waves	6	16	No equivalent – to be offered again		
PHY3601: Optics	6	8	S3611PW: Waves & Optics	6	16
PHY3612: Electromagnetism	6	16	No equivalent – to be offered again		
PHY3622: Electronics	6	8	S3611PE: Electronics	6	16
PHY3701: Thermodynamics & Kinetic Theory	7	8	S3702PT: Thermal Physics	7	9
PHY3711: Electrodynamics	7	16	S3711PE: Electrodynamics	7	18
PHY3741: Computational Physics	7	8	S3712PC: Computational Physics	7	18
PHY3722: Research Methodology	7	8	No equivalent – to be offered again		
PHY3742: Analytical Mechanics	7	8	No equivalent – to be offered again		
PHY3752: Modern Physics	7	16	S3702PM: Modern Physics	7	18

F.3.6.3. PHYSICS & CHEMISTRY CURRICULUM COURSE DESCRIPTIONS

S3411PS: PHYSICS SUPPORT I

NQF Level: 4
Contact Hours: Four (4) lectures and a 3-hour practical session every second week alternating with a 1hour tutorial session every second week per week for one semester.
Credits: **NCB (13)**
Course assessment: (50% of the final mark) consisting of a combination of tests & quizzes, assignments, & practical reports (at least 5 gradable items).
Examination: 3-hours (50% of the final mark).
Pre-requisites: NONE

Course description**: Measurement & estimation**: units, unit conversions, uncertainties, significant figures; **Mechanics:** Kinematics in 1D & 2D, vectors, dynamics, Newton's laws, circular motion, Newtonian gravitation, work & energy, linear momentum, rotational motion, static equilibrium, fluids; **Waves & Acoustics**: oscillations, waves, sound; **Thermodynamics**: temperature, kinetic theory, heat, the laws of thermodynamics.

S3412PS: PHYSICS SUPPORT II

NQF Level: 4
Contact Hours: Four (4) lectures and a 3-hour practical session every second week alternating with a 1hour tutorial session every second week per week for one semester.
Credits: **NCB (13)**
Course assessment: (50% of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination: **3-hours (50% of the final mark).**
Pre-requisites: NONE

Course description**: Electricity & Magnetism**: electric charge & electric field, electric potential, electric currents, DC circuits, magnetism, electromagnetic induction, Faraday's law**; Electromagnetic waves & light**: electromagnetic waves, light, geometric optics, wave nature of light, optical instruments; **Radioactivity**: radioactivity, elementary nuclear physics, effects & use of radiation. other products in the food industry; cosmetics, personal hygiene items, and cleaning products; paints, and adhesives.

S3431CS: CHEMISTRY SUPPORT I

NQF Level: **4**
Contact Hours: 4 lecture periods and 1 practical session per week.
Credits: **14**
Course assessment: **Tests:** A minimum of three tests which counts **70%** towards the continuous assessment (CA) mark. **Laboratory Mark:** Laboratory work is graded and the average counts **20%** towards the CA mark. **Tutorials:** Each tutorial session is graded and counts **10%** towards the CA mark.
Examination: There is a one 3hr examination at the end of the semester and counts **50%** towards the final mark.
Pre-requisites: NONE

Course description: I**ntroduction:** Matter, Measurement and Molecules; **Stoichiometry:** Calculations with Chemical Formulae and Equations, Aqueous Reactions and Solutions Stoichiometry; Redox reactions; **Electronic Structure of Atoms:** introduction to quantum theory; electron configuration and the Aufbau principle. Periodic Properties of the Elements and Relationships among elements. **Basic Concepts of Chemical Bonding:** Intermolecular Forces; drawing Lewis structures of molecules; Valence shell electron pair repulsion model; Molecular Geometry and Bonding Theories.

S3432CS: CHEMISTRY SUPPORT II

NQF Level: **4**
Contact Hours: 4 lecture periods and 1 practical session per week.
Credits: **14**
Course assessment:Tests: A minimum of three tests which counts 70% towards the continuous assessment (CA) mark.
Laboratory Mark: Laboratory work is graded and the average counts 20 % towards the CA mark.
Tutorials: Each tutorial session is graded and counts 10% towards the CA mark.
Examination: There is a one 3hr examination at the end of the semester and counts 50% towards the final mark.
Pre-requisites: NONE;
Co-requisites: NONE

Course description: Properties of gases: pressure, volume; temperature, amount; **Thermochemistry:** Enthalpy and enthalpy changes; calorimetry; **Entropy**: laws of thermodynamics; Free Energy; standard enthalpy; Chemical Kinetics; **Chemical Equilibrium:** solubility equilibria; Acid-Base Equilibria; **Additional Aspects of Aqueous Equilibria:** The Common-Ion Effect; Buffer Solutions, Acid-Base Titrations, **Electrochemistry:** electrolysis, electrolytic cells**; Introduction to Organic Chemistry:** Name hydrocarbons and draw structures (alkanes, cycloalkanes, alkenes, cycloalkenes and alkynes); aromatic hydrocarbons; naming and distinguish between functional groups (alcohols, haloalkakanes, ketones, aldehydes, carboxylic acids, ethers, esters and amides); Reactivity of functional groups; Cis-trans isomerism

S3520PY: PYTHON PRIMER

NQF Level: **5**
Contact Hours: One 3-hour practical session every week for the duration of CS1
Credits: **2**
Course assessment: 100% of the final mark consisting of mark generated by a participation rubric and programming assignment. A final mark of **50%** is required to pass this module.
Pre-requisites: NONE

Course description: Installation: Anaconda; Introduction to an Integrated Development Environment (IDE); **Python3** language keywords and data types; Loops & conditionals; NumPy data types and arrays; Screen output; File output; Data visualisation and plotting with matplotlib.

S3511PG:	GENERAL PHYSICS I
NQF Level:	**5**
Contact Hours:	**4** lectures, a 3-hour practical session every week with a bi-weekly 1-hour tutorial session for 1 semester.
Credits:	**14**
Course assessment:	CA of **50%** of the final mark) consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items). A final mark of **50%** is required to pass this module.
Examination:	3-hours (50% of the final mark).
Pre-requisites:	NONE
Co-requisites:	NONE

Course description: **Mechanics:** Units, Physical Quantities, and Vectors; Motion Along a Straight Line; Motion in Two or Three Dimensions; Newton's Laws of Motion; Applying Newton's Laws; Work and Kinetic Energy; Potential Energy and Energy Conservation; Momentum, Impulse, and Collisions; Rotation of Rigid Bodies; Dynamics of Rotational Motion; Equilibrium and Elasticity; Fluid Mechanics; Gravitation; Periodic Motion. **Waves & Acoustics:** Mechanical Waves; Sound and Hearing. **Thermodynamics:** Temperature and Heat; Thermal Properties of Matter; The First Law of Thermodynamics; The Second Law of Thermodynamics. **Practical:** Experimental techniques, reading, measuring, uncertainty/error estimation, tabulation of data, graphing, elementary hypothesis verification, practical report writing.

S3512PG:	GENERAL PHYSICS II
NQF Level:	**5**
Contact Hours:	4 lectures, a 3-hour practical session every week with a bi-weekly 1-hour tutorial session for one semester.
Credits:	**14**
Course assessment:	CA of **50%** of the final mark, consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	3-hours (**50%** of the final mark).
Pre-requisites:	NONE
Co-requisites:	NONE

Course description: **Electromagnetism:** Electric Charge and Electric Field; Gauss's Law; Electric Potential; Capacitance and Dielectrics; Current, Resistance, and Electromotive Force; Direct-Current Circuits; Magnetic Field and Magnetic Forces; Sources of Magnetic Field; Electromagnetic Induction; Inductance; Alternating Current; Electromagnetic Waves. **Optics:** The Nature and Propagation of Light; Geometric Optics; Interference; Diffraction. **Modern Physics:** Relativity; Photons: Light Waves Behaving as Particles; Particles Behaving as Waves; Quantum Mechanics I: Wave Functions; Quantum Mechanics II: Atomic Structure; Molecules and Condensed Matter; Nuclear Physics; Particle Physics and Cosmology. **Practical:** More formal error propagation graphical representation of errors, interpreting errors, and their use in elementary hypothesis verification.

S3512PS:	STATISTICAL & NUMERICAL METHODS IN PHYSICS
NQF Level:	**5**
Contact Hours:	Four (4) lectures and a 3-hour practical session every week for one semester.
Credits:	**14**
Course assessment:	CA of **50%** of the final mark, consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	3-hours (**50%** of the final mark).

Course description: **Statistical methods:** Descriptive statistics: sampling, summary statistics, medians, averages, variances, standard deviations, graphical summaries; Histograms & Commonly occurring distributions; Scatterplots, corelation and simple linear regression, interpretation & finding regression coefficients (slope & y-intercept); Elementary hypothesis verification; Spreadsheet statistical functions; Introduction to R. **Numerical Methods:** Continuation in programming in Python, using numpy & Matplotlib; Interpolation: Lagrange interpolation, Linear interpolation, Neville's algorithm; One-sided and central derivatives; Numerical integration: Root finding/Solution of non-linear equations: bisection, Newton's method, secant method; First order differential equations: Euler, Euler-Cromer, Modified Euler methods & Runge-Kutta method; Matrices: Gauss elimination, LU -decomposition and the Thomas algorithm; **CAS:** Introduction to a Computer Algebra System (CAS) like Maxima and/or SageMath; Simple CAS applications.

S3531CG:	INTRODUCTORY PHYSICAL & INORGANIC CHEMISTRY
NQF Level:	**5**
Contact Hours:	4 lecture periods and 1 practical session per week.
Credits:	**14**
Course assessment:Tests:	A minimum of three tests which counts **70%** towards the continuous assessment (CA) mark.
	Laboratory Mark: Laboratory work is graded and the average counts **20 %** towards the CA mark.
	Tutorials: Each tutorial session is graded and counts **10%** towards the CA mark.
Examination:	There is a one **3hr examination** at the end of the semester and counts **50%** towards the final mark.

Course description: **Properties of gases**: Gas laws, The kinetic molecular theory of gases, Root-mean-square speed; **Thermodynamics**: Concepts, The First and Second laws of thermodynamics; **Thermochemistry**: Exothermic and endothermic reactions, Calorimetry, Standard enthalpy changes, Standard enthalpies of formation, Hess' law, Kirchhoff's law; **Entropy, Free energy and Chemical Equilibrium**: The Third law of thermodynamics; Gibbs free energy, Relationship between equilibrium constants K_p and K_c, Stoichiometric numbers, The response of chemical equilibria to the conditions, The ICE table, The Van't Hoff equation, The value of K at different temperatures; **Properties of solutions**: Molecular view of solution process, Intermolecular forces and solutions, Types of solutions, The effect of pressure on solubility of gases, Colligative properties; **Phase Equilibria**: Phase diagrams, Phase transitions, Gibbs phase rule, Clausius-Clapeyron equation, Trouton's law; **Chemical kinetics**: Rates of reactions, Rate laws, Integrated rate expressions, Half-life, Arrhenius equation, Collision theory (basics), Reaction mechanisms, Activation energy barrier diagrams, Catalysis (Heterogeneous, Homogeneous and Enzyme). **Electronic structure of an atom**: wave nature of matter, Quantum mechanics and atomic orbitals, Electron configuration and the periodic table; **Periodic trends**: Atomic and ionic radii, ionization energy, electron affinities; **Concepts in chemical bonding**: Chemical Bonds, Lewis Symbols, and the Octet Rule, Ionic Bonding and Covalent Bonding, Bond Polarity and Electronegativity, Drawing Lewis Structures, Resonance Structures, strength; **Molecular geometries and bonding theories**: The VSEPR Model, Molecular Shape and Molecular Polarity, Valence Bond theory and Hybridization of atomic orbitals, Molecular Orbital theory, molecular orbital diagrams, bond order, Delocalized multiple bonds.

S3532CG:	INTRODUCTORY ANALYTICAL & ORGANIC CHEMISTRY
NQF Level:	**5**
Contact Hours:	4 lecture periods and 1 practical session per week.
Credits:	**14**
Course assessment:	**Tests:** A minimum of three tests which counts **70%** towards the continuous assessment (CA) mark. **Laboratory Mark:** Laboratory work is graded and the average counts **20 %** towards the CA mark. **Tutorials:** Each tutorial session is graded and counts **10%** towards the CA mark.
Examination:	1X **3hr Examination** at the end of the semester and counts **50%** towards the final mark.
Pre-requisites:	NONE;
Co-requisites:	NONE

Course description: **Review of some fundamental concepts in chemistry:** sampling and sample preparation; expressions of concentration and content; evaluation of analytical data; measures of accuracy and precision; random and systematic errors; **aqueous equilibria:** mass and charge balance equations; principles of titrimetry; acid-base titrations; titration curves and indicators; applications of acid-base titrations; gravimetric methods of analysis; common ion and diverse ion effects; precipitation titrations; indicators used in precipitation titrations; EDTA titrations (complexometric titrations); **electrochemistry**: the half-cell concept; voltaic cells; potentiometry and other electroanalytical techniques; overview of separation methods; **organic chemistry:** nomenclature of hydrocarbons; Functional groups and their nomenclature (with chain length up to 15); introduction to stereochemistry; introduction to organic chemistry reactions including acids and bases.

S3520CZ:	CHEMISTRY IN FOCUS
NQF Level:	**5**
Contact Hours:	2-hours lectures per week and one 3-hours practical session every 2nd week 2
Credits:	**2**
Course assessment:	Students will be given **case studies-based assignments** to solve during the online-based lab sessions and presents in groups in the final week of the semester. The final mark will be **100% mark** (CA). To pass student must obtain a final mark of **50%**.
Pre-requisites:	NONE
Co-requisites:	NONE

Course description: **Roles of chemistry in everyday life**: foundation concepts in chemical toxicology and risk assessment on use of chemicals in industry. **Chemistry of natural and commercial products:** fertilizers, and pesticides; food additives, and

S3532CP:	LABORATORY TECHNIQUES AND SKILLS
NQF Level:	**5**
Contact Hours:	4 Online lecture periods and 1 practical session per week
Credits:	**14**
Course assessment:	**Tests:** A minimum of three tests which counts **70%** towards the continuous assessment (CA) mark. **Laboratory Mark:** Laboratory work is graded and the average counts **20 %** towards the CA mark. **Tutorials:** Each tutorial session is graded and counts **10%** towards the CA mark.
Examination:	**No examination**. **Final Mark: 100% Continuous Assessment** (Bi-weekly laboratory capability assessments – 35%, Electronic Report writing – 20%, Practical-based assignments – 25%, Practical tests (at least two tests) – 30%) To pass this module the student must obtain a minimum final mark of 50%.
Pre-requisites:	NONE
Co-requisites:	**S3531CG** (Introductory Physical & Inorganic Chemistry), **S3532CG** (Introductory Analytical & Organic Chemistry)

Course description: The topics to be covered in this module include but are not limited to **a review of laboratory safety and equipment**; **chemical changes; laboratory techniques and measurement; separation of mixtures; properties of gases; liquids and solids; physical and chemical properties; identification of metallic ions; ionic reactions; stoichiometry of a precipitation reaction; caloric content of food;** and **water-hardness determination.** The content of this module will be distributed as follows: Content related to Introductory Physical & Inorganic Chemistry; Content related to Introductory Analytical & Organic Chemistry

S3611PW:	WAVES & OPTICS
NQF Level:	**6**
Credits:	16
Contact Hours:	Four (4) lectures and a 3-hour practical session every week for one semester.
Course assessment:	CA **50%** of the final mark consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items.
Examination:	One examination with minimum duration of 3-hours (**50%** of the final mark). – 35%, Electronic Report writing – 20%, Practical-based assignments – 25%, Practical tests (at least two tests) – 30%) To pass this module the student must obtain a minimum final mark of 50%.
Pre-requisites:	NONE
Co-requisites:	(S3511PG: General Physics I) & (S3512PG: General Physics II)

Course description: **Linear oscillations:** Classical SHM; Damped SHM; Driven (forced) SHM). **Wave motion:** 1D waves; Harmonic waves; Phase & phase velocity; Superposition; Complex representation; Phasors and wave addition; Plane waves; 3D differential wave equation; Spherical waves; Cylindrical waves. **Propagation of light:** Rayleigh scattering; Reflection & refraction; Fermat's principle. **Geometrical Optics:** Lenses; Stops; Mirrors; Prisms; Optical systems; Wavefront shaping & adaptive optics; Gravitational lensing. **Superposition of waves:** Addition of waves of the same and different frequencies. **Polarisation:** Nature of polarised light; Polarisers; Scattering and polarisation; Polarisation by reflection. **Diffraction:** Fraunhofer diffraction; Fresnel diffraction. **Practical:** Mandatory use of word processors and computational tools learned in *Statistical and Numerical Methods in Physics* and linear regression and estimating errors on slope ($m \pm \sigma_m$) & y-intercept ($c \pm \sigma_c$) to produce practical reports, focus on labs in the field of waves and optics.

S3611PE:	ELECTRONICS
NQF Level:	**6**
Credits:	16
Contact Hours:	Four (4) lectures and a 3-hour practical session every week for one semester.
Course assessment:	CA **50%** of the final mark consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items.
Examination:	One examination with minimum duration of 3-hours (**50%** of the final mark).
Pre-requisites:	NONE
Co-requisites:	(S3511PG: General Physics I)

Course description: Theory: Semi-conductor theory, intrinsic, p & n type doping, extrinsic semiconductors, conduction processes. Semiconductor diodes and diodes applications, devices transistors, biasing of transistors, load line and the Q-point and its stability; Small signal equivalent circuits and frequency response; p-n-p-n devices, thyristors, diacs and triacs, IC's, logic operation of integrated circuits; Operational amplifier characteristics, Op-amps practical applications, electronic control circuits and feedback concept. Digital circuits, analogue circuits, hybrid (digital plus analogue) circuits; Standard logic functions and gates - AND, OR, NOT, NAND, NOR, XOR, XNOR; truth tables; Boolean theorems; laws and rules; truth tables; Boolean algebra and simplification of basic logic network circuits; Basic combinational logic circuits, flip-flops and their applications. **Practical:** Soldering, designing, building, and testing circuits, using multimeters and oscilloscopes.

S3601PC:	COMPUTER METHODS
NQF Level:	**6**
Credits:	16
Contact Hours:	Two (2) lectures and a 3-hour practical session every second week for one semester.
Course assessment:	**100% CA** consisting of a combination of tests and/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (at least 4 gradable items).
Pre-requisites:	S3520PY: *Python Primer*
Co-requisites:	(S3512PC: *Statistical & Numerical Methods in Physics*)

Course description: GNU/Linux: OS; Working set of commands, GUI; **Python interactive environment:** Jupyter Notebooks and/or JupyterLab; Intermediate Python; File I/O; NumPy, Matplotlib & SciPy; **Presentation and report writing:** Program output; Use self-contained coding and report writing software; Producing publication quality graphs and visualisations; Introduction to automatic referencing systems; Introduction to LATEX and BibTEX.

S3612PD:	DYNAMICS
NQF Level:	**6**
Credits:	16
Contact Hours:	Four (4) lectures and a 3-hour practical session every week for one semester.
Course assessment:	**100% CA** consisting of a combination of tests and/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (at least 4 gradable items).
Examination:	One examination with minimum duration of 3-hours (**50%** of the final mark).
Co-requisites:	(S3511PG: *General Physics I*) & (S3512MG: *Calculus II*)

Course description: Central Force Problem: Kepler's laws and Rutherford scattering; **Multi-Particle Dynamics:** Configurations and degrees of freedom, Energy principle for a system, Energy conservation for a system, Kinetic energy of a rigid body, multiparticle dynamics in a non-inertial frame; **Linear momentum and the linear momentum principle:** Conservation of linear momentum, Rocket motion, Collision theory; **Angular momentum and the angular momentum principle**: Conservation of angular momentum; **Lagrangian Mechanics:** Forces of constraint and generalised coordinates, D'Alembert's principle, Lagrange's equations and the energy function *h*, Symmetry, and conservation principles; **Calculus of Variations:** Minimisation problems, The Euler-Lagrange equation, and variational principles; **Hamiltonian Mechanics:** Legendre transforms, Hamilton's equations, Hamiltonian phase space, Liouville's theorem and recurrence, Poisson brackets; **General rigid body kinematics:** Tensors and the inertia tensor, Problems in rigid body dynamics.

S3602ZC:	CWIE Pre
NQF Level:	**6**
Credits:	16
Contact Hours:	Up to 2 lectures per week for one semester.
Course assessment:	**100% CA** of the final mark) consisting of a combination of tests and quizzes, assignments, and a CWIE portfolio.

Course description: Cooperative Work-Integrated Education (CWIE) aims to develop students' work-based generic skills that will be valuable to their future career development. This module prepares the students for engaging in CWIE and find a CWIE situation for in the following year. Professional behaviour, work-readiness, diligence & work ethics. Active searching for a CWIE situation with the aid of UNAM and the School.

S3700PP:	Project- or Product-based Learning
NQF Level:	7
Credits:	16
Contact Hours:	As determined by the specific activity.
Course assessment:	**100% CA** consisting of a combination of tests and/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (at least 4 gradable items).
Pre-requisites:	S3602ZP: *CWIE prep*

Course description: Engage in Cooperative Work Integrated Education through the execution of a project, develop and/or produce a product of some kind. Cooperative Work-Integrated Education (CWIE) aims to develop students' work-based generic skills that will be valuable to their future career development. This module provides a framework to structure the functional part of CWIE. *This allows students to learn from the executing a specific project or producing a product of some kind.*

S37100PS: SIMULATION

NQF Level: 7
Credits: 24
Contact Hours: As determined by the specific activity.
Co-requisites: S3602ZP: *CWIE prep*

Course description: Engage in Cooperative Work Integrated Education through the simulation of a real-world situation or situations. Cooperative Work-Integrated Education (CWIE) aims to develop students' work-based generic skills that will be valuable to their future career development. This module provides a framework to structure the functional part of CWIE. *This allows students to learn from engaging in a simulated activity that mimics a real-world situation or situations.*

S3711PE: ELECTRODYNAMICS

NQF Level: 7
Credits: 18
Contact Hours: Four (4) lectures and a 3-hour practical session every week for one semester.
Course Assessment: (50% of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination: 1 x 3-hour examination paper, **50%**.
Co-requisites: (S3611MC: *Calculus III*)

Course description: **Vector Analysis:** gradient, divergence, curl, fundamental theorems, curvilinear coordinates, Dirac delta, Helmholtz theorem; **Electrostatics:** the $\boldsymbol{E}$-field and its divergence & curl, Gauss' law, electric potential, work & energy in electrostatics, conductors; **Potentials:** Laplace's equation, method of images, separation of variables; **Electric Fields in Matter:** polarisation, field of a polarised object, electric displacement, linear dielectrics; **Magnetostatics:** the Lorentz force law, the Biot-Savart law, the divergence & curl of $\boldsymbol{B}$, the magnetic vector potential $\boldsymbol{A}$; Magnetic Fields in Matter: magnetisation, the field of a magnetised object, the auxiliary field $\boldsymbol{H}$, linear and non-linear media; **Electrodynamics:** emf, electromagnetic induction, Maxwell's equations in free space and in matter; **Conservation laws:** continuity equations, Poynting's theorem, Maxwell's stress tensor; **Electromagnetic waves:** EM waves in vacuum & matter, absorption & dispersion; guided waves; **Practical:** Visualisation and interpretation of logarithmic graphs & logarithmic regression in experimental work.

S3711PM: MODERN PHYSICS

NQF Level: 7
Credits: 18
Contact Hours: Four (4) lectures and a 3-hour practical session every week for one semester.
Course Assessment: (50% of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination: 1 x 3-hour examination paper, **50%**.
Co-requisites: (S3611PW: *Waves & Optics*)

Course description: **The Failures of Classical Physics:** Review of classical physics, failures of classical concepts of space & time and classical theory of particle statistics, theory, experiment, law; **The Special Theory of Relativity:** classical relativity, MichelsonMorley experiment; Einstein's postulates and its consequences, Lorentz transformation, twin paradox, relativistic dynamics, conservation laws, experimental evidence; **The Particle Properties of EM Radiation:** review of EM waves, photoelectric effect, classical & quantum theories thermal radiation, Planck-function, Compton effect, other photon processes, photons; **The Wavelike Properties of Particles:** De Broglie's hypothesis, experimental evidence for De Broglie waves, uncertainty relationship for classical waves, Heisenberg uncertainty relationships, wave packets, motion of a wave packet, probability & randomness; **The Schrödinger Equations:** behaviour of a wave at a boundary, confining a particle, Schrödinger equation, applications (constant PE, free particle, infinite potential well, finite potential well, 2D infinite potential well), expectation values & operators, the SHO, steps & barriers, tunnelling; **The Rutherford-Bohr Model:** properties of atoms, Thomson model, Rutherford nuclear atom, line spectra, Bohr model, Franck-Herts experiments, correspondence principle, deficiencies of the Bohr model; **The Hydrogen Atom:** 1D atom, angular momentum in the Hydrogen atom, Hydrogen atom wave functions, radial probability densities, intrinsic spin, energy levels and spectroscopic notation, Zeeman effect, fine structure; **Many-Electron Atoms:** Pauli exclusion principle, electronic states, screening & optical transitions, properties of elements, absorption edges & X-rays, addition of angular momenta, lasers; **Practical:** Use of Formal hypothesis verification in practical work (z-test; Student's t-test; χ^2-test); Analyse Poisson-distributed data sets.

S3712PC: COMPUTATIONAL PHYSICS

NQF Level: 7
Credits: 18
Contact Hours: Four (4) lectures and a 3-hour practical session every week for one semester.
Course Assessment: 100% of the final mark) consisting of a combination (or subset) of tests and quizzes (at least 2 hours in total), assignments, practical and/or project reports and/or presentations (at least 6 gradable items).

Pre-requisites: P3601PC: *Computer Methods*

Course description: **Principles:** Introduction to the principles of scientific computing; Problem analysis, numerical approach, program design, construction & testing, radioactive decay; **Realistic projectile motion:** Air resistance; Projectile motion; Corrections for changes in pressure & Magnus effect. **Harmonic motion:** Simple, damped, and driven oscillators; Chaos in the driven, non-linear pendulum. **The Solar System:** Kepler's laws; Inverse square law and planetary orbits; Precession of the perihelion of Mercury; **Potentials and Fields:** Electric potentials and Laplace's equation; **Random systems:** Sampling, Markov chains, random walks, random flights, diffusion; **Machine learning:** Introductory machine learning (ML) and artificial intelligence; classification; regression; ML algorithms with sci-kit learn; boosted decision trees; naïve bayes; random forest.

S3702PT:	THERMAL PHYSICS
NQF Level:	**7**
Credits:	18
Contact Hours:	Two (2) lectures and a 3-hour practical session every second week for one semester.
Course Assessment:	**(50%** of the final mark) consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1 x 2-hour examination paper, **50%.**
Pre-requisites:	P3601PC: *Computer Methods*

Course description: Fundamental concepts: equilibrium, zeroth law, temperature, equilibrium; equations of state of different thermodynamic systems. **Heat and the First Law of Thermodynamics**: internal energy, heat, work; macroscopic heat capacities. **The Second Law of Thermodynamics:** Heat engines, refrigerators, reversible & irreversible processes, Carnot engine, Carnot theorem; **Entropy:** Carathéodory principle, heat and entropy in irreversible processes, entropy principle; **Thermodynamic potentials:** Enthalpy, Helmholtz & Gibbs functions, Maxwell's relations. Phase transitions, Clausius-Clapeyron equation and applications; **Statistical Physics & Kinetic Theory:** classical statistical analysis, Boltzmann distribution of molecular speeds and KE, equipartition theorem, heat capacities of gasses & solids, classical & quantum statistics, density of states, Maxwell-Boltzmann distribution, quantum statistics, Bose-Einstein & FermiDirac distributions, bosons & fermions, liquid helium, condensates, photon gas.

S3702PA:	INTRODICTORY ASTRONOMY
NQF Level:	**7**
Credits:	9
Contact Hours:	Two (2) lectures and a 3-hour practical session every second week for one semester.
Course Assessment:	**(50%** of the final mark) consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1 x 2-hour examination paper, **50%.**
Pre-requisites:	**NONE**

Course description: Basic ideas about the night sky such as the motions of the Sun, Moon, stars and planets; the changing sky over the year, the zodiac constellations, circumpolar stars; Right Ascension and Declination; Different types of telescopes and mountings; The Solar System; the Sun as a star & other stars; Stellar classification; Distance determinations such as stellar parallax, moving cluster, cepheid variables and other standard candles; The Hertzsprung-Russell diagram and stellar evolution; Stellar motions (proper and radial); the interstellar medium; extra-solar planets; our Local Group; the low-redshift Universe and Hubble's galaxy classification system; Active and peculiar galaxies; The expanding Universe; galaxy clusters; observational evidence for dark matter; The steady state and Big Bang theories; The cosmic microwave background and evidence for the Big Bang; Quasars as evidence for an evolving Universe; The intra-cluster medium; Evidence for an accelerating Universe and the possible fate of the Universe; Desktop planetarium program.

S3702PR:	ASPECTS OF RENEWABLE ENERGY PHYSICS
NQF Level:	**7**
Credits:	9
Contact Hours:	Two (2) lectures and a 3-hour practical session every second week for one semester.
Course Assessment:	**(50%** of the final mark) consisting of a combination of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1 x 2-hour examination paper, **50%.**
Co-requisites:	(S3611PE: *Electronics*)

Course description: Physics of energy sources and energy systems – fundamentals of energy sources, energy conversion technologies, energy storage, energy transmission, energy use, energy efficiency, sustainability; introduction to photovoltaics; solar thermal energy; wind energy; introductory concepts to other renewable energy technologies like, tidal, biomass, geothermal; Environmental impacts of energy systems.

F.4. BSC IN CHEMISTRY (HONOURS) 11BSAC & BSC IN PHYSICS (ARTICULATIONS) PROGRAMMES

F.4.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of this qualification is to provide an opportunity for holders of level 7 NQA degrees in Physics/ Chemistry or pre-NQF BSc degree in Physics/ Chemistry to upgrade to NQA level 8 honours degree. This programme will provide students with knowledge, skills and competence in the science of Physics/ Chemistry at BSc NQF Level 8 in order to develop Namibia's own human resources and capacity in Chemistry and Biochemistry.

Graduates of the Chemistry programme will contribute towards the social and economic development of the country through their participation in entrepreneurship or employment in the education, public or private sectors especially in fields like Forensics, Medicine, etc. where a balanced Chemistry knowledge is important.

The programme is in line with UNAM's mission "To provide quality higher education through teaching, research and advisory services to our customers with the view to produce productive and competitive human resources capable of driving public and private institutions towards a knowledge-based economy, economic growth and improved quality of life."

F.4.2. ADMISSION REQUIREMENTS

The applicant must be in a possession of either

a) a BSc degree in Chemistry/Biochemistry at NQL level 7.

OR

b) Pre-NQF BSc degree in Chemistry/ Biochemistry or any equivalent qualification from a recognized institution.

c) Students who have completed double major BSc degree maybe required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

F.4.3. ASSESSMENT CRITERIA

A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the typical modules in this program and details are further specified under respective modules. The minimum CA mark that will allow entrance into the examination is 50% and the minimum final mark of 50% is required for a pass. Assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, research reports, oral examinations, and seminar presentations. Attendance of lectures and practical classes is compulsory (at least 80%).

F.4.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted to the Faculty of Science for a second year of registration, a student must have passed a minimum of 64 credits by the end of the first year.

F.4.5. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year programme.

F.4.6. DURATION OF STUDY

The minimum duration of the study is one year and the maximum is two years for full-time students and three (3) years for part-time students. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

F.4.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates who have cleared all prescribed modules as indicated in the curriculum framework.

F.4.8. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions, but the exemptions shall not exceed 50% of the programme in line with the General Information and Regulations Prospectus.

F.4.9. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred percent attendances of practical classes are required.

F.4.11. Bachelor of Science in Chemistry Honours 11BSAC - Articulation

TABLE FOR ALL MODUELS IN BSC IN CHEMISTRY HONOURS 11BCAC

CODE	COURSE	NQF	CREDIT	PREREQUISITES	COREQUISITES
Year 1 Semester 1					
CHM3801	Instrumental Analysis II	8	8	CHM3702	None
CHM3811	Organic Chemistry III	8	16	CHM3752	None
CHM3831	Physical Chemistry III	8	16	CHM 3631; MAT3611	None
GLC3821	Geochemical Analysis	8	8	GLY3662; GLC3700	None
GLY3801	Industrial Minerals and Gemstones	8	8	GLY3711	None
CHP3811	Wastewater Treatment (Elective)	8	16	CHP3701, CHP3711	none
CHM3821	Natural Product I (Elective)	8	8	CHM3752, CHM3702	None
Year 1 Semester 2					
CHM3812	Industrial Chemistry II	8	16	CHM3712 CHM3761	None
CHM3802	Inorganic Chemistry III	8	8	CHM3751, CHM3752	None
CHM3822	Natural Product Chemistry II	8	8	CHM3752	CHM3801
CHC3822	Petroleum Chemistry (Elective)	8	8	CHM3752, CHM3761&CHM3712	None
CHP3822	Environmental Chemistry II (Elective)	8	8	CHP3711	none
CHP3842	Medicinal Chemistry II (Elective)	8	8	CHP3741, CHP3721	CHM3811
CHM3880	Research Methodology & Project	8	38	**Pass in all levels 7 modules**	none
Total Credits			**126**		

F.4.12. Bachelor of Science in Physics Honours Articulation

Students registering for the Physics articulation programme (11BSPA) must take all the following courses:

YEAR 1 – 11BSPA

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
Semester 1					
PHY3811	Quantum Mechanics	8	16	None	None
PHY3831	Statistical Mechanics	8	16	None	None
PHY3809	Advanced Electrodynamics	8	8	None	None
PHY3821	Plasma Physics	8	8	None	None
Semester 1					
PHY3812	Solid State Physics	8	16	None	None
PHY3802	Nuclear Physics	8	8	None	None
PHY3822	Optics & Laser Physics	8	8	None	None
PHY3842	Astrophysics	8	8	None	None
REP3802	Aspects of Renewable Energy Physics	8	8	PHY3701, PHY3752	None
PHY3880	Research Methodology & Project	8	38	None	None
Total Credits			**134**		

F.4.13. PHYSICS SERVICE COURSES

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
Semester 1					
PHY3501	Physics for Life Sciences I	5	8	None	None
PHE3751	Modern Physics for Educators	7	16	PHY3511, PHY3512, MAT3511, MAT3512	None
Year 4 Semester 1					
PHY3402	Physics for Radiographers	4	8		None
PHY3532	Physics for Life Sciences II	5	16	None	PHY3501
PHE3642	Electricity and Magnetism	6	8	PHY3512, MAT3511, MAT3512	None
Total Credit			**56**		

F.5. MSC PHYSICS (11MSPH)

F.5.1. REGULATIONS

F.5.2. ADMISSION REQUIREMENTS

The admission requirement for this **fully accredited** master programme in Physics is a University of Namibia NQF Level 8 degree in Physics or equivalent degree from a recognised institution. The applicant will be accepted based on his/her undergraduate academic record with an average mark of at least **60%**.

F.5.3. DURATION OF STUDY

The duration of this programme will be two (2) years minimum and three (3) years maximum for full-time students. The first year will mostly consist of coursework, while the second year will be dedicated to a supervised research project and the writing of a thesis.

F.5.4. EXAMINATION REGULATIONS

Formal examinations, subject to external moderation, will take place at the end of each semester of the first year of the programme. A minimum continuous assessment mark of 40% and a minimum of 80% class attendance is required to be admitted to write the examination in a specific course. Students must pass all courses to proceed to the thesis component of the degree. In all cases, a minimum mark of 50% is required to pass.

F.5.5. FORMAT AND EVALUATION OF THESIS WORK

During the thesis year, the student shall conduct supervised research in a Senate approved field of study. At the end of this year, the candidate must submit a completed Master Thesis/Dissertation in the English language. This thesis must be in a format prescribed by the Department as per University regulations. The completed thesis will be evaluated by the supervisor(s) and one (or more, if needed) external examiners, normally within a month after submission. The student will be expected to successfully defend his/her thesis in a viva voce examination.

F.5.6. PRACTICALS

Attendance of practical classes, experiments, projects, field trips and/or internships as prescribed by the course lecturers and thesis supervisor(s) are compulsory.

F.5.7. CURRICULUM COMPILATION

YEAR 1

CODE	COURSE NAME	NQF	CREDIT	PREREQUISITE	Compulsory/Elective	COREQUISITES
Year 1 Semester 1						
PHY5911	Advanced Quantum Mechanics	9	24	None	Compulsory	None
PHY5951	Mathematical Methods of Physics	9	24	None	Compulsory	None
UAE5819	Advanced Academic Writing for Postgraduate Students	9	NCB	None	Compulsory	None
PHY5920	Research Methodology &Project Proposal	9	24	None	Compulsory	None
Year 1 Semester 2						
PHY5952	Computational Physics	9	24	None	Elective	None
PHY5972	Advanced Classical Mechanics	9	24	None	Elective	None
PHY 5992	Astro- and Space Physics	9	24	None	Elective	None
Total credits			**144**			

YEAR 2

CODE	COURSE NAME	NQF	CREDIT	PREREQUISITE	Compulsory/Elective	COREQUISITES
PHY5900	Thesis	9	120	**All** Year 1 subjects passed	Compulsory	None
Total credits			**120**			

Total credits = 144 (year 1) + 120 (year 2) = 264

NCB = Non-Credit Bearing

F.6. MSC NUCLEAR SCIENCE – 11MSNU (NOT OFFERED IN 2024)

F.6.1. REGULATIONS

F.6.2. ADMISSION REQUIREMENTS

The admission requirement for the MSc in Nuclear Science programme will be a NQF Level 8 degree or its equivalent with major in Physics or Chemistry or Mathematics and with one of the following disciplines on at least a second-year level: Chemistry, Mathematics, Physics, Geology and Computer Science (but excluding Mathematics/Computer Science and Mathematics/Geology combinations). The applicant will be accepted based on his/her undergraduate academic record with an average mark of 60%.

F.6.3. DURATION OF STUDY

The duration of this programme will be two (2) years minimum and three (3) years maximum. The first year will mostly consist of coursework, while the second year will be dedicated to a supervised original research project and the writing of a thesis.

F.6.4. CURRICULUM COMPILATION

The curriculum for the MSc in Nuclear Science consists of coursework and the writing of a research thesis. Please refer to the Postgraduate Student Guide from the School of Postgraduate Studies, and the General Prospectus: Information, Regulations & Fees.

F.6.5. EXAMINATION REGULATIONS

Formal examinations, subject to external moderation, will take place at the end of each semester of the first year of the programme. A minimum continuous assessment mark of 40% and a minimum of 80% class attendance are required to be admitted to write the examination in a specific course. Students must pass all courses to proceed to the thesis component of the degree. In all cases, a minimum mark of 50% is required to pass.

F.6.6. FORMAT AND EVALUATION OF THESIS WORK

Before a candidate can proceed to the thesis, he/she must first successfully complete the coursework examinations. Each student will submit a Master Thesis/Dissertation at the end of this second year. The thesis must be in a format prescribed by the Department as per University regulations. The completed thesis will be evaluated by the supervisor(s) and one (or more, if needed) external examiners, normally within a month after submission. The student will be expected to successfully defend his/her thesis in a viva voce examination.

F.6.7. PRACTICALS

Attendance of practical classes, experiments, projects, field trips and/or internships as prescribed by the course lecturers and thesis supervisor(s) are compulsory.

F.6.8. MSC NUCLEAR SCIENCE – 11MSNU (NOT OFFERED IN 2024)

YEAR 1

CODE	COURSE NAME	NQF	CREDIT	PREREQUISITE	Compulsory/Elective	COREQUISITES
Year 1 Semester 1						
NUC5911	Principles of Nuclear Physics	9	24	None	Compulsory	None
NUC5901	Nuclear Instrumentation	9	12	None	Compulsory	None
NUC5921	Mathematical Methods for Nuclear Scientists	9	12	None	Compulsory	None
UAE5819	Academic Writing for Postgraduate Students	9	NCB	None	Compulsory	None
PHY5920	Research Methodology and Project Proposal	9	24	None	Compulsory	None
Year 1 Semester 2						
NUC5912	Nuclear Chemistry	9	24	None	Compulsory	None
NUC5932	Radiation Protection and Health Physics	9	24	None	Compulsory	None
NUC5902	Radiobiology	9	12	None	Compulsory	None
NUC5922	Nuclear Reactor Science and Technology	9	12	None	Elective	None
NUC5942	Radiation Techniques and Applications	9	12	None	Elective	None
NUC5962	Special Topics in Nuclear Science and Technology	9	12	None	Elective	None
NUC5982	Computational Physics for Nuclear Scientists	9	12	None	Elective	None
Total credits			**144**			

YEAR 2

CODE	COURSE NAME	NQF LEVEL	CREDIT	PREREQUISITE	Compulsory/Elective	COREQUISITES
NUC5900	Thesis	9	120	**All Year 1 subjects passed**	Compulsory	None
Total credits			**120**			

Total credits for the programme = 144 (year 1) + 120 (year 2) = 264
NCB = Non-Credit Bearing

F.7. MASTER OF SCIENCE IN CHEMISTRY (11MSCC)

F.7.1. ADMISSION REQUIREMENTS

The MSc programme is open to all BSc graduates with Chemistry or Biochemistry as one of their majors respectively. The admission to the MSc programme of the holders of the B.Sc. Chemistry or Biochemistry degree is not automatic. The applicants will be accepted on the basis of their undergraduate record. An average mark of **60%** is required. The course normally extends over a minimum period of two years for full-time students.

F.7.2. DURATION OF STUDY

The duration of the MSc in Chemistry is two (2) years for full-time students and three (3) years for part-time students. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

F.7.3. ASSESSMENT CRITERIA

The curriculum for the MSc programme consists of coursework and research leading to a thesis. Coursework component in the first year will be assessed through written tests, laboratory work, seminar presentation and final examination. Each course assessment is based on continuous assessment mark (50%) and examination mark (50%). Continuous assessment mark is computed as 60% test and 40% practical mark. In order to pass a course, a student must obtain a final mark of at least 50%. Refer to specific courses for detailed assessment criteria.

F.7.4. MSC THESIS IN THE SECOND YEAR:

A candidate must first successfully complete the coursework examinations before commencing thesis work. The thesis must be drafted in English language and submitted to the supervisor. It must be in a university approved format. The thesis will be evaluated by UNAM approved internal and external examiners. The UNAM grading system will be used for the evaluation. Each student will defend the thesis in a viva voce examination. Refer to the General Information and Regulations Prospectus and Postgraduate Prospectus for detailed information.

F.7.5. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 264 credits, and who have met all the requirements of the degree programme.

F.7.6. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions but the exemptions shall not exceed 50% of the programme in line with the General Information and Regulations Prospectus.

F.7.7. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred percent attendances of practical classes are required.

F.7.8. CURRICULUM COMPILATION

The curriculum for the MSc Chemistry consists of coursework and the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations & Fees.

F.7.8.1. MASTER OF SCIENCE IN CHEMISTRY (11MSCC)

CODE	Course name	NQF	Credits	Compulsory-/Elective	Prerequisites
Year 1 Semester 1					
UAE5819	Advanced Academic Writing for Post Graduate Students	**9**	24	C	None
CHM5961	Chemistry Seminars	**9**	12	C	None
CHM5911	Advanced Analytical & Instrumental Methods	**9**	24	C	None
CHM5991	Research Methodology &Project Proposal	**9**	12	C	None
Electives (Any two courses)					
CHM5931	Advanced Organic Chemistry	**9**	24	E	None
CHM5951	Advanced Inorganic Chemistry	**9**	24	E	None
CHM5971	Advanced Physical Chemistry	**9**	24	E	None
CHI5931	Advanced Industrial Chemistry	**9**	24	E	None
Year 1 Semester 2: Electives (Any two courses)					
CHM5912	Current Topics in Analytical Chemistry	**9**	24	E	CHM5911
CHM5932	Current Topics in Organic Chemistry	**9**	24	E	CHM5931
CHM5972	Current Topics in Physical Chemistry	**9**	24	E	CHM5971
CHM5952	Current Topics in Inorganic Chemistry	**9**	24	E	CHM5951
CHI5932	Current Topics in Industrial Chemistry	**9**	24	E	CHI5931
Total credits Year 1					**144**

YEAR 2

CODE	Course name	NQF	Credits	Compulsory-/Elective	Prerequisites
YEAR 2					
CHM5900	M.Sc. Thesis	**9**	120	C	Pass in all year 1 courses
Total credits Year 2					**120**
Total credits for the programme					**264**

F.8. MASTER OF SCIENCE IN RENEWABLE ENERGY: MATERIAL SCIENCE STREAM (11MSRM) & PHOTOVOLTAICS STREAM (11MSRP)

F.8.1. ADMISSION REQUIREMENTS

MSc applicants for Photovoltaics or Renewable Energy Materials may be required to complete selected undergraduate NQF level 8 courses and obtain a **60% average** in those modules before applying for admission to this qualification: Applicants planning to specialise in **Renewable Energy Materials** must register and complete **(for non-degree purposes)** *Inorganic Chemistry III* (CHM3802), *Organic Chemistry III* (CHM3811), *Physical Chemistry III* (CHM3831) and *Instrumental Analysis II* (CHM3801). Applicants planning to specialise in **Photovoltaics** must register and complete **(for non-degree purposes)** *Quantum Mechanics* (PHY3811), *Statistical Mechanics* (PHY3831), and *Solid-State Physics* (PHY3812).

F.8.2. DURATION OF STUDY

The duration of the **MSc in Renewable Energy is two (2) years for full-time on full time basis**, only. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

F.8.3. ASSESSMENT CRITERIA

The curriculum for the **MSc programme consists of coursework and research leading to a thesis.** Coursework component in the first year will be assessed through written tests, laboratory work, seminar presentation and final examination. Each course assessment is based on continuous assessment mark **(50%)** and examination mark **(50%)**. Continuous assessment mark is computed as **60% test and 40% practical mark.** In order to pass a course, a student must obtain a final mark of at least **50%**. Refer to specific courses for detailed assessment criteria.

F.8.4. MSC THESIS IN THE SECOND YEAR:

A candidate **must first successfully complete the coursework examinations** before commencing thesis work. The thesis must be drafted in English language and submitted to the supervisor. It must be in a university approved format. The thesis will be evaluated by UNAM approved internal and external examiners. The UNAM grading system will be used for the evaluation. Each student will defend the thesis in a viva voce examination. Refer to the General Information and Regulations Prospectus and Postgraduate Prospectus for detailed information.

F.8.5. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with 240 NQF level 9 credits as prescribed in the curriculum, and who have met all the requirements of the programme with respect to the thesis component.

F.8.6. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions but the exemptions shall not exceed 50% of the programme in line with the General Information and Regulations Prospectus.

F.8.7. CLASS ATTENDANCE

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark. Hundred percent attendances of practical classes are required.

F.8.8. CURRICULUM COMPILATION

The curriculum consists of coursework and the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations & Fees.

F.8.8.1. MATERIAL SCIENCE STREAM (11MSRM)

CODE	COURE NAME	NQF	CREDITS	Compulsory-C/Elective-E	PREREQUISITES
UAE5819	Advanced Academic Writing for Post Graduate Students	**9**	(24*)	C	None
REP5920	Research Methodology and Project Proposal	**9**	24	C	None
REP5911	Advanced Theory of Solar Cells I	**9**	24	C	None
REP5931	Renewable Energy Frontiers	**9**	24	C	None
REP5912	Advanced Theory of Solar Cells II	**9**	24	C	REP5911
REM5932	Computational Methods in Material Science	**9**	24	E	None
REM5952	Electroceramics, Electronic, Optical, Magnetic and Characterization of Materials	**9**	24	E	None
CHM5900	M.Sc. Thesis	9	120	**Compulsory**	
Total credits Year 2					**120**
Total credits for the programme					**264**

F.8.8.2. PHOTOVOLTAICS STREAM (11MSRP)

UAE5819	Advanced Academic Writing for Post Graduate Students	9	(24*)	C	None
REP5920	Research Methodology & Project Proposal	9	24	C	None
REP5911	Advanced Theory of Solar Cells I	9	24	C	None
REP5931	Renewable Energy Frontiers	9	24	C	None
REP5912	Advanced Theory of Solar Cells II	9	24	C	REP5911
REP5932	Characterization of Photovoltaic Devices	9	24	E	None
REP5952	Photovoltaic Systems	9	24	E	None
MRE5900	M.Sc. Thesis (**Compulsory**)	9	120	Pass in all year 1 courses	
Total credits Year 2					**120**
Total credits for the programme					**240**

***(Credits for this UNAM compulsory course do not contribute to the total credits for this qualification)**

F.9. PHD PHYSICS (11DPSC)

This doctorate programme in Physics has been **fully accredited** by the Namibian Council for Higher Education (NCHE) for a period of 6 years.

F.9.1. REGULATIONS

F.9.1.1. ADMISSION REQUIREMENTS

The entry requirements for are the possession of a NQF level 9 master's degree from a recognized institution as well as a well-written concept note developed together with a prospective supervisor in the Department of Physics

F.9.1.2. DURATION OF STUDY

The duration of the programme is normally three (3) years for full-time students and four (4) years for part-time students.

F.9.2. ADDITIONAL INFORMATION

Additional information can be found in the prospectus of the Centre for Postgraduate Studies

F.10. MSC AND PHD CHEMISTRY BY THESIS (11MASC & 11DPSC, RESPECTIVELY)

F.10.1. ADMISSION REQUIREMENTS

Student must be in possession of NQF level 8 Honours degree to be admitted for MSc by thesis or NQF level 9 masters degree for PHD by thesis from a recognized institution. In addition, students must submit a well-written concept note developed together with a prospective supervisor in the Department of Physics, Chemistry & Material Science.

F.10.2. DURATION OF STUDY

The duration of the programme for MSc by thesis is usually two (2) years for full-time students and three years for Part-time students. The Duration for PhD students is normally three (3) years for full-time students and four (4) years for part-time students.

F.10.3. ADDITIONAL INFORMATION

Additional information can be found in the prospectus of the Centre for Postgraduate Studies

F.11. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

PHY5911:	ADVANCED QUANTUM MECHANICS
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	Continuous Assessment (**50%**) and will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**) &
Pre-requisites:	None

Course description: Review of time independent perturbation theory: Non-degenerate case - First order correction to energy and corresponding wave function, second order correction to energy and corresponding wave function, applications; Time independent perturbation theory: Degenerate case - Applications to first order Stark effect and to the normal Zeeman effect; Variational principle: Principle and applications to the ground state of hydrogen and helium atoms; Wentzel-Kramers-Brillouin (WKB) approximation: Development and applications of the WKB approximation: Probability of penetration of a barrier, theory of a- decay, Geiger-Nuttel law, potential-well; Time-dependent perturbation theory (method of variation of constants) : Zero and first order perturbation calculations, adiabatic approximation, Fermi-golden rule, sudden approximation, harmonic perturbation, applications - a charge particle in an electromagnetic field, semi-classical theory of radiation, Einstein's transition probabilities; Scattering theory: Scattering cross-section, Greens function approach, Born approximation, partial wave analysis; Relativistic quantum mechanics: Klein-Gordon equation, Klein-Gordon with external electromagnetic potentials, bilinear covariants, solution of the Dirac equation for free particles, plane waves, projection operators, relativistic hydrogen atom; Elements of second quantization: Introduction, canonical quantization of fields, second quantization of Schrodinger field, systems of bosons, system of fermions, creation and annihilation operators.

PHY5951:	MATHEMATICAL METHODS OF PHYSICS
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA **50%** (will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**)
Pre-requisites:	None

Course description: Tensors - tests for tensor character, types of tensors, operations with tensors, compressed notation. Complex analysis - complex variable functions; continuity and differentiability of complex variable functions; Cauchy-Riemann equations; analytic functions; sequences and series; Boltzano-Weierstrass theorem; differentiability of the sum of a power series; integral of complex variable functions; properties of integrals; paths, piecewise continuous paths; path integral; analytical continuation; elementary functions of complex variables as analytic continuations of functions of real variables; Cauchy integral theorem, Cauchy integral formula; Liouville's theorem; fundamental theorem of algebra; singularities; Lauren series; residue; residue theorem; conformal mappings; applications of conformal mappings; basics of operational calculus. Special functions - Legendre, Laguerre, Hermite, Jacobi, Bernoulli, Chebishev polynomials, Bessel functions, hypergeometric function, degenerate hypergeometric function, Beta function, Riemann zeta function; boundary conditions problems - harmonic functions, harmonic analysis. PDEs - parabolic, hyperbolic, elliptic; boundary conditions problems - Green function, Sturm-Liouville problem, eigenvalues, eigenfunctions.

PHY5952:	COMPUTATIONAL PHYSICS
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).
Pre-requisites:	None

Course description: NUMERICAL SOLUTIONS OF ODES: Generalizations of the Euler method; Runge-Kutta methods; Linear multistep methods; Predictor-Corrector methods; Adams-Moulton method; FINITE DIFFERENCES AND FINITE DIFFERENCE METHODS: Forward, backward and central derivatives; Numerical "stencils"/Computational "molecules"; Grid transformations; MATRIX INVERSION METHODS: Gauss elimination; Techniques for sparse matrices: Iterative methods; the Thomas algorithm; Eigenvalue problem; NUMERICAL SOLUTION OF PDES: Classification of PDEs (parabolic, elliptical, hyperbolic); Methods for frequently occurring PDEs in Physics: Crank-Nicolson, ADI, LOD; Applications: heat, diffusion, diffusion-convection, wave and poison equations; STOCHASTIC (MONTE CARLO) METHODS: Random number generators; Random walk & random flights; Statistical fundamentals; Sampling from spectra; Successive over-relaxation, Hybrid MC method; Applications.

PHY5972:	ADVANCED CLASSICAL MECHANICS
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).

Course description: SURVEY OF ELEMENTARY PRINCIPLES: Mechanics of a particle and a system of particles; Constraints; D'Alembert's principle and Lagrange's equations; Velocity-dependent potentials and the dissipation function; Simple applications of the Lagrangian formulation; VARIATIONAL PRINCIPLES AND LAGRANGE'S EQUATIONS: Hamilton's principle; Calculus of variations; Derivation of Lagrange's equations from Hamilton's principle; Extension to nonholonomic systems; Conservation theorems; RIGID BODY MOTION: Euler angles; Caley-Klein parameters; Euler theorem on the motion of a rigid body; Finite and infinitesimal rotations; Coriolis force; Tensors and dyadics; Inertia tensor; Applications; SPECIAL RELATIVITY IN CLASSICAL MECHANICS: Lorentz transformations in real 4 dimensional spaces; Covariant 4 dimensional formulations; Force and energy equations in relativistic mechanics; Lagrangian formulation of relativistic mechanics; Covariant Lagrangian formulations; HAMILTON EQUATIONS OF MOTION: Legendre transformations and the Hamilton equations of motion; Cyclic coordinates and conservation theorems; Hamiltonian formulation of relativistic mechanics; Derivation of Hamilton's equations from a variational principle; The principle of least action; CANONICAL TRANSFORMATIONS: Equations of canonical transformations; Sypmplectic approach to canonical transformations; Poisson brackets and Poisson bracket formulation of mechanics; Liouville's theorem; LAGRANGIAN AND HAMILTONIAN FORMULATIONS FOR CONTINUOUS SYSTEMS AND FIELDS: Transition from discrete to continuous systems; Lagrangian formalism for continuous systems; Stress tensor; Hamiltonian formulation, Poisson brackets and momentum representation; Relativistic field theory; Noether's theorem.

PHY5992:	ASTRO- & SPACE PHYSICS
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).

Course description: COSMIC RAYS: Properties of Cosmic Rays; Distribution functions, intensities, energy and mass spectra; Second order Fermi-acceleration; DIFFUSIVE SHOCK ACCELERATION: Astrophysical magnetohydrodynamic shocks; Rankine-Hugoneot relations; Compression ratios and derived properties of astrophysical shocks; First order Fermi-acceleration; Diffusive shock acceleration; DIFFERENTIAL TRANSPORT AND MODULATION THEORY: The Heliosphere; Solar and stellar winds; Termination shock and Heliopause; Interplanetary magnetic field; Parker spiral field and the neutral sheet; Derivation of Parker transport equation from Boltzmann equation; Particle and current sheet drift; The diffusion tensor; Cosmic ray modulation; Anomalous cosmic rays and acceleration at the solar wind termination shock; RADIATIVE PROCESSES: Synchrotron radiation; Compton and inverse Compton effects; Inverse Compton collision cross sections: Thompson and Klein-Nishina; Synchrotron-self-Compton processes; Photon-photon collisions; REVISION OF ASTROPHYSICAL BASICS: Stellar Physics; Stellar Evolution; Star Formation;Stellar Remnants & Degenerate objects:white dwarfs & neutron stars; Pulsars, Plerions and Supernova Remnants; Black Holes;THE MILKY WAY AND OTHER GALAXIES: Structure of the Milky Way; Galaxy Demographics; Active Galactic Nuclei and Quasars; Groups & Clusters of Galaxies. BIG BANG COSMOLOGY: Olbers' Paradox; Extragalactic Distances; Hubble's Law; Cosmic Clocks; Isotropy; The Friedmann-Robertson-Walker Metric; The Friedmann Equations; The Future of the Universe; Light Element Nucleosynthesis; Tests of Big Bang Cosmology: cosmological redshift & Hubble's Law, the cosmic microwave background, quasars as cosmological probes.

NUC5911:	Principles of Nuclear Physics
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements
Course description:	Review of atomic and nuclear structures, atomic and nuclear radiation, classification of radiation, natural and man-made sources of radiation; Radioactive decay and decay process; Radioactive Equilibrium; Interaction of heavy charged particle with matter: Maximum energy transfer, stopping power, range; Interaction of beta particles with matter: Collisional stopping power, radiative stopping power, radiation yield, range; Interaction of photon with matter; Neutron interaction with matter: elastic scattering and capture process; Nuclear binding energy; Nuclear reactions; Nuclear models; Fission and fusion.

NUC5901:	Nuclear Instrumentation
NQF level:	9
Contact hours:	2 hours per week for 1 semester and 18h of practical work or a mini project
Credits:	12
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 2-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements

Course description: A review of the interaction of nuclear radiation with matter; Methods of radiation detection**:** Ionization in gases, gas-filled detectors, Scintillation detectors, semiconductor detectors and neutron detectors; Spectroscopy and spectra unfolding; Pulse signal processing; Statistics of counting and associated errors; Components of electronic detector systems: Rate meters, High voltage power supplies, AC-DC converters, Scalars, Amplifiers, Single channel analyze and Multi-channel analyzers.

NUC5921:	Mathematical Methods for Nuclear Scientists
NQF level:	9
Contact hours:	2 hours per week for 1 semester and 18h of practical work or a mini project
Credits:	12
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 2-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements

Course description: Complex variable techniques; Eigenvalue problems; Boundary value problems for ordinary differential equations, Integral equations and Partial differential equations. Analysis of data: Weighted mean, measure of dispersion, skewness and kurtosis; Significance tests and theory of errors; Binomial, Gaussian and Poisson distributions; Correlation ratio, smoothing and interpolation; Method of least squares in curve fitting and test of fit. Monte Carlo methods.

NUC5912:	Nuclear Chemistry
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements

Course description: Radionuclides in nature; Natural radioactivity and decay series; Anthropogenic radioactivity; Chemistry of nuclear materials; Radiolysis; radiochemical separation techniques, Radioisotope production; Isotope identification; Determination of activity concentration; Analytical techniques: α-spectrometry, β-spectrometry and γ-spectrometry; Neutron activation analysis: Instrumental neutron activation analysis and cyclic activation analysis.

NUC5932:	Radiation Protection & Health Physics
NQF level:	9
Contact hours:	4 hours per week for 1 semester and 36h of practical work or a mini project
Credits:	24
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements

Course description: Radiation sources; Effects of different types of radiation; Radiation quantities, units and measurements. Biological effects of radiation; Radiation safety guides and Philosophy of radiation protection. Health physics instrumentation: Radiation detectors, dose measuring instruments, neutron measurements, calibration of measuring instruments and counting statistics. External radiation protection: Distance, time and shielding, gamma-ray shielding, protection from beta radiation, and neutron shielding. Internal radiation protection.Computation of exposure and dose; Radiation shielding principles and radiation attenuation calculations.

NUC5902: R	Radiobiology
NQF level:	9
Contact hours:	2 hours per week for 1 semester and 18h of practical work or a mini project
Credits:	12
Course assessment:	CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination:	1 x 3-hour Exam Paper (**50%**).
Pre-requisites:	MSc admission requirements

Course description: Use of radioisotopes in molecular biology techniques; Radiation and mutations; Genomic instability; Molecular mechanisms of radiation damage; Total body irradiation; Inheritable effects of radiation; Effects of radiation on developing embryo; Radiation carcinogenesis; Radiation oncology technology, quality and safety. Brachytherapy; Radiation and cataracts; Radiation safety, radioprotectors and radiosensitizers; Mutation breeding; Radiation, food and nutrition; Radiation and water treatment.Biological impacts of nuclear accidents and disasters.

NUC5922: **Nuclear Reactor Science & Technology**

NQF level: 9
Contact hours: 2 hours per week for 1 semester and 18h of practical work or a mini project
Credits: 12
Course assessment: CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination: 1 x 3-hour Exam Paper (**50%**).
Pre-requisites: MSc admission requirements
Course description: Review of nuclear energy. Uses and classification of reactors; Reactor components: Moderators, fuel, coolants and control rods. Determination of neutron fluxes using foil irradiation. Thermalization of neutrons; Macroscopic slowing down process. Steady state reactor core and four factor formula. Calculations of resonance escape probability and neutron leakage; Neutron balance equation; Flux distribution in rectangular slab reactor core and in cylindrical reactor core. Transient reactor behavior and control; Reactor safety, kinetics and control; Multi-group theory.

NUC5942: **Radiation Techniques and Applications**

NQF level: 9
Contact hours: 2 hours per week for 1 semester and 18h of practical work or a mini project
Credits: 12
Course assessment: CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination: 1 x 2-hour Exam Paper (**50%**).
Pre-requisites: MSc admission requirements
Course description: Radiation sources and irradiation facilities. Radioisotope applications in industry, agriculture, medicine and environment. Radioactive dating techniques. Theory of X-ray fluorescence and X-ray diffraction; Operation of X-ray fluorescence and X-ray diffraction machines. Neutron diffraction, Mossbauer spectroscopy and neutron activation analysis. Other applications and techniques in basic research.

NUC5962: **Special Topics in Nuclear Science and Technology**

NQF level: 9
Contact hours: 2 hours per week for 1 semester and 18h of practical work or a mini project
Credits: 12
Course assessment: CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination: 1 x 2-hour Exam Paper (**50%**).
Pre-requisites: MSc admission requirements
Course description: Introduction to Nuclear law: Concept and principles of nuclear law, legislative process for nuclear law, and regulatory body and functions. Safe transportation of radioactive materials, and radioactive waste management. Accelerator physics: Historical development of accelerators, types of accelerators, applications in nuclear physics, material science, medicine, art and culture, environment and industry. Fusion reactors, neutron activation analysis and other topics of interest.

NUC5982: **Computational Physics for Nuclear Scientists**

NQF level: 9
Contact hours: 2 hours per week for 1 semester and 18h of practical work or a mini project
Credits: 12
Course assessment: CA (**50%**) will consist of at least two (2) class tests and/or assignments & practical report(s) and/or presentation(s) to be consolidated into one (1) practical mark.
Examination: 1 x 2-hour Exam Paper (**50%**).
Pre-requisites: MSc admission requirements
Course description: Numerical integration and iterative methods; Monte Carlo method; Finite difference methods and finite element methods. Fourier and Laplace transformations; Special and orthogonal functions; Variation principle and optimization methods. Interpolation and approximation methods; Numerical solution of linear and non-linear systems. Eigenvalues and eigenvectors. Algorithms and software applications.

CHI5931 **Advanced Industrial Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester and 36h Practical or mini project
Credits: **24**
Course Assessment: **CA** two tests which counts 80%; Laboratory work (or mini project) 20% towards.
Examination: There is a one 3hr examination **Final Mark: 50%** CA mark and **50%** Examination mark
Course Description: Selected topics of the following will be covered: Momentum transfer, Mass transfer, Heat transfer, mixing process of liquids, chemical reaction kinetics, reactor design, Homogeneous chemical reaction, Heterogeneous chemical reaction and Industrial process equipment.

CHM5951 **Advanced Inorganic Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester and 36h Practical or mini project
Credits: **24**
Course Assessment: CA two tests which counts 80%; Laboratory work (or mini project) 20% towards.
Examination: **1X3hr** examination Final Mark: 50% CA mark and 50% Examination mark
Course Description: Selected topics of the following will be covered: The chemistry of 17(halogens) and 18(noble gases). Lanthanides and Actinides Solid State Chemistry: Lattice energy; bonding in solids – bond model. Electrical properties of semiconductors; doped semiconductors.Defects and non-stoichiometry. Low-dimensional solids: one-dimensional solids; two-dimensional solids. Optical properties of solids; optical fibres. Magnetic properties of solids; Superconductors: theory, magnetic properties, Josephson effects. Isolobal analogies and relationships.Metal-metal bonds. Cluster compounds. Bioinorganic Chemistry.

CHM5931 **Advanced Organic Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester and 36h Practical or mini project
Credits: **24**
Course Assessment: **CA** two tests which counts 80%; Laboratory work (or mini project) 20% towards.
Examination: There is a one 3hr examination Final Mark: 50% CA mark and 50% Examination mark
Prerequisites: None
Course Description: *Stereochemistry:* definition of terms, representations, conformational analysis; *Stereoselective synthesis:* strategies in stereoselective synthesis (substrate control, chiral auxiliary control, reagent control and catalyst control); *Pericyclic reactions:* the frontier orbital theory, orbital symmetry study and application to electrocyclic reactions, sigmatropic hydride shifts and cycloaddition reactions; *Retrosynthetic analysis:* definitions, functional group interconversion, synthons, umpolung, protective groups, one-group disconnections, two-group disconnections; *Organometallic compounds in synthesis:* organo-sulphur chemistry, organolithium compounds, direct ortho-metallation, synthetic applications; *Polymer chemistry:* the polymerization process, condensation polymers, addition polymers, block, graft and ladder polymers, selected applications, recycling: *Natural product chemistry*: classification of natural products, approaches to the study of natural products, selected natural products, biosynthesis, total synthesis.

CHM5971 **Advanced Physical Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester and 36h Practical or mini project
Credits: **24**
Course Assessment: **CA** two tests which counts 80%; Laboratory work (or mini project) 20% towards.
Examination: There is a one 3hr examination **Final Mark: 50%** CA mark and **50%** Examination mark
Prerequisites: None
Course Description: Selected topics of the following will be covered: Advanced kinetics: rates of chemical reactions; reactions in the gas and solution phases; complex reactions. Quantum Chemistry. Computational Chemistry: practical applications of electronic structure methods [Density Functional Theory (DFT) and Ab-initio Methods]; Molecular dynamics. Biophysical Chemistry. Statistical Mechanics.

CHM5961 **Chemistry Seminars**

NQF Level: 9
Contact Hours: 2 lectures/consultations per week for one semester
Credits: **12**
Course Assessment: Presentations are graded by staff members and count toward the CA mark. Final Mark: **100% CA mark**
Prerequisites: None
Course Description: The main component of this course involves the application of presentation skills through seminars, review of scientific literature and communication of recent developments in chemistry and biochemistry.

CHM5912 **Current Topics in Analytical Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester
Credits: **24**
Course Assessment: A minimum of two independent study reports (or one report and one test) which counts 80% towards the continuous assessment mark (CA).
Presentations: at least one presentation which counts 20% towards the CA mark.
Examination: There is one 3hr examination at the end of the semester and counts **50%** towards the final mark
Prerequisites: Advance Analytical and Instrumental Method (SCHM5911)
Course Description: Students will be asked to perform literature review, write reports, present and conduct seminars in the current advances in the following topics (topics may change): Topic 1- inductive coupled plasma M.S. and atomic absorption spectroscopy, Topic 2- application of analytical techniques in environmental monitoring., Topic 3- ion-exchange, size-exclusion and reversed phase HPLC., Topic 4- supercritical–fluid chromatography, affinity and chiral chromatography and capillary-electro chromatography. Topic 5- voltametric, potentiometric and polarographic methods.Topic 6- atomic mass spectrometry {spark source M.S, glow discharge M.S} and atomic fluorescence spectroscopy.

CHM5932 **Current Topics in Organic Chemistry**

NQF Level: 9
Contact Hours: 4 lectures per week for one semester
Credits: **24**
Course Assessment: A minimum of two independent study reports (or one report and one test) which counts 80% towards the continuous assessment mark (CA). **Presentations:** at least one presentation which counts 20% towards the CA mark.
Examination: There is one 3hr examination at the end of the semester and counts 50% towards the final mark.
Course Description: Students will be asked to perform literature review, write reports, present and conduct seminars in the current advances in the following topics (topics may change): Amide coupling reagents: applications & limitations Recent advances in C-C bond formation reactions; Natural Products in Drug Discovery; Advances in Biomimetic Organic Synthesis Advances in the Huisgen 1,3-dipolar cycloaddition reaction and its application in drug discovery; Advances in multicomponent reactions (mcr) and their application in drug discovery; Complex natural product synthesis; Chiral auxiliaries: principles, preparations and recent applications; Advances in chemoenzymatic synthesis; Advances in the synthesis of heterocycles; Introduction of Quaternary stereogenic centers; Biosynthetically inspired approaches to natural product synthesis; Stereoselective Aldol reactions; Advances in Physical Organic Chemistry; Advances in Functional group transformations; Advances in the synthesis of Alkene, Alkynes, Allenes, etc Functional group protection.

CHM5972	Current Topics in Physical Chemistry
NQF Level:	9
Contact Hours:	4 lectures per week for one semester
Credits:	**24**
Course Assessment:	A minimum of two independent study reports (or one report and one test) which counts 80%towards the continuous assessment mark (CA). **Presentations:** at least one presentation which counts 20% towards the CA mark.
Examination:	There is one 3hr examination at the end of the semester andcounts 50% towards the final mark.
Prerequisites:	Advanced Physical Chemistry (SCHM5971

Course Description: Students will be asked to perform literature review, write reports, present and conduct seminars in the current advances in the following topics (topics may change): Topic 1; quantum and computational chemistry, topic 2 molecular spectroscopy, topic 3 chemical kinetics and dynamics, topic 4 statistical thermodynamics; topic 5 interstellar chemistry.

CHM5952	Current Topics in Inorganic Chemistry
NQF Level:	9
Contact Hours:	4 lectures per week for one semester
Credits:	**24**
Course Assessment:	A minimum of two independent study reports (or one report and one test) which counts 80% towardsthe continuous assessment mark (CA). **Presentations:** at least one presentation which counts 20%towards the CA mark.
Examination:	1X3hr examination at the end of the semester andcounts 50% towards the final mark.
Prerequisites:	Advanced Inorganic Chemistry (SCHM5951

Course Description: Students will be asked to perform literature review, write reports, present and conduct seminars in the current advances in the following topics (topics may change): Reactions of coordinated diatomic ligands NO, CO and NO_2, Boron hydrides compounds, fullerenes chemistry of transition metals, transition metal complexes containing s-based ligands

CHI5932	Current Topics in Industrial Chemistry
NQF Level:	9
Contact Hours:	4 lectures per week for one semester
Credits:	**24**
Course Assessment:	A minimum of two independent study reports (or one report and one test) which counts 80%towards the continuous assessment mark (CA). **Presentations:** at least one presentation which counts 20% towards the CA mark.
Examination:	There is one 3hr examination at the end of the semester and counts 50% towards the final mark. **Final Mark: 50%** Continuous Assessment (literature review 2500 words) and **50%** Examination
Prerequisites:	Advanced Industrial Chemistry (CHI5931)

Course Description: Students will be asked to perform literature review, write reports, present and conduct seminars in the current advances in the following topics (topics may change); technical processes invented in industrial chemistry; nanomaterials created in industrial chemistry; chemical reaction, equipment designed and used; newly invented substances and technical method.

REP5911	Advanced Theory of Solar Cells I
NQF Level	9
Contact Hours	2 lectures per week for one semester and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts **40%**, Laboratory Mark (or Mini project) counts **50%**, at least 2 presentations which counts **10%,**
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark
Prerequisite	None

Course Descriptor: Review of Modern Physics: topics in quantum mechanics, electromagnetic theory, statistical thermodynamics; Fundamentals of semiconductors: crystals and crystal structure, energy bands, direct and indirect band gap; density of states, carrier distribution functions, carrier densities and carrier transport, intrinsic and extrinsic semiconductors (doping) , carrier generation and recombination, continuity equation, drift-diffusion model, Fermi levels, quasi-Fermi energy levels; p-n junction electrostatics; diode equation, depletion approximation, fundamentals of solar cells: solar cell boundary conditions; p-n junction under illumination: absorption of light, carrier generation and recombination, charge collection probability.

REP5931	Renewable Energy Frontiers
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 40%, Laboratory Mark (or Mini project) counts 50%, at least 2 presentations which counts 10%,
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark
Prerequisite	None

Course Descriptor: Overview of renewable energy technologies; system-view of the manufacturing process that aims to efficiently use energy, water and other raw materials, to minimize air and water pollution and generation of waste per unit of the manufactured product; the course will discuss methods to maximize yield and minimize waste effluents in processes, ways to devise treatment strategies for handling manufacturing wastes. Innovative ways to decrease energy consumption manufacturing; by-product use and product recycling; policies that encourage green manufacturing; quality and environmental standards.

REP5912	Advanced Theory of Solar Cells II
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 50%, Laboratory Mark (or Mini project) counts 40%, atleast 2 presentations which counts 10%,
Examination:	1x3hr examination. Final Mark: 50% CA mark and 50% Examination mark
Prerequisite	**REP5911**

Course Descriptor: Photovoltaic effect, characteristic curves, solar cell parameters; limitations to energy conversion in solar cells, quantum efficiency and spectral response, ideal and non-ideal solar cells; effects of light intensity and temperature; solar cell equivalent circuit models; metal-semiconductor junction; Solar cell technologies and fabrication: silicon solar cells, thin film solar cells, multi-junction solar cells; Emerging solar cell technologies dye sensitized solar cells and their syntheses; organic solar cells, quantum dot cells, inorganic solar cells.

REM 5932	Computational Methods in Material Science
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 40%, Laboratory Mark (or Mini project) counts 50%, at least 2 presentations which counts 10%,
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark
Prerequisite	**None**

Course Descriptor: Introduction to computational materials science. Multi-scale simulation methods; electronic structure, atomistic, micro-structure, continuum, and mathematical analysis methods; rate processes and rare events. Materials defect theory; modeling of crystal defects, solid micro-structures, fluids, polymers, and bio-polymers. Materials scaling theory: phase transition, dimensionality, and localization. Perspectives on predictive materials design.

REM5952	Electroceramics, Electronic, Optical, Magnetic and Characterization of Materials
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 70%, Laboratory Mark (or Mini project) counts 20%, at least 2 presentations which counts 10%,
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark
Prerequisite	**None**

Course Descriptor: This course will explore the structure property relationships and phenomena in ceramic materials used in electronic, dielectric, ferroelectric, magnetic, and electrochemical applications. In particular, discover how to functionalize a component for a particular application- a capacitor, a thermistor, actuator, or a fuel cell. Such a discovery process demands an in-depth understanding of the roles and interrelationships between the crystal structure, defect chemistry, microstructure, and texture in such materials. Statistical thermodynamics, quantum mechanics, and solid mechanics principles will be used when necessary in the course. Fit in the space and act as a bridge between solid state theory where the emphasis is largely on theory and a ceramic materials course where the emphasis is largely on processing. The study of the crystal structure, crystal diffraction and the related techniques used as diagnostic tools; the electronic, thermal, optical and magnetic properties of material systems important for electronics and photonics device applications. The theory of superconductivity, the chemistry aspects of solid state materials and will provide an introduction to solid state biophysics. The properties of semiconductor materials and semiconductor devices with its focus on technologically relevant structural, optical, thermal and magnetic material properties.

REP5932	CHARACTERIZATION OF PHOTOVOLTAIC DEVICES
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 40%, Laboratory Mark (or Mini project) counts 50%, at least 2 presentations which counts 10%,
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark

Course Descriptor: Properties of light, irradiance, space and terrestrial solar radiation; atmospheric effects; motion of the sun-declination, elevation, azimuth; solar radiation on tilted surface; measurement of solar radiation; instrumentation; solar radiation databases. Solar cell and module characterization techniques, measurement of cell efficiency, IV characterization, optical characterization, carrier lifetime measurement, electroluminescence; thermography; instrumentation.

REP5952	PHOTOVOLTAIC SYSTEMS
NQF Level	9
Contact Hours	2 lectures per week for one semester and and 18h (cumulative) practical
NQF Credits	24
Course Assessment	A minimum of two tests which counts 50%, Laboratory Mark (or Mini project) counts 40%, at least 2 presentations which counts 10%.
Examination:	1x3hr examination. Final Mark: **50%** CA mark and **50%** Examination mark

Course Descriptor: Properties of light, irradiance, extra-terrestrial and terrestrial solar radiation; atmospheric effects; motion of the sun-declination, elevation, azimuth; solar radiation on tilted surface; measurement of solar radiation; instrumentation; solar radiation databases. Solar modules: module structure and characteristics, mismatch effects, shading, hot-spots, bypass diodes; temperature effects; module degradation; PV arrays: solar generator, Balance of System (BOS) components: batteries; inverters, charge controllers; types of PV systems: grid-connected and stand-alone PV systems, PV systems sizing and installation; systems performance characteristics; care and maintenance, Introduction to suitable design and simulation software; life-time costing.

CHM5921	RESEARCH METHODOLOGY & PROJECT PROPOSAL
NQF Level:	9
Contact Hours:	2 lectures per week and 2h consultation per week for one semester
NQF Credits:	12
Course Assessment:	Research proposal counts 80% and Statistics assessed by a test, assignment or report count 20%. **Final Mark: 100%** CA from which 20% is statistics component.
Prerequisite:	None

Course Descriptor: The lecturers will present some chemostatistics topics i.e. handling experimental data, processing and reporting, e.g. significance tests. Analysis of variance (ANOVA), regression analysis methods, validation experimental data (quality control) and experimental design and optimization of parameters. The student will write a comprehensive research proposal for his/her MSc research work in a particular field of national interest, under the supervision of an academic researcher. The evaluation will be done in accordance with UNAM Post-graduate School guidelines.

PHY5920:	RESEARCH METHODOLOGY & PROJECT PROPOSAL
NQF level:	9
Contact hours:	2 hours per week for 2 semesters
Credits:	24
Course assessment:	Continuous Assessment (**100%**), will consist of reports son various topics and, most importantly, a well developed project proposal for his/her M.Sc. thesis.
Pre-requisites:	None

Course description: Philosophical underpinnings of the Scientific Method, Fallacies of Reason & Rhetoric, aviding "bad science" and pseudoscience, ethical and legal issues, statistical and mathematical principles, error analysis and propagation, hypothesis verification/refutation, the IOP referencing style and citation; Logic and the taxonomy of the Fallacies of Rheason & Rhetoric, philosophical streams in the Philosophy of Science and overview of modern philosophers like Russell, Popper and Kuhn; Library resource utilization, mini literature reviuew projects in prospective fields of research, identification of supervisor(s), writing and presentation of a draft Research Proposal.

NUC5900/PHY5900:	THESIS
NQF level:	9
Contact hours:	N/A
Credits:	120
Course assessment:	Thesis to be submitted at the end of the year for internal and external examination.
Pre-requisites:	All courses of the first year must be completed.

Course description: The student will be required to undertake research activities in a selected topic of Nuclear Science and to submit a thesis. Students will work under the supervision of a researcher of their own choice which will enable the candidate to gain theoretical and analytical knowledge in course work to a substantive problem relevant to their area of specialization.

G. DEPARTMENT OF GEO-SCIENCES

Geology is the science about our planet Earth; it involves the analysis of the Earth's structure, composition, and its evolution through Earth History. Geology is a science under the umbrella of Geosciences; it is a relevant discipline in the understanding of Earth Materials and Earth Processes. These encompass natural resources including ores, energy resources such as hydrocarbons, building material, and water.

Geology extends into environmental science as far as the pollution of our environment, in particular that of soils and groundwater is concerned. In addition geology is linked with engineering, as construction on and within the ground needs to consider the mechanics of bedrocks and soils. Geohazards, in particular landslides, earthquakes and volcanic eruptions, form another discipline under the umbrella OF geosciences.

Geology is a professional career, where graduates become members of the professional organizations in the countries that they will be employed. As such the standard of the graduands are expected to meet the high standards in industry. This requires that students acquire a sound background in natural sciences, in particular chemistry, physics and mathematics, but do also participate in field trips. Practical competences will be learned and sharpened in the field. These practical competences of the graduands are highly valued, and therefore we expect all our students to take a keen interest in the field trip aspect of the geology curricula.

The field work activity varies from 1-3 day trips to 1-4 weeks during semester breaks and at the end of the year. Students should note that field trips are physically strenuous and all students participating in field trips are therefore required to be medically fit for outdoor activities. In addition students will be required to purchase certain items essential for field work and outdoor activities in remote areas.

The department of geology offers coursework programmes for **Bachelor of Science Geology Honours**, **Master of Science in Applied Geology (with Major in Exploration & Economic Geology, or Major in Environmental Geology & Hydrogeology), and Master of Sciene in Petroleum Geology.**

The BSc Geology Honours qualification is a comprehensive geoscience degree that allows graduates to enter a professional career. The Master of Science qualifications are more advanced and specialized in the respective fields of the curricula.
In addition to the taught BSc and MSc programmes the Geology department offers MSc and PhD degrees by research (thesis only).

G.1. BACHELOR OF SCIENCE IN GEOLOGY - FULL-TIME: 3 YEARS - (33BSGY)

The purpose of the geoscience programme is to provide students with fundamental knowledge of the diverse fields in Geosciences through courses of highest academic quality in a supportive learning environment; thereby equipping them with requisite skills for their professional careers in the field of Geosciences and further studies in view of national and international agenda such as Vision 2030, African Mining Vision, Agenda 2063, Maputo Declaration of 2006, United Nation Framework Convention on Climate Change (UNFCCC) and various Sustainable Development Goals. Ultimately the programme gives effect to the University Vision and Mission of sustained excellence in education, quality training, translational research and innovation contributing to the attainment of national and international development goals.

G.1.2. ADMISSION REQUIREMENTS

N.1.2.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with **EITHER** a pass in five (5) different subjects with:

- ★ 3 subjects on NSSCAS level with a **"d"** average or higher, specifically Mathematics, Physics and Chemistry
- ★ 2 Subjects on NSSCO level **C** or higher of which one should be **English**

Candidates that lack the appropriate subjects (or grades) on NSSCAS as outlined above for admission to the program (or their chosen electives) can opt to rather enroll for an Extended Programme that will take one year longer.

G.1.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued prior to 2021 (only) and has a pass in 5 different subjects can enroll in the Extended mode of this programme:
EITHER a pass in five (5) different subjects with

- ★ English, Mathematics and Physical Science must be at minimum **C** or high on **NSSCO.**

G.1.3. ALTERNATE PATHWAYS TO ADMISSION

G.1.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions. Candidates should:

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought,
- ★ have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.

Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of: English Proficiency, General Knowledge, Mathematical Ability and Physical Science.

A 60% average of all the papers is required, with no paper below 50%.

G.1.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **RECOGNITION OF PRIOR LEARNING (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's **RPL** portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

G.1.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference will be given to students with the higher aggregate mark calculated from Physics and Mathematics at NSSCAS. Consideration will also be given to matters of equity guided by National policies.

G.1.5. ARTICULATION OPTIONS

This qualification serves as an entry point to the following related qualifications: BSc Honors degrees in various fields of geology, in national, regional, and international universities and colleges.

G.1.6. ASSESSMENT CRITERIA

Assessment will be both formative and summative and is based on continuous assessment **50%** and final examination **50%**. Continuous assessment is calculated from series of summative and formative assessments. A minimum of **40%** of the continuous assessment is required to qualify for final examination. A comprehensive final examination is given in the final exam period and includes 1 x 3 h examination paper (Paper I) and 1 x 2 h practical paper (Paper II). Paper I is weighted **60%** and Paper II is weighted **40%.** A minimum of **50%** of the final exam is required to be calculated to the final mark. The final mark to pass the module is **50%** of the combined continuous and final examination results. For **100%** Continuous Assessment modules, a final aggregate mark of **50%** shall be required to pass.

N.1.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

N.1.7.1. NORMAL ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 124 credits (of which 92 must be non-core) by the end of the second year of registration.
- ★ 214 credits by the end of the third year of registration
- ★ 264 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration Extended enrolment.

N.1.7.2. EXTENDED ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 28 number of credits (of which 12 must be non-core) by the end of the first year of registration.
- ★ 92 number of credits (of which 28 must be non-core) by the end of the second year of registration.
- ★ 170 number of credits by the end of the third year of registration
- ★ 230 number of credits by the end of the fourth year of registration
- ★ 298 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration.

G.1.8. ADVANCEMENT AND PROGRESSION RULES

N.1.8.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **87 credits** including the entire core.
- ★ Year 2 to Year 3: **All first-year credits** in addition to at least **84** second-year credits

G.1.8.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least 60 credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 64 second year credits
- ★ Year 3 to Year 4: All second-year credits and at least 54 third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

G.1.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **400 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

G.2.5. IMPLEMENTATION STRATEGY

The restructured Bachelor of Science in Geology (new curriculum) will take effect from January 2023. The programme will be implemented on a year-by-year basis, starting in 2023 with implementation being completed by the end of 2025.

The Bachelor of Science in Geology Honours (old curriculum) will be phased out systematically until 2025 with minimal disruption to existing students' learning progression. The last intake of 1st year students for the existing programme (old curriculum) was in January 2022. This cohort of students will exit the existing programme (old curriculum) in 2025.

G.2.6. EQUIVALENCY OF MODULES OF OLD PROGRAMME TO MODULES IN THE NEW PROGRAMME.

Students who are registered in the existing programme (old curriculum), and who do not pass 50% of their courses at the end of 2023, will be required to change their registration to the new programme and will be granted credits on a course-by-course basis in accordance with information in Table 29.1 below.

G.2. BACHELOR OF SCIENCE IN GEOLOGY - FULL-TIME: 3 YEARS - (33BSGY)

Students opting for BSc Geology must take all the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 1 Core Semester 1					
U3500UO	Skills portfolio	5	0		
U3583AL	Academic Literacy 1	5	8		
U3583DD	Digital Literacy	5	8		
U3420E M	Ethics and Morality	5	2		
U3420CN	National and global citizenship	5	2		
S3520GY	Mathematics for geologists	5	2		
S3500GY	Fundamentals of Geoscience Education	5	2		
Year 1 Semester 1					
S3531CG	Introduction to Physical & Inorganic Chemistry	5	14		
S3511MC	Calculus I	5	12		
S3511PG	General Physics I	5	14		
S3531CG	Introduction to Physical & Inorganic Chemistry	5	14		
S3531DP	Programing Fundamentals I	5	14		
Year 1 Semester 2					
S3502GY	Introduction to Physical geology and Earth Systems Science	5	14		
S3512MC	Calculus II	5	12		
S3511PG	General Physics II	5	14		
S3532DF	Programming Fundamentals II	5	14		
Total Credits			**132**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 2 Core Semester 1					
U3420SE	Sustainability and Environment awareness	6	2		
U3683AL	Academic Literacy II	6	8		
U3520TH	Critical thinking	6	2		
U3640UL	Leadership	5	2		
U3420RT	Entrepreneurship	4	2		
U3420PJ	Project Management	4	2		
S3620GY	The Blue Economy and Green Energy	6	4		
Year 2 Semester 1					
S3611GY	Fundamentals of Mineralogy and Petrology	6	16	S3502GY	
S3631GY	Fundamentals of Geochemistry and Geophysics	6	16	S3511PG, S3502GY, S3531CG	
S3651GY	Introduction to Hydrology and Environmental Geochemistry	6	16	S3502GY, S3531CG	
S3601GY	Mineral Processing and Geostatistics	6	8	S3502GY, S3531CG	
S3671GY	Crystallography and Gemology	6	8	S3502GY, S3531CG	
Year 2 Semester 2					
S3612GY	Introduction to GIS and Remote Sensing	6	16	S3531DP	
S3632GY	Principles of Stratigraphy & Paleontology	6	16	S3502GY	
S3652GY	Structural Geology	6	16	S3502GY, S3511MC	
S3623GY	Prep CWIE (Field Geologyl, Earth Science Field Skills)	6	8		
Total Credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 3 Core Semester 1					
U3710UI	**CWIE**	7	24	**Pass all second- and first-year modules**	
Year 3 Semester 1					
S3701GY	Igneous Petrology	7	9	S3611GY	
S3711GY	Sedimentology and Energy Resources	7	18	S3632GY	
S3721GY	Metamorphic Petrology and Tectonics	7	9	S3611GY, S3652GY	
S3731GY	Economic Geology	7	18	S3611GY; S3652GY	
Year 3 Semester 2					
S3702GY	Exploration Geology - geophysics and geochemistry	7	18	S3652GY, S3631GY, S3612GY	
S3723GY	Field Geology II	7	9	S3623GY	
S3712GY	Environmental and Engineering Geology	7	18	S3652GY, S3651GY	
S3732GY	Hydrogeology	7	9	S3651GY	
Total Credits			**132**		

G.2.1. EXTENDED ENROLMENT

This option caters for students that have **NSSCAS Physics and NSSCAS Mathematics**, **but not NSSCAS Chemistry** that wishes to pursue **a career in Geology** anyways. Thus, in additions to normal enrolment these students will enrol for the following extra/ extended modules:

1. **S3431CS** Chemistry Support I
2. **S3432CS** Chemistry Support II

G.2.2. EXTENDED ENROLMENT

This option caters for students that have NSSCAS Mathematics and NSSCAS Chemistry, **but not NSSCAS Physics** that wishes to pursue **a career in Geology** anyways. Thus, in additions to normal enrolment these students will enrol for the following extra/ extended modules:

1. **S3411PG** Physics Support I
2. **S3412GS** Physics Support II

G.2.3. EXTENDED ENROLMENT

This option caters for students that have **NSSCO Mathematics & Physical Science** obtained **prior to 2021** AND NSSCO Mathematics and with one or both NSSCAS Physics & NCCAS Chemistry NSSCAS Chemistry and NSSCAS Physics, but not **NSSCAS Mathematics** that wishes to pursue **a career in Geology** anyways. Thus, in additions to normal enrolment these students will enrol for the following extra/ extended modules:

1. **S3431CS** Chemistry Support I
2. **S3432CS** Chemistry Support II
3. **S3411PG** Physics Support I
4. **S3412GS** Physics Support II
5. **S3411MS** Mathematics Support I
6. **S3412MS** Mathematics Support II

G.2.4. TABLE OF EQUIVALENTS DURING THE PHASING IN/OUT PERIOD

OLD MODULE			NEW MODULES		
Code	**Module Names**	**Level**	**Code**	**Module Names**	**Level**
GLY3521	Introduction to Physical Geology & Surface Processes	5	S3500GY	Physical Geology	5
GLY3502	Introduction to Earth Systems	5	S3502GY	Geology & the Environment	5
GLY3600	Field Geology I	6	S3623GY	Field Geology I	6
GLY3612	Stratigraphy & Geological Mapping	6		**to be reoffered**	
GLY3621	Introduction to Hydrology	6			
GLY3632	Crystallography & Mineral Chemistry	6			
GLY3642	Introduction to Geochemistry	6			
GLY3662	Introductory Petrology	6			
GLY3700	Field Geology II	7	S3723GY	Field Geology II	7
GLY3702	Hydrogeology I			**to be reoffered**	
GLY3711	Mineralogy	7			
GLY3712	Structural Geology I	7			
GLY3721	Plate Tectonics	7			
GLY3732	Igneous & Metamorphic Petrology	7		Igneous Petrology	S3701GY
				Metamorphic Petrology & Tectonics	S3721GY
GLY3741	GIS	7		**to be reoffered**	
GLY3751	Sedimentology	7			
GLY3761	Regional Geology of Namibia	7			
GLY3762	Research Methodology	7			
GLY3782	Exploration Geochemistry & Geostatistics	7			
GLE3701	Environmental & Engineering Geology I	7			

G.2.3. COURSE DESCRIPTIONS FOR BSC GEOLOGY

FIRST YEAR COURSES

S3502GY: INTRODUCTION TO PHYSICAL GEOLOGY, ENVIRONMENT & EARTH SYSTEMS SCIENCE

NQF level: 5
Contact hours: 4 hours lectures per week and 3 hours practical per fortnight for one semester
Credits: 8
Course assessment: 1 assignment, two (2) tests, and five (5) graded Practicals. A minimum of 40% of the continuous assessment is required to qualify for final examination.
Examination 60%: 1x 3-hour exam paper.
Prerequisites: None
Co-requisite: GLY3502 Introduction to Earth Systems
Course description: Introduction to the science of geology: nature and origin of the earth; minerals and rocks; plate tectonics; volcanism; metamorphism; sedimentation; earthquakes; geologic structures (crustal deformation); geologic time scales; weathering and soil formation; mass wasting; winds and deserts.Earth Materials and Structure; glaciers & glaciation; shorelines; climate change; geologic hazards such as floods, landslides, volcanoes and earthquakes; geologic resources such as metals, stone, fossil fuels, and water; and, environmental challenges such as waste disposal and ground water contamination. Impacts of

S3661GY: THE BLUE ECONOMY & GREEN ENERGY

NQF level: **6**
Contact hours: 1 hour lecturer per week for six weeks
Credits: **4**
Course assessment: Continuous assessment 100%.
Course description: The evolution of ocean basins; ocean floor morphology & continental margins. Geochemical processes of the oceans, Sea water chemistry, global sea levels and patterns of ocean circulation. Marine sedimentation. Mineral placers; diamonds, phosphate. Energy Resources (green hydrogen, hydrocarbon potential for the blue economy), Benguela Current Large Marine Ecosystem (BCLME).

S3623GY: PREP CWIE (FIELD GEOLOGY I, EARTH SCIENCE FIELD SKILLS)

NQF level: 6
Contact hours: 2-3 weeks field work
Credits: **8**
Course assessment: Continuous assessment 100%.
Prerequisites: None
Co-requisite: NONE
Course description: Field studies on the techniques of geological field mapping: Identifying minerals and rock types; data collection; field descriptions; structural measurements; note taking; use of GPS; report writing.

S3631GY: FUNDAMENTALS OF GEOCHEMISTRY AND GEOPHYSICS

NQF level: 6
Contact hours: **4** hours lectures per week + 3 hours practical per week for one semester
Credits: **16**
Course assessment: CA is based on 40% with at least one (1) assignment, two (2) tests, and five (5) graded practicals
Examination: 1 x 3-hour examination paper, 60%.
Prerequisites: S3531CG, S3502GY
Course description: **Geochemical Principles**; chemical substitution in crystals; formation of Solar System; formation and abundance of elements in the solar system; Nucleosynthetic processes; Earth structure and composition; Goldschmidt's classification of the elements and distribution in the Earth; igneous and sedimentary geochemistry; Introduction to the course and the methodology of science, isotope geochemistry. **Geophysics Principles**; Earth's gravity, mass and density, Variation of gravity with latitude, Variation of gravity with altitude, Interpreting gravity anomalies, Isostasy, Gravity measurements and applications, Atmospheric geophysics, Introduction to Seismology, Elementary elastic theory and seismic waves, Seismic refraction and crustal layering, Whole Earth Structure, Earthquake size, Earthquake focal mechanisms, Seismotectonics and seismic hazard, **Introduction to Geomagnetism and Geoelectricity**, Earth's main magnetic field, The non-dipole field, Transient variation of the magnetic field, Magnetic survey methods, Electrical resistivity methods, Introduction to rock and palaeomagnetism, Geomagnetic polarity reversals, Continental drift and apparent polar wander paths, Geothermal Energy, Heat and temperature, Heat and time: daily, seasonal and glacial cycles, The Earth's Heat, Heat and time: thermal history of the Earth.

S3651GY: INTRODUCTION TO HYDROLOGY & ENVIRONMENTAL GEOCHEMISTRY

NQF level: **6**
Contact hours: **4** hours lectures per week + 3 hours practical per week for one semester
Credits: **16**
Course assessment: CA is based on **40%** with at least 1 assignment, 2 tests, and 5 graded practicals.
Examination: 1 x 3-hour examination paper, **60%.**
Prerequisites: S3502GY, S3531CG
Course description: Inventory of water resources on Earth; Elements of the hydrologic cycle; Rainfall run-off relationships; stream hydrograph analysis as well as separation of baseflow and run-off. Porosity; permeability; aquifers and confining units; confined and unconfined aquifers; homogeneity and isotropy in aquifers; primary and secondary permeability in aquifers; Darcy's Law, specific discharge; average linear velocity; hydraulic head concept; potentiometric surface; equipotential lines; flow lines and transmissivity; Specific storage; storativity and specific yield. Hydrochemical facies, and graphical methods of representation of hydrochemical facies. Geochemical behaviours in secondary environment, cations and valency, processes of sorption, importance of Ph and Eh. Physical, biological and chemical weathering, geochemical maps. Human activities are metal sources to the environment. Geochemistry and human health.

S3611GY: FUNDAMENTALS OF MINERALOGY & PETROLOGY

NQF level: 6
Contact hours: **4** hours lectures per week + 3 hours practical per week for one semester
Credits: **16**
Course assessment: CA is based on **40%** with at least 2 assignment, 4 tests, and 10 graded practicals.
Examination: 1 x 3-hour examination paper, **60%.**
Prerequisites: None
Co-requisite: NONE

Course description: Introduction to mineralogy and petrology: silicate structures; non silicate structures; change in P-T conditions within the rock cycle; most common igneous, metamorphic and sedimentary rocks and minerals and their related chemistry; phase diagrams; binary and ternary systems; systematic mineralogy; natural and industrial use of mineralogy and petrology. Identification of minerals and rocks using hand specimens; introduction to optical microscopy.

S3601GY: MINERAL PROCESSING & GEOSTATISTICS

NQF level: **6**
Contact hours: **2** hours lectures per week + 3 hours practical per fortnight for one semester
Credits: **8**
Course assessment: CA is based on **100%** with at least 2 assignment (with presentations), 2 tests, and 5 graded practicals.
Prerequisites: S3502GY
Co-requisite: NONE

Course description: Minerals processing in perspective (economic importance, economic nature of mineral deposits, mineral properties and analysis, mineral processing functions). Liberation analysis (importance and measurement of liberation; particle size analysis). Comminution (theories and principles, crushers, grinding mills). Screening and classification (industrial screening, cyclones). Concentration processes (gravity concentration, dense medium concentration). Froth flotation. Geostatistical methods in ore reserve estimation, relation between geostatistics and geochemical patterns, factors affecting geochemical patterns in space and in time; statistics versus geostatistics, statistical significance and data handling; laws of distribution for ore deposits; Kriging and other estimation methods, error estimation.

S3671GY: CRYSTALLOGRAPHY AND GEMOLOGY

NQF level: 6
Contact hours: **2** hours lectures per week + 3 hours practical per fortnight for one semester
Credits: **8**
Course assessment: CA is based on 100% with at least 2 assignment (with presentations), 2 tests, and 5 graded practicals.
Prerequisites: None
Co-requisite: NONE

Course description: Physical properties of minerals, Crystal Chemistry, Crystallographic Concepts, indexing of directions and planes in lattices, the crystal systems, and the Bravais lattice. Lattice, crystal structure, Miller index, interplanar distance, coordination number, packing efficiency, zone, reciprocal lattice, stenographic projection, Wulff net. Elements of crystal chemistry, aspects of crystal structures, crystallography and external symmetry of minerals, internal order and symmetry of minerals, crystal projections, selected point groups and aspects of space groups, crystal growth and defects; twinning, color and magnetism. Classifying Gemstone, Crystallization in gemstones. Classifying Gemstone, Crystallization in gemstones, Properties of Gemstones, Light and gemstones, Cause of color in gemstone, Color and Crystal form of Gemstone, Gemstones and their phenomenal, Synthetic process of gemstones. GIA method of Color Describing. Gemstone Hotspot in Namibia. Gemstone Grading. Gemstone Mining and trading in Namibia and their socio-economic implications.

S3671GY: STRUCTURAL GEOLOGY

NQF level: 6
Contact hours: **4** hours lectures per week + 3 hours practical per week
Credits: **8**
Course assessment: CA is based on 100% with at least 2 assignment, 2 tests, 1 (field report), and 5 graded practicals.
Prerequisites: S3502GY, S3511MC, S3511PG
Co-requisite: NONE

Course description: **Topographic base maps & sections**; types of geological maps; geological map symbols; cross-sections and 3D illustrations; horizontally bedded units; uniformly dipping beds; three-point problems; structure contours; folding, faulting and igneous bodies; geological mapping techniques. **Analysis of stress and strain** in brittle, ductile and viscous media; microstructures; primary structures; folds; foliation; lineation; joints; **faults and earthquake mechanisms**; geometrical analysis and stereographic projections. Structural associations with plate tectonic settings.

S3612GY: INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEMS AND REMOTE SENSING

NQF level: 6
Contact hours: **4** hours lectures per week + 3 hours practical per week
Credits: **16**
Course assessment: CA is based on 100% with at least 1 assignment, 2 tests, and 10 graded practicals.
Prerequisites: None
Co-requisite: NONE

Course description: **GIS platforms**, data formats, raster and vector files, georeferencing, data sources, digitising, databases in GIS, regionalisation of data / gridding, digital elevation models, digital geological maps, GIS data as input for various models; geological modelling using software packages. **Electromagnetic spectrum and its properties**; atmospheric windows and earth materials; remote sensing systems, data acquisition and storage; **Image Processing and filtering**; image visualization; interpretation of remote sensing images; elements of photogeology, interpretation and analysis; Remote Sensing and GIS.

S3632GY: PRINCIPLES OF STRATIGRAPHY & PALEONTOLOGY

NQF level: 6
Contact hours: **4** hours lectures per week + 3 hours practical per week
Credits: **16**
Course assessment: CA is based on 40% with at least 1 assignment, 2 tests, and 5 graded practicals.
Examination: 1 x 3-hour examination paper, 60%.
Prerequisites: **S3502GY**
Course description: Stratigraphy: the geological time scale, principles of stratigraphy, including Steno's Law, Law of superposition, Law of inclusions and Walthers's law; various stratigraphic concepts: lithostratigraphy, chronostratigraphy, biostratigraphy, chemostratigraphy, magnetostratigraphy. Paleontology: evolutionary patterns and biostratigraphy in common Precambrian and Phanerozoic taxa, paleoecology; fossilization, taphonomy, ichnofossils.

S3623GY: FIELD GEOLOGY I

NQF level: 7
Contact hours: 2-3 weeks of field work
Credits: **7**
Course assessment: CA is based on 100% with at least 1 field quiz, field activities, field notebook evaluation and field report.
Course description: Introduction to field mapping and sampling techniques; sedimentary rocks, folded and polyphase deformed strata; igneous bodies, extrusive & intrusive; high grade metamorphic complexes; stratigraphic logging; field report writing.

S3711GY: SEDIMENTOLOGY AND ENERGY RESOURCES

NQF level: **7**
Contact hours: **4** hours lectures per week and 3 hours practical per week for one semester
Credits: **16**
Course assessment: CA is based on 50% with at least 2 assignment, 4 tests, and 10 graded practicals.
Examination: 1 x 3-hour examination paper, 50%.
Prerequisites: S3632GY
Course description: Petrography: Mineralogy, texture and fabric of sediments and sedimentary rocks; Sedimentary lithofacies and biofacies; sedimentary structures; fossils in sedimentary facies analyses; Sedimentary petrogenesis; diagenesis; Sedimentary basins; Sedimentary successions and depositional environments: recognition of sedimentary cycles and their climatic and tectonic controls, facies architecture and facies analysis. Coal, petroleum and gas. Storage of Carbon and Hydrogen for Green Energy.

S3701GY: IGNEOUS PETROLOGY

NQF level: **7**
Contact hours: 2 hours lectures per week and 3 hours practical per fortnight for one semester
Credits: **8**
Course assessment: CA is based on 50% with at least 2 assignment, 4 tests, and 10 graded practicals.
Examination: 1 x 3-hour examination paper, 50%.
Prerequisites: NS3611GY
Course description: Classification, textures and structures of igneous rocks; mode of emplacement in different geotectonic settings; origin and physical and chemical properties of magma; magmatic differentiation, fractionation, assimilation and contamination; mineralogy and geochemistry of igneous rocks; basic concepts in crystal-liquid relations (phase diagrams) one-component, binary, and ternary systems; geochemical classification using spider and Harker variation diagrams, radiogenic and stable isotopic systems; LREE, HFSE and HREE and their use in igneous petrology; chondrite, primitive mantle, N-MORB and P-MORB relations; magmatism at different tectonic environments.

S3721GY: METAMORPHIC PETROLOGY AND TECTONICS

NQF level: **7**
Contact hours: 4 hours lectures per week and 3 hours practical per fortnight for one semester
Credits: **9**
Course assessment: CA is based on **50%** with at least 2 assignment, 4 tests, and 10 graded practicals.
Examination: 1 x 3-hour examination paper, **50%.**
Prerequisites: **S3611GY**
Course description: **Basics of metamorphism**: Pressure-Temperature depth time paths; the different types of metamorphism in relation to bulk chemistry from the protolith; progressive metamorphism of various rock types based on prograde, retrograde and peak metamorphic conditions as well as on bulk chemical and fluid composition during metamorphism; fundamental relations of thermodynamics; use of the petrogenetic grid; Calculation of AFM, ACF, MSH, CMS-HC ternary diagrams. **The Wilson Cycle;** Plate Motions; geomagnetic reversals in the earth over time; the Earth's magnetic field; hot spots and mantle plumes; **Supercontinent formation and dispersal**; Seismic crustal structure and Benioff zones; Earthquake distribution around the globe; Plate tectonic settings and rock associations; Crustal Provinces.

S3702GY: HYDROGEOLOGY

NQF level: **7**
Contact hours: 2 hours lectures per week and 3 hours practical per fortnight for one semester
Credits: **9**
Course assessment: CA is based on 50% with at least 1 assignment, 2 tests, and 5 graded practicals.
Examination: 1 x 3-hour examination paper, 50%.
Prerequisites: S3651GY
Course description: **Groundwater flow net analysis**; Piezometers; piezometer nests and potentiometric surface map; Regional groundwater flow systems; Tangent law and Dupuit Assumption; **Infiltration capacity of soil**; methods for determining infiltration capacity; Groundwater recharge mechanisms; **Groundwater recharge methods;** computing drawdown; determining aquifer parameters; slug tests; effect of hydrogeologic boundaries; aquifer test design; test and production wells; Thermodynamic principles applied to hydrochemistry; Redox reactions; cation exchange; carbonate dissolution & precipitation reactions; silicate weatherings.

S3732GY:	EXPLORATION GEOLOGY, GEOPHYSICS & GEOCHEMISTRY
NQF level:	**7**
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester
Credits:	**18**
Course assessment:	CA is based on 50% with at least 1 assignment, 2 tests, and 5 graded practicals.
Examination:	1 x 3-hour examination paper, 50%.
Prerequisites:	S3652GY, S3631GY, S3612GY
Co-requisite:	NONE

Course description: **Remote sensing applications**. Geochemical exploration concepts, precision and accuracy, geochemical anomalies, primary and secondary environments and dispersion, indicator and pathfinder elements and minerals, sampling techniques, geochemical techniques in mineral exploration, regional and detailed surveys, Area selection and sequential exploration model, geochemical conceptual models. **Geochemical, metallogenic and biogeochemical provinces**, geochemical associations, geochemical relief, productive plutons. Geological mapping and prospecting, application of photogeology and remote sensing in mineral exploration. Soil, water and biological Sampling methods for geochemical exploration. **Deep sampling methods**: pitting and trenching, drilling methods. **Geological mapping and prospecting**, application of photogeology and remote sensing in mineral exploration, deep sampling methods: pitting and trenching, drilling methods, ore reserve estimation using conventional methods. **Principle aspects of geophysical exploration**: resolution, corrections, and ambiguity in interpretation of geophysical data Potential field geophysical exploration methods: principles and applications of magnetic, gravity, resistivity, electromagnetic induced polarization methods; data processing, derivative extractions; interpretation Radiometric surveys: ground vs aerial surveys; data processing and interpretation Seismic exploration techniques: principles and applications of seismic reflection and seismic refraction survey techniques, data processing and interpretation.

S3731GY:	ECONOMIC GEOLOGY
NQF level:	**7**
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester
Credits:	**18**
Course assessment:	CA is based on 50% with at least 2 assignment, 4 tests, and 10 graded practicals.
Examination:	1 x 3-hour examination paper, 50%.
Prerequisites:	S3611GY, S3652GY

Course description: Ore-forming processes and theories of ore genesis. Classification of mineral resources. Mineral economics: economic recovery of minerals; environmental impact of mineral exploitation; Ore deposit types: magmatic, volcanogenic, volcano-sedimentary, sedimentary, and metamorphic. Metals - their uses and economics: ferrous and base metals; precious and rare metals. Environmental impacts of mineral exploration and production (critical minerals). Geopolitical impacts of mineral resources.

U3710UI:	CO-OPERATIVE & WORK INTEGRATED EDUCATION (CWIE)
NQF level:	**7**
Contact hours:	Minimum of three weeks of work integrated learning.
Credits:	**18**
Course assessment:	CA is based on 100% with at least 2 reports, 1 progress report and, 1 final report; and an evaluation from the industry mentor.

Course description: The course is based on an individual internship in industry. Students are preferably attached to geological-related industry for a minimum of three weeks. During their internship time, students must be supervised by a professional in the geological field. Students can also opt to do a project-based learning or community engagement, particularly in mining towns or communities using underground water resources.

S3712GY:	ENVIRONMENTAL & ENGINEERING GEOLOGY
NQF level:	**7**
Contact hours:	4 hours lectures per week and 3 hours practical per week.
Credits:	**18**
Course assessment:	CA is based on 100% with at least 2 reports, 1 progress report and, 1 final report; and an evaluation from the industry mentor.
Prerequisites:	S3652GY, S3651GY

Course description: Topical environmental issues. SDGs. Types of contaminants in natural water resources, soils and atmosphere; groundwater, soil and air pollution, anthropogenic contaminant sources from agriculture, mining, waste disposal and other human activities; Assessment of contaminated sites, Natural sources of pollution, Environmental Impact Assessment, remediation and rehabilitation techniques, reclamation. Transition to Green Economy. Engineering properties of rocks and rock masses; Soils and soil description for engineering processes; grain size analysis: sieve and hydrometer analysis, moisture content of soil; reservoirs & dams structures; slope stability: landslides, classification and their mitigation; subsurface exploration and geotechnical site investigations; engineering geological maps and tunnel mapping. Soil mechanics and Engineering geology of sediments, the Triaxial test, soil compaction; Rocks Mechanics: physical and mechanical properties of rocks, stress and strain in rocks, strength and deformability of intact rock, in situ stress, Foundations; Earth structures: design methodology, material, implementation and control, embankment on soft soil and slopes; Geological Hazards: seismic hazard and prevention of geological hazards; Groundwater control: permanent and temporary water exclusion.

S3723GY:	FIELD GEOLOGY II
NQF level:	**7**
Contact hours:	2-3 weeks of field work
Credits:	9
Course assessment:	CA is based on 100% with at least 1 field quiz, field activities, field notebook evaluation and report.
Prerequisites:	S3623GY

Course description: Introduction to field mapping and sampling techniques; sedimentary rocks, folded and polyphase deformed strata; igneous bodies, extrusive & intrusive; high grade metamorphic complexes; stratigraphic logging; field report writing.
CA is based on 100% with at least 1 field quiz, field activities, field notebook evaluation and field report.

G.3. BSC GEOLOGY HONOURS ARTICULATION PROGRAMME - 11BSGA

This programme allows geology NQF level 7-degree holders to upgrade their degree to a full BSc Geology Honours degree at NQF level 8 within one academic year. NQF level 7 degrees are commonly 3-year BSc Geology and 4 year BSc double major degrees. The NQF level 8 BSc Geology Honours degree is usually required to enter a professional career or to enroll for a Master of Science programme.

G.3.1. REGULATIONS

G.3.2. Admission Requirements

The following admission criteria shall be met:

1. The applicant should be a UNAM BSc degree holder under the old curriculum with a double major in geology and another course (e.g. chemistry, computer science, economics, physics, statistics, or environmental biology), or a 3-year BSc Geology holder (equivalent to NQA level 7) from another institution.
2. The applicant's BSc degree classification should be Lower Second or higher with a mean % score of 60% and above for the courses of the final and previous year of the respective curriculum.
3. The number of successful applicants will be limited by the availability of resources. Selection will be based on a competency test.

G.3.3. Graduation

In **2015** year four (4) of the outphasing **11BGLY** BSc Geology Honours curriculum (see old 11BGLY curriculum) applies. Therefore students have to clear all 11BGLY final year courses (136 credits) in order to articulate from BSc Geology to 11BSGA BSc Geology Honours. In 2016 year four (4) of the revised **11BSCG** curriculum is phased in. Therefore, from 2016 onwards, all final year NQF level 8 courses (120 credites) of the 11BSCG BSc Geology Honours curriculum shall be cleared in order to articulate from BSc Geology to 11BSGA BSc Geology Honours.

G.3.4. Curriculum Articulation Bachelor of Science in Geology Honours - 11BSGA

QUALIFICATION: BSc Geology Honours - 11BSGA

Students opting for BSc Geology Honours via the 11BSGA Articulation Programme must take all of the following courses:

For **2015** year four (4) (136 credits) of the 11BGLY curriculm applies (see old 11BGLY curriculum). From 2016 year four (4) of the the revised 11BSCG curriculm is phased. In 2016 year four (4) of the 11BSCG curriculum is identical with the one-year 11BSGA curriculum. In 2016 the 11BSGA curriculum includes compulsory and elective courses summing up to a total of **120** credits.

From 2016 onwards students chose one of the following 3 options of the elective courses:

1. **GLY3871 Igneous & Metamorphic Petrogenesis** plus any other half course of the elective courses (GLE3821 or GLY3801)
2. **GLY3811 Coal, Gas & Petroleum** plus any other half course of the elective courses (GLE3821 or GLY3801)
3. **GLY3812 Hydrogeology II** plus any other half course of the elective courses (GLE3821 or GLY3801). It is recommended to take GLE3821 Environmental & Engineering Geology II

G.3.4.1. ALL THREE OPTIONS ARE SUMMARIZED IN THE NEXT TABLE REFERRING TO THE ONE-YEAR 11BSGA ARTICULATION:

CODE	COURSE NAME	NQF	CREDITS	PRE–REQUISITES	CO-REQUISITES
GLE3821*OR	Environmental & Engineering Geology II **OR**	8	8	GLE3701 **OR**	None
GLY3801*	Industrial Minerals and Gemstones	8	8	GLY3711	None
GLY3831	Economic Geology		16	GLY3711 & GLY3721	None
GLY3871* OR	**Igneous & Metamorphic Petrogenesis (option 1) OR**	8	16	GLY3732 & GLY3711	None
GLY3811* OR	**Coal, Gas & Petroleum (option 2) OR**	8	16	GLY3751 **OR**	None
GLY3812*	**Hydrogeology II (option 3) OR**	8	16	GLY3702	None
GLY3832	Exploration Geology & Geophysics	8	16	GLY3712	None
GLY3822	Remote Sensing	8	8	GLY3712	None
GLY3862	Structural Geology II	8	8	GLY3712 & GLY3700	None
GLY3810	Research Project	8	32	All third year courses	GLY3820
GLY3800	Field Geology III	8	8	GLY3700	None
GLY3820	Field Geology for Research	8	8	All third year courses	GLY3810
Total Credits			**120**		

*** ELECTIVE Course descriptions are to be found under section N.5.**

G.3.4.2. GEOLOGY SERVICE COURSES FOR BSC IN CHEMISTRY HONOURS - 11BSGC

G.3.4.3. QUALIFICATION: BSC CHEMISTRY HONOURS WITH GEOCHEMISTRY APPLICATION 11BSGC

The geology department offers the following service modules to the 11BSGC degree:

G.3.4.4. REGULATIONS

These courses are not part of the 11BSCG and 11BSGA curricula and therefore the regulations of the Scicence Faculty and the Department of Chemistry apply.

G.3.4.5. SUMMARY TABLE OF SERVICE COURSES TO BSC IN CHEMISTRY HONOURS 11BSGC

CODE	COURSE NAME	NQF Level	CREDITS	PRE–REQUISITES	CO-REQUISITES
GLC3712	Chemical Metallurgy	7	16	CHM3611 & GLY3662	None
GLC3700	Field Geology	7	8	GLY3521 & GLY3662	None
GLC3821	Geochemical Analysis	8	8	GLY3662 & GLC3700	None
Total Credits			32		

G.4. MASTER OF SCIENCE IN PETROLEUM GEOLOGY -11MSPG

G.4.1. REGULATIONS

G.4.2. ADMISSION REQUIREMENTS

To register for the Master of Science in Petroleum Geology, a candidate must hold a BSc Geology Honours degree (NQF level 8) or a recognized equivalent qualification. The applicants will be accepted on the basis of their undergraduate record (grades and course contents). An average mark of 60% is required. For overseas students equivalent qualifications are required. International students whose tertiary education was not in English must prove proficiency in English (IELTS 7.0 or better). For all candidates interviews shall be considered to confirm their suitability for admission. The number of successful applicants will be limited by the availability of resources.

G.4.3. MODE OF DELIVERY

The programme is offered on a full-time basis on a block course schedule over a period of two years for full time students. The mode of teaching will include lectures, seminars, laboratory practicals, field practicals, site visits, case studies, and group projects. Examinations shall follow each teaching block within a reasonable time frame (3-10 days).

G.4.4. DURATION OF STUDY

The study duration shall be two years for full time students. The maximum study period shall not exceed three years. An extension of registration beyond the stipulated maximum study period may be granted by relevant committees if valid reasons are advanced.

G.4.5. ADVANCEMENT AND PROGRESSION RULES

Students must pass all first year courses in order to advance to the second year of study.

G.4.6. MAXIMUM NUMBER OF COURSES PER YEAR

The maximum number of courses in year one are one full courses and nine half course for a total of **132 credits**, including field work. The MSc Thesis and Industry Internship are scheduled in the second year, for a total of **132 credits**. The MSc thesis contributes with 120 credits.

G.4.7. ASSESSMENT CRITERIA

Unless otherwise indicated, assessment is based on a written examination and continuous assessments (CA) with a **50 (exam):50 (CA)** weighting for each course. Examinations shall follow each teaching block within a reasonable time frame (3-10 days). The final-year master thesis is based on a research project. A minimum of 50% is required to pass each course and **a student is required to attend 80% of all lectures and practicals**. The thesis will be supervised by a PhD holder and examined by at least one internal and one external examiner of a recognized institution.

G.4.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to MSc candidates credited with all **264 credits**, and who have met the requirements of the compulsory courses, industrial attachments, field and laboratory practicals as well as the MSc Thesis. In addition students are required to provide proof of **competency in first aid**. This competency should strongly relate to field activities, in particular field trips. It is required that students obtain a competency certificate from a recognized institution that offers tailor made training. According course(s) are, for example, offered by e-med rescue. It is recommended that students obtain their certificate before commencing any coursework.

G.4.9. CURRICULUM MASTER OF SCIENCE IN PETROLEUM GEOLOGY - 11MSPG

Students opting for a Master of Science in Petroleum Geology (11MSPG) must take the following courses:

YEAR 1

CODE	COURSE	NQF	CREDITS	PRE-REQUISITE	COMPULSORY
Semester 1					
UAE5819	Academic Writing for Postgraduate Studies	9	NCB	None	Yes
GLY5941	Research Methodology	9	12	None	Yes
GLP5901	Sedimentology and Sedimentary Basins	9	12	None	Yes
GLP5921	Petroleum Systems	9	12	None	Yes
GLP5941	Geophysics, Seismic Acquisition & Processing	9	12	None	Yes
GLP5961	Petrophysics	9	12	None	Yes
Semester 2					
GLP5902	Sequence Stratigraphy and Stratigraphic Forward Modelling	9	12	None	Yes
GLP5912	Subsurface Geology & Seismic Interpretation	9	24	None	Yes
GLP5942	Sedimentary Petrography and Organic Geochemistry	9	12	None	Yes
GLP5962	Reservoir Geology and Prospect Analysis	9	12	None	Yes
GLP5990	Field Trip – Onshore Analogues	9	12	None	Yes
Total Credits			**132**		

YEAR 2

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITE	COMPULSORY
GLP5999	Industry Internship	9	12	All 1st year courses	Yes
GLP5900	Master Thesis	9	120	All 1st year courses	Yes
Total Credits			**132**		

G.5. MASTER OF SCIENCE IN APPLIED GEOLOGY - 11MSGL

G.5.1. ADMISSION REQUIREMENTS

To register for an MSc postgraduate degree programme a candidate must hold a BSc Honours degree in Geology (NQF level 8) or a recognized equivalent qualification. The applicants will be accepted on the basis of their undergraduate record. An average mark of minimum 60% is required. The number of successful applicants will be limited by the availability of resources.

G.5.2. MODE OF DELIVERY

The programme is offered on a full-time basis on a block course schedule over a period of two years for full time students. The mode of teaching will include lectures, seminars, laboratory practicals, field practicals, site visits, case studies and group projects.
Student intake into the first year will be done every two years so that courses are offered only every second year (first year courses in odd years [i.e. 2017, 2019,] and second year courses in the even years [i.e. 2016, 2018]. **Next student intake is 2019**.

G.5.3. DURATION OF STUDY

The study duration shall be two years for full time students. The maximum study period shall not exceed three years. An extension of registration beyond the stipulated maximum study period may be granted by relevant committees if valid reasons are advanced.

G.5.4. ADVANCEMENT AND PROGRESSION RULES

Students must pass all first-year courses (132 credits) in order to advance to the second year of study. A candidate must pass all first-year coursework examinations before commencing with the MSc thesis.

G.5.5. MAXIMUM NUMBER OF COURSES PER YEAR

The maximum number of courses in year one are eleven (11) with a total of **132 credits**, including field work, technical visits and industrial attachments. The maximum number of courses in the second year is six (6) with a total of **72 credits**. The MSc thesis (60 credits) is scheduled in the second year.

G.5.6. ASSESSMENT CRITERIA

Unless otherwise indicated, assessment is based on a written examination and continuous assessments (CA) with a **50 (exam):50 (CA)** weighting for each course. The final-year master thesis is based on a research project. A minimum of 50% is required to pass each course and **a student is required to attend 80% of all lectures and practicals**. The thesis will be supervised by a PhD holder and examined by at least one internal and one external examiner of a recognized institution.

G.5.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with all **264 credits**, and who have met the requirements of the compulsory courses, industrial attachments, field and laboratory practicals as well as the project thesis. In addition students are required to provide **proof of competency of at least one foreign language other than English**. It is recommended that students should learn a language that is relevant in internationally operating companies such as French, Russian, German, Spanish or Chinese. The language course(s) will be offered in consultation with the UNAM Language Centre (non-degree purposes).
Student will graduate with an MSc in Applied Geology, either majoring in **Exploration & Economic Geology** or majoring in **Environmental Geology & Hydrogeology** depending on the elective courses a student chooses in year two of the programme.

G.5.8. CURRICULUM MASTER OF SCIENCE IN APPLIED GEOLOGY - 11MSGL

CODE	COURSE	NQF	CREDITS	PRE-/CO-REQUISITE	COMPULSORY
UAE5819	Academic Writing for Postgraduate Studies	9	NCB	None	Yes
GLY5901	Applied GIS and Remote Sensing	9	12	None	Yes
GLY5921	Mineral Processing and Metallurgy	9	12	None	Yes
GLY5902	Applied Geochemistry	9	12	None	Yes
GLY5922	Applied Geophysics	9	12	None	Yes
GLY5911	Project Management, Economics and Law	9	24	None	Yes
GLY5941	Research methodology	9	12	None	Yes
GLY5912	Field Techniques and Technical Visits	9	24	None	Yes
GLY5919	Industry Internship	9	24	None	Yes
Total Credits			**132**		
Courses for Major: Exploration & Economic Geology					
GLA5901	Ore Forming Processes	9	12	GLY5902, GLY5912	Yes
GLA5911	Exploration Techniques, Methodology, & Economics	9	24	GLY5901, GLY5912, GLY5922	Yes
GLA5931	Ore Body Modelling and Evaluation	9	24	GLY5912	Yes
GLA5921	Underground and Open Pit Mining	9	12	GLY5921, GLY5912	Yes
Courses for Major: Environmental Geology & Hydrogeology					
GLE5911	Hydro-geochemistry	9	24	GLY5902	Yes
GLE5931	Protection and Management of Water Resources	9	24	GLY5902, GLY5911	Yes
GLE5941	Environmental Impact Assessment and Sustainable Development	9	12	GLY5911, GLY5912	Yes
GLE5961	Impact of Mining Activities on Aquatic Systems	9	12	GLY5902, GLY5911	Yes
Courses for both Majors					
GLY5900	Master Thesis (Mini Thesis)	9	60	**All first-year courses**	Yes
Total Credits			**132**		

G.6. MSC AND PHD GEOLOGY PROGRAMMES BY THESIS – 11MASC AND 11DPSC

The geology department offers a **2-year MSc (by thesis only) – 11MASC** and **a 3-year Doctor in Philosophy (PhD)** – 11DPSC. Interested candidates shall inquire with the geology department for MSc and PhD projects.

G.6.1. REGULATIONS

Regulations are given in the 2022 prospectus of the School of Postgraduate Studies.

G.6.2. COURSE DESCRIPTIONS MASTER OF SCIENCE IN APPLIED GEOLOGY - 11MSGL

FIRST YEAR COURSES

GLY5901: APPLIED GIS AND REMOTE SENSING

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Course assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X2 hour exam paper.
Course description: Basics of remote sensing: systems, scanners, data availability, data formats, data processing software; Applications RS: topographic analysis, relief and landform, hydrological analysis (streams, drainage patterns, flooding and flood control), introduction to hydrotop-concept and application for recharge studies, evapotranspiration determination from RS data, vegetation indices, landuse, erosion, Permeability classification, identification karstic features, geometry of joint systems; Resource satellites; Remote sensing applications for mineral resource exploration; techniques used to diminish vegetation effect; soil-rock ratios; uses of spectral curves and digital data analysis; image interpretation keys; image classification and interpretation; using collateral information; uses of thermal infrared images; radiometric and ratio images; image processing, restoration, enhancement and information extraction; using RS images from ocean surfaces.
GIS: data formats, data processing software, data exchange, data sources, digitising, database management, regionalisation of data, data analysis for routes, data merging including RS data, digital elevation models, digital geological maps, engineering maps, hydrogeological maps, vulnerability mapping based on spatial patterns, GIS data as input for various models/modelling software packages.

GLY5921: MINERAL PROCESSING AND METALLURGY

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Course Assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X2 hour exam paper.
Course Description: Comminution: role of comminution. Comminution laws.Basic principles of crushing and crushing equipment; grinding and grinding equipment. Screening and sieve analysis. Concentration: gravity concentration and equipment, magnetic and electrostatic separation and equipment, floatation: principles. Solid and Liquid separation: sedimentation, thickening and filtration. Basic flowsheet design for selected minerals coal preparation, heavy sands processing. Basic Extractive Metallurgy: pyrometallurgy, hydrometallurgy, electrometallurgy.

GLY5902: APPLIED GEOCHEMISTRY

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Course Assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X2 hour exam paper.
Course Description: Thermodynamic principles and concepts; Activity coefficients and speciation; CO2 Acids and Bases; Speciation modelling using PHREEQC; Oxidation and Reduction; Iron, Sulphur and Nitrogen Geochemistry; Geochemical Reactions in PHREEQC Implicit Equilibrium, Mixing, Dissolution, Precipitation, Co-precipitation and Redox Reactions; Sorption and Ion Exchange (theory and PHREEQC modelling); Carbonates, Silicates, Clay Minerals and Solid Solutions; Reaction Path Modelling; PHREEQC carbonate geochemistry; Reactive Transport – Modelling Mine Waste Seepage; Common Error Modelling; Radionuclides in Dust, Surface Soil, Surface water and Groundwater; Analytic techniques for major, minor and trace element chemistry; Isotope analytic techniques.

GLY5922: APPLIED GEOPHYSICS

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Course assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X2 hour exam paper.
Course description: Theoretical considerations, data acquisition, and data processing and interpretation, of magnetic, gravity, radioactivity, resistivity, Induced Polarization, electromagnetic, seismic and geophysical well logging methods; with the objective of locating concentrations of natural resources and defining their extent; improved techniques for calculating gravity fields, the use of proton-precession and optically-pumped magnetometers, improved quality of seismic data, magnetotelluric as a practical exploration method, new electromagnetic exploration methods, the use of gamma-ray spectrometers in radioactive exploration, and improved well-logging techniques.

GLY5911: PROJECT MANAGEMENT, ECONOMICS AND LAW

NQF level: 9
Contact hours: 56 h lectures and 72 h practical.
Credits: 24
Course Assessment: **Continuous 50%**: At least 3 seminars; 2 tests, 2 assignments.
Examination 50%: 1X3 hour exam paper.

Course Description: Role of a geologist: legislation and codes of a rig geologist; drill rig management - covers program planning and daily rig management; Regolith geochemistry and logging - regolith terminology, architecture of the regolith profile; practical logging workshop; Field sections, reporting and data management - daily data management and reporting, importance of using field sections.Project management: project initiation, project planning, project implementation and project termination; basic concepts of project and project management, project selection, project definition, project organization structure, team building, communication and conflict management, project planning methods and techniques, resource allocation, project monitoring and control, project termination. Economics: Microeconomics: elements of economics; demand and supply; elasticity; applied market analysis; utility; competition and monopoly; labour markets. Macroeconomics: inflation and the business cycle; Keynesian aggregate demand; money and interest rates; central banking and monetary policy; world trade and the balance of payments; unemployment. Financial accounting: nature of costs, product costing, cost accounting, profit-volume relationships, financial statements. Introduction to budgeting.Introduction to marketing.Long and short-term decision making. Law: Environmental law - principles and norms; - Environmental governance; - Environmental planning and assessment; - Administrative Justice; - Enforcement and Compliance; - Pollution law; - Mining and energy law; - Biodiversity law; - Water law; - Compliance and enforcement in environmental law. Health & Safety in the exploration and mining environment: Dust and associated health risks (calcidosis, silicosis). Radon emissions, toxicity of heavy metals, sulfides and arsenides. Measure to reduce hazardous emissions during exploration and mining, protective measures. Drilling safety: hazard identification and risk reduction around the drill rig; site visits to operating drill rigs. Environment: best practice environmental procedures and implications for drilling activities; cultural awareness.

GLY5941: RESEARCH METHODOLOGY

NQF level: 9
Contact hours: 28 h lectures and 36 h practical
Credits: 12
Course assessment: **Continuous 100%**: At least 5 assignments and one written test.

Course description: Overview of research. Ethics of research. The scientific method: logic and the scientific method, natural observations, formulation of hypothesis/research question, predictions. Types of hypotheses. Summary statistics: measures of central tendency, measures of dispersion. Statistical significance, Testing hypotheses. Experimental (research study/project) design.Data collection, documenting research data and other records.Presentation of data in scientific reports/theses/dissertation. Data processing: Data base management, data format conversions, header information
Scientific writing: Plagiarism, finding and using literature references, citation of references. Writing a literature review.Report writing. Giving a good oral presentation (including use of powerpoint).

GLY5912: FIELD TECHNIQUES & TECHNICAL VISITS

NQF level: 9
Contact hours: 18 days.
Credits: 24
Course Assessment: **Continuous 100%:** 50% of the continuous assessment comprises a minimum of 5 practicals, 2 written tests, and 2 assignments, a final report and presentation will contribute to the remaining 50% of the assessment.

Course Description: Geological maps and cross-sections: Introduction to the interpretation of complex geological maps and sections; balanced cross sections; Review of stratigraphic projections, stereographic projection of borehole data; Petro fabrics; deformation in low and high grade rocks; deformation associated with plutons; Domes and basins; Analysis of data from deformation experiments; microfabrics; microtectonics; stress mapping for ore deposit geology; structural geology of ore deposits; fluid-flow mineralization and deformation; finite strain analysis in 2D – 3D; Strain markers in ore deposits. On site field studies and technical visit: Field work in selected areas of a specific geological/environmental/technical interest for research purposes and technical visits to relevant exploration companies, mines industrial plants and enterprises.

GLY5919: INDUSTRY INTERNSHIP

NQF level: 9
Contact hours: Face to face consultations with supervising lecturer and/or coordinating lecturer on a regular basis.
Credits: 24
Course Assessment: **Continuous 100%:** daily field/lab logbook (30%), Company assessment (10%), Lecturer assessment (10%), Final Report (30%), and Seminar Presentation (20%).

Course Description: During Industrial Internship I, students will conduct project work under company supervision in areas of geological/environmental/technical interest for research purposes and industrial internships with relevant exploration companies, mines, industrial plants and enterprises. During attachment, students will be visited at their work place twice by their Lecturers.

GLY5900: MSC THESIS (MINI THESIS)

NQF level: 9
Contact hours: Face to face consultation with supervisor and coordinator on a regular basis.
Credits: 60
Prerequisites: Pass all first year courses
Course assessment: **Continuous 100%:** The assessment is based on: **(i) Research report (60%)**, **(ii) presentation (25%)** based on the research report, and **(iii) an oral examination (15%)**. The student will be required to demonstrate competence in research design, conducting research and report writing. The final mark to pass the course is 50% of the combined report, presentation and oral examination results, with a minimum of 50% for each of the three components.

Course description: Research proposal: preparation of research proposal according to recommended UNAM guidelines based on a selected research topic in consultation with project supervisors; submission of proposal to relevant postgraduate study committees

for approval. Research project: conducting research, including desk study, field work, sampling and data collection, sample and data analysis, data interpretation.Research thesis: writing of thesis in accordance with recommended UNAM guidelines.

G.6.3. SECOND YEAR COURSES: MAJOR IN EXPLORATION & ECONOMIC GEOLOGY

GLA5901: ORE FORMING PROCESSES

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Prerequisites: GLY5902, GLY5912
Course assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X2 hour exam paper.
Course description: Igneous ore-forming processes: magmas and metallogeny, partial melting and crystal fractionation, liquid immiscibility, mineralisation in layered mafic intrusions; Magmatic-hydrothermal ore-forming processes: composition and characteristics of magmatic-hydrothermal solutions, pegmatites and granite-related ore-forming processes, fluid-melt trace element partitioning, formation of porphyry deposits of Cu-Mo-W-Au-Sn, formation of skarn deposits, epithermal Au-Ag-(Cu) deposits.Hydrothermal ore-forming processes: origin and movement of hydrothermal fluids in the Earth's crust, precipitation mechanisms, fluid/rock interactions, metal zoning and paragenetic sequences, formation of VMS and SEDEX deposits, deposits associated with metamorphic, connate and meteoric fluids.Surficial and supergene ore-forming processes: principles of chemical weathering, lateritic, clay, and calcrete-hosted deposits; supergene enrichment in near surface deposits.Sedimentary ore-forming processes: Clastic sedimentation and heavy mineral (placer) concentrations; chemical sedimentation of banded iron-formations, phosphorites and evaporites; fossil fuels.

GLA5911 EXPLORATION TECHNIQUES, METHODOLOGY, & ECONOMICS

NQF level: 9
Contact hours: 56 h lectures and 72 h practical.
Credits: 24
Prerequisites: GLY5901, GLY5912, GLY5922
Course Assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X**3** hour exam paper.
Course Description: Geological exploration techniques: geological mapping and prospecting; exploration guides for various ore deposit types (magmatic, magmatic-hydrothermal, hydrothermal, metamorphic, sedimentary); application of remote sensing techniques in mineral exploration. Exploration drilling methods and techniques (percussion and diamond drilling, reverse circulation, rotary drilling for oil and gas). Geophysical exploration techniques: principles and techniques for mineral resource exploration using magnetic, gravity, induced polarization, electromagnetic, radioactivity and seismic surveys; Interpretation and field examples. Ore reserve estimations: principles of reserves and resource classifications; orebody evaluation; conventional plan and section methods, grade evaluation, reserve calculation. Fossil Fuels: Methods of exploration and exploitation; Nuclear Fuels, Carbonaceous Fuels (coal, conventional gas, petroleum, coal-bed methane, shale gas) Exploration geochemistry: geochemical prospecting, choice of methods, optimizing survey techniques, geochemical survey parameters, survey organization and operation; mechanical and biological dispersion; dispersion patterns; mineral deposit geochemistry.

GLA5921: UNDERGROUND & OPEN PIT MINING

NQF level: 9
Contact hours: 28 h lectures and 36 h practical.
Credits: 12
Prerequisites: GLY5912, GLY5921
Course assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X**2** hour exam paper.
Course description: Introduction to underground mining: Selection of mining techniques; Shaft sinking and layouts. Major development layout; level, horizon and panels methods of development. Mining systems: mining methods of extracting ore. Mine design parameters and mining processes in underground operations. Mechanization of operations and special technologies. Trackless mining: selection and operation of underground trackless equipment for massive mining. Introduction to open-pit mining: Selection of open pit mining; Open pit design; slope stability; haul road design; drilling and blasting patterns; economics and stripping ratios; economic cut-offs; pit optimization. Quarry operations; working platforms; bench width; optimum depth; Strip mining of mineral deposits; environmental considerations; dragline operations. Marine mining; dredging; mechanized earth- moving; hydraulic mining; equipment selection and power systems. Formation of soils and rocks: soil and rock types. Properties of soils and rocks: classification; Stresses in soils: effective stresses, failure theories. Shear strength of soils. Settlement; elastic, plastic (consolidation).

GLA5931: ORE BODY MODELLING & EVALUATION

NQF level: 9
Contact hours: 56 h lectures and 72 h practical.
Credits: 24
Prerequisites: GLY5912
Course Assessment: **Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%: 1X**3** hour exam paper.
Course Description: Introduction to geostatistics in geology: examples as used in aquifer analysis and porosity measurement; in structural geology stress mapping; in economic geology resource evaluation. Overview of resource estimation: decision making and resource estimation; scarcity of data, sample quality and effect and influence of geology; Estimation at different stages of a project: evaluation; systematic sampling; infill sampling; drilling methods and errors associated with them; sampling errors; overcoming errors in sampling. Overview of resource estimation: polygons, sections, panels from U/ground; inverse distance; Kriging. Systematic Resource Estimation Practice; Statistical Fundamentals and their limitations in geology: statistics and geostatistics; probability; random variables; cumulative distribution functions; moments and expected values; covariance and correlation; linear regression; Gaussian distribution; Lognormal. Regionalised variables and variograms: randomness and ore bodies; probabilistic models; geostatistical approach; random functions; stationarity. The variogram: main features, uses of variograms, what a

variogram can do and how it can be used and imporved. Variography: the science and art of variography; the aims of structural analysis; practical aspects; 1-D variograms; 2-D variograms; 3-D variograms; experimental variograms; additivity in variography; estimation of error in variography; models of variograms; models for nugget effect; why we must not fit variograms bt computers; troublesome variograms; combining models; other approaches to calculating variograms; Case studies and effect on ore reserves. Dispersion variance and support effect: dispersion as a function of support; variances of dispersion within a given volume, V; change of support and regularisation. Extension and Estimation Variances: concept of extension variance; formula of extension variance; extension and dispersion variance; factors affecting extension variance; Extension variance and dispersion variance; geometry of mineralisation; sampling patterns. Kriging: estimation; how kriging works; kriging equations; properties of kriging; Kriging practice. Operational Geostatistics: Grade control; why kriging? Variogram as a tool; Block estimation; Kriging technique; Indicator models; Non-linear geostatistics; Multi-variate geostatistics. Computer techniques for geological characterization; 3D Geological Modelling; how to combine various 3D spatial data sets to solve problems in 3D geological settings; introduction to scripting, gridding algorithms, constructing 3D geological computer models of mineral deposits, gridding of faulted and folded geological data, geostatistical simulation, facies modelling, and calculating the volume of ore. Case studies from mining. Application of modeling software: assessment of mineralisation to help determine the potential project value; processing of data to identify trends leading to exploration and evaluation targets. Interpretation of structures of high grade zones within the full data set. Combining maps, cross-sections, wireframes, polylines, points, drillholes, and GIS data to create a realistic, consistent and reliable 3D interpretation; slicing options. Structural data modeling: incorporating measurements of planar features into the model for the development of more geologically realistic models; Vein modelling: interval selection in modelling laminar structures. Lithological modelling: how to model complex lithologies. Grade modelling for enhanced visualization of trends and to produce a range of ore-waste cut-off. Importing geo-reference and display maps and sections to provide geological context. Enhancing visualization and understanding of data based on 3D measurement tools, the transparency function, layering GIS and draping on topography.

G.6.3. SECOND YEAR COURSES: MAJOR IN ENVIRONMENTAL GEOLOGY & HYDROGEOLOGY

GLE5911:	**HYDRO-GEOCHEMISTRY**
NQF level:	9
Contact hours:	56 h lectures and 72 h practical.
Credits:	24
Prerequisites:	GLY5902
Course Assessment:	**Continuous 50%**: At least 3 seminars; 2 tests, 2 assignments.
Examination 50%:	1X**3** hour exam paper.

Course Description: Non-reactive tracer transport: advection and dispersion; reactive transport: precipitation and dissolution, sorption, filtration, degradation and persistence; transport equations; introduction to modelling packages; finite differences, finite elements; modelling calibration; inverse problems. Hydrogeochemistry of geothermal water: origin & occurrence of geothermal water; description and presentation of geothermal waters; classification of geothermal waters; geothermal waters in Namibia; usage of geothermal waters; geothermal water as an alternative energy source

GLE5931:	**PROTECTION & MANAGEMENT OF WATER RESOURCES**
NQF level:	9
Contact hours:	56 h lectures and 72 h practical.
Credits:	24
Prerequisites:	GLY5902, GLY5911
Course assessment:	**Continuous 50%**: At least 3 seminars; 2 tests, 2 assignments.
Examination 50%:	1X**3** hour exam paper.

Course description: Groundwater recharge: direct, indirect, localized groundwater recharge; interaction surface water – groundwater; groundwater recharge in different climates; soil water balance modelling; precipitation – runoff models; precipitation regionalisation; evapotranspiration quantification; streamflow analysis; hydrograph analysis; separation techniques; tracer studies including isotopic studies; forward and inverse techniques; aquifer response to pumping; artificial (managed) groundwater recharge.Water Sources and Quality: Different water supply sources; water quality standards; water treatment technology (potable); water supply infrastructure; basic waste water infrastructure and treatment technologies; urban groundwater management; integrated water resource management; exploration, evaluation and exploitation of groundwater resources; Waste/Risk: land fill disposals; containments of waste disposals; geomembranes, combined liners; monitoring of waste/landfills; monitoring of sewage; contamination sources; saltwater intrusion; vulnerability of aquifers: concept and background.

GLE5941:	**ENVIRONMENTAL IMPACT ASSESSMENT & SUSTAINABLE DEVELOPMENT**
NQF level:	9
Contact hours:	28 h lectures and 36 h practical.
Credits:	12
Prerequisites:	GLY5911, GLY5912
Course Assessment:	**Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%:	1X**2** hour exam paper.

Course Description: Relevant environmental acts and laws in Namibia; international approaches to EIA; assessment techniques for EIA; basic environmental methodologies; monitoring of water, soil & air: relevance of time series, spatial set up and monitoring parameters; tolerable daily intake, - disability-adjusted-life years approach, lowest-observed-adverse effect levels; uncertainty factors; toxicological review of relevant substances mobilized by mining.

GLE5961:	**IMPACT OF MINING ACTIVITIES ON AQUATIC SYSTEMS**
NQF level:	9
Contact hours:	28 h lectures and 36 h practical.
Credits:	12
Prerequisites:	GLY5911, GLY5902
Course Assessment:	**Continuous 50%**: At least 5 practicals; 2 tests, 2 assignments.
Examination 50%:	1X**2** hour exam paper.

Course Description: Basic hydrobiology including basic groundwater biology; contaminants derived from mining activities (Focus:

gold, uranium, zinc, copper, manganese mining); dewatering of mines; subsidence; aquifer vulnerability: methodology for assessment and presentation of results; remediation: in-situ, on-site, off-site methods; active treatments; monitored/enhanced natural attenuation.

G.6.4. COURSE DESCRIPTIONS MASTER OF SCIENCE IN PETROLEUM GEOLOGY - 11MSPG

GLY5941:	RESEARCH METHODOLOGY
NQF level:	9
Contact hours:	28 h lectures and 21 h practical.
Credits:	12
Course assessment:	**Continuous 100%**: A minimum of 2 assignments, 1 written test, and 1 seminar presentation. The students will be required to demonstrate competence in developing a research topic based on a research design, including proposal writing, literature review and data presentation.

Course description: Overview and ethics of research. The scientific method: logic and the scientific method, natural observations, formulation of hypothesis/research question, predictions; Types of hypotheses. Summary statistics: measures of central tendency, measures of dispersion. Statistical significance and testing hypotheses; experimental (research study/project) design. Data collection, geo-statistical methods for data inter- and extrapolation used in spatial geological models (kriging, gridding, 3D geological models), documenting research data and other records, presentation of data in scientific reports/theses/dissertation; Field trips and field surveys: Planning, design and execution; identification and avoidance of hazards associated with field work; safety measures, lost and first aid procedures;Scientific writing: Plagiarism, finding and using literature references, citation of references. Write a literature review, report writing. Givinga good oral presentation (including use of PowerPoint).

GLP5910:	SEDIMENTOLOGY & SEDIMENTARY BASINS
NQF level:	9
Contact hours:	28 h lectures and 21 h practical.
Credits:	12
Course assessment:	**Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%:	1X**2** hour exam paper.

Course description: Sedimentary Processes: Weathering, erosion, transport mechanisms, current action, diagenesis; Facies Models: Construction of facies models, environmental interpretation: fluvial, lacustrine, shallow marine, deep marine, carbonate environments, influence of climate and climatic evolution on depositional facies; Basin Evolution: Geotectonic settings: subduction, fore-arc, back-arc, foreland, folded thrust belts, rift, failed rift, continental sags, cratonic basins, transtensional basins, basin inversion; Rifted Volcanic Passive Margins: Examples from Namibia, Angola, South America and other regions; Concept of Sequence Stratigraphy: Recognition of base level fluctuations, changes in accommodation space, subsidence, transgression, regression, progradation, retrogradation, aggradation.

GLP5921:	PETROLEUM SYSTEMS
NQF level:	9
Contact hours:	28 h lectures and 21 h practical.
Credits:	12
Course assessment:	**Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%:	1X**2** hour exam paper.

Course description: Upstream Exploration and Production Business: Disciplines involved - exploration vs. production, field life-cycle, markets and cost elements, environmental impact assessment, socio-economy of HC exploration and production, Southern African licencing frameworks;Accumulation of Organic Matter: depositional settings for accumulation of peat, sapropel and gythia, preservation and high primary OM production models, biogenic OM sources, recognition of origin of biogenic origin of OM;HC Source Rocks and HC generation: Formation of kerogen, macerals and origin of OM, indicators of dysoxic/anoxic depositional conditions, maturation and kerogene conversion – katagenesis, metagenesis, van Krevelen diagram, evaluation of HC potential using Rock Eval and other parameters; Oil density, chemistry of hydrocarbons; Migration Pathways and Migration: Concept of porosity and permeability, primary and secondary porosity/permeability, faults and fracture zones as migration avenues, permeable lithologies as migration avenues, primary migration/expulsion of HC, secondary migration, driving forces vs. restricting forces for HC movement; Reservoir Lithologies: Siliciclastic and carbonate reservoir lithologies, depositional geometries of reservoir rocks; depositional environments for reservoir lithologies; Seal Lithologies: Lithologies such as shales, salts and carbonates, requirements regarding thickness and lateral extent, depositional environments for seal rocks; Traps: Structural traps such as anticlines, roll-over structures, diapirs and faults, slumps, gravitational and compactional traps; stratigraphic traps such as lateral facies changes, pinchout, unconformities, reefs, channels, turbidites;HC Accumulation and Preservation: Timing of trap formation, maturation and HC migration, burial history and critical moment, dynamics of HC accumulation, spill points, HC losses and degradation, interpretation of HC system charts;Basin Modeling: Concept of modeling thermal and subsidence history of a basin;Outline of Unconventional Resources: CBM and ECBM, tight oil and gas, shale oil and gas;Production: water drive, gas cap drive, dissolved gas drive, artificial lift and enhanced recovery, production wells.

GLP5941:	GEOPHYSICS, SEISMIC ACQUISITION & PROCESSING
NQF level:	9
Contact hours:	28 h lectures and 21 h practical.
Credits:	12
Course assessment:	**Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%:	1X**2** hour exam paper.

Course description: Common Geophysical Exploration Methods: Gravimetry, magnetic, magneto-telluric; principles of physics, applications and limitations; combination of methods; Interpretation of Common Methods: Delineation of gross basin architecture, faults, basement highs and lows, recognitions of diapers and intrusive bodies; Seismic Acquisition: Principles of physics, seismic ray paths, seismic anisotropy, parameters controlling reflection and transmission, set-up of onshore and offshore seismic surveys, survey geometries, CDP surveys, parameters controlling resolution and survey depths; Seismic Data Processing: Selection of optimum processing parameters, velocity analysis, NMO correction, CMP stacking, deconvolution, removal of multiple reflectors, reflector enhancement, migration, tuning, depth conversion, attribute analysis.

GLP5961: PETROPHYSICS

NQF level: 9
Contact hours: 28 h lectures and 21 h practical.
Credits: 12
Course assessment: **Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%: 1X**2** hour exam paper.
Course description: Physical parameters of rocks: Density, compressibility, elasticity, sonic velocity, porosity, permeability, capillary pressure, electric resistivity, radioactivity; Borehole geophysics: Mechanical, radioactive, sonic, density, neutron, electric, NMR, and image logging methods: their principles, applications and limitations; interpretations in terms of lithofacies, porosity, permeability, density, pore fluid, pore gas, and acoustic impedance; Evaluation of geological data: Formation evaluation with seismic attributes and geophysical well log evaluation; Integration of seismic and well data: Seismic to well ties, synthetic seismograms; Reservoir Physics: Reservoir pressures, fluid dynamics, pressure – temperature relationships.

GLP5902: SEQUENCE STRATIGRAPHY AND STRATIGRAPHIC FORWARD MODELLING

NQF level: 9
Contact hours: 28 h lectures and 21 h practical.
Credits: 12
Course assessment: **Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%: 1X**2** hour exam paper.
Course description: Seismic Stratigraphy: Seismic reflections, seismic facies, terminology in seismic stratigraphy;
Seal level changes: Eustatic and relative sea level fluctuations, accommodation, combined subsidence and sea level curves, hierarchy of stratigraphic elements;Sequence Stratigraphy: Cycles, parasequences as sequence building blocks, parasequence stacking patterns and sets, system tracts, types of sequence boundaries, key surfaces, Wheeler diagrams, genetic sequence stratigraphy; application to tectonically active basins;Applied Sequence Stratigraphy: Application on seismic, core and wireline data sets, examples for carbonate and siliciclastic sequences, exploration significance;
Stratigraphic Forward Modeling: Subsurface prediction with SFM, applications and limitations; examples of clinoform, carbonate platform and turbidite models; Reservoir Characterisation: Reservoir quality and continuity.

GLP5912: SUBSURFACE GEOLOGY AND SEISMIC INTERPRETATION

NQF level: 9
Contact hours: 98 h combined lectures and practical.
Credits: 24
Course assessment: **Continuous 50%**: A minimum of 1 written test, 3 assignments, and 1 seminar presentation
Examination 50%: 1X**3** hour exam paper.
Course description: Wavelet Analysis and Seismic Stratigraphy: Petrophysics and velocity models, phase and polarity conventions, diffractions and migrations, velocity pull up/pull down, gas effect, fluid substitution, review on seismic stratigraphy, seismic facies analysis and paleoenvironmental interpretation;Geological structures and their seismic expression: Termination patterns, clinoforms, anticlines, folds, roll-over, slumps, faults, growth-faults, thrusts, toe-trusts, diapirs, channels, turbidite fans, carbonate buildups, seaward dipping reflectors and other features of volcanic margins; Petrel and PetroMod: Surfaces and input data, seismic to well tie, stratigraphic modeling, structural and fault analysis, fracture modeling, maturity modeling;Evaluation of geological data: Formation evaluation and well log evaluation.

GLP5942: SEDIMENTARY PETROGRAPHY AND ORGANIC GEOCHEMISTRY

NQF level: 9
Contact hours: 28 h lectures and 21 h practical.
Credits: 12
Course assessment: **Continuous 50%**: A minimum of 1 written test, 2 assignments, and 1 seminar presentation
Examination 50%: 1X**2** hour exam paper.
Course description: Source Rock Petrography: Lithologies, macroscopic description and classification, trace and body fossils, maceral analyses, vitrinite reflectance, pyrite framboide microscopy, fluorescence microscopy, radioactivity, stable isotopes,; Reservoir Rock Petrography: Lithologies, macroscopic description and classification, thin section petrography, texture analysis, cementation, fracturing, dissolution, dolomitisation, primary and secondary porosity/permeability, wettability; Seal Rock Petrography: Lithologies, macroscopic description and classification, thin section petrography, texture analysis, porosity and permeability;Organic chemistry of source rocks: Proximate and elemental analysis, rock eval pyrolysis, biomarkers, source - oil correlation;Chemistry of hydrocarbons: Organic constituents, API grades, trace elements, gaschromatography.

GLP5962: RESERVOIR GEOLOGY AND PROSPECT ANALYSIS

NQF level: 9
Contact hours: 28 h lectures and 21 h practical.
Credits: 12
Course assessment: **Continuous 100%**: The continuous assessment (CA) comprises a major assessment based on the 'virtual oil company' group project and a seminar presentation.
Course description: Petroleum Resource Assessment: Basin analogues, volumetric yield, geochemical material balance, play assessment, discovery process modelling;Reserve Calculations: Preliminary and post-discovery reserve calculations; Risking Petroleum Resources: risks and uncertainties, risks assessments, risk models, probability concept, risk levels;Lead and Prospect Evaluation: prospect identification, levels of prospect understanding, Monte Carlo Simulation; petroleum resource classification systems; Group Exercise "Virtual Oil Company": Exercise in groups of 3-6 students to produce a complete Petroleum Resource Assessment based on real data. The exercise is for the duration of 5 weeks.

GLP5990:	FIELD TRIP – ONSHORE ANALOGUES
NQF level:	9
Contact hours:	Two to three weeks excursion and field work.
Credits:	12
Course assessment:	**Continuous 100%**: CA comprises day reports during field trips, a seminar presentation, & a final report.

Course description: Lithology: source, reservoir and seal lithologies, weathered and fresh lithologies and their assessment regarding porosity, permeability, OM content; Facies: recognition of 3D facies architectures and interpretation of depositional environments, focus on passive continental volcanic margins; Stratigraphic Surveying: procedures for measuring and documenting sedimentary, stratigraphic, gamma ray, and magnetic logs; Sampling: sampling for porosity and permeability evaluation, source rock sampling, geochemical sampling.

GLP5999:	INDUSTRY INTERNSHIP
NQF level:	9
Contact hours:	Face to face consultations with supervising lecturer and/or coordinating lecturer on a regular basis.
Credits:	12
Course assessment:	**100%**: CA comprises daily field/lab logbook (30%), company assessment (10%), lecturer assessment (10%), final report (30%), and seminar presentation (20%).

Course description: During Industrial Internship, students will conduct project work under company supervision in areas of petroleum exploration and/or production. The internship duration should be for a minimum of three months. Ideally the internship is related to the MSc thesis.

GLP5900:	MASTER THESIS
NQF level:	9
Contact hours:	Face to face consultations with supervising lecturer and/or coordinating lecturer on a regular basis.
Credits:	120
Course assessment:	CA is based on: **(i) research report (70%)**, **(ii) presentation (15%)** based on the research report, and **(iii) an oral examination (15%)**.

Course description: Research proposal: Preparation of research proposal according to recommended UNAM guidelines based on a selected research topic in consultation with project supervisors; submission of proposal to relevant postgraduate study committees for approval; **Research project:** Conducting research, including desk study, field work, sampling and data collection, sample and data analysis, data interpretation; Research thesis: Writing of thesis in accordance with recommended UNAM guidelines; Examination: Internal and external examination of thesis.

H. DEPARTMENT OF WILDLIFE MANAGEMENT AND TOURISM STUDIES

H.1. BACHELOR OF SCIENCES IN WILDLIFE & TOURISM MANAGEMENT [33BSWM]

All modules listed below, excluding University core modules such as skills portfolio, academic literacy I and digital literacy will be offered by the School of Science. University and faculty core modules are taken by all First Year University of Namibia students.

H.1.1. Purpose of the programme

Biodiversity conservation is an important pillar of sustainable development. In Namibia, wildlife-based tourism contributes significantly to the socioeconomic development of local communities. The purpose of this qualification is to train qualified wildlife managers, conservation scientists, and tourism operators for effective management and sustainable utilization of the fauna and flora in Namibia and the region, in accordance with the United Nations Sustainable Development Goals. This is important because Article 95 (l) of the Namibian Constitution calls for biodiversity conservation and its sustainable use for the benefit of the Namibian people. The main rationale of the programme is to develop the necessary personnel for the growing wildlife management and tourism sectors of Namibia and other SADC countries. This contributes to the UN Sustainable Development Goals (SDG's) e.g., life of land, life under water and quality education by training professionals in the field of biodiversity conservation. This programme will also contribute significantly to the realization of the United Nations Convention on Biological Diversity.

H.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with Either a pass in five (5) different subjects with:

- ★ **Two (2) subjects on NSSCAS level with a "D" average or higher grade/s.**
- ★ These two subjects on NSSCAS level can either be **"Biology", "Geography", "Agriculture","Chemistry and Physics" or "History".** Where an applicant has an "E" in one of the two required subjects at NSSAS level, and extended study mode will apply provided such as subject is available on extended mode.
- ★ Three (3) subjects on NSSCO level with a "c" **average or higher grade/s.**
- ★ Two of the three subjects (3) must be **English and Mathematics** with a minimum **C** grade on NSSCO level.
- ★ The other two subjects can either be "Biology", "Geography", "Chemistry and Physics" or "History".
- ★ Where an applicant has a "d" in one of the three (3) required subjects at NSSCO level, an extended study mode will apply provided such a subject is available on extended mode.

A specific subject cannot be used to contribute to **total points** at both the NSSCAS and NSSCO level, despite the learner having written both NSSCAS and NSSCO examinations for that specific subject.

OR

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with Either a pass in five (5) different subjects with:

- ★ Three (3) subjects on NSSCAS level with a "**d"** average or higher grade/s. These three (3) subjects on NSSCAS level can either be **"Biology", "Geography", "Physical Science" or History**.
- ★ Two (2) subjects on NSSCO level with a **d** average or higher grade/s.
- ★ Two (2) of the subjects on NSSCO level must be Mathematics and English.
- ★ English must be at minimum **C** grade on NSSCO level.

A specific subject cannot be used to contribute to **total points** at both the NSSCAS and NSSCO level, despite the learner having written both NSSCAS and NSSCO examinations for that specific subject.

H.1.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued prior to 2021 (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme:

Either a pass in five (5) different subjects with:

- ★ Two (2) subjects on NSSCH with **4** or higher,
- ★ Three (3) subjects on NSSCO with **c** or higher, and
- ★ Additionally, English, Mathematics and Biology or Geography must be at minimum a **c** on NSSCO.

Or a pass in five (5) different subjects with:

- ★ Three (3) subjects on NSSCH with **4** or higher,
- ★ Two (2) subjects on NSSCO with **c** or higher, and
- ★ Additionally, English, Mathematics and Biology or Geography must be at minimum a **C** on NSSCO.

H.1.4. ALTERNATE PATHWAYS TO ADMISSION

H.1.4.1. Mature Age Entry Scheme (MAE) under the following conditions. Candidates should:

- ★ Be at least **25 years old** on the 1st day of the academic year in which admission is sought,
- ★ Have at least completed senior secondary education, and
- ★ Have proof of at least **5 years' relevant work experience** relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of: English Proficiency, General Knowledge, Mathematical Ability, and Physical Science.
- ★ **A 60% average of all the papers is required, with no paper below 50%.**

H.1.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department (HOD), into either the normal mode or the extended mode of this programme.

H.1.4.3 CANDIDATES WITH A THREE-YEAR DIPLOMA in Agriculture, Forestry, Animal Health, Natural Resources or Fisheries and Marine/Aquatic Sciences from a recognized and accredited institution may be granted admission to the programme. Such candidates may be exempted from certain modules in the degree programme provided that equivalent modules were completed.

H.1.5. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the **UNAM point scale** in five (5) different subjects guided by to matters of equity as outlined by National Policies.

H.1.6. ARTICULATION OPTIONS

This qualification may serve as an entry point to an honor's degree in Wildlife management, Nature Conservation, Biodiversity Management, or any other related postgraduate qualification at NQF level 8.

H.1.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE PROGRAMME NORMAL

To be re-admitted into the school, a student must have passed the minimum number of credits as indicated below by programmes.

H.1.7.1. NORMAL ENROLMENT

To be re-admitted in this programme, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits by the end of the first year of registration.
- ★ 123 credits by the end of the second year of registration.
- ★ 218 credits by the end of the third year of registration.
- ★ 230 credits by the end of the fourth year of registration.

The programme must be completed after a maximum 5 years of study

H.1.7.2. EXTENDED ENROLMENT

To be re-admitted in this programme, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits by the end of the first year of registration.
- ★ 123 credits by the end of the second year of registration.
- ★ 218 credits by the end of the third year of registration.
- ★ 230 credits by the end of the fourth year of registration.
- ★ 230 credits by the end of the fourth year of registration.

The programme must be completed after a maximum 6 years of study.

H.1.8. ADVANCEMENT AND PROGRESSION RULES

H.1.8.1. NORMAL ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least 87 credits representing two-third of the first-year module credits have been attained.
- ★ Year 2 to Year 3: A student has attained all **131 first year credits** in addition to at least 86 second year credits, representing two-third of the credits for year 2.
- ★ A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules.

Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

H.1.8.2. EXTENDED ENROLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- ★ Year 1 to Year 2: At least 60 credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 64 second year credits
- ★ Year 3 to Year 4: All second-year credits and at least 54 third year credits

H.1.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates who have been credited a minimum of 396 credits, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

H.10. B.SC. WILDLIFE & TOURISM MANAGEMENT [33BSWM]

PROGRAMME SCHEDULE NORMAL MODE

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 1 Core Semester 1					
U3403FS	Skills portfolio	**4**	NCB		
U3583AL	Academic Literacy I	**5**	8		
U3583DD	Digital Literacy	**5**	8		
S3540WT	Wildlife Tracking	**5**	4		
S3540WB	Bush craft and field survival techniques	5	4		
Year 1 Semester 1					
S3511WA	Physical Geography and Climate	5	14		
S3531WB	Evolution and Biogeography	5	14		
S3551WC	Fundamentals of Tourism Management	5	14		
S3571WD	Introduction to Wildlife Studies	5	12		
Year 1 Semester 2					
S3512WE	Environmental Awareness and Extension	5	12		
S3532WF	Botany	5	14		
S3552WG	Zoology	5	14		
S3572WH	Ecotourism Principles and Practices	5	14		
TOTAL CREDITS			**132**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 2 Core Semester 1					
	Academic Literacy II	6	8		
U3520LP	Leadership	4	2		
U3420EM	Ethics and morality	4	2		
U3420PJ	Project management	4	2		
S3640WN	Nature interpretation	6	4		
S3640WP	Digital Wildlife photography	6	4		
S3620WH	Historical development of Wildlife Conservation	6	2		
Year 2 Semester 1					
S3611WA	African Aquatic Ecology	6	16	None	C
S3621WB	Economics of Wildlife Resources and Tourism	6	7		C
S3631WC	African Terrestrial Ecology	6	16	S3532WF & S3552WG	C
S3651WD	Sustainable Tourism	6	16	S3572WH	C
Year 2 Semester 2					
S3612WE	Biostatistics	6	14	None	**C**
S3622WF	Wild Animal Nutrition and Disease	6	9	None	**C**
S3632WG	Customer Experience Management	6	14	None	**C**
S3642WH	Operations in Tourism Management	6	8	None	**C**
S3662WI	CWIE prep	6	8		**C**
TOTAL CREDITS			**132**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 3 Core Semester 1					
S3721J	CWIE	7	24		**C**
Year 3 Semester 1					
S3711WK	Geo-Informatics for wildlife resources	7	18	S3511WA	**C**
S3731WL	Ecological Methods & Wildlife Monitoring Techniques	7	18	S3631WC	**E**
S3751WM	Sustainable Utilization of Wildlife Resources	7	18	S3731WL	**E**
S3771WN	Financial Management in Tourism	7	18	S3711WO	**E**
S3711WO	Tourism product development and marketing	7	18	S3771WN	**E**
Year 3 Semester 2					
S3712WP	Wildlife Management & Conservation	7	18		**C**
S3732WA	Ethnobiology	7	18	S3751WM	**E**
S3752WB	Animal Behavior	7	18	S3731WL	**E**
S3772WC	Tourism Entrepreneurship	7	18	S3771WN	**E**
S3712WD	Tourism and Local Economic Development	7	18	S3711WO	**E**
TOTAL CREDITS			**132**		

1. ***The student must register for one (1) core module and choose either of the two (2) co-requisite/elective modules.***
2. ***The student must register for one (1) core module and choose either of the two (2) co-requisite/elective modules.***

H.10.1. EXTENDED ENROLMENT

P.2.3. NSSCAS BIOLOGY, GEOGRAPHY & NSSCO MATHEMATICS

This option caters for students who have the required NSSCAS Biology and NSSCAS Geography, but not **Mathematics** that wish to pursue a career in Wildlife & Tourism Management. Thus, these students will enrol for the following extra modules.

1. **S3411MS** Mathematics support I
2. **S3412MS** Mathematics support II

H.10.2. NSSCAS PHYSICAL SCIENCE, NSSCAS GEOGRAPHY & NSSCO BIOLOGY

This option caters for students who have NSSCAS Physical science, and Geography, but not **Biology** that wishes to pursue a career in Wildlife & Tourism Management. Thus, these students will enrol for the following extra modules.

1. **S3411TM** Biology support I
2. **S3511TM** Diversity of Life

H.10.2. NSSCAS BIOLOGY & NSSCO PHYSICS & GEOGRAPHY

This option caters for students who have NSSCAS Biology, but not **Geography** that wishes to pursue a career in Wildlife & Tourism Management. Thus, these students will enrol for the following extra modules.

1. Geography Support I
2. Geography Support II

H.10.3. TABLE OF EQUIVALENTS DURING THE PHASING IN/OUT PERIOD

Old course	NQL	CR	New course	NQL	CR
GHE3582: Fundamentals of Physical Geography	**5**	**12**	**S3511WA:** Physical Geography/ Climate	**5**	**14**
WLM 3732: Mammalogy	**5**	**8**	No equivalent – to be offered again		
WLM3802: Ecotourism Marketing & Travel Pan Development	**8**	**8**			
WLM3681: Freshwater ecology	**6**	**8**	**S361WG** 1: African Aquatic Ecology	**6**	**16**
WLM 3622: Wildlife Nutrition	**6**	**8**	**S3622WF:**Wild Animal Nutrition and Disease	6	9
WLM 3642: Wildlife diseases	**6**	**8**	**S3622WF:** Wild Animal Nutrition & Disease	6	9
WLM 3611: Wildlife Ecology	**6**	**16**	**S3631WC:** African Terrestrial Ecology	6	16
WLM 3601: Wildlife management	**6**	**8**	No equivalent – to be offered again		
WLM 3781: Wildlife conservation	**7**	**12**	**S3712WP:** Wildlife management & conservation	7	18
WLM 3651: Systematic Botany	**6**	**16**	No equivalent – to be offered again		
WLE 3601: Ethnobotany	**6**	**8**	**S3532WF:** Ethnobiology	7	18
WLM 3712: Animal behaviour	**7**	**16**	**S3752WB:** Animal behaviour	7	18
WLM 3721: Ecological methods in wildlife studies	**7**	**8**	**S3731WL:** Ecological Methods & Wildlife Monitoring Techniques	7	18
WLM3722: Wildlife survey & monitoring techniques	**7**	**8**	**S3731WL:** Ecological Methods & Wildlife Monitoring Techniques	7	18
WLM 3821 Economics of Wildlife Resources	**8**	**8**	No equivalent – to be offered again		
WLM 3631: Ecotourism	**6**	**6**	**S3712WD:** Tourism & Local Economic Development	7	18
WLM 3612: Ecology of African Ecosystems	**6**	**16**	**S3611WA:** African Terrestrial Ecology	6	16
WLM 3662: Geo-informatics for wildlife management	**6**	**8**	**S3711WK:** Geo-Informatics for wildlife resources	7	18
Environmental and Ecotourism Education	**8**	**8**	Environmental Awareness and extension		
CRS 3681: Biostatistics	**6**	**12**	**S3612WE:** Biostatistics		
WLM 3682: Ornithology	**6**	**12**	**No equivalent – to be offered again**		
WLM 3701: Governance of wildlife resources	**7**	**8**			
WLM 3741: National Park and Game reserves	**7**	**8**			
WLM 3702: Genetic Conservation	**7**	**8**			
WLM3782: Herpetology and terrarium	**7**	**12**			
WLM3801: Freshwater ichthyology	**8**	**8**			
WLM3811: Entomology	**8**	**16**			
WLM3881: Environmental impacts analysis	**8**	**12**			
WLM3841: Digital Wildlife Photography	**8**	**8**			
WLM3822: Wildlife in Agriculture Ecosystems	**8**	**8**			
WLM3742: Habitat Management	**7**	**8**			

H.10.4. MODULE DESCRIPTORS FOR BACHELOR OF WILDLIFE

S3540WT	WILDLIFE TRACKING
NQF level:	5
Contact hours:	1 lecture period + 1 practical per week for one semester.
Credits:	4
Module assessment:	Continuous assessment (100%): Theoretical practical on track and sign identification (40%), field practical on track and sign identification and interpretation (60%)
Prerequisites:	University Entry

Module Content: Concept of wildlife tracking: definition of wildlife track, wildlife signs; difference among track, sign, and spoor. **Identification of sign and tracks**; carnivore signs and tracks, herbivore signs and tracks, skull identifications, pellets, and scat identification. **Interpretation of sign and tracks:** interpret gaits, track patterns, and behaviors; sexing and aging tracks; trailing. **Application of wildlife tracking:** Wildlife management, human-wildlife conflict, hunting, research.

S3540WTB	BUSH CRAFT & FIELD SURVIVAL TECHNIQUES
NQF level:	5
Contact hours:	1 lecture hours + two practical per week for 1 semester. There will be compulsory laboratory practical and field excursions
Credits:	4
Module assessment:	Continuous assessment (100%).
Prerequisites:	University Entry

Module Content: *Introduction to bushcraft:* Working and staying in the field; why the necessity for a module on survival skills; what students are to expect in the wilderness; a practical understanding of the basic principles and techniques of bushcraft; to adapt confidently to any environment; basic skills and techniques of bushcraft; ***Camp ethics:*** The need for discipline and order; the importance of choosing the best location; the role of the camp leader; the need to conduct business in a manner reflecting honesty, honour, and integrity; principals to adhere to when camping; ***First Aid:*** The steps to be followed by a survivor in case of an emergency; Basic skills in assisting a person who has been injured; techniques that can be used in saving a person's life; the First Aid kit – what it should contain; ***Navigation and Signalling:*** Finding your way and maintaining communication; necessary skills of survival through navigational techniques and signals, using tools such as compasses, maps, fire, and mirrors; map reading and interpretation; ***Fight for survival:*** The survival mind, learning how to think like a survivor; using signs in the natural environment to interpret local conditions, and potential hazards; edible and toxic plants and animals; ***Nature interpretation:*** Know where you are; be aware of possible dangers from the physical environment such as flooding, lightening; and potentially dangerous animals; to plan your next steps well.

S3571WD	INTRODUCTION TO WILDLIFE STUDIES
NQF level:	**5**
Contact hours:	4 lecture hours + 1 practical per week for one semester.
Credits:	14
Module assessment:	Continuous assessment (100%)
Prerequisites:	University Entry

Module Content: Concept of wildlife studies as a diversified discipline: social and institutional aspects of wildlife management; Involvement of natural scientists and social scientists**;** participation of local communities in wildlife management**;** careers in wildlife management; **Wildlife Education:** Effect of wildlife benefits and losses on wildlife perception and consciousness; **Human population growth**: Effect of increased demand for space and resource use; human-wildlife interaction (conflicts); livestock depredation and crop raiding; research to provide models of co-existence; **Wildlife population**: Management of populations to produce a harvestable quota; **Habitat Management**: Food habits and habitat requirements; Management of quality and quantity of habitat to support wildlife population

S3531WTB	EVOLUTION & BIOGEOGRAPHY
NQF level:	5
Contact hours:	4 lecture hours + 1 practical per week for one semester. There will be compulsory laboratory practical and field excursions.
Credits:	14
Module assessment:	CA will be based on (**50%**) and Quizzes will be administered every other week.
Examination:	**50%,** 1 x 3 hr. paper. A final mark of 50% is required to pass this course.
Prerequisites:	University Entry

Module Content: Origin of life: Theory of evolution and the invasion of species on land, the theory of plate tectonics, and fundamental principles of palaeontology. **Basics of evolution and evolutionary processes**: how they affect species characteristics and vulnerabilities, the evolutionary history of major groups of organisms along the geological time scale, major events of life on earth, mass extinctions and the Ice Age. **Species distribution**: concepts of temporal and spatial patterns of species distribution, convergent and parallel evolution and evolutionary constraints, the biome system, forms and agents of disturbance, Island Biogeography, and causes of extinction. **Main biomes of the worlds:** main concepts and rules of biogeography, worldwide distribution of biomes, distribution of biomes in Namibia, key properties of biomes, geographical barriers and island biogeography, conservation biogeography.

S3551WC	FUNDAMENTALS OF TOURISM MANAGEMENT
NQF level:	5
Contact hours:	4 lecture hours + 1 practical per week for one semester.
Credits:	14
Module assessment:	CA will be based on tests and assignments weighing **60%.**
Examination:	**40%,** 1 x 3 hr. paper. A final mark of 50% is required to pass this course.
Prerequisites:	University Entry

Module Content: Introduction to tourism management: define the terms tourism as well as tourism management; **Different tourist attractions in Namibia:** their locations as well as their significance. Also describe the roles that different heritage resources play in

the tourism industry in Namibia. **The tourism industry in Namibia**: private and public sectors of the tourism industry in Namibia. **Different requirements to establish tourism businesses in Namibia**: government requirements and tourism industry related requirements. **Management of accommodation, transport, travel intermediaries businesses and visitors attractions:** important components of tourism businesses. **Principles of business management**: defining planning, controlling, leading and organizing as part of business management. Applying planning, controlling, leading and organizing in SME tour-operations, public sector and Community Based Tourism Enterprises; **Marketing, human resources and financial business management functions**: Definitions, the roles of these business management functions in tourism businesses. **The roles of information technology in managing tourism businesses. Environmental sustainability in managing tourism businesses:** the role of environmental sustainability in tourism businesses.

S3512WE	**ENVIRONMENTAL AWARENESS & EXTENSION**
NQF level:	5
Contact hours:	2 lecture hours + 1 practical per week for 1 semester.
Credits:	14
Module assessment:	**60%** (tests, assignments, seminars and presentations);
Examination:	**40%** (1 x 3 hr paper).

Module Content: Definitions of environmental education: Environmental Education objectives, principles and goals. **History of the conservation movement**, pertinent legislation and its impact on environmental education, **Contemporary environmental issues**. The rise of environmental education, **Environmental and Conservation awareness**, Introduction to environmental ethics, values and attitudes, Bio-centric, Anthropocentric, Eco-centric, **Define the term environmental literacy**, characteristic of an environmental literate person. Forms of environmental education: Formal programme vs non formal programmes. **Exemplary environmental education programs.** Exemplary environmental education materials, Infusing environmental education into public schools. Elements of an effective environmental education programme. The role of the media in Environmental Education.

S3532WF	**BOTANY**
NQF level:	5
Contact hours:	4 lecture hours + 1 practical per week for 1 semester. There will be **compulsory laboratory practical** and **field excursions.**
Credits:	12
Module assessment:	**50%** (at least three tests, practical assessments, field work and assignments);
Examination:	**50%** (1 x 3 hours paper).
Prerequisites:	Evolution and Biogeography **(S3531WC)**

Module Content: Introduction to plant taxonomy: History of plant taxonomy: 500 BC to the present; Taxonomic concepts; plant classification and nomenclature procedures; **Plant morphology, anatomy and physiology:** Focus on the Phylum Spermatophyta; shape and structure of flowers in plant ID; functioning of plants in an ecosystem; **Botanical ID field keys and plant ID:** Type and use of keys; Plant specimen collection for Herbarium; Identification of major plant families (main characteristics) in southern Africa: trees, shrubs, grasses, and herbs. **Quantify and describe plant communities:** To demonstrate different methods used to classify and determine the status of plant communities. **Economic and Ecological importance of plants:** The entire Plant Kingdom (each Phylum) to determine in each case the value of plants to the environment and its role it plays and possible economic advantages to mankind; **Forestry Act and Regulation:** The objective of the Act and Regulation; which plants are listed as protected and why; procedures of enforcement; Awareness **campaigns / extension (practical):**Target group; which information to include in the campaign; establish wildlife clubs; visit schools and communities.

S3552WG	**ZOOLOGY**
NQF level:	5
Contact hours:	4 lectures and 1 practical session per week for one semester. There will be compulsory laboratory practical and field excursions
Credits:	12
Module assessment:	**50%** (minimum 2 tests 25%, field work 50%, tutorial assignments 25%).
Examination:	**50%;** (1 x 2-hour exam paper).
Prerequisites:	Evolution and Biogeography **(S3531WC)**

Module Content: Systematics and classification of the subphylum vertebrata: origins, diversity, structure, and function within and among the vertebrate classes (including fish, amphibians, reptiles, birds and mammals); **Characteristics:** evolution; morphology and anatomy; **Ecophysiology**: movements and orientation; Communication and social behavior; **Mating systems:** sexual selection; reproduction and parental care, life cycles. **Adaptation:** convergent, parallel evolution and evolutionary constraints. **Conservation:** conservation status (IUCN), regional and international conservation strategies with more emphasis on vertebrates in Namibia and southern Africa; interaction with humans.

3572WH	**ECOTOURISM PRINCIPLES & PRACTICES**
NQF level:	**5**
Contact hours:	4 lecture hours + 1 practical per week for 1 semester. There will be compulsory laboratory practical and field excursions
Credits:	14
Module assessment:	**50%** (at least three tests, practical assessments, field work and assignments);
Examination:	**50%** (1 x 3 hours paper).
Prerequisites:	Introduction to Tourism Studies

Module Content: Identifying the major principles: The dimensions of ecotourism: Economic, cultural, social, environmental, and institutional; **Environments of ecotourism: Key stakeholders in ecotourism and their roles: Perspectives and major issues: Ecotourism practices:** Transportation, facilities, services, eco-labelling, green-washing, best practice guidance and certification.

S36402WN **NATURE INTERPRETATION**

NQF level: **6**
Contact hours: **1** lecture hours + 1 practical per week for 1 semester.
Credits: **4**
Module assessment: **100%:** preparation of an interpretation guide **(40%)**, practical field interpretation **(60%)**.
Module Content: **The concept of nature interpretation and its importance to conservation and tourism**: application of communication and experiential learning theories to nature interpretation; identification of major tourism and conservation resources in Namibia and southern Africa; **The interpretation model**: connections between resource meanings and audience interest; connections between audiences knowledge and emotions to resource meanings; roles and relationships of resource knowledge, audience knowledge, and interpretive techniques.

S3630WN **DIGITAL WILDLIFE PHOTOGRAPHY**

NQF level: **6**
Contact hours: **1** lecture hours + 1 practical per week for 1 semester.
Credits: **4**
Module assessment: **CA 100%** (at least five **(5)** practical assessments based on field excursions & three **(3)** assignments).
Module Content: **Introduction to photography:** Definition of terminologies and contrast between Digital vs. Film cameras, History of photography and its application to wildlife; **Equipment required in wildlife photography:** Camera gears and transportation Camera lenses, Terminologies to know in photography; **Ethics and safety in wildlife photography**: Know your subject prior to photographic excursions, Gain the trust of your subject, The role of primes and polarizers ; **Flashing, shading and colouring**: Image formatting into RAW, JPEG, TIF, The use of light, filters, flash, infrared; **Photographing the big five:** Logistics involved if photographing the big 5,Tips for photographing lions, elephant, buffalo, rhino, leopard, Use of high tech technology in photographing the big five. ; **Underwater photography:** Set up and preparation for underwater photography, Strobes, underwater camera case, O-rings, fisheye wide angle lens, Maintaining buoyancy under water and shooting angles; **Camera traps:** Different types of camera traps, Advantages and disadvantages of camera traps, Baited vs lured camera traps, checking procedures and data collection from camera traps ; **Macrophotography of birds:** Bird behaviour, shooting techniques of nesting, coastal, island, migratory birds, Basic controls/exposure; **Composing pictures, processing images:** Importing images, Cloning, resizing, and Sharpening, Framing images for sharing and exhibition. ; **Learning and Teaching Strategies/Activities** Lectures, written assignments, field work, class discussions, and presentations.

S3620WH **HISTORICAL DEVELOPMENT OF WILDLIFE CONSERVATION**

NQF level: **6**
Contact hours: **1** lecture hours + 1 practical per week for 1 semester.
Credits: **2**
Module assessment: **100%** (at least five **(5)** practical assessments based on field excursions and three **(3)** assignments).
Prerequisites: None
Module Content: **Era of harmonious co-existence between man and nature:** hunter-gatherer and agrarian societies; **Era of wildlife over-exploitation:** agricultural, and industrialized societies; Uncontrolled exploitation of wildlife; subsistence hunting versus market hunting; **Public Trust Doctrine Principal:** government ownership versus inclusive multi-stakeholder engagement. **Era of establishment of Protected Areas**: legal protection of wildlife; **Era of wildlife Research and management:** science-based wildlife management decisions; **Era of Environmentalism:** Development of national and international environmental laws; **Community and Private wildlife Ownership:** Devolution of wildlife management.

S3611WA **AFRICAN AQUATIC ECOLOGY**

NQF level: **6**
Contact hours: **4** lecture hours + 1 practical per week for 1 semester.
Credits: **16**
Module assessment: **50%** of the final mark consisting of a combination (or subset) of tests and quizzes (at least 3 hours in total), assignments, practical reports and/or presentations (at least 4 gradable items).
Examination: **1 x 3-hour** examination at the end of the semester and counts **50%** towards the final mark.
Module Content: **Introduction to the Freshwater biome:** Different aquatic ecosystems, with particular reference to Namibia. Describe the various niches of organisms. Ecological and Economic services; **Aquatic biodiversity:** Community structure, Diversity, Introduction of aquatic exotic fish species; **General properties of Freshwater:** Physical components, Chemical components, Adaptation of zoos to density of water. Understanding how aquatic organisms are affected by abiotic factors. Understanding the range of tolerance of aquatic species and conditions that impact aquatic life; **Classification of freshwater:** Categorise and characterise different water bodies in Namibia into lotic (Ponds, lagoons & lakes) and lentic systems (Rivers and streams); Describe how nutrients and dissolved gasses are utilised and recycled in lotic and lentic systems in relation to the River continuum concept, Floodplain concept and nutrient spiralling concept; **Special attempt to Wetlands of Namibia:** To demonstrate different methods used to classify and determine the different wetlands of Namibia, their locality, with special reference to Ramsar sites; **Economic and Ecological importance of wetlands:** Unpacking the economic and ecological role of wetlands, such as (water supply, fish, breeding sites, water purification and water replenishment; **Organism's interaction in their environment:** Explore energy flow (Food chains vs. Food webs), Biotic and Abiotic factors, shaping the abundance and distribution of aquatic organisms.

S3611WC **AFRICAN TERRESTRIAL ECOLOGY**

NQF level: **6**
Contact hours: **4** lecture hours + 1 practical per week for 1 semester.
Credits: **16**
Module assessment: **50%** (at least three tests, practical assessments, field work and assignments);
Examination: 1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Module Content: **Concept of ecology:** Organism and its environment (adaptation, water and thermal balance, light, soil); Properties of populations: distribution, densities, age and sex structure, mortality and natality, survival, migration and immigration; population regulation; feeding niche; life histories patterns. **Community ecology**: ecological succession; community structure, stability, disturbance, species and functional diversity, ecological patterns; **Species interactions:** competition, predation, commensalism, commensalism, mutualism; **Ecosystem ecology**: energy flow, biomass, trophic levels, biogeochemical cycles; **Major ecosystems of**

southern Africa, with special reference to Namibia: Savannah, wetlands, tropical forest, deserts. Distribution of savannah biomes in Africa: determinants of savannah structure and function; water, soil, nutrients, fire, herbivore; Energy flow and food web; Biodiversity of savannah; Animal adaptations to different ecosystems.

S3621WDE	ECONOMICS OF WILDLIFE RESOURCES & TOURISM
NQF level:	**6**
Contact hours:	**2** lecture hours + 1 practical/tutorial session per week.
Credits:	**7**
Module assessment:	**50%** (at least three tests, practical assessments, field work and assignments);
Examination:	**1 x 3-hour** examination at the end of the semester and counts **50%** towards the final mark.

Module Content: Consumptive and non-consumptive economic tourism activities: Game viewing, Culture and trophy hunting; **Negative impacts of overutilization**: Extinction of species, Degradation of tourism products; **Wildlife and tourism projects:** Innovative/viable eco-projects for rural communities; **Total economic valuation of wildlife and tourism resources:** Cost benefit analysis, Tangible and intangible values; **Monitoring of wildlife and tourism projects:** Economic failures and successes, Design alternative actions; **Research and management:** Formulation of guidelines to enhance economic benefits from wildlife resources and tourism.

S3651WD	SUSTAINABLE TOURISM
NQF level:	**6**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**16**
Module assessment:	**60%** and formal exam **40%.** The CA will be compiled from assignments and class tests.
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: Tourism studies: Define the terms tourism and heritage, Classification of tourists, evolution and development of tourism and tourism model; **Structure of the tourism industry in Namibia**: Private and public sectors and Non-Governmental Organizations (NGOs); **Roles of national governments and NGOs in the tourism industry**: Challenges experienced by tourism State Owned Enterprises (SOEs) as well challenges in tourism marketing (Namibian context); **Main tourist attractions and heritage resources in Namibia**: Geographical locations, and their significances to the tourism industry in Namibia; **External and internal factors that influence tourism demand**: in tourist generating regions and destinations. The effects of these factors on tourism trends in Namibia; **Economic, social, cultural and environmental impacts (costs and benefits)**: Impacts of tourism on destinations such as Namibia; **Effects of tourism on land consumption**: Effects on local communities' cultural values and beliefs of their heritage sites as well as cultural commodification; **Sustainable tourism and sustainable development**: Define the topic, Aims of sustainable development goals, Roles of cultural heritage in sustainable development in Namibia; **Social Exchange Theory (SET)**: Applications in sustainable tourism studies focusing on local communities' attitudes of sustainable tourism and development in their areas; **Sustainable use of wildlife resources in Namibia**: Community–Based Natural Resources Management (CBNRM) program, Success and challenges of CBNRM, Geographical distribution of conservation areas and communal conservancies in Namibia.

S3622WF	WILD ANIMAL NUTRITION & DISEASES
NQF level:	**6**
Contact hours:	**3** lecture hours + 1 practical per week for 1 semester.
Credits:	**9**
Module assessment:	50% (minimum 2 tests 25%, fieldwork 50%, tutorial assignments 25%).
Examination:	1 x 2-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: Anatomy and physiology of the mammalian herbivore digestive system; nutrition and digestion in large game animals and domestic stock; **feeding ecology** of game animals; diet composition and analysis; nutritional value of plants; plant chemicals and toxins; water quality and water requirements; mineral deficiencies and supplementary feeding; nutrition in captivity. **Overview of major diseases** affecting large mammals in the region influencing both agriculture and wildlife management; especially foot and mouth disease, bovine tuberculosis and rabies. **Monitoring disease and parasite occurrence** in large mammal populations. **Recent advances in immunology**. Viral, bacterial and protozoan diseases; ecto- and endoparasites (pathology, diagnosis, treatment and control). **Epizootia and enzootia**. **Wildlife disease investigation**, preventive medicine. Physical and chemical restraint and anesthesia. Aspects of wildlife surgery.

S3632WG	CUSTOMER EXPERIENCE MANAGEMENT
NQF level:	**6**
Contact hours:	4 lecture hours + 1 practical per week for 1 semester.
Credits:	**14**
Module assessment:	CA will be based on tests and assignments. The CA mark will contribute a weight of **60%,**
Examination:	1 x 2-hour examination at the end of the semester and counts **40%** towards the final mark.
Prerequisites:	None

Module Content: Introduction to customer experience management: Define concepts such as customers and customer experience within the tourism industry context; **Different concepts associated with excellent customer service delivery**. For example; customer service, customer satisfaction, customer expectations and customer loyalty. **Exceeding customer expectations:** the importance of exceeding customer expectations and creating customer loyalty, ten **dimensions of excellent customer service:** applying the dimensions of customer service to tourism businesses. **Impacts of great customer experience on profitability of tourism businesses: Customer-centric and customer retention in tourism businesses**: definitions of the concepts and strategies that tourism businesses can use to achieve customer retention. **Customer service training in tourism businesses**: the importance of customer service training. Different methods of customer service training including using customer feedback in tourism businesses. **Dealing with customer-related problems:** problem solving methodologies. **Managing customer experience using the internet**: different forms of technologies that can be used to enhance customer services in tourism businesses.

S3642WH	OPERATIONS IN TOURISM MANAGEMENT
NQF level:	**6**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**8**
Module assessment:	CA will be based on tests and assignments. The CA mark will contribute a weight of **60%,**
Examination:	1 x 2-hour examination at the end of the semester and counts **40%** towards the final mark.
Prerequisites:	None

Module Content: Introduction to service operations management: The definitions of the concept of operations management and other related concepts within the context of tourism and heritage management; the importance of operations management in the tourism industry. **Operations and processes in tourism businesses:** different operations and processes used to manage various tourism businesses such as tour-operations, public sector, Community Based Tourism Enterprise sectors of the tourism industry; **Responsibilities of operation managers:** common responsibilities of operation managers in the tourism industry. **Job designing:** strategies used to design operations necessary for tourism enterprises (amid and post Covid-19); Job **motivation and satisfaction:** definitions and factors influencing job motivation and job satisfaction. **Employee empowerment:** definitions and strategies to implement staff empowerment in tourism businesses. **Benchmarking operations.** Different strategies to benchmarking.

S3711WK	GEO-INFORMATICS FOR WILDLIFE RESOURCES
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	CA will be based on tests and assignments. The CA mark will contribute a weight of **60%,**
Examination:	1 x 2-hour examination at the end of the semester and counts **40%** towards the final mark.
Prerequisites:	None

Module Content: Introduction to GIS: Define GIS terminologies such as spatial data, spatial analysis, overlay, software, and hardware, remote sensing. Discuss the evolution of GIS, contributing technologies and Disciplines. The applications of GIS in the field of Wildlife Management **Map projections and coordinate systems** Define map projection, types of map projection, purpose of map projection. Coordinate systems, XY coordinates, LAT LONG coordinates, UTM coordinate system, UTM zones. Know your UTM zone. Data re-projections. Converting between Degree Decimal and Degree minute and Seconds **Introduction to GPS** Overview of the GPS system, benefits of a satellite-based navigation system. GPS dilution of precision and accuracy. Factors that affect GPS accuracy. The Use of GPS in conservation. **Spatial data modelling** Vector data structure, raster data structure, data overlay, data conversion, spatial resolution, geodatabase, and spatial data, attribute data. **Spatial Analysis** Spatial query, data overly, neighbourhood analysis, hotspot analysis, intersect, buffer, clipping, data merging.

S3731WL	ECOLOGICAL METHODS & WILDLIFE MONITORING TECHNIQUES
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**50%** CA Quizzes will be administered every other week.
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: General principles of surveys and monitoring: accuracy and precision of counts (sources of error and bias, environmental variables), types of data (presence/absence, detection/non-detection), imperfect detection, and types of surveillance. **Community structure**: measuring species diversity, community similarities, and niche width and overlap. **Habitat utilisation**: quantifying habitat selection and preference, niche partitioning, home range size and territory, and temporal activity. **Animal diet:** determining diet composition, selection and preference, and scat analysis. **Bird surveying techniques:** point counts, territory mapping, bioacoustics, line transects, mist netting, citizen science, non-invasive methods (e.g., DNA surveys) and atlas studies. **Mammal surveying techniques**: line transect, remote camera trapping, bioacoustics, pellet counts, footprints count, drones, playback, citizen science, non-invasive methods (e.g., DNA surveys), and atlas studies. **Population estimation analytical frameworks**: basics capture-recapture, distance sampling and species distribution models. **Wildlife capture methods and marking**: pitfall traps, cage traps, nets, marking of animals (e.g., ear tags, chips). **Morphometric measurements and functional traits**: height of trees, diameter at breast height, leaf cover area, canopy cover, body mass, litter size, diet, foraging strata and habitat breadth. **Telemetry and** unmanned aerial vehicles: basics of drone operation, GPS and VHF telemetry equipment, programming of telemetry equipment **Wildlife reproduction:** estimating reproductive success, productivity and proximate causes of breeding failure.

S3751WM	SUSTAINABLE UTILIZATION OF WILDLIFE RESOURCES
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**50%** CA will be compiled from written tests.
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: Philosophical views of wildlife utilization: stewardship and dominion; **Typologies of wildlife utilization:** Consumptive and non-consumptive; **Wildlife utilization policies:** role of research in wildlife utilization**; Utilization for Conservation:** economics and conservation**; Private and community wildlife utilization:** innovative and incentive-driven wildlife utilization; **Wildlife utilization threats:** overexploitation and effects on wildlife resources.

S3771WN	FINANCIAL MANAGEMENT IN TOURISM
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**40%** CA will be based on tests and assignments.
Examination:	1 x 3-hour examination at the end of the semester and counts **60%** towards the final mark.
Prerequisites:	None

Module Content: **Introduction to financial management:** Define the terms financial management and accounting. **Scope, objectives and significance of financial management in tourism enterprises**. The scope of accounting and financial management in the tourism industry in Namibia. **Accounting information**: usefulness in accounting information in tourism businesses. **Accounting equation:** Define the terms (assets, liabilities and capital) associated with the accounting equation. **Forms of business enterprises:** different forms of business enterprises that entrepreneurs can choose to invest their money in the tourism industry in Namibia, their requirements including different forms of taxes payable. **Financial management in small and large tourism businesses:** The differences between financial management in small and large tourism businesses. **Financing tourism businesses:** different sources of funding available for tourism businesses in Namibia. Problems associated with financing tourism SME tourism businesses in Namibia. **Budgeting and in tourism businesses:** definitions of budgets and concepts associated with budgets. Budgeting procedures. Features and stages of budgeting procedures.

S3711WO	TOURISM PRODUCT DEVELOPMENT & MARKETING
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**50% CA**, at least three assignments, practical assessments, tests and projects.
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: **Components of tourism supply and demand**: Goods, services; **Sustainable tourism products**: new product development, the product development process, product life cycles, product packaging; **Market research**: price management, transportation management, competition in tourism products, distribution channels, distribution strategies; **destination marketing**, promotion, branding, information technology, communication and advertising.

S3712WP	WILDLIFE MANAGEMENT & CONSERVATION
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**100%** (at least five (5) practical assessments based on field excursions and three (3) assignments).
Prerequisites:	None

Module Content: **Principles of Wildlife Management**: ecological concepts; wildlife ecology, biotic and abiotic factors structuring wildlife populations; Wildlife habitat characteristics: why managing wildlife habitat, habitat diversity,habitat quality, determining habitat quality index (score), determining grazing and browsing capacity, fragmentation, arrangement; changes to habitat (physical, biological, pollution; assessing habitat conditions; grazing management; bush encroachment;; determining carrying capacity; habitat enrichment and restoration. **Human and wildlife:** Human dimension of wildlife management; Human-wildlife interaction; wildlife utilization; Law enforcement strategies; Transborder conservation; Transfrontier Conservation areas; Community based wildlife management; Game ranch planning; Wildlife management and rural development. **Values and ethics of wildlife conservation**: Species conservation; conservation strategies.

S3732WA	ETHNOBIOLOGY
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**50%** (at least 2 tests, 1 practical assessment, 1 excursion and 2 assignments);
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: **Introduction to Ethnobiology:** Historic overview: 500 BC to the present; he inter-disciplinary field of ethnobiology—the study of knowledge of and beliefs about the natural world among human groups (ethnos); to what extent and why our ancestors relied on Ethnobiology for survival; history of plant and animal use; **Ethnobiology research:**1st books and Journals on Ethnobiology; current research in the fields of Ethnobotany and Ethnozoology; **Exotic species: potential value and risk:**Benefits and risks; agriculture (new crop strains), medicine, construction, food, paper, new domestic strains (inbreeding), potential pathogens being introduced; furniture industry; ecosystem degradation.**Plant and Animal Products and their uses:**Changes in diet over time (Nomads; Sedentary Village; Modern man); plants and animals (domesticated) that changed the world (food, medicine, clothing, implements, construction, culture, transport; product utilization: subsistence, sustainability, resource management; potential for new crop species.**The Future of Ethnobiology:**Classification of natural kinds (inventory); biopiracy (ITK); policy and legal framework; awareness.

S3752WB	ANIMAL BEHAVIOR
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**50%** of CA **(Quizzes)** will be administered every other week
Examination:	1 x 3-hour examination at the end of the semester and counts **50%** towards the final mark.
Prerequisites:	None

Module Content: **Historical perspective of animal behaviour:** Key pioneers and ethology, behavioural ecology and sociobiology; **Simple and complex behaviour**: endocrine and nervous system; **Motivation and learning:** motivation (i.e., homeostatic model of motivation, the state-space and physiological models); learning (i.e., innate behaviour, habituation, conditioning, social, latent, classical and operant learning) **Social and non-social behaviour:** classification of social behaviour, the coefficient of relatedness, and living in groups, cooperation, altruism **Communication, signals and cues**: sign-stimulus (acoustic, electrical, chemical, mechanical channels) and animal recognition **Foraging behaviour:** feeding behaviour versus feeding ecology (marginal value theorem) and spatial distribution (territoriality, navigation and migration (trail laying, dead reckoning, landmark use, cognitive maps, compasses and clocks) **Antipredator behaviour**: prey predator relationship and behaviour, aggression behaviour, ungulate and carnivore behaviour, landscape of fear **Reproductive behaviour:** sexual behaviour and environmental effects on breeding **Genes, behaviour and natural selection:** genotypes, phenotypes, and mutations; single gene effects and epistatic; pleiotropic effects; polygenic phenotypes.

S3772WC	TOURISM ENTREPRENEURSHIP
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**100%** CA of the final mark consisting of a combination (or subset) of the following written and/or online assessments: Test(s) and/or quiz(es) – at least a minimum of 2 hours in total. Assignments and/or project reports – at least a minimum of 5 notional hours in total.
Prerequisites:	None

Module Content: The history and development of the entrepreneurial process; the historical development of entrepreneurship in the global north: the historical development of entrepreneurship in the global south: the definition of an entrepreneur: the character of an entrepreneur: the different types of entrepreneurs. **Theories of entrepreneurship**; Social Change Theory: Innovation Theory: Cultural Theory: Theory of Need of Achievement: Theory of Recover the Withdrawal of Status: Behaviour Theory: Entrepreneurial Group Theory: Cultural Value Theory: Hofstede's four cultural dimensions: SWOT analysis. PEST analysis. **Case studies on tourism entrepreneurs and entrepreneurial businesses within Southern Africa**; guest lectures , virtual lectures and reading of assigned current Journal Articles for discussion in class: Case studies from countries where tourism entrepreneurship is having an impact. **Business plans for small and medium enterprises (SMEs);** the importance of a business plan: the functions of a business: the types of business plans: the sections of a business plan. **Strategic managerial and financial business matters**; defining the business' objectives: identifying and quantifying available and potential resources: devising a specific plan to use finances and other capital resources toward achieving the business goals: creating business financial plans, setting up financial controls, and financial decision making. **The juridical and organizational environment within which entrepreneurs and SMEs operate in Namibia**: the history of the evolution of entrepreneurship in Namibia: Business registration and other related legislations in Namibia: Intellectual Property Right, Copyrights: Trademarks: Patents. **Successful management of small tourism businesses;** Reasons for business failure**:** Opportunities and threats of tourism businesses. **Social entrepreneurship in tourism**; Definition of social entrepreneurship: A conceptual and theoretical framework for understanding the uniqueness of social entrepreneurship in the tourism Context. business models of social entrepreneurship in tourism: Case studies from countries where tourism social entrepreneurship is having a positive impact. **Tourism entrepreneurship digital marketing strategies and tools**; Defining digital marketing, strategies and tools: Why the need to make use of Digital Marketing: Successful Digital Marketing use in the tourism industry: Current digital marketing trends. **Contemporary issues or trends in tourism entrepreneurship**; Recognizing the responses of tourism businesses to globalisation: the globalized business.: awareness of the importance of embedding within networks for tourism businesses: Digital Nomadism: Multigenerational Travel: Sharing Economy: Business from Home: Mobile Commerce: Social Commerce: The Gig Economy: Increasingly Niche Markets: The Continuous Rise of Subscription-Based Business: Adoption of Disruptive Technologies.

S3712WD	TOURISM & LOCAL ECONOMIC DEVELOPMENT
NQF level:	**7**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Credits:	**18**
Module assessment:	**100%** CA of the final mark consisting of a combination (or subset) of the following written and/or online assessments: Test(s) and/or quiz(es) – at least a minimum of 2 hours in total. Assignments and/or project reports – at least a minimum of 5 notional hours in total.
Prerequisites:	None

Module Content: The history and development of tourism local economic development (LED)and management; Definitions for Local Economic Development: the historical development of local economic development (LED): the tourism local economic development agenda: the business case for engagement with local economic development and poverty reduction. **Theories of and approaches to tourism local economic development (LED) and management;** Approaches to local economic development (LED): Conducting a SWOT analysis: Conducting a PEST analysis: Location and Space Theories: Theories of regional development: Political and Social Theories: Collaboration theory: Stakeholder theory. Theories on tourists' destination selection and management. **Case studies on tourism local economic development (LED) and management efforts within Southern Africa and beyond**; guest lectures, virtual lectures and reading of assigned current Journal Articles for discussion in class: Case studies from countries where tourism local economic development (LED) and management efforts are having an impact. **Data-driven decision-making for tourism local economic development and management;** the importance of data: the functions of data driven decision-making: the types of data needed in tourism local economic development and management. **Promoting tourism local economic development through small tourism business development**; defining the objectives for promotion: tourism role in promoting economic development: the role of tourism small and medium sized enterprises in promoting economic development. Current case studies and Journal articles on promoting tourism local economic development through small tourism business development. **Investment promotion for tourism local economic development**; the significance of socially responsible investment: benefits of a corporate responsibility approach to stimulating tourism Local Economic Development: Business retention and expansion for local economic development: Industrial clusters: the role of investors and developers. **Promoting sustainable tourism local development;** Impacts of tourism development**:** Critical Success Factors for Tourism Businesses: Public-private partnerships for local economic development: **Management of a tourism local economic development directorate/unit**; Theories on organizational structures: the role of government engagement: development of local capacity: strategic tourism management. **Contemporary issues or trends in tourism local economic development and management**; Lectures will be based on current Journal articles and case studies.

I. DEPARTMENT OF COMPUTING, MATHEMATICAL & STATISTICAL SCIENCES

I.1. 33DSST - DIPLOMA IN APPLIED STATISTICS (LEVEL 6) FULL - TIME: 3 YEARS

Purpose: National development planning, together with implementation, monitoring and evaluation of national programmes have become evidence based. Qualified Statisticians/Assistant Statisticians are central to achieving and guiding national planning programmes. This qualification aims to develop skills in learners by offering a broad range of courses from Statistics, Mathematics, Population Studies, Computing, Geographical Information Systems and Economics. The graduates of this qualification will apply their skills attained to techniques used in data collection, analysis and interpretation of results in the fields of Economics, Population Studies, labour and employment, marketing and business, and ICT to achieve evidence-based decisions.

I.1.1 ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To qualify for admission to the Diploma in Applied Statistics based on Namibian School Leaving Certificate, an applicant shall satisfy the following minimum requirements:

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in five (5) different subjects as follows (minimum 22 points on the UNAM scale):

(a) 1 subject on NSSCAS level with a minimum **e** or higher.
(b) 4 subjects on NSSCO level with a **D** or higher.
(c) English and Mathematics must be at minimum **D** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

I.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in five (5) different subjects as follows (minimum **22** points on the UNAM scale):

(a) 5 subjects on ordinary level (NSSCO) **OR** a combination of ordinary level (NSSCO) and higher level (NSSCH).
(b) English and Mathematics must be at a minimum "**D**" at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

I.1.3. ALTERNATE PATHWAYS TO ADMISSION

I.1.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for three (3) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge,** and **Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%.**

I.1.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme. **Candidates may also be admitted into the programme through the national indigenous or marginalized scheme, regional representation, as well as quota and equity systems.**

I.1.3.3 CONDITIONAL ADMISSION PATHWAYS TO DIPLOMA PROGRAMMES

The following conditional admission pathways are also available for entrance into Diplomas:

(a) Applicants who have obtained **20** points with at least **2 AS** (minimum **e** symbol)/ **HIGCSE** (minimum **4** symbol) or equivalent subjects and minimum NSSCO English D symbol AND meeting ALL the programme specific subject grades;
(b) Applicants who have obtained at least **22** points with at least **2 AS** (minimum **e** symbol)/ **HIGCSE** (minimum **4** symbol) or equivalent, subjects but have one symbol lower in English (i.e. NSSCO / IGCSE or equivalent English E symbol) and / or other programme specific subject grade requirements;
(c) Applicants who have obtained at least **23** points with at least **1 AS /HIGCSE** subject (minimum **4** symbol), and minimum NSSCO English D symbol AND meeting ALL the programme specific subject grades;
(d) Applicants who have obtained at least **24** points with at least **1 AS /HIGCSE** subject (minimum **4** symbol), but have one symbol lower in English (i.e. NSSCO / IGCSE or equivalent English E symbol) and / or other programme specific subject grade requirements;

Prospective students who meet the requirements in any of the categories above will be admitted and enrolled **conditionally**.
To ensure continued registration beyond the first year of registration, one of the following conditions must be met before a student will be allowed to continue with his/her studies:

- Pass the first year, i.e. receive an annual result code "**pass first year**" at the end of the first year of registration
- Pass all modules related to the school subject(s) in which the required grades were not met (*applicable to the categories where subject specific grades have not been met)*
- Upgrade his/her school results in those particular subjects in order to meet the normal admission criteria.

I.1.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the **UNAM point scale in five (5) different subjects *guided*** by to matters of equity as outlined by National Policies.

I.1.5. DURATION OF STUDY

The Diploma in Applied Statistics programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

I.1.6. MODE OF DELIVERY

The Diploma in Applied Statistics programme is offered on a mode(s) of delivery face-to-face, blended, online**.** The mode of delivery consists of a combination of lectures, tutorials, lab practical, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

I.1.7. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- ★ A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- ★ The final mark for each module will be calculated using a ratio of CA mark: Exam mark of 5**0: 50** and
- ★ In order to pass a module, a minimum final mark of **50%** shall be required.
- ★ Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- ★ To qualify for a Supplementary Exam a final mark of **45 – 49**% is required, subject to the subminimum of 40% in the exam.

For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.

I.1.8. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

I.1.8.1. NORMAL ENROLLMENT

To be re-admitted to the School of Science, a student must have completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration
- ★ 124 credits by the end of the second year of registration
- ★ 214 credits by the end of the third year of registration

The programme must be completed after a maximum of 6 years of registration.

I.1.8.2. EXTENDED ENROLLMENT

Extended enrolment **does not apply** to the Diploma in Applied Statistics.

I.1.9. ADVANCEMENT AND PROGRESSION RULES

I.9.1. NORMAL ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **80** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 84 second-year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%. **Students need to be always treated fairly, allowing them a reasonable opportunity to advance to the next level while picking up some modules from the previous year.**

I.1.10. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification shall be awarded to candidates credited with a minimum of **352** credits, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

I.1.11. ARTICULATION ROUTES

After successful completion of the Diploma in Applied Statistics, students may be admitted to degree programme in Statistics, Population Studies or other degree programmes within the department or other departments at UNAM, provided that the minimum admission requirements have been met.

I.12. 33DSST - DIPLOMA IN APPLIED STATISTICS (LEVEL 6) FULL - TIME: 3 YEARS

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3403FS	Skills Portfolio		NCB		**C**
U2583LA	Academic Literacy I	5	8		**C**
U3583DD	Digital Literacy	5	8		**C**
U3480SE	Sustainable Environment Awareness	4	2		**C**
U3420EM	Ethics & Morality	4	2		**C**
S3520DC	Computional Problem Solving	5	4		**C**
Year 1 Semester 1					
S3411MS	Mathematics Support I	4	12		
S2411SS	The Statistical System	4	12		
S2431SB	Basics of Statistics	4	12		
S2411DB	Business of Information Systems	4	12		
Year 1 Semester 2					
S2412SI	Index Numbers and Time series	4	12		
S2432SD	Basic Demography and Epidemiology	4	12		
S2472SB	Basic Data Processing	4	14		
S3412MS	Mathematics Support II	4	12		
Total credits			**122**		

YEAR 2

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3683AL	Academic Literacy II	6	8		**C**
U3420RT	Entrepreneurship	4	2		**C**
U3520LP	Leadership	5	2		**C**
U3520TH	Critical Thinking	5	2		**C**
U3420CN	National and Global Citizenship	4	2		**C**
S2480DE	Elementary Computing Concepts	4	8		**C**
Year 2 Semester 1					
S3531DP	Programming Fundamentals I	5	14		**C**
S2501SP	Introduction to Probability	5	12	S2431SB	**C**
S3511VD	Introduction to GIS and Remote Sensing	5	14		**C**
G3511ES	Economic Statistics I	5	14		**C**
Year 2 Semester 2					
S2502SS	Statistical Methods and Techniques	5	6	(S2431SB)/S2501IP	**C**
S3532DP	Programming Fundamentals II	5	14	S3531DP	**C**
S3512SC	Fundamentals of Statistical Computing	5	14	S2472SB	**C**
G3512ES	Economic Statistics II	5	14	G3511ES	**C**
Total credits			**126**		

YEAR 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
W3700IC	CWIE	6	824		C
Year 3 Semester 1					
S3611VP	Introduction to Programming with Python	6	16		**C**
S3611SS	Survey Sampling	6	14	S2502SS	**C**
G3611EA	Intermediate Microeconomics I	6	14		**C**
S3601SN	Non-parametric Statistics	6	8	S2511SP; S2502SS	**C**
Year 3 Semester 2					
G3612EA	Intermediate Microeconomics II	6	14	G3611EA	**C**
S3612SE	Experimental Design & Analysis of Variance	6	14	S2502SS	**C**
S3632SE	Epidemiology and Biostatistics	6	14		**C**
S3602DE	Emerging Computer Technologies	6	8		**C**
Total credits			**126**		

I.1.13. MODULE EQUIVALENTS

Table of equivalents during the phasing in/out period					
Old course	**Level**	**Credits**	**New course**	**Level**	**Credits**
EMI2571: Basic Micro Economics	5	8	No equivalence/replaced	5	
LEA3519: English for Academic Purposes	5	32	U3583AL: Academic Literacy II	5	8
STD2532: Basic Statistical Modeling	5	8	No equivalence/Replaced		
EMA2572: Basic Macro Economics	5	8	No equivalence/Replaced		
STD 2452: Sampling Concepts in Survey Works	4	16	S3631SS: Survey Sampling	6	14
STS2432: Introduction to Mathematics	4	16	S3411MS: Mathematics Support I	4	12
STS3532: Introduction to Probability	5	16	S2501IP: Introduction to Probability	5	6

I.2. DIPLOMA IN COMPUTING

I.2.1. DIPLOMA IN COMPUTING 33DCMP (OSHAKATI CAMPUS)

Purpose: The capabilities and utilisation of ICTs within organisational, scientific and social contexts require a skilled workforce to maintain growth and increase productivity. The purpose of the qualification is to ensure the adequate development and training of ICT personnel with the basic skills needed to design, develop and analyse software and hardware tools used to solve problems in a variety of business, scientific and social contexts. The skills attained by the graduates will contribute towards supporting domestic solutions development, research and innovation in the ICT sector.

I.2.2 ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To qualify for admission to the Diploma in Computing based on Namibian School Leaving Certificate, an applicant shall satisfy the following minimum requirements:

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in five (5) different subjects as follows (minimum 22 points on the UNAM scale):

(a) 1 subject on NSSCAS level with a minimum **e** or higher.
(b) 4 subjects on NSSCO level with a **D** or higher.
(c) English and Mathematics must be at minimum **D** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

I.2.3. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in five (5) different subjects as follows (minimum **22** points on the UNAM scale):

(a) 5 subjects on ordinary level (NSSCO) **OR** a combination of ordinary level (NSSCO) and higher level (NSSCH).
(b) English and Mathematics must be at a minimum "**D**" at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

I.2.3. ALTERNATE PATHWAYS TO ADMISSION

I.2.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for three (3) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge,** and **Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%.**

I.2.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme. **Candidates may also be admitted into the programme through the national indigenous or marginalized scheme, regional representation, as well as quota and equity systems.**

I.2.3.3 CONDITIONAL ADMISSION PATHWAYS TO DIPLOMA PROGRAMMES

The following conditional admission pathways are also available for entrance into Diplomas:

(e) Applicants who have obtained **20** points with at least **2 AS** (minimum **e** symbol)/ **HIGCSE** (minimum **4** symbol) or equivalent subjects and minimum NSSCO English D symbol AND meeting ALL the programme specific subject grades;
(f) Applicants who have obtained at least **22** points with at least **2 AS** (minimum **e** symbol)/ **HIGCSE** (minimum **4** symbol) or equivalent, subjects but have one symbol lower in English (i.e. NSSCO / IGCSE or equivalent English E symbol) and / or other programme specific subject grade requirements;
(g) Applicants who have obtained at least **23** points with at least **1 AS /HIGCSE** subject (minimum **4** symbol), and minimum NSSCO English D symbol AND meeting ALL the programme specific subject grades;
(h) Applicants who have obtained at least **24** points with at least **1 AS /HIGCSE** subject (minimum **4** symbol), but have one symbol lower in English (i.e. NSSCO / IGCSE or equivalent English E symbol) and / or other programme specific subject grade requirements;

Prospective students who meet the requirements in any of the categories above will be admitted and enrolled **conditionally**.
To ensure continued registration beyond the first year of registration, one of the following conditions must be met before a student will be allowed to continue with his/her studies:

- Pass the first year, i.e. receive an annual result code "**pass first year**" at the end of the first year of registration
- Pass all modules related to the school subject(s) in which the required grades were not met (*applicable to the categories where subject specific grades have not been met)*
- Upgrade his/her school results in those particular subjects in order to meet the normal admission criteria.

I.2.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the UNAM point scale in five (5) different subjects guided by equity matters as outlined by National Policies.

I.2.5. DURATION OF STUDY

The Diploma in Computer Science cannot be completed in less than two (2) years. All students registering for this qualification must complete their studies **within three (3) years of full-time study** unless special permission is granted for this period to be exceeded.

I.2.6. MODE OF DELIVERY

The Diploma in Computer Science is a full-time programme. The programme comprises of a total credit of 256 and it is at Namibian Qualification Framework (NQF) level 5. The year 1 courses are at NQF level 4 whereas the year 2 courses are at NQF level 5.

I.2.7. EXAMINATION REGULATIONS

A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of 40% in a particular course. Examination will be administered at the end of each semester. For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees.

I.2.8. MINIMUM REQUIREMENTS FOR RE-ADMISSION

J.2.7.1. NORMAL ENROLMENT

To be re-admitted to the School of Science, a student must have completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 124 credits by the end of the second year of registration
- ★ 214 credits by the end of the third year of registration

The programme must be completed after a maximum of 6 years of registration.

I.2.8.2. EXENTENDED ENROLMENT

Extended enrolment does not apply to the Diploma in Computing.

I.2.8.3. ADVANCEMENT AND PROGRESSION RULES

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **80** credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least **84** second-year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

Students need to be treated fairly at all times, allowing them a reasonable opportunity to advance to the next level while picking up some modules from the previous year.

I.2.8.4. MAXIMUM NUMBER OF COURSES PER YEAR

Students can register for all first-year courses and thereafter, no more than 10 courses in any academic year.

I.2.9. ARTICULATION ROUTE

The qualification may serve as an entry point to a BSc. Degree in Computing undergraduate degrees.

I.2.10. Requirements for Qualification Award

This qualification will be awarded to candidates credited with a minimum of **366 credits** and who have met the prescribed curriculum requirements and have met all other relevant UNAM requirements.

I.1.11. ARTICULATION ROUTES

After successful completion of the Diploma in Computing, students may be admitted to degree programme in Computing or other degree programmes within the department or other departments at UNAM, provided that the minimum admission requirements have been met.

I.2.10. DIPLOMA IN COMPUTING - 33DCMP - 3 YEARS FULL-TIME (OSHAKATI CAMPUS)

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 1 Core Semester 1					
U3403FS	Skills Portfolio		NCB		**C**
U2583LA	Academic Literacy I	5	8		**C**
U3583DD	Digital literacy	5	8		**C**
U3480SE	Sustainable Environment Awareness	4	2		**C**
U3420EM	Ethics & Morality	4	2		**C**
S3520DC	Computional Problem Solving	5	4		**C**
Year 1 Semester 1					
S2411DC	Introduction to Computer Systems	4	12		**C**
S2411DB	Business Information Systems	4	12		**C**
S2431SB	Basics of Statistics	4	12		**C**
S2411DI	Interactive Web Programming	4	14		**C**
Year 1 Semester 2					
S2412DS	Software Project Management	4	14		**C**
S2412DP	Programming Principles	4	14		**C**
S2412DD	Database Systems Design	4	12		**C**
S2512IS	Introduction to Statistics	5	12	(S2431SB)	**C**
Total credits			**126**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 2 Core Semester 1					
U3583LA	Academic Literacy II	6	8		None
U3420RT	Entrepreneurship	4	2		**C**
U3520LP	Leadership	5	2		**C**
U3520TH	Critical Thinking	5	2		**C**
U3420CN	National & Global Citizenship	4	2		**C**
S2580DE	Elementary Computing Concepts	5	8		**C**
Year 2 Semester 1					
S2511MF	Fundamentals of Mathematics I	5	12		**C**
S3531DP	Programming Fundamentals I	5	14		**C**
S2511DP	Database Systems Programming	5	14		**C**
S3531DC	Computing 1A	5	14		**C**
Year 2 Semester 2					
S2512MF	Fundamentals of Mathematics II	5	14	S2511MF	**C**
S3532DI	Introduction to Digital Electronics	5	14		**C**
S3532DP	Programming Fundamentals II	5	14	S3531DP	**C**
S3532DC	Computing 1B	5	14	(S3531DC)	**C**
Total credits			**134**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 3 Core Semester 1					
W2600IA	Industrial Attachment	6	24		**C**
Year 3 Semester 1					
S2611DD	Database Administration	6	16		**C**
S3631DO	Object Oriented Programming I	6	16	(S3532DP)	**C**
S2611DN	Computer Networks I	6	16		**C**
S2601DC	Fundamental of Cybersecurity	6	8		**C**
Year 3 Semester 2					
S2612DI	Internet Applications Development	6	16		**C**
S2612DN	Computer Networks II	6	16	(S2611DN)	**C**
S2612DS	System Administration	6	16		**C**
S2602DE	Emerging Computer Technologies	6	8		**C**
Total credits			**136**		

I.2.11. MODULE EQUIVALENTS

TABLE OF EQUIVALENTS DURING THE PHASING IN/OUT PERIOD					
Old course	**NQF**	**Credits**	**New course**	**NQF**	**Credits**
CLC3509: Computer Literacy	**5**	**8**	Digital Literacy	5	8
CMP2411: Introduction to Computer Systems	**4**	**16**	*To be offered again*		
CMP2421: Principles of Information Systems	**4**	**8**	S2411D: Business Information Systems	4	12
STD2431: Basics of Statistics	**4**	**16**	*To be offered again*		
MAT2432: Introduction to Mathematics	**4**	**8**	*To be offered again*		
CMP2412: Programming Principles	**4**	**16**	*To be offered again*		
CMP2432: Information Systems Management	**4**	**16**	*To be offered again*		
CMP2511: Fundamentals of Database Systems	**5**	**16**	*To be offered again*		
CMP2531: Fundamentals of System Administration	**5**	**16**	*To be offered again*		
CMP2551: Fundamentals of Computer Networks	**5**	**16**	Computer Networks I	6	18
CMP2571: Programming I	**5**	**16**	*To be offered again*		
CMP2512: Database management	**5**	**16**	*To be offered again*		
CMP2532: System Administration	**5**	**16**	System Administration	6	18
CMP2552: Network Administration	**5**	**16**	Computer Networks II	6	18
CMP2572: Programming II	**5**	**16**	*To be offered again*		

For the students of the old programme that need to repeat the following equivalents are to be used:

I.2.12. Articulation Options

Successful completion of this Diploma serves as an entry point to the Bachelor of Science in Computing. Students who successfully complete the Diploma in Computing will be exempted from all the equivalent core semester modules as well as for the following semester modules:

MODULE PASSED		**MODULES EQUIVALENT / MODULE TO BE EXEMPTED**	
CODE	**NAME**	**CODE**	**NAME**
S2512IS	Introduction to Statistics	S3511SF	Fundamentals of Statistics
S3531DP	Programming Fundamentals I	S3531DP	Programming Fundamentals I
S3532DP	Programming Fundamentals II	S3532DP	Programming Fundamentals II
S3531DC	Computing 1A	S3531DC	Computing 1A
S3532DC	Computing 1B	S3532DC	Computing 1B
S3532DI	Introduction to Digital Electronics	S3532DI	Introduction to Digital Electronics
S3631DO	Object Oriented Programming I	S3631DO	Object Oriented Programming I
S2611DD	Database Administration	S3631DI	Introduction to Databases Systems
S2612DN	Computer Networks II	S3632DN	Computer Networks

I.2.13. MODULE DESCRIPTORS FOR THE DIPLOMA IN APPLIED STATISTICS & DIPLOMA IN COMPUTING

S2411SS: The Statistical System

NQF Level 5
Contact Hours 4 contact lecture periods per week for one semester
NQF Credits 12
Course Assessment: 50% of the final mark.
Examination: **50%** (1 x 3-hour examination paper)
Prerequisite None

Course description: **Purpose and scope of official statistics**. **Structure of the National Statistical Systems**, Organization, methods and practices of data collection and dissemination. Explain the **role of statistics** in evidence-based policymaking. The role of statistics in National development policies and frameworks; **Assessment** of the National statistical system. **Components** of the National Statistical System and their roles; **Characteristics** of an effective National statistical system; **Types of data and their sources**. Basic concepts of **national accounts**. Introduction to National Accounts, GDP statistics by activity, GDP by expenditure, National Income, and the balance of payment, measuring GDP.

S2411MS: Mathematics Support I

NQF Level 5
Contact Hours 4 lecture periods and 1 tutorial session (2 hours) per week for one semester
NQF Credits 12
Course Assessment: 50% of the final mark.
Examination: **50%** (1 x 3-hour examination paper)

Course description: **Sets** and their combinations: Sets, equality of sets, revision of intersection, union, relative complement, de Morgan's laws and other laws of algebra of sets, proving simple tautologies, the power set, cardinality, inclusion-exclusion formula, number fields, Cartesian products, ordered pairs and relations. **Intervals on the real number line**: Introduction, combinations, types of inequalities – linear, absolute value, quadratic; identification of the respective solution sets in interval form. **Matrix calculus:** Definition, matrix operations, (square) matrix algebras and the laws – associativity, distributivity- that hold in them, invertible matrices. **Systems of linear equations:** Linear systems and their (augmented) matrices, homogeneous and inhomogeneous systems, Gaussian row and column operations, echelon form, rank of a matrix, types of solution behaviour and how to recognise them, matrix inversion with the companion method. **The concept of function**: Definition of a function, when is a relation a function? domain and range of a real valued function, injective, surjective, bijective functions, the inverse of a bijective function, odd or even real functions,

piecewise defined functions, introduction to function graphs, graph transformations, graphical correlates of function properties already discussed.

S2412MS:	**Mathematics Support II**
NQF Level	4
Contact Hours	4 lecture periods and 1 tutorial session (2 hours) per week for one semester
NQF Credits	NCB
Course Assessment:	**50%** of the final mark of a minimum of **3 (three) main tests &** a minimum **of 3 (three) tutorial tests.**
Examination:	**50%** (1 x 3-hour examination paper)

Course description: More theory of functions: Exponentials and logarithms, the exact definitions of limit and continuity, end behaviour of a graph; differentiation, definition, product, quotient, chain rules, examples from the natural sciences. **Function graphs:** The graphs of polynomial, rational, trigonometric, exponential, logarithmic functions. **Integration:** Definition and basic properties of the Riemann integral, the Fundamental Theorem of calculus, integrals of simple function, integration by parts & substitution rule; applications to the computation of areas and (rotational) volumes. **Complex numbers:** Definition and basic computations, polar coordinates, complex powers, complex roots, roots of unity, complex trigonometric, exponential, logarithmic functions, the complex plane.

S2412SI:	**Index Numbers and Time Series**
NQF Level	5
Contact Hours	4 contact lecture periods per week for one semester
NQF Credits	12
Course Assessment:	CA will be compiled from: individual and group practical activities; quizzes, tests; assignments.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Introduction to index numbers; Basic theory of index number, consumer price indices, errors in index numbers, rebasing techniques, Introduction **to time series**; Trends in time series; seasonal components, cyclical components, irregular component decomposing a time series; moving averages, exponential smoothing, regression, forecasting and review.

S2432SD:	**Basic Demography & Epidemiology**
NQF Level	4
Contact Hours	4 contact lecture periods per week for one semester
NQF Credits	12
Course Assessment:	CA will be compiled from written tests, presentations and assignments.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Meaning of Demography; demographic data sources: census, vital registration, surveys and secondary sources; **the need for large samples**; **data collection problems**: sampling frame; non-response and measurement errors; **concepts in demographic data collection**: e.g. household, family and migration; the need for use of age-groups and conventional age-groupings; **absolute versus relative numbers**: ratios, proportions and rates; **fertility**, **mortality** and **migration** measures; **meaning of Epidemiology**; **sources of data in the study of epidemiology**: routine data, cross-sectional surveys, longitudinal and sentinel site studies; **incidence and prevalence**; risk factors; cohort and case-control studies;

S2472SB:	**Basic Data Processing**
NQF Level	4
Contact Hours	4 contact lecture periods per week for one semester; one practical session per week for one semester
NQF Credits	12
Course Assessment:	**CA** will be compiled from written practical tests and practical based exercises, quizzes and assignments.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Introduction to variables and data: qualitative vs quantitative; **Questionnaire design**: open vs closed questions, creating variables, coding of questions; **Spreadsheets**: uses and limitations for data entry, organising data in a spreadsheet; **Introduction to SPSS interface**: Creating a database: dealing with data: creating variables, data entering, add/delete variables or cases, sort cases/variables, saving worksheet, importing data from other files e.g. Excel, efficient storage and management of databases, organising multiple response data; **Data Analysis**: Exploratory data analysis: creating frequency tables, graphing, descriptive statistics, cross tabulations, analysing numeric variables, presenting good tables and graphs, analysing categorical variables; **Testing for relationships and associations**: chis-square test, correlations; Simple regression model.

S2501IP:	**Introduction to Probability**
NQF Level	5
Contact Hours	2 contact lecture periods per week for one semester; one tutorial session per week for one semester
NQF Credits	6
Course Assessment:	**50%** of the final mark) consisting of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of **3 hours in total Assignments** – at least a minimum of 3 notional hours in total; Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1x2 hour Examination paper).

Course description: Basic Set Theory, **Basic probability concepts:** Random variables; **Probability distributions:** Bernoulli, Binomial, Exponential, Poisson, Normal, Standard Normal.

S2502SS:	**Statistical Methods & Techniques**
NQF Level	5
Contact Hours	2 contact lecture periods per week for one semester; 1 hour tutorial
NQF Credits	6
Course Assessment:	**CA** will be compiled from written class tests and assignments.
Examination:	**50%** (1x2 hour Examination paper).

Course description: Sampling and Sampling distributions, for population mean and proportion. **Inferential statistical method** of confidence intervals, Hypothesis testing: **Test of significance for single mean and pr**oportions (dependent and independent samples); Use of P-values and **Calculating type I and Type II errors**. **Test of association for categorical variables,** Chi-square tests; Concepts of the types of errors encountered in hypothesis testing, type I and Type II errors. **finding the sample size** for estimating a

single population mean; relationships between hypothesis testing procedure and confidence intervals; Significance levels and p-values as ways of reporting results of a statistical test.

S2502SS:	Elementary Computing Concepts
NQF Level	4
Contact Hours	Up to 2 contact lecture periods per week for one semester
NQF Credits	8
Course Assessment:	**CA** will be compiled from: individual and group practical activities, quizzes, tests, assignments, Continuous Assessment 100%
Prerequisite	None

Course description: Computers and devices: Device set up, Log on using UNAM Credentials, connecting peripherals; **File Management:** Creating and editing files and folders (MS word, MS PowerPoint, MS excel). **File Manipulation:** File properties, file compression, backup and recovery. **Device Security:** usernames, passwords, physical security. **Cyber Skills:** Internet Browsing, Email, Educational cites, wikis, social media. **Microsoft Access DBMS:** tables, views, forms, relationships, queries, reports.

S2411DC:	Introduction to Computer Systems
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester.
NQF Credits:	12
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Introduction to computer systems: History of computers; computer components, input and output computer level hierarchy, Von Neumann architecture**. Number systems**: binary; decimal; octal; hexadecimal; floatingpoint representation; binary arithmetic. **Operating systems**: Basic structure and functions; file systems. **Internet and World Wide Web:** History of the Internet and World Wide Web (WWW); Intranet and Extranet; Internet principles of operation (Web Browsers, Internet Service Provider (ISP), MAC address, Internet Protocol (IP) address, Uniform Resource Locator (URL)).

S2412DP:	Programming Principles
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Problem Solving: Problem-Solving Strategies; Algorithms; Structure Theorem; Algorithm Validation. **Sequences**: Data Types; Variables; Expressions; Assignment; Simple I/O. **Selection**: Relational and Logical Conditions; If-Else Statements; Case Structure. **Repetition:** For, For-Each, While, Do-While Loops; Nested Loops. **Arrays and Lists**: Declaration; Assignment; Traversal; Sorting; Searching. **String Manipulation**. **Functions**: Parameterised Functions; Parameterless Functions; Functions with Return Values and Types. **File Operations:** Creating Text Files; Reading and Writing to Files. **Debugging Strategies**: Syntax Errors; Semantic Errors; Run-Time Errors. **Testing Strategies**: Tests-Case Design; White Box Testing, Black Box Testing; Requirements Testing; Unit Testing.

S2480DE:	Elementary Computing Concepts
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for six weeks.
NQF Credits:	8
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Computers and devices: Device set up, Log on using UNAM Credentials, Connecting peripherals; **File Management:** Creating and editing files and folders (MS word, MS PowerPoint, MS excel). **File Manipulation:** File properties, file compression, backup and recovery. **Device Security:** usernames, passwords, physical security. **Cyber Skills:** Internet Browsing, Email, Educational cites, wikis, Social Media. **Microsoft Access DBMS:** tables, views, forms, relationships, queries, reports.

S2411DC:	Introduction to Computer Systems
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester.
NQF Credits:	12
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Introduction to computer systems: History of computers; computer components, input and output computer level hierarchy, Von Neumann architecture**. Number systems**: binary; decimal; octal; hexadecimal; floatingpoint representation; binary arithmetic. **Operating systems**: Basic structure and functions; file systems. **Internet and World Wide Web:** History of the Internet and World Wide Web (WWW); Intranet and Extranet; Internet principles of operation (Web Browsers, Internet Service Provider (ISP), MAC address, Internet Protocol (IP) address, Uniform Resource Locator (URL)).

S2411DB:	Business Information Systems
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester.
NQF Credits:	12
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Introduction to information systems: data, information and technology; types of information systems. **Information systems in organisations**: Cost and value of information; quality of information; information systems and organisational strategy. **The Internet and WWW**: E-business, intranets, Internet, extranets. **New forms of collaboration**: social networking, virtual teams, virtual marketing, crowd-sourcing. **Security of information systems**: Threats to information systems; technology-based safeguards; human-based safeguards; information systems security planning and management. **Business intelligence**: Organisational functions and

levels (executive, managerial, operational); Systems to support organisational functions; decision making. **Information systems ethics and crime**: privacy, accuracy, accessibility, computer crime, cyber- war and terrorism.

S2431SB:	**Basics of Statistics**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester.
NQF Credits:	12
Course Assessment:	**2 tests**, **two tutorial tests** and **two assignments (40%;)**
Examination:	1 x 2-hour examination paper. A final mark of **60%** is required to pass this module.

Course description: Data types: categorical, continuous, numerical; Measurement scales: Nominal, ordinal, interval, ratio; Data sources: primary, secondary; Descriptive statistics: graphical (histogram, bar charts, pie charts, frequency polygons, stem-and-leaf plots, box and whiskers plot) and numerical (frequency tables, cross-tabulations) summaries; Identifying outliers; Measures of central tendency; Measures of dispersion; Simple random sampling; Introduction to Inference; Confidence Intervals and Hypothesis Testing on means and proportions; Correlation; Regression and an introduction to One-way ANOVA; sampling finite populations; Basic probability; Most encountered discrete probability distributions (Bernoulli, Binomial, Poisson, Geometric and Hyper-geometric)

S2411DI:	**Interactive Web Programming I**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester.
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: **Hyper Text Mark-up Language (HTML5)**: **HTML Elements**: The HTML Element, Inline Elements; Block Elements; **HTML Sections:** Body, Header, Footer, Navigation Menus. HTML Attributes: Class Attribute, Id Attribute, Style Attribute; **Grouping Content**: The P Element, List Elements, Div Elements. **Text-Level Semantics**: The Span Element, Links, Headings; **Embedded Content**: Embedding Pictures, Embedding Videos. **Tabular Data**: Tables Headers, Columns and Rows. **Forms**: The Form Element, Input Elements; Linking Static Resources: Linking to CSS Files; Linking to JavaScript Files. **Cascading Style Sheets (CSS3)**: Selectors; Box Model; Colours; Fonts; Backgrounds; Links; Lists; Display; Position; Pseudo-Classes; Transformations; Transitions; Animations; Media Queries.

S2412DS:	**Software Project Management**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: Introduction to project management. Project management in the information technology context. Project Integration Management. Project scope management. Project time management. Project cost management. Project quality management. Project human resources management. Project risk management.

S2412DP:	**Programming Principles**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: **Problem Solving:** Problem-Solving Strategies; Algorithms; Structure Theorem; Algorithm Validation. **Sequences**: Data Types; Variables; Expressions; Assignment; Simple I/O. **Selection**: Relational and Logical Conditions; If-Else Statements; Case Structure. **Repetition:** For, For-Each, While, Do-While Loops; Nested Loops. **Arrays and Lists**: Declaration; Assignment; Traversal; Sorting; Searching. **String Manipulation**. **Functions**: Parameterised Functions; Parameterless Functions; Functions with Return Values and Types. **File Operations:** Creating Text Files; Reading and Writing to Files. **Debugging Strategies**: Syntax Errors; Semantic Errors; Run-Time Errors. **Testing Strategies**: Tests-Case Design; White Box Testing, Black Box Testing; Requirements Testing; Unit Testing.

S2412DD:	**Database System Design**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester.
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.

Course description: **Database Theory**: File-based systems; evolution of database technologies; types of databases; database components. **Database Design**: Design approaches; business rules; enterprise model; conceptual model; logical model; physical model. **Normalisation**: First normal form; second normal form; third normal form; de-normalisation. **Structured Query Language (SQL)**: Data Definition Language (DDL); Data Manipulation Language (DML); Data Control Language. **NoSQL Databases**: NoSQL Database Management; Create, Retrieve, Update and Delete Data.

S2511DC:	**Computer Systems I**
NQF Level:	**5**
Contact Hours:	Up to 2 contact lecture periods and 1 Practical session per week for one semester
NQF Credits:	**7**
Course Assessment:	CA **50%** tests, lab exercises, assignments, presentations, individual and group projects.
Examination:	1 x 2-hour examination paper, **50%.**

Course description: **Introduction to Computing:** History of Computing, Computing Disciplines: Computer Science, Information Technology, Information System, Software Engineering, Computer Engineering and its Application Domains. **Data and Information:** Data Representation (Number, Images, Text, Sound, Video & Compression Techniques). **Hardware and Software:** Computer Hardware (Classification of Computers, Components, Input, output and storage devices & media, CPU architecture); Software: Application and System Software (Operating systems, Utility programs, Library programs, assembly language and machine code translators, Virtual machine). **Networking Fundamentals:** Network Types, Reference Models, Client-Server Model, Network Standards & Communication protocols; **Data Communications and Transmission:** Communications Channels: Guided & Unguided media; Synchronous vs Asynchronous Transmission; Analog & Digital Data Transmission, Serial and Parallel data transmission; simplex, duplex and half-duplex data transmission).

S2412DI:	**Interactive Web Programming II**
NQF Level:	4
Contact Hours:	Up to 4 contact lecture periods per week for one semester; one practical session per week for one semester
NQF Credits:	14
Course Assessment:	CA **50%** will be compiled from individual and group practical activities quizzes, tests, assignments.
Examination:	1 x 2-hour examination paper. A final mark of **50%** is required to pass this module.
Prerequisite	None

Course description: **CSS Layout Frameworks**: Grid; Flexbox. CSS Positioning. **CSS Frameworks**: Bootstrap; Materialise. **SASS**: SASS Pre-processing; Variables, Maps; Expressions and Operations; Nesting; Functions; Mixins and Partials; Modules; Inheritance. **LESS**: LESS Pre-processing; Variables, Maps; Expressions and Operations; Nesting; Functions; Mixins and Partials; Modules; Inheritance.

S2512DC:	**Computer Systems II**
NQF Level:	**5**
Contact Hours:	Up to 2 contact lecture periods and 1 Practical session per week for one semester
NQF Credits:	**7**
Course Assessment:	CA **50%** tests, lab exercises, assignments, presentations, individual and group projects.
Examination:	1 x 2-hour examination paper, **50%.**

Course description: **Fundamentals of Computer Networks:** Communications Hardware (Routers, Hubs, Switches, Bridges); Wired and Wireless LAN technologies (Ethernet, Token Ring, Fiber Distributed Data Interface, Wireless LAN); Network Topologies. **Introduction to Telecommunications Systems:** Telecommunication Principles(Electromagnetic spectrum, Bits, Bauds and Bandwidth, Analog and Digital Signals, analogue to digital conversion, Modulation systems, Signal Multiplexing & Duplexing, Redundancy, Error Correction and Detection, Switching Systems in Telecommunication Networks. **Internetworks:** Web sites, E-mail, Instant Messaging, Social Media, Blogging, RSS, podcasting, Google application, and Digital Marketing. **Web Search:** Web search engine architecture, Web crawling and indexing; **Security, privacy and data integrity:** Introduction to Data, information and Network Security; malware and attacks (viruses, worms, Trojans, DoS, etc.); countermeasures: Firewall, VPN, Intrusion Detection System (IDS), Intrusion Prevention System (IPS), Passwords, encryption, digital signature, and authentication.

S2611DD:	**Database Administration**
NQF Level:	**6**
Contact Hours:	4 contact lecture periods and 3 hour practical session per week for one semester
NQF Credits:	**16**
Course Assessment:	**50%** of minimum of 2 tests and 2 assignments.
Examination:	1 x 3-hour examination paper, **50%.**

Course description: **Introduction to Database Management:** Administrator responsibilities; database architecture. **The database instance**: System Global Area (SGA), Program Global Area (PGA); background processes; instance management. **The physical structures**: managing table spaces; managing data files. **Users and security**: managing users and schemas; managing privileges; managing roles. **Schema Objects**: Managing tables; managing views; managing indexes. **Networking**: Understanding Oracle Net; understanding the listener Backup and Recovery, loading and moving data, Globalization Support. Transactions and Concurrency control.

S2611DN:	**Computer Systems I**
NQF Level:	**6**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
NQF Credits:	**16**
Course Assessment:	**50%,** individual & group practical activities, quizzes, tests, assignments
Examination:	1 x 3-hour examination paper, **50%.**

Course description: **Introduction to Networking:** Introduction, Network Components, Network Representations and Topologies, Types of Networks, Network Trends, Network Security. **Basic Switch and End Device Configuration:** Configure console, vty and enable passwords, Configure IP addressing and default gateway parameters, Verify Connectivity. **Protocols and Models:** Protocols and Protocol Suites, Standard Organisations, Reference Models, Data encapsulation and access. **Physical Layer:** Purpose of the Physical Layer, Physical Layer Characteristics, Network Media. **Number Systems:** Binary and Hexadecimal Number Systems. **Data Link Layer:** Purpose of the Data Link Layer, Topologies, Data Link Frame. **Ethernet Switching:** Ethernet Frame, Ethernet MAC Address, the MAC Address Table, Switch Speeds and Forwarding Methods. **Address Resolution:** MAC vs IP, ARP, IPv6 Neighbour Discovery. **Network Layer:** Network Layer Characteristics, IPv4 and IPv6 Packets, Routing. **Basic Router Configuration:** Configure Initial Router Settings, Configure Interfaces, Configure devices to use the default gateway. **IP Addressing:** IPv4 Addressing, IPv6 Addressing. I**CMP:** ICMP Messages, Ping and Traceroute. **Transport Layer:** Purpose of the transport layer, TCP and UDP, Port Numbers. **Application layer:** Application Layer Protocols and Services. **Network Security Fundamentals:** Security Threats and Vulnerabilities, Network Attacks and Mitigation, Device Security. **Build a small network**.

S2612DN:	Computer Systems II
NQF Level:	**6**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
NQF Credits:	**16**
Course Assessment:	**50%,** individual & group practical activities, quizzes, tests, assignments
Examination:	**1 x 3-hour** examination paper, **50%.**

Course description: **Basic Device Configuration**: Configure a Switch with Initial Settings, Configure Switch Ports, SSH, Basic Router Configuration, Verify Directly Connected Networks. **Switching Concepts:** Frame Forwarding, Switching Domains**. VLANs:** Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration, VLAN Trunks, DTP**. Inter-VLAN Routing:** Inter-VLAN Routing Operation, Router-on-aStick Inter-VLAN Routing, Inter-VLAN Routing using Layer 3 Switches, Troubleshoot Inter-VLAN Routing**. STP Concepts:** Purpose of STP, STP Operations, Evolution of STP. **EtherChannel:** EtherChannel Operation, Configure, Verify and Troubleshoot EtherChannel. **DHCPv4:** DHCP4 Concepts, Configure a Cisco IOS DHCP4 Server, Configure a DHCP4 Client**. SLAAC and DHCPv6;** IPv6 Global Unicast Address Assignment, SLAAC, DHCPv6, Configure DHCPv6 Server. **FHRP Concepts:** First Hop Redundancy Protocols, HSRP.**; LAN Security Concepts:** Endpoint Security, Access Control, Layer 2 Security Threats, MAC Address Table Attack, LAN Attacks**,** Switch Security Configuration**. WLAN Concepts and Configuration:** Components of WLANs, WLAN Operation, WLAN Threats, Implement a WLAN using a wireless router and WLC. **Routing Concepts:** Path Determination, Packet Forwarding, IP Routing Table, Static vs Dynamic Routing. **; IP Static Routing**: Static Routes, Configure IPv4 and IPv6 static routes**,** Troubleshoot Static and Default Routes.

S2612DI:	Internet Applications Development
NQF Level:	**6**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
NQF Credits:	**16**
Course Assessment:	**CA** of **50%** will comprise of a minimum of 2 assignments and a project.
Examination:	1 x 3-hour examination paper, **50%.**

Course description: **Evolution of Web Technologies**: Syntactic Web; Social Web; Semantic Web. **MVC Applications Development**: Models, Entity Frameworks, Controllers, Views and View Engines. **Client-Side Programming**: Client-Side Web Frameworks; Document Object Model (DOM); Virtual DOM, Template Engines; Web Components; Component Lifecycle; Mixins; Form Handling and Validation; State Management; Properties and Event; Routing; Reusability and Composition; AJAX and Server Communication. **Client-Server Communication**: CORS; JSON; **Server-Side Programming**: Application Programmer Interfaces (APIs); Authentication; Authorisation; **Databases**: Using SQL and NoSQL databases; **Cross-Platform Native Runtime**: Hybrid Applications. **Device Sensors**: GPS Location; Camera; File System access. **Collaboration Tools and Deployment**: Version Control, Application Store Deployment

S2612DS:	System Administration
NQF Level:	**6**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
NQF Credits:	**16**
Course Assessment:	**CA** of **50%** will comprise of a minimum of 2 assignments and a project.
Examination:	1 x 3-hour examination paper, **50%.**

Course description: **Introduction to system administration**: Basic tasks of a system administrator; essential administrative tools; installing and configuring a multi-user and multi-tasking operating system (e.g. Linux, Windows server). **Introduction to virtualisation technologies**. **Introduction to a server operating system. Server administration**: File systems; processes; user management; file permissions and ownership. **Software management. Introduction to service management. Introduction to networking for system administrators. Shell scripting. Introduction to system security.**

J. QUALIFICATION: BACHELOR OF SCIENCE IN STATISTICS – 33BSST -3 YEARS FULL-TIME

The purpose of this programme is to provide the successful candidates with both theoretical & practical foundation & training in Statistics. Generally, this programme is designed to impart statistical (combined with mathematical & computing) knowledge and skills. The programme will also allow for logical progression of learning and teaching. The emphasis is mainly put on practical applications of Statistics. In accordance with that, programme will provide the successful candidate with a good foundation and training in Statistics to enable entry into almost any type of NQF levels 8 & 9 degrees in Statistics or Applied Mathematics and/or postgraduate diplomas in the region or abroad. This represents a transformation of an existing programme that provides a generic foundation programme in Statistics. Moreover, this first degree is designed to produce candidates that may articulate in honours degrees and thereafter into master's and doctoral qualifications in Statistics. With an introduction of more computing modules than in the existing programme, this transformed programme speaks best in line with our UNAM institutional vision & mission, national SDGs and 4IR which calls for more computing & AI skills as we march into the future.

J.1. ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Statistics degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an **EXTENDED PROGRAMME** that will take one year longer. i.e., students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

J.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects as follows (minimum **27** points on the UNAM scale):

(a) 2 subjects on NSSCH with **4** or higher,
(b) 3 subjects on NSSCO with **C** or higher, and additionally,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

OR

(a) 3 subjects on higher level (NSSCH) with **4** or higher,
(b) 2 subjects on ordinary level (NSSCO) with **C** or higher,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an *EXTENDED PROGRAMME* that will take one year longer. For example, students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

J.1.3. ALTERNATE PATHWAYS TO ADMISSION

J.1.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge,** and **Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%.**

J.1.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

Admission for International Students:

International students seeking admission to the University of Namibia should possess equivalent school-leaving qualifications which is accredited by the Namibian Qualifications Authority. Candidates must have completed secondary school with excellent grades/marks in relevant subjects and have earned a certificate of completion equivalent to a Namibian school-leaving certificate which would enable them to be admitted to a university in their own home country.

J.1.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

J.1.5. DURATION OF STUDY

The Bachelor of Science in Statistics degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

J.1.6. MODE OF DELIVERY

The Bachelor of in Statistics degree programme is offered on a mode(s) of delivery face-to-face, blended, online. The mode of delivery consists of a combination of lectures, tutorials, lab practical, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

J.1.7. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- The final mark for each module will be calculated using a ratio of CA mark: Exam mark of **1:1** and
- In order to pass a module, a minimum final mark of **50%** shall be required.
- Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- To qualify for a Supplementary Exam a final mark of **45 – 49**% is required, subject to the subminimum of 40% in the exam.

For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.

J.1.8. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

The candidate must have passed 100% of the first-year modules.

J.1.8.1. NORMAL ENROLLMENT

To be re-admitted to the Bachelor of Science in Statistics programme for a particular year of registration, a student must have passed the minimum number of courses as indicated below:

- 38 credits (of which 23 must be non-core) by the end of the first year of registration
- 118 credits (of which 82 must be non-core) by the end of the second year of registration
- 203 credits by the end of the third year of registration
- 250 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration

J.1.8.2. EXTENDED ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 38 credits (of which 24 must be non-core) by the end of the first year of registration
- 87 credits (of which 82 must be non-core) by the end of the second year of registration
- 161 credits by the end of the third year of registration
- 219 credits by the end of the fourth year of registration
- 283 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 6 years of registration

J.1.9. ADVANCEMENT AND PROGRESSION RULES

J.1.9.1. NORMAL ENROLLMENT

A student advances to the following academic level of study when at least 2/3 of the modules of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any modules of the following year. In all cases, prerequisites for modules have to be passed before a student can proceed to register for modules that require prerequisites.

- Year 1 to Year 2: At least **84** credits.
- Year 2 to Year 3: All first-year credits in addition to at least **80** second-year credits

J.1.9.2. EXTENDED ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the EXTENDED Programme year structure:

- Year 1 to Year 2: At least 57 credits including the UNAM Core
- Year 2 to Year 3: All first-year credits in addition to at least 61 second-year credits
- Year 3 to Year 4: All first-year credits in addition to at least 51 second-year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

J.1.10. EQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **372 credits**, and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

J.1.11. ARTICULATION ROUTES

This qualification serves as an entry point to an honour's degree in Statistics, or related postgraduate degrees and diplomas.

J.1.12. QUALIFICATION: BACHELOR OF SCIENCE IN STATISTICS – (33BSST) - 3 YEARS FULL-TIME

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP/ELECT
Core Semester					
U3403FS	Skills Portfolio		NCB		C
U3583AL	Academic Literacy I	5	8		C
U3583DD	Digital Literacy	5	8		C
U3420EM	Ethics & Morality	4	2		C
U3420CN	National & Global Citizenship	4	2		C
U3420SE	Sustainability & Environmental Awareness	4	2		C
S3520MV	Introduction to EXCEL & VBA	5	2		C
Year 1 Semester 1					
S3511SF	Fundamentals of Statistics	5	12		C
S3511MC	Calculus I	5	12		C
S3511ML	Linear Algebra I	5	12		C
S3511DP	Programming Fundamentals I	5	14		C
Year 1 Semester 2					
S3532DP	Programming Fundamentals II	5	14		
S3512ST	Statistical Methods	5	12		C
S3512SC	Fundamentals of Statistical Computing	5	14	(S3511SF)	C
S3512MC	Calculus II	5	12		C
S3512MT	Elementary Number Theory & Combinatorics	5	12		C
Total credits			**126**		

YEAR 2

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP/ELECT
Core Semester					
U3683LA	Academic Literacy II	6	8		C
U3520LP	Leadership	5	2		C
U3420PJ	Project Management	4	2		C
U3420RT	Entrepreneurship	4	2		C
U3520TH	Critical Thinking	5	2		C
S3680MZ	Mathematical Problem Solving	6	8		C
Year 2 Semester 1					
S3611SP	Probability Theory	6	14	S3511SF, S3512MC	C
S3611SS	Survey Sampling	6	14	S3512ST	C
S3601SN	Nonparametric	6	8	S3511SF, S3512ST	C
S3631DI	Introduction to Database	6	16	S3532DF	C
Year 2 Semester 2					
S3612SD	Distributions Theory	6	14	(S3611SP), S3512MC	C
S3612SE	Experimental Designs & Analysis of Variance	6	14	S3511SF, S3512ST	C
S3612ML	Linear Algebra II	6	14	S3511ML	C
S3602ZS	CWIE Prep	6	8		C
Total credits			**126**		

YEAR 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP/ELECT
Core Semester					
W3700IC	CWIE	7	24		C
Year 3 Semester 1					
S3711SI	Statistical Inference	7	16	S3611SP, S3612SD	C
S3711SR	Linear Models	7	18		C
S3711SV	Survival Analysis	7	16		C
Year 3 Semester 2					
S3712SO	Stochastic Processes	7	16	S3612SD	C
S3712SQ	Statistical Quality Control	7	16	S3611SP	C
S3712SA	Data Processing	7	18	(S3711SR)	C
Total credits			**124**		

J.1.13. EXTENDED ENROLMENT

This option/mode caters for students who may be admitted based on the criteria mentioned under reference points **J.1.9.2.** of Section. These students register for the following extra/extended modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II
3. **S3511MC`** Calculus I

J.2. BACHELOR OF SCIENCE IN POPULATION STUDIES – 33BSPO (3 YEAR FULL-TIME)

The 21st Century is faced with challenges of growing global population which have implication for sustainable development (SDGs) in terms of social, environment, economic development. The programme is designed to address certain issues of SDGs such as zero hunger, good health and wellbeing, sustainable cities and communities, no hunger as well as indirectly climate changes. Thus, the purpose of this qualification is to develop qualified population study professionals to examine population dynamics with respect to the size, structure, and movements of populations over space and time. Moreover, population expansion has some advantages too. The programme shall provide students with analytical stills to project future population and explore some dividends of demographic transition that current generation and future generations will gain from expanding population and the innovation associated with opportunities offered by the fourth industrial revolution.

J.2.1. ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Population Studies degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an EXTENDED PROGRAMME that will take one year longer. i.e., students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

J.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued prior to 2021 (only) and has a pass in 5 different subjects, as outlined below, can enrol in the Extended mode of this programme: **EITHER a pass in five (5) different subjects** with:

- ★ two (**2**) subjects on NSSCH with **4** or higher,
- ★ three (3) subjects on NSSCO with C or higher, and additionally, - **English and Mathematics** must be at minimum a C on NSSCO.

OR a pass in five (5) different subjects with

- ★ three (3) subjects on NSSCH with 4 or higher,
- ★ two (2) subjects on NSSCO with C or higher, and additionally, - **English and Mathematics** must be at minimum a C on NSSCO.

Candidates that qualify for admission to the University but lack the appropriate subjects on NSSCAS (or grades), as outlined above, for admission to the programme can opt to rather enrol for the Extended mode, which will take one year longer than this programme.

Admission based on Diploma in Applied Statistics

Candidates in possession of a Diploma in Applied Statistics (Level 6), can enroll for the Bachelor of Science in Population Studies given that the credit exemption does not exceed 50 of the Bachelor of Science in Population Study programs.

J.2.3. ALTERNATE PATHWAYS TO ADMISSION

J.2.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge, and Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%.**

J.2.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

J.2.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

J.2.5. DURATION OF STUDY

The Bachelor of Science in Computing degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

J.2.6. MODE OF DELIVERY

The Bachelor of in Computing degree programme is offered on a mode(s) of delivery face-to-face, blended, online, distance **(Blended Modes).** The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

J.2.7. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- ★ A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- ★ The final mark for each module will be calculated using a ratio of CA mark: Exam mark of **40: 60** and
- ★ In order to pass a module, a minimum final mark of **50%** shall be required.
- ★ Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- ★ To qualify for a Supplementary Exam a final mark of **45 – 49**% is required, subject to the subminimum of 40% in the exam.

For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.

J.2.8. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.2.8.1. NORMAL ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 40 credits (of which 24 must be non-core) by the end of the first year of registration
- ★ 122 credits (of which 88 must be non-core) by the end of the second year of registration
- ★ 242 credits by the end of the third year of registration
- ★ 276 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration

J.2.8.2. EXTENDED ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 16 number of credits (of which 12 must be non-core) by the end of the first year of registration
- ★ 96 number of credits (of which 76 must be non-core) by the end of the second year of registration
- ★ 112 number of credits by the end of the third year of registration
- ★ 192 number of credits by the end of the fourth year of registration
- ★ 272 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration

J.2. 9. ADVANCEMENT AND PROGRESSION RULES

J.2.9.1. NORMAL ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **88** credits.
- ★ Year 2 to Year 3: All first-year credits in addition to at least **84** second-year credits

J.2.9.2. EXTENDED ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the EXTENDED Programme year structure:

- ★ Year 1 to Year 2: At least 32 credits
- ★ Year 2 to Year 3: All first-year credits in addition to at least 60 second year credits Year 3 to Year 4: All second-year credits and at least 64 third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

J.2.10. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **368 credits**, and who have met the requirements of the prescribed curriculum and met all other relevant UNAM requirements.

J.2.11. -ARTICULATION ROUTES

This qualification may serve as an entry point to an honour's degree in Population Studies, or related postgraduate degree and diplomas.

J.12. QUALIFICATION: BACHELOR OF SCIENCE IN POPULATION STUDIES – (33BSPO) - 3 YEARS

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3403FS	Skills Portfolio	4	NCB		
U3583AL	Academic Literacy I	5	8		
U3583DD	Digital Literacy	5	8		
U3420PJ	Project Management	4	2		
U3420RT	Entrepreneurship	4	2		
U3420EM	Ethics & Morality	4	2		
U3420SE	Sustainability & Environmental Awareness	4	2		
Year 1 Semester 1					
S3511MC	Calculus I	5	12		
S3511ML	Linear Algebra I	5	12		
S3511SF	Fundamentals of Statistics	5	12		
S3511UO	Official Statistics	5	12		
Year 1 Semester 2					
S3512MC	Calculus II	5	12		
S3512ST	Statistical Methods	5	12		
S3512SC	Fundamentals of Statistical Computing	5	14		
S3512UF	Fundamentals of Population Theory	5	12		
Total credits			**122**		

YEAR 2

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3683AL	Academic Literacy II	6	8		
S3600MZ	Mathematical Problem Solving	6	8		
U3520LP	Leadership	5	2		
U3452CN	National & global citizenship	5	2		
U3520TH	Critical Thinking	5	2		
S3520MV	Introduction to EXCEL & VBA	5	2		
Year 2 Semester 1					
S3601UD	Demographic Data	6	8	S3511UO	C
S3611SS	Survey Sampling	6	14	S3511SF, S3512ST	C
S3611UI	Introduction to Demographic Analysis	6	14	S3512UF	C
S3611SP	Probability Theory	6	14	S3511SF, S3512MC	C
Year 2 Semester 2					
S3612UE	Epidemiology and Biostatistics	6	14	S3511UF	C
S3612UP	Fundamentals of Population & Development	6	14	S3512UF	C
S3612SE	Experimental Designs & Analysis of Variance	6	14	S3511SF, S3512ST	C
S3602ZU	CWIE Prep	6	8		C
Total credits			**124**		

YEAR 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
W3780ZU	CWIE	7	24		**C**
Year 2 Semester 1					
S3711UD	Demographic Methods and Analysis I	7	16	S3611UI	C
S3711SR	Regression Models	7	18		C
S3711SV	Survival Analysis	7	16		C
Year 2 Semester 2					
S3712UM	Population Migration and Urbanization	7	16		C
S3712UD	Demographic Methods and Analysis II	7	16	S3711UD, S3611UI	C
S3712SA	Data Processing	7	16	S3711SR	C
Total credits			**122**		

J.12.1. EXTENDED ENROLMENT

J.12.1.1. OPTION ONE: NSSCAS & NSSCO Mathematics

This option caters for students that **do not have required NSSCAS & NSSCO Mathematics** entry grades. These students register for the following extra/extended modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II

K. BACHELOR OF SCIENCE IN MATHEMATICS 33BSMM - 3 - YEAR FULL-TIME

The purpose of this qualification is to provide students with, in the broadest terms, Mathematical thinking skills and attitudes. The programme has been transformed in order to reflect the changed workplace demands and opportunities that digitalisation and, more specifically, the fourth industrial revolution, are creating for a Mathematics graduate: Students will be taught computer programming as well as the use of specific Mathematical software – in particular MATLAB, Python and/or SAS - as an essential part of their training. A strand of newly designed modules are aimed to convey the techniques and results of Discrete Mathematics, necessary for designing and analysing algorithms, information security, data encryption, and logistics. Mathematics is the language of modern science which anybody needs to have mastered who aspires to use modern technology in an insightful, proactive manner. Equipped with the use of this language, holders of a BSc Mathematics will be able to wield its powers and become innovators. The programme aims to provide a broad base of integrated Mathematical skills, covering the entire spectrum and emphasizing applications in IT, financial analysis, and logistics.

K.1. ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Mathematics degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an EXTENDED PROGRAMME that will take one year longer. i.e., students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

K.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects as follows (minimum **27 points on the UNAM scale**):

(a) 2 subjects on NSSCH with **4** or higher,
(b) 3 subjects on NSSCO with **C** or higher, and additionally,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

OR

(a) 3 subjects on higher level (NSSCH) with **4** or higher,
(b) 2 subjects on ordinary level (NSSCO) with **C** or higher,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an *EXTENDED PROGRAMME* that will take one year longer. For example, students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

K.1.3. ALTERNATE PATHWAYS TO ADMISSION

H.18.2.1.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for three (3) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge,** and **Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%**.

K.1.4. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

K.1.5. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

K.1.6. DURATION OF STUDY

The Bachelor of Science in Computing degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

K.1.7. MODE OF DELIVERY

The Bachelor of in Computing degree programme is offered on a mode(s) of delivery face-to-face, blended, online, distance **(Blended Modes).** The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

K.1.8. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- The final mark for each module will be calculated using a ratio of CA mark: Exam mark of **40: 60** and
- In order to pass a module, a minimum final mark of **50%** shall be required.
- Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- To qualify for a Second Opportunity Examination, a student must have sat for the First Opportunity Examination and failed such examination or a student who qualified based on the admission to examination criteria but opted not to sit for First Opportunity Examination.
- **For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.**

K.1.9. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

K.1.9.1. NORMAL ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 64 credits (of which 24 must be non-core) by the end of the first year of registration
- 144 credits (of which 42 must be non-core) by the end of the second year of registration
- 240 credits by the end of the third year of registration
- 320 credits by the end of the fourth year of registration
- 396 credits by the end of the fifth year of registration

K.1.9.2. EXTENDED ENROLMENT

The programme must be completed after a maximum of 5 years of registration EXTENDED ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 32 credits (of which 12 must be non-core) by the end of the first year of registration
- 102 credits (of which 36 must be non-core) by the end of the second year of registration
- 192 credits by the end of the third year of registration
- 260 credits by the end of the fourth year of registration
- 326 credits by the end of the fifth year of registration
- 396 credits by the end of the sixth year of registration

The programme must be completed after a maximum of 6 years of registration

Further to the above **all First-Year modules** must be passed before one can register for any Third-Year module.

K.1.10. ADVANCEMENT AND PROGRESSION RULES

K.1.10.1. NORMAL ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- Year 1 to Year 2: At least **87** credits.
- Year 2 to Year 3: All first-year credits in addition to at least **84** second-year credits

K.1.10.2. EXTENDED PROGRAMME

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- Year 1 to Year 2: At least **48** credits
- Year 2 to Year 3: All first-year credits in addition to at least **48** second year credits
- Year 3 to Year 4: All second-year credits and at least **70** third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

K.1.11. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **388 credits**, and who have met the requirements of the prescribed curriculum.

K.1.12. ARTICULATION ROUTES

Graduates of the programme will articulate into an NQF level 8 bachelor's degree(s) at UNAM:

- BSc Honours degree in Financial Mathematics and BSc Honours degree in Quantitative Risk Management May also articulate into other relevant.
- NQF level 8 BSc Honours degrees and diplomas offered in local and foreign institutions.

K.1.13. QUALIFICATION: BACHELOR OF SCIENCE IN MATHEMATICS - 33BSMM - 3 YEARS

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PREREQUISITES	COMP-C/ELECT-E
Year 1 Core Semester 1					
U3403FS	Skills Portfolio	4	NCB		**C**
U3583AL	Academic Literacy I	5	8		**C**
U3583DD	Digital literacy	5	8		**C**
S3420MT	Mathematical Tools for University	4	2		**C**
U3420EM	Ethics and Morality	4	2		**C**
U3420CN	National and Global Citizenship	4	2		**C**
U3520LP	Leadership	5	2		**C**
Year 1 Semester 1					
S3511MC	Calculus I	5	12		**C**
S3511ML	Linear Algebra I	5	12		**C**
S3511SF	Fundamentals of Statistics	5	12		**E**
S3511PG	General Physics I	5	14		**E**
S3531DP	Programming Fundamentals I	5	14		**C**
Year 1 Semester 2					
S3512MC	Calculus II	5	12		**C**
S3512MS	Sets and Logic	5	12		**C**
S3512MT	Elementary Number Theory & Combinatorics	5	12		**C**
S3532DF	Programming Fundamentals II	5	14		**C**
Total Credits			**124**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PREREQUISITES	COMP-C/ELECT-E
Year 2 Core Semester 1					
U3683AL	Academic Literacy II	6	8		**C**
U3420SE	Sustainability & Environmental Awareness	6	2		**C**
U3420PJ	Project Management Skills	6	2		**C**
U3420RT	Entrepreneurship	6	2		**C**
U3520TH	Critical Thinking	6	2		**C**
S3600MZ	Mathematical Problem Solving	6	8		**C**
Year 2 Semester 1					
S3611MC	Calculus III	6	14	S3511MC **OR** S3512MC	**C**
S3601MN	Numerical Mathematics	6	8	S3511MC	**C**
S3611MT	Game Theory	6	16	S3512MT	**E**
S3611SP	Probability Theory	6	14	S3511SF, S3512MC	**E**
S3631DO	Object-Oriented Programming I	6	16	S3532DF	**C**
Year 2 Semester 2					
S3602MN	Numerical Analysis	6	8	(S3601MN) / S3512MC	**C**
S3612ML	Linear Algebra II	6	14	S3511ML	**C**
S3612MA	Mathematical Analysis I	6	14	S3512MC	**C**
S3612PD	Dynamics	6	16	S3511PG, S3512MC	**E**
S3632DO	Object-Oriented Programming II	6	16	(S3631DO) /S3532DF	**E**
S3602ZP	CWIE: Prep	6	8		**C**
Total Credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PREREQUISITES	COMP-C/ELECT-E
Year 3 Core Semester 1					
W3700IC	CWIE	7	24		
S3711MA	Mathematical Analysis II	7	16	S3612MA	**C**
S3711MD	Discrete Mathematics	7	16	S3512MT	**C**
S3701MT	Number Theory	7	8	S3512MT	**C**
S3701MS	Set Theory	7	8	S3512MS	**C**
Year 3 Semester 2					
S3712MP	Partial Differential Equations	7	16	S3611MC	**C**
S3712ML	Algebraic Structures and Applications	7	16	(S3701MT) / S3612ML	**C**
S3712MF	Complex Function Theory	7	16	(S3711MA) / S3612MA	**C**
S3712MO	Optimization	7	16	S3612ML	**C**
Total Credits			**136**		

K.1.14. EXTENDED ENROLMENT NSSCO MATHEMATICS

This option caters for students that has not the required **NSSCAS Mathematics** though meeting the admission requirements, but with **NSSCO level in Mathematics** with a minimum **"C".** These students register for the following extra/extended modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II
3. **S3411PG** Physics Support I

K.2. BACHELOR OF SCIENCE IN QUANTITATIVE FINANCE – 33BSQF (3 YEAR FULL-TIME)

PURPOSE: Learning finance separately is very easy, learning mathematics of on the other hand is easier too, now combining both fields is what becomes a challenge. Bringing the concepts of both fields and synchronizing it into a perfect suit created the new field of study of quantitative finance. The Quantitative Finance degree is a transformed program that offers an econometric approach to and indepth knowledge of all aspects of finance and the skills to apply quantitative techniques and econometric models to complex financial problems and develop and apply new econometric solutions in studying extremely large data sets to analyse financial markets, securities, pricing problems and risk management strategies. The programme answers to SDG 9.5 "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" in its aim to build graduates who have the broad scope of mind and analytical acumen to create resilient solutions. The goals encompassed in SDG 4 "Provision of quality education" inform the programme in a twofold way: Holders of the BSc Quantitative Finance will have the resilience and know-how to build their own lives regardless of obstacles or setbacks and contribute to the country's development. They may also become providers of transformative, quality education to others. As per the Namibia Labour Market Outlook Report 2019 by Namibia Planning commission projected about 13,000 jobs opening in Finance sector during the period 2018 – 2023. The Covid19 pandemic situation has created huge opportunities for Quants as the need for risk analysts, investment analysts, quantitative analysts etc. to assess and mitigate the risks emanates due to the crisis such as Covid19. Asset Securitization is an emerging idea in the Namibian Financial Market and it requires skilled graduates who will be able to understand and develop tradable financial derivatives customized to Namibian and SADC financial markets

K.2.1. ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Quantitative Finance degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an EXTENDED PROGRAMME that will take one year longer. For example, students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

K.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects as follows (minimum **27 points on the UNAM scale**):

(a) 2 subjects on NSSCH with **4** or higher,
(b) 3 subjects on NSSCO with **C** or higher, and additionally,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

OR

(a) 3 subjects on higher level (NSSCH) with **4** or higher,
(b) 2 subjects on ordinary level (NSSCO) with **C** or higher,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Candidates that qualify for admission to the University but lack the appropriate subjects (or grades) on NSSCAS, as outlined above, for admission to the programme (or their chosen electives), can opt to rather enrol for an *EXTENDED PROGRAMME* that will take one year longer. i.e., students that do not have the required Mathematics on the NSSCAS level though meeting the admission requirements, but with NSSCO level in Mathematics with a minimum "C".

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

K.2.3. ALTERNATE PATHWAYS TO ADMISSION

K.2.3.1. MATURE AGE ENTRY SCHEME (MAE)

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge,** and **Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%.**

K.2.3.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

K.2.3.3. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

K.2.4. DURATION OF STUDY

The Bachelor of Science in Computing degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

K.2.5. MODE OF DELIVERY

The Bachelor of in Computing degree programme is offered on a mode(s) of delivery face-to-face, blended, online, distance **(Blended Modes).** The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

K.2.6. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- The final mark for each module will be calculated using a ratio of CA mark: Exam mark of **40: 60** and
- In order to pass a module, a minimum final mark of **50%** shall be required.
- Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- To qualify for a Second Opportunity Examination, a student must have sat for the First Opportunity Examination and failed such examination or a student who qualified based on the admission to examination criteria but opted not to sit for First Opportunity Examination.
- **For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.**

K.2.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

K.2.7.1. NORMAL ENROLLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 40 credits (of which 24 must be non-core) by the end of the first year of registration
- 124 credits (of which 92 must be non-core) by the end of the second year of registration
- 214 credits by the end of the third year of registration
- 264 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration EXTENDED ENROLMENT

K.2.7.2. EXTENDED ENROLMENT

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 28 number of credits (of which 12 must be non-core) by the end of the first year of registration
- 92 number of credits (of which 28 must be non-core) by the end of the second year of registration
- 170 number of credits by the end of the third year of registration
- 230 number of credits by the end of the fourth year of registration
- 298 number of credits by the end of the fifth year of registration

The programme must be completed after a maximum of 6 years of registration.

K.2.8. ADVANCEMENT AND PROGRESSION RULES

K.2.8.1. NORMAL ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- Year 1 to Year 2: At least **87** credits.
- Year 2 to Year 3: All first-year credits in addition to at least **84** second-year credits

K.2.8.2. EXTENDED PROGRAMME

A student advances to the subsequent academic year of study when the following conditions have been met in terms of the Extended Programme year structure:

- Year 1 to Year 2: At least 48 credits
- Year 2 to Year 3: All first-year credits in addition to at least 48 second year credits
- Year 3 to Year 4: All second-year credits and at least 70 third year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than 20%.

K.2.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **388 credits**, and who have met the requirements of the prescribed curriculum.

K.2.10. ARTICULATION ROUTES

Graduates of the programme will articulate into an NQF level 8 bachelor's degree(s) at UNAM:

- BSc Honours degree in Financial Mathematics and BSc Honours degree in Quantitative Risk Management May also articulate into other relevant.
- NQF level 8 BSc Honours degrees and diplomas offered in local and foreign institutions.

K.11. QUALIFICATION: BACHELOR OF SCIENCE IN QUANTITATIVE FINANCE – (33BSQF) - 3 YEARS FULL-TIME

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3403FS	Skills portfolio	4	NCB		**C**
U3583AL	Academic Literacy 1	5	8		**C**
U3583DD	Digital Literacy	5	8		**C**
U3420PJ	Project Management Skills	4	2		**C**
U3420EM	Ethics and Morality	4	2		**C**
U3420SE	Sustainable Environmental awareness	4	2		**C**
S3520MV	Introduction to EXCEL & VBA	5	2		**C**
Year 1 Semester 1					
S3511MC	Calculus I	5	12		**C**
S3511ML	Linear Algebra I	5	12		**C**
S3511SF	Fundamentals of Statistics	5	12		**C**
C3511FF	Financial Accounting 1A	5	12		**C**
G3511EA	Basic Microeconomics	5	12		**C**
Year 1 Semester 2					
S3512MC	Calculus II	5	12		**C**
C3512FF	Financial Accounting 1B	5	12		**C**
G3512EB	Basic Macroeconomics	5	12		**C**
S3512MQ	Introduction to Quantitative Finance	5	12		**C**
Total credits			**132**		

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
2nd Year's Core Semester Modules					
U3683LA	Academic Literacy II	6	8		**C**
U3420RT	Entrepreneurial	4	2		**C**
U3420CN	National and Global Citizenship	4	2		**C**
U3520LP	Leadership	5	2		**C**
U3520TH	Critical thinking	5	2		**C**
S3660ME	Business Ethics	6	8		**C**
Year 2 Semester 1					
S3611MD	Differential Equations and Integral Transforms	6	14	S3511MC **OR** S3512MC	**C**
S3611SP	Probability Theory	6	14	S3511SF, S3512MC	**C**
S3611MF	Financial Derivatives analysis	6	14	S3532MQ	**C**
S3601MN	Numerical Mathematics	6	8	S3511MC	**C**
Year 2 Semester 2					
S3612SD	Distribution Theory	6	14	S3511SF, S3512MC	**C**
S3612MN	Numerical Analysis	6	8	(S3601MN) / S3512MC	**C**
S3612ML	Linear Algebra II	6	14	S3531ML	**C**
S3602ZP	CWIE prep	6	8		**C**
Total credits			**118**		

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
3rd Year's Core Semester Modules					
W3700IC	CWIE	7	24	S3602ZP	**E**
W3700MC	Community Engagement	7	24	S3602ZP	**E**
Year 3 Semester 1					
S3711MP	Investment analysis & Portfolio Management	7	16	S3651MF	**C**
S3711SV	Survival Analysis	7	16		**C**
S3711SR	Regression Models	7	18		**C**
S3711MA	Analysis of Equities and Valuation	7	16	S3612MP	**C**
Year 3 Semester 2					
S3712MA	Fixed Income analysis	7	16	S3651MF	**C**
S3712MR	Risk Analysis and Modelling	7	16	S3612MP	**C**
S3712SO	Stochastic Processes	7	16	S3611SP, S3612SD	**C**
Total credits			**138**		

K.12. EXTENDED ENROLMENT NSSCO MATHEMATICS

This option caters for students that have not the required **NSSCAS Mathematics** though meeting the admission requirements, but with **NSSCO level in Mathematics** with a minimum **"C".** These students register for the following extra/extended modules:

1. **S3411MS** Mathematics Support I
2. **S3412MS** Mathematics Support II

L. BACHELOR OF SCIENCE IN DATA SCIENCE – 33BSDS (3 YEAR FULL-TIME)

The purpose of this programme is to not only offer students an opportunity to gain knowledge in three disciplines i.e. Computing, Mathematics and Statistics but it will also expose students to concepts and 4th/5th IR emerging technologies in the field of data science, focusing on building and deploying data science, machine learning, and data analytics solutions. Students will develop proficiency skills with statistical data analysis and learn to use libraries for visualizing data, finding patterns in data using machine learning. Graduates of this programme will further be able to provide solutions to a variety of complex problems in their quest to attain a myriad of business goals and this contributes to SDG 9 i.e. Industry, Innovation and Infrastructure as well as SDG 11 i.e. Sustainable cities and communities. The programme is well aligned to UNAM institutional vision & mission, national SDGs (NDP5 and Harambe Prosperity Plans) and 4IR which calls for more computing & AI skills (including blockchain technology, cryptocurrency, etc) as we march into the future.

L.1. HADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Data Science degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

L.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects as follows (minimum **27 points on the UNAM scale**):

(a) 2 subjects on NSSCH with **4** or higher,
(b) 3 subjects on NSSCO with **C** or higher, and additionally,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

OR

(a) 3 subjects on higher level (NSSCH) with **4** or higher,
(b) 2 subjects on ordinary level (NSSCO) with **C** or higher,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

L.1.1.1. ALTERNATE PATHWAYS TO ADMISSION

I.4.MATURE AGE ENTRY SCHEME (MAE

Mature Age Entry Scheme (MAE) under the following conditions: Candidates should

- ★ be at least 25 years old on the 1st day of the academic year in which admission is sought, - have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience relevant to the proposed study programme.
- ★ Additionally, such candidates will sit for four (4) Mature Age Entry Examination papers, which are covering the topics of **- English Proficiency, General Knowledge, and Mathematical Ability.** A **60%** average of all the papers is required, with no paper below **50%**.

L.1.1.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

L.1.2. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with the higher number of points as calculated from the *UNAM point scale* in five (5) different subjects guided by to matters of equity as outlined by National Policies.

L.1.3. DURATION OF STUDY

The Bachelor of Science in Computing degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

L.1.4. MODE OF DELIVERY

The Bachelor of in Computing degree programme is offered on a mode(s) of delivery face-to-face, blended, online, distance **(Blended Modes).** The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

L.1.5. ASSESSMENT CRITERIA

Unless stated otherwise in the module descriptor, the following shall apply:

For modules assessed with Continuous Assessment (CA) and Examination,

- A minimum CA Mark of **40%** is required to gain entrance into the relevant module examination.
- The final mark for each module will be calculated using a ratio of CA mark: Exam mark of **40: 60** and
- In order to pass a module, a minimum final mark of **50%** shall be required.
- Notwithstanding the above, a subminimum of at least **40%** will apply to the Exam Mark,
- To qualify for a Second Opportunity Examination, a student must have sat for the First Opportunity Examination and failed such examination or a student who qualified based on the admission to examination criteria but opted not to sit for First Opportunity Examination.

For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.

L.1. 6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- 40 credits (of which 24 must be non-core) by the end of the first year of registration
- 124 credits (of which 92 must be non-core) by the end of the second year of registration
- 214 credits by the end of the third year of registration
- 264 credits by the end of the fourth year of registration

The programme must be completed after a maximum of 5 years of registration

L.1.7. ADVANCEMENT AND PROGRESSION RULES

A student advances to the next level of academic year when at least 2/3 of the modules of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any modules of the following year. In all cases, prerequisites for modules have to be passed before a student can proceed to register for such modules.

A student advances to the subsequent academic year of Full-time and Part-time study when the following conditions have been met:

- Year 1 to Year 2: At least **84** credits
- Year 2 to Year 3: All first-year credits in addition to at least **88** second year credits

A student who fulfilled the re-admission regulations but could not advance to the next academic year must first register for all failed modules. Subject to pre-requisites, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than **20%.**

L.1.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **324** credits, and who have met the requirements of the compulsory section.

L.1.9. ARTICULATION ROUTES

Graduates of the programme will articulate into an NQF level 8 bachelor's degree(s) at UNAM:

- Graduates of the program will articulate into the Bachelor of Bachelor of Science in Data Science (Honours).
- Graduates may also articulate into other relevant NQF level 8 BSc Honours degrees and postgraduate diplomas offered in local and foreign institutions.

L.1.10. QUALIFICATION: BACHELOR OF SCIENCE IN DATA SCIENCE – (33BSDS) - 3 YEARS

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3403FS	Skills portfolio	4	NCB		C
U3583AL	Academic Literacy 1	5	8		C
U3583DD	Digital Literacy	5	8		C
S3520OI	Open Innovation in Data Science	5	2		C
U3420EM	Ethics and Morality	5	2		C
U3420CN	National & Global Citizenship	5	2		C
U3520LP	Leadership Skills	5	2		C
Year 2 Semester 1					
S3511SF	Fundamentals of Statistics	5	12		C
S3511MC	Calculus I	5	12		C
S3531DP	Programming Fundamentals I	5	14		C
S3511ML	Linear Algebra I	5	12		C
Year 2 Semester 2					
S3532DP	Programming Fundamentals II	5	14	S3531DP	C
S3512ST	Statistical Methods	5	12		C
S3512MC	Calculus II	5	12	S3511MC	C
S3512DM	Fundamentals of Machine Learning	5	14		C
Total credits			**126**		

YEAR 2

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
U3683AL	Academic Literacy II	6	8		C
U3420SE	Sustainability Environmental Awareness	6	2		C
U3420PJ	Project Management Skills	6	2		C
U3420RT	Entrepreneurship Skills	6	2		C
U3520TH	Critical Thinking	6	2		C
S3620DM	Digital Marketing, Social Media & Web Analytics	6	8		C
Year 2 Semester 1					
S3611SP	Probability Theory	6	14	S3511SF	C
S3631DI	Introduction to Database	6	16		C
S3612DD	Data Science Solutions Architecture and Design	6	8		C
S3631DO	Object-Oriented Programming I	6	16	(S3532DP)	C
Year 2 Semester 2					
S3632DA	Advanced Databases	6	16	S3631DI	C
S3631DO	Object-Oriented Programming II	6	16	S3631DO	C
S3612ML	Linear Algebra II	6	14	S3531ML	C
S3602ZP	CWIE prep	6	8		C
Total credits			**132**		

YEAR 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
W3780QP	CWIE	7	24	S3602ZP	C
Year 3 Semester 1					
S3711SR	Regression Models	7	18		C
S3731DD	Data Structures and Algorithms	7	18	(S3632DO)	C
S3731DA	Data Management and Analysis	7	18		C
Year 3 Semester 2					
S3712SA	Data Processing	7	18	S3731SR	C
S3722DS	Data Security and Data Privacy	7	16		C
S3732DL	Artificial Intelligence and Machine Learning	7	18		C
Total credits			**130**		

L.2. BACHELOR OF SCIENCE IN COMPUTING

L.2.1. ADMISSION REQUIREMENTS BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To be admitted into the Bachelor of Science in Computing degree programme, candidates must be in possession of a valid Namibian Senior Secondary Certificate (NSSC) with a pass in a total of five (5) different subjects as follows (minimum **27** points on the UNAM Scale):

(a) 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
(b) 3 subjects on NSSCO level with **C** average or higher, and
(c) English must be at minimum **C** at NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

L.2.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES PRIOR TO 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued **PRIOR TO 2021** (only) and has a pass in 5 different subjects as follows (minimum **27 points on the UNAM scale**):

(a) 2 subjects on NSSCH with **4** or higher,
(b) 3 subjects on NSSCO with **C** or higher, and additionally,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

OR

(a) 3 subjects on higher level (NSSCH) with **4** or higher,
(b) 2 subjects on ordinary level (NSSCO) with **C** or higher,
(c) English and Mathematics must be at minimum **C** on NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

L.2.3. ALTERNATE PATHWAYS TO ADMISSION

L.2.3.1. MATURE AGE ENTRY (MAE

Computing Diploma or equivalent qualifications may articulate into the programme. In addition to the above, **Mature Age Entry (MAE) and Prior Learning Recognition (RPL)** may server as alternative entry pathways subject to meeting requirements.

L.2.3.2. Mature Age Entry Scheme under the following conditions:

- ★ Candidates should be at least **25 years old** on the 1st day of the academic year in which admission is sought,
- ★ have at least completed senior secondary education, and
- ★ have proof of at least 5 years' relevant work experience **relevant** to the proposed study programme.
- ★ Additionally, such candidates will sit for three (3) Mature Age Entry Examination papers, which are covering the topics of **English Proficiency**, **General Knowledge,** and **Mathematical Ability**, and A **60%** average of all the papers is required, with no paper below **50%**.

L.2.3.3. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through **Recognition of Prior Learning (RPL)** according to the UNAM RPL policy. Depending on the content of a qualifying candidate's RPL portfolio placement in the programme can be accomplished at the discretion of the Head of Department, into either the Normal mode or the Extended mode of this programme.

L.2.3.4. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference shall be given to students with a higher number of points from the computing entry test.

L.2.4 DURATION OF STUDY

The Bachelor of Science in Computing degree programme cannot be completed in less than three (3) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

L.2.5. MODE OF DELIVERY

The Bachelor of in Computing degree programme is offered on a mode(s) of delivery face-to-face, blended, online, distance **(Blended Modes).** The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

L.2.6. ASSESSMENT CRITERIA

For modules assessed with Continuous Assessment (CA) and Examination, o a minimum CA mark of **40%** is required to gain entrance into the relevant module examination,

- ★ the final mark for each module shall be calculated using a ratio of **CA mark: Exam Mark of 50%: 50%** unless stated in module descriptor and,
- ★ to pass such a module, a minimum final mark of **50%** shall be required.
- ★ Notwithstanding the result of the mark above, a subminimum of at least 40% shall apply to the Exam Mark.
- ★ To qualify for a Supplementary Exam a final mark of **45—49%** is required, subject to a subminimum of 40% in the Exam.
- ★ **For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass.**

L.2.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

L.2.7.1. NORMAL ENROLLMENT: To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 64 credits (of which 24 must be non-core) by the end of the first year of registration.
- ★ 144 credits (of which 42 must be non-core) by the end of the second year of registration.
- ★ 240 credits by the end of the third year of registration
- ★ 320 credits by the end of the fourth year of registration
- ★ 396 credits by the end of the fifth year of registration

The programme must be completed after a maximum of 5 years of registration.

L.2.7.2. EXTENDED ENROLLMENT

The following re-admission regulations will apply to students enrolled for the Extended programme:

To be re-admitted to the School of Science, a student must have successfully completed the following minimum number of credits as indicated below:

- ★ 32 credits (of which 12 must be non-core) by the end of the first year of registration.
- ★ 102 credits (of which 36 must be non-core) by the end of the second year of registration.
- ★ 192 credits by the end of the third year of registration
- ★ 260 credits by the end of the fourth year of registration
- ★ 326 credits by the end of the fifth year of registration
- ★ 396 credits by the end of the sixth year of registration

The programme must be completed after a maximum of 6 years of registration.

Further to the above all First-Year modules must be passed before one can register for any Third-Year module.

L.2.8. ADVANCEMENT AND PROGRESSION RULES

L.2.8.1. NORMAL ENROLLMENT

A student advances to the subsequent academic year of study when the following conditions have been met:

- ★ Year 1 to Year 2: At least **84** credits
- ★ Year 2 to Year 3: All first-year **credits (144) +** in addition to at least 88 second year credits =232 credits

A student who fulfilled the **re-admission regulations** but could not advance to the next academic year must first register for all failed modules. **Subject to pre-requisites**, such a student may then add modules of the subsequent academic year, provided that the total number of registered credits does not exceed the prescribed number of credits of the current academic year by more than **20%**.

L.2.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **376 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

L.2.10. ARTICULATION OPTIONS

This qualification may serve as an entry point to an honour's degree in Bachelor of Science in Information Technology, Bachelor of Science in Computer Science, Bachelor of Science in Data Science or related postgraduate degrees.

L.2.11. QUALIFICATION: BACHELOR OF SCIENCE IN COMPUTING – 3 YEARS - 33BCMP

YEAR 1

CODE	COURSE NAME	NQF Level	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 1 Core Semester 1					
U3403FS	Skills portfolio	4	NCB		**C**
U3583AL	Academic literacy I	5	8		**C**
U35B3DD	Digital literacy	5	8		**C**
S3520DC	Computational problem solving	5	4		**C**
U3420CN	National & Global Citizenship	4	2		**C**
U3520LP	Leadership Skills	5	2		**C**
Year 1 Semester 1					
S3511MC	Calculus I	5	12		**C**
S3531DP	Programming Fundamentals I	5	14		**C**
S3511SF	Fundamentals of Statistics	5	12		**C**
S3531DC	Computing 1 A	5	14		**C**
Year 1 Semester 2					
S3512MC	Calculus II	5	14	S3511MC	**C**
S3532DI	Introduction to Digital Electronics	5	14		**C**
S3532DP	Programming Fundamentals II	5	14	S3531DP	**C**
S3532DC	Computing 1B	5	14	(S3531DC)	**C**
Total credits			**132**		

YEAR 2

CODE	COURSE NAME	NQF Level	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 2 Core Semester 1					
U3683AL	Academic Literacy II	6	8		**C**
U3420PJ	Project Management	4	2		**C**
U3520TH	Critical thinking	5	2		**C**
U3420RT	Entrepreneurship	4	2		**C**
S3420CE	Computer Ethics	4	2		**C**
S3620CT	Computational Thinking	6	8		**C**
Year 2 Semester 1					
S3631DI	Introduction to Database Systems	6	16		**C**
S3631DO	Object-Oriented Programming I	6	16	(S3532DP)	**C**
S3621DA	Computer Organisation and Architecture	6	8	(S3532DI)	**C**
S3631DM	Discreet Mathematics	6	16		**C**
Year 2 Semester 2					
S3632DD	Advanced Databases	6	16	S3631DI	**C**
S3632DO	Object Oriented Programming II	6	16	S3631DO	**C**
S3632DN	Computer Networks	6	16		**C**
S3602ZP	CWEI Prep	6	8		**C**
Total credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF Level	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Year 3 Core Semester 1					
S3700ZP	CWIE	7	24	S3602ZP	**C**
Year 3 Semester 1					
S3731DS	Software Engineering	7	18		**C**
S3731DD	Data Structures and Algorithms	7	18	(S3632DO)	**C**
S3731DC	Computer Theory	7	18		**C**
Year 3 Semester 2					
S3732DW	Web and Mobile Programming	7	18	(S3632DO)	**C**
S3722DO	Operating Systems	7	9		**C**
S3722DH	Human Computer Interaction	7	9		
S3732DC	Cybersecurity	7	18	(S3632DN)	
Total credits			**132**		

M.1.1. MODULE EQUIVALENTS

For the students of the old programme that need to repeat the following equivalents are to be used.

Old module	Level I	Credits	New module	Level I	Credits
CIT3521: Fundamentals of Information Technology I	5	16	*To be offered again*		16
CIT3512: Fundamentals of Information Technology II	5	16	*To be offered again*		16
STS3522: Introduction to Statistics	5	16	**S3511SF:** Fundamentals of Statistics	5	16
CIT3631 Discreet Mathematics	6	16	*To be offered again*		8
CMP3651 Mathematics for Computer Science	6	16	*To be offered again*		16
CIT3731 Information Security	7	16	**S3732DC:** Cybersecurity	7	16
COS3731: Emerging Technologies	7	16	*To be offered again*		16
CIT3732 Platform Technologies	7	16	*To be offered again*		16
CMP3712 Internet Technologies & Applications	7	16	*To be offered again*		16
CIT3771 Systems Administration & Maintenance	7	16	*To be offered again*		16
CIT3632 Telecommunications	6	16	*To be offered again*		16
CMP3772: Web design and programming	7	16	**S3732DW:** Web and Mobile Programming	7	16
CMP3752: Research Methodology	7	16	*To be offered again*	7	16

If there is no equivalent module, offer the module again for a maximum of two times and thereafter, move over to the new programme.

M.1.2. MODULE EQUIVALENTS DURING THE PHASING IN/OUT PERIOD

For the students of the old programme that need to repeat the following equivalents are to be used:

TABLE OF EQUIVALENTS DURING THE PHASING IN/OUT PERIOD					
OLD MODULE	**Level**	**Credits**	**New Module(s)**	**Level**	**Credits**
MAT3511: Basic Mathematics	5	16	**Discontinued in the new programme**		
MAT3512: Precalculus	5	16	**Discontinued in the new programme**		
MAT3521: Matrices and Complex Numbers	5	8	**Discontinued in the new programme**		
MAT3501: Analytic Geometry	5	8	**Discontinued in the new programme**		
MAT3611: Calculus I	6	16	**Discontinued in the new programme**		
MAT3641: Numerical Methods with MATLAB			**Discontinued in the new programme**		
MAT3661: Sets and Logic	6	8	**Discontinued in the new programme**		
MAT3612: Calculus II	6	16	**Discontinued in the new programme**		
MAT3642: Ordinary D.E.s	6	8	**Discontinued in the new programme**		
MAT3652: Elementary Linear Algebra	6	16	**Discontinued in the new programme**		
MAT3731: Real Analysis I	7	16	**Discontinued in the new programme**		
MAT3701: Numerical Analysis I	7	8	**Discontinued in the new programme**		
MAT3781: Elements of Set Theory	7	8	**Discontinued in the new programme**		
MAT3711: Linear Algebra I	7	16	**Discontinued in the new programme**		
MAT3732: Real Analysis II	7	16	**Mathematical Analysis II**	**7**	**16**
MAT3722: Number Theory	7	8	**Number Theory**	**7**	**8**
MAT3752: Partial Differential Equations	7	16	**Partial Differential Equations**	**7**	**16**
MAT3712: Linear Algebra II	7	16	**Discontinued in the new programme**	**7**	**16**

Discontinued in the new programme. To be offered again for the current BSc Mathematics programme

M.1.3. MODULE EQUIVALENTS

H.12.10.5. STATISTICS MODULE EQUIVALENT

Old Module			New/Revised Module		
Old Code	**Name**	**Level**	**New Code**	**Name**	**Level**
STS3531	Descriptive Statistics	5	**S3511SF**	Fundamentals of Statistics *(Merger of old Descriptive Statistics & Introduction to Probability)*	5
STS3532	Introduction to Probability	5	**S3511SF**	Fundamentals of Statistics *(Merger of old Descriptive Statistics & Introduction to Probability)*	5
STS3671	Statistical Methods	6	***No change, to be offered again***		
STS3652	Fundamentals of Statistical Computing	6	***No change, to be offered again***		
STS3611	Probability Theory	6	**S3611SP**	Probability Theory	6
STS3672	Distributions Theory	6	**S3612SD**	Distributions Theory	6
STS3731	Sampling Techniques	7	***No change, to be offered again***		
STS3752	Experimental Design & Analysis of Variance	7	***No change, to be offered again***		
STS3741	Nonparametric & Categorical Statistics	7	***No change, to be offered again***		
STS3771	Statistical Inference	7	**S3711SI**	Statistical Inference	7
STS3732	Data Processing	7	**S3712SA**	Data Processing	7
STS3772	Linear Models	7	**S3711SR**	Regression Models	7
STS3871	Survival Analysis	8	*No change, to be offered again*		
STS3831	Stochastic Processes	8	*No change, to be offered again*		
STS3832	Statistical Quality Control	8	*No change, to be offered again*		

M1.4. POPULATION MODULE EQUIVALENT

Old Module(s)	NQF	Credits	New Module (s)	Level	Credit
POP3512: Fundamentals of Population Theory	**5**	**16**	**S3512UF:** Fundamentals of Population Theory	**5**	**12**
STS3542: Introduction to Probability	**5**	**8**	**S3511SF:** Fundamentals of Statistics[4]	**5**	**12**
STS3552: Fundamentals of Statistical Computing	**5**	**16**	**S3512SC:** Fundamentals of Statistical Computing	**5**	**14**
POP3611: Introduction to Demography	**6**	**16**	**S3611UI:** Introduction to Demographic Analysis	**6**	**14**
STS3611: Probability Theory	**6**	**16**	*No equivalent – to be offered again*		
POP3631: Official Statistics and National Statistical Systems	**6**	**16**	*No equivalent – to be offered again*		
POP 3612: Epidemiological Methods	**6**	**16**	**S3612UE:** Epidemiology & Biostatistics	**6**	**14**
POP:3632: Fundamentals of Population and Development	**6**	**16**	**S3612UP:** Fundamentals of Population & Development	**~~6~~**	**14**
STS3671: Statistical Methods	**6**	**16**	*No equivalent – to be offered again*		
STS3741: Non-Parametric & Categorical Statistics	**7**	**8**	*No equivalent – to be offered again*		
STS370: Research and Survey Methods			*No equivalent – to be offered again*		
STS3731: Sampling Techniques	**7**	**16**	*No equivalent – to be offered again*		
STS3772: Linear Models	**7**	**16**	**S3711SR:** Regression Models	**7**	**16**
POP3731: Fundamentals of Data Processing	**7**	**16**	**S3712SA:** Data Processing	**7**	**18**
POP3711: Demographic Methods I	**7**	**16**	**S3711UD:** Demographic Methods and Analysis I	**7**	**16**
POP3712: Demographic Methods II	**7**	**16**	**S3712UD:** Demographic Methods and Analysis II	**7**	**18**

Modules from older curricula with no equivalents will be offered again until either phased out, or for a maximum of 2 times only. The Department reserves the right to offer these in whatever mode logistics allow (blended or online).

[4] *STS3541-Descriptive Statistics and STS3542-Introduction to Probability have both been merged into a new course called STS3551-Fundamentals of Statistics.*

M.1.5. MODULE DESCRIPTOR POPULATION STUDIES AND STATISTICS

S3512UF:	Fundamentals of Population Theory
NQF Level	5
Contact Hours	4 lecture periods per week for one semester; 1 tutorial session per week for one semester 12
NQF Credits	12
Course Assessment:	50% of the final mark; consisting of a combination (or subset) of tests and quizzes and assignments.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Concepts of population theories:** The importance of population studies, Components of population studies, population structure and the Demographic Transition Theory, Use of population pyramids and rates and ratios in understanding population structure. **Pioneers in the discussion of population issues**: Classification of theories, the genesis of population studies from the mercantilist theories through the Malthusian, Neo-Malthusian theories and Marxist viewpoints, and present-day perspectives (Theories of Population Change), Common population theories that have come into being and part played by such theories in current world affairs. **Development of Demography as a field of study:** Definitions of terminologies used in Demography, Pre-modern doctrines, History of population growth culminating in mid-20th century terminologies like population being a time-bomb; **Theories of the Demographic processes:** Fertility theories; Wealth flows theory, Human ecological theory, Political economic theory and the Fertility Transition, Migration theories, Fertility transition and Mortality transition.

S3511UO:	Official Statistics
NQF Level	5
Contact Hours	4 lecture periods per week for one semester; 1 tutorial session per week for one semester.
NQF Credits	12
Course Assessment:	**50%** of the final mark; Test(s) and quiz(es) – at least a minimum of 3 hours in total o Assignments – at least a minimum of 3 notional hours in total; Tutorial tests – at least 10 notional hours in total o A continuous assessment mark of 40% is required to gain exam admission.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Purpose and scope of official statistics:** Definition, uses and aims of official statistics, categories of Official Statistics, principle of official statistics, code of ethics and code of practice of Official Statistics Producers. **The National Statistical System:** Structure and work of the national statistical system, its organization. Components of the national statistical system and their roles; characteristics of an effective national statistical system, the legal framework, **assessment of the national statistical system: The role of statistics**: In evidence-based policy-making and in national development policies and frameworks. **Typology of data**: Types of data and their sources, methods and practices of data collection and dissemination. **Social Statistics:** Educational Statistics; Define educational levels, purpose, principles and procedures with respect to education statistical data collection, data requirement for educational development purposes, rate and ratios required for analysis of statistics on teacher and pupils: **Social Statistics:** Definition and scope of health related statistical issues; understand statistics on medical facilities and uses of hospital records, comprehend basic ideas of epidemiological issues and indicators of health, understand and define scope of housing statistics; understand the importance of statistics related to: definition of a dwelling unit, housing condition, housing needs requirements, understand labour and employment statistics: **Others Social Statistics:** Defined and calculated; labour force, economically active and inactive population, employment rates etc. The importance of statistics on wages, labour income, social security, underemployment etc. The importance of: Trade statistics, Migration statistics, Civil registration statistics, Economic statistics (Concept and measure of poverty, Poverty line- Economic growth versus population growth). **System of national accounts (SNA)**: Introduction to National Accounts, GDP statistics by activity, GDP by expenditure, National Income and the balance of payment, measuring GDP, the importance of compiling national accounts, the uses of national accounts in socio-economic planning.

S3511SF:	Fundamentals of Statistics
NQF Level	5
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
NQF Credits	12
Course Assessment:	**50%** of the final mark; Test(s) and quiz(es) – at least a minimum of 3 hours in total o Assignments – at least a minimum of 3 notional hours in total; Tutorial tests – at least 10 notional hours in total o A continuous assessment mark of 40% is required to gain exam admission.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Data types:** categorical, continuous, numerical; **Measurement scales:** Nominal, ordinal, interval, ratio; **Data sources:** primary, secondary; **Descriptive Statistics:** graphical (histogram, bar charts, pie charts, frequency polygons, stem-and-leaf plots, box and whiskers plot) and numerical (frequency tables, cross-tabulations) summaries; Identifying outliers; **Measures of central tendency**; **Measures of dispersion**; **Measure of position**; **Basic Set Theory**, **Basic probability concepts:** Random variables; **Probability distributions:** Bernoulli, Binomial, Exponential, Poisson, Normal, Standard Normal.

S3512SC:	Fundamentals of Statistical Computing
NQF Level	5
Contact Hours	4 lectures plus 3 practical's hours per week/ semester
NQF Credits	12
Course Assessment:	at least two test and two assignments) 50%; Examination 50% (project using real data assessed through presentation and written report).
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Introduction to Statistical packages:** SPSS, R, Excel for analysis; **Data acquisition and management**: Transferring information from paper form to electronic Form; **Create datasets:** variable definition, variable labels, data entry, data cleaning, selecting cases, split files. **Import/copying files:** tables from excel, SPSS to word; **Data Analysis:** Descriptive Statistics; **Graphical representation-editing,** cross tabulation, estimation and hypothesis testing using a Statistical package. **Introduction to R basic loops and basic functions.**

S3601UD:	Demographic Data
NQF Level	6
Contact Hours	2 lecture periods per week for one semester. 2 tutorial sessions per week for one semester
NQF Credits	8
Course Assessment:	**50%** of the final mark consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Censuses and vital registration**: Censuses; Vital Registration Systems; Sample registration systems; Population registers; Confidentiality and abuse of population data; **Single-round surveys**: What is a survey; Data collection in surveys; Design and conduct of surveys; Relationship between survey and qualitative research; Major global surveys; **Sources of Longitudinal Data**: What are longitudinal studies; Demographic applications for longitudinal data; Demographic sources of longitudinal data; Stages in the collection of longitudinal data; Longitudinal studies in other disciplines; Longitudinal studies data collection; Types of longitudinal studies; Demographic surveillance systems; acknowledge. **Design and conduct of surveys**: The demographic survey process: Planning to dissemination (*Design and Planning, Pre-fieldwork, Fieldwork, Data management and processing, Data analysis, reporting and disseminating results*); **Conducting quantitative demographic inquiries:** Sampling error and selection bias; Selecting sample; Basic and complex sampling techniques; Demographic and Health Surveys: Introduction to Demographic and Health surveys; Sampling used in DHS and other national surveys; Uses and Limitations of DHS data and other national surveys; **Internal evaluation of demographic data**: Errors in demographic data (*Random, systematic, post data collection errors*); Correcting for errors in demographic data (*Diagnostics*).

S3512ST:	Statistical Methods
NQF Level	5
Contact Hours	4 lectures periods per week for one semester; 1tutorial sessions per week for one semester
NQF Credits	**12**
Course Assessment:	**CA (50%)** and formal exam (50%). The CA will be compiled in a **70:30 ratio** from three written class tests and fortnightly tutorial tests.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Sampling and sampling distributions:** sample mean, proportion, difference between means and difference between proportions. **Sampling distributions related:** to the Normal distribution, the Central Limit Theorem; **Estimation of parameters:** Point estimation; **confidence intervals and hypothesis testing:** for means, proportions, variances, difference in means and proportions. **Chi-square test for:** goodness of fit & independence. **Construction and use of Index numbers:** unweighted (simple aggregate index, average of price relative) and weighted index numbers (Laspeyres, Paasche and Fischer's ideal index, CPI).

S3612SD:	Distributions Theory
NQF Level	**6**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**14**
Course Assessment:	**CA 50%** of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total o Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Sum of independent random variables**, **further probability distribution functions** (Bivariate Normal, Chi-square, Gamma, Beta, F and t distributions); **Moment-generating functions and Moments**: Bivariate Normal, Chi-square, Gamma, Beta, F and t distributions; **Functions of random variables** (Sum, difference, product and quotient); **Methods of Distribution functions** (distribution of minimum and maximum, sum and differences, products and quotients); **Method of Transformations** (probability integral transform, transformation of discrete random variables, transformation of continuous random variables); **Method of Moment-generating functions** and related generating functions (characteristic functions, factorial moment generating functions of random variables); **Multivariable Transformations Using Jacobians**; **Order Statistics**.

S3611UD:	Introduction to Demographic Analysis
NQF Level	**6**
Contact Hours	4 lecture periods per week for one semester
NQF Credits	**16**
Course Assessment:	**50%** of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Demography on the world stage:** What is demography; Births, deaths and migration; The world today; Diversity in trends; High fertility and population growth; Low fertility and population ageing; The demographic transition: The demographic transition in high income and low income countries; **How to measure demographic events:** The basic demographic tools; Age-sex structures and population pyramids; Growth rate; Proportions; Ratios; Rates; Incidence vs. prevalence; Period and cohort data; Lexis diagrams; **How demographers think about populations age and sex:** Age-sex structures; Age structures and demographic events; Namibia Population history (trends); Variation in age structures; The age structural transition; Sex ratios; **Measuring fertility:** Some measures of fertility; Crude Birth Rate; Child Woman Ratio; General Fertility Rate; Age-specific Fertility Rates; The Total Fertility Rate; Parity Progression Ratios; **Proximate determinants of fertility:** Concept of proximate determinants; Bongaarts' aggregate model of the proximate determinants of fertility; Limitations and Measurement Problems; Stover's revised model; **Mortality statistics and standardization:** Uses of mortality statistics; Basic measures of mortality; Standardization: *direct & indirect*; **Life Tables:** Introducing the life table; How are life tables derived; Life tables from a set of rates; Life tables beyond the l_x column; The expectation of life; Healthy life expectancy; **Migration and population distribution:** Concepts and definitions; How is migration derived; Estimating migration from a set of rates; Age patterns of migration;

S3612UE:	Epidemiology & Biostatistics
NQF Level	**6**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial per week for one semester
NQF Credits	**16**
Course Assessment:	**50%** of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination:	**50%** (1 x 3-hour examination paper)

Course description: The basic concepts of epidemiology and biostatistics as applied to public health problems. The principles and methods of epidemiologic investigation, appropriate summaries and displays of data, and the use of classical statistical approaches to describe the health of populations. Use EpiData to enter and manage data. Critically evaluate evidence for causation, reliability and validity; Behaviour of disease; usage of rates, ratios and proportions; methods of direct and indirect adjustment, and clinical life table which measures and describes the extent of disease problems. Epidemiologic study designs for investigating associations between risk factors and disease outcomes, culminating with criteria for causal inferences; The application of these disciplines in the areas of health services, screening, genetics, and environment policy are presented.

S3612UP:	Fundamentals of Population & Development
NQF Level	**6**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial per week for one semester
NQF Credits	**14**
Course Assessment:	**50%** of the final mark) consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Development: Definition, Dimensions of development, Measures of development (Human Development Index), Development Indicators, Sustainable development Goals (SDGs), **Population and development:** Global variation in population size and growth, examination of the relations between population and development and their potential consequences from sociological, economic and geographical perspective, **Economic and demographic interaction** – effects of socio-economic change on demographic variables (fertility, mortality, marriage, migration), various demographic perspectives and their modern implication, effects of socio-economic variables (supply of goods and services, demand for goods and services, income distribution); **Conceptual Framework for Development Planning:** definition, process, institutional framework, principle variables and challenges **Gender and development:** Definitions, Gender Inequality Index, Equality vs equity, gender based disparities and its implication to development, Gender based violence, Affirmative action (women empowerment) and development. **Economic Development, Population and Environment (**Climate Change): Change in climatic system, climate change and developmental challenges, causes (sectors) of pollution, impact of pollution on human and environment, responding to climate change, environmental impact and population policy. **Gender and development**; Definition, social change and development, benefits and challenges.

S3612SE:	Experimental Design & Analysis of Variance
NQF Level	**6**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**14**
Course Assessment:	**CA 50%** of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total o Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**S3511SF, S3512ST**

Course description: Experimental designs: Factorial designs, Latin squares design, Graeco-Latin squares design; **Analysis of Variance:** One-way ANOVA, Two-way ANOVA; **Multiple comparisons:** Multiple comparison methods; **Incomplete designs and missing values:** Analysis involving incomplete tables missing observations.

S3612SE:	CWIE
NQF Level	**7**
Contact Hours	As determined by the specific activity.
NQF Credits	**24**
Course Assessment:	The endorsed CWIE portfolio shall be evaluated according to a rubric & they shall be noted as completed or not.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Engage in Cooperative Work Integrated Education through any of the following (or combination) of the following activities: Internship at an outside organisation/institution/business/research institution; Industrial attachment in an industry; Engage in a community project/engagement; Engage in community outreach; Engage in a simulation of an activity; Execute a project; Engage in product development; Engage in a service of some kind, Etc.

S3711SI:	Statistical Inference
NQF Level	**6**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**18**
Course Assessment:	CA 50% of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Properties of estimators: unbiased, minimum variance estimators, mean square error, and some common unbiased point estimator; **efficiency:** relative efficiency, full efficiency and Cramer- Rao lower bound, sufficiency and the Rao-Blackwell theorem; **large sample properties:** consistency; **Method of estimation:** the method of moments, the method of least squares, the method of maximum likelihood, **Bayesian estimation**; **robust estimation**, bootstrap. **The Neyman-Pearson Lemma; Likelihood Ratio Tests**.

S3611SS:	Survey Sampling
NQF Level	**7**
Contact Hours	4 lectures periods per week for one semester. 1 tutorial session per week for one semester.
NQF Credits	**14**
Course Assessment:	**CA 50%** of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**S3512ST**

Course description: **Data collection methods:** probability and non-probability methods. **Response and non-response errors**. **Estimations**: population mean, population total, population proportion and population variance in simple random sampling, stratified random sampling, systematic sampling, and two-stage cluster sampling. **Calculation of confidence intervals for**: population mean, total, proportion and variance for simple random sampling, stratified random sampling, systematic sampling, and two-stage cluster sampling. **Sample size allocation in:** simple random sampling (with and without replacement), stratified random sampling, systematic sampling, cluster sampling and two-stage. **Non-probability sampling methods:** quota sampling, judgmental sampling, and snowball sampling. **Calculation of Sampling and Non-sampling errors. Use of weighting in survey sampling**.

S3711SV:	Survival Analysis
NQF Level	**7**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**16**
Course Assessment:	**CA 50%** of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**S3611SP, S3612SD**

Course description: **Concepts in Survival Analysis**; **Nature of survival data:** common assumptions, censoring and truncation, Calendar time and study time; **Functions that describe survival:** some commonly used survival functions, fully parametric and nonparametric methods; **Introduction to standard statistical software for analysing time-to-event data; Survival curves:** Lifetables, Kaplan-Meier curves; **Comparison of survival curves:** Log-rank test-Use and assumptions; **Design issues in time-to-event data:** Designing time to event studies, Choice of end-point, Sample size calculation; **Parametric survival modelling; Types of models:** Exponential, Weibull, Lognormal and log-logistic models; **Testing parameters:** likelihood ratio test, Wald test and Akaike Information criteria; **Regression models; Cox's Proportional hazard models, Hazard ratios, risk and survival times, Hypothesis test and confidence intervals**, **Binary and Continuous predictors**, **Interaction/confounding/Mediation**, **Adjusting survival curves for comparison.**

S3711UD:	Demographic Methods & Analysis I
NQF Level	**7**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for one semester.
NQF Credits	**16**
Course Assessment:	**CA** 50% of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Demographic models: model life tables:** Why are model mortality patterns needed; Methods of construction of model patterns of mortality; A prelude to the model methodologies; Empirical approaches to representing mortality; Model Tables: the Coale-Demeny set; Model Tables: the New UN set; Model Tables: In-Depth tables; Relational model life tables; Fitting the relational model; **Mathematical approaches to representing mortality**: *Gompertz' Law*, *The force of mortality*, *Makeham's Law, Heligman and Pollard's function*; **Fertility:** Fertility levels and patterns; Parametric models of fertility; Hybrid models of fertility; Brass's relational Gompertz model of fertility; **Advanced fertility analysis:** GRR and NRR; Effect of fertility and mortality schedules on NRR; Population Growth based on NRR; Measures of generation length; Male and female measures of reproductivity; **Demographic models - stable population models:** Stable populations based on a life table and assumed growth rate; Lotka's stable population equations; Calculating r using an iterative method; Method of Moments; Approximate estimates of stable population growth rate based on generation length; Effects of mortality and fertility patterns on growth and age structure in stable populations; **Population dynamics and momentum:** Replacement level fertility; Population momentum as a general concept; Population dynamics and momentum in a growing population; The time-scale of momentum effects; The size of momentum effects; Achieving and maintaining zero population growth.

S3712SO:	Stochastic Processes
NQF Level	**7**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**16**
Course Assessment:	**CA** 50% of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**S3611SP, S3612SD**

Course description: **Conditional probability and conditional expectations; Elements of Stochastic Processes:** Definition, Stationarity, finite –dimensional distributions, versions and modification; **Markov Chains in discrete time and in continuous time:** The basic limit theorem of Markov chains and applications, Classification of states, Limiting probabilities, Branching processes and Extinctions; **The Poisson Processes:** Counting process, Compounding stochastic processes, Queuing processes; **Gaussian distribution:** for variables, vectors and processes; **Brownian motion:** Definition, Gaussian construction, independence of increments Geometric Brownian motion, Brownian Bridge and Ornstein-Uhlenbeck process

S3712SQ:	Statistical Quality Control
NQF Level	**7**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
NQF Credits	**16**
Course Assessment:	**CA** 50% of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**S3611SP, S3612SD**

Course description: **Quality improvement in modern business:** dimensions of quality, quality philosophy and management strategies; **total quality, quality standards and registrations, six sigma**; **statistical methods used in quality improvements:** describing variation, important distribution of note, inference about process quality; **methods and philosophy of statistical process control:** chance and assignable cause of quality variation, **statistical basis of control charts:** sample size and sampling, rational subgroups, analysis and patterns on control charts, rules for control charts; **control charts for variables:** simple control charts for variables, charts for individual measurements, operating characteristic functions, application; **control charts for attributes:** properties of charts, charts for fraction nonconforming, charts for nonconformities (defects), choice between attributes and variable control charts; **process and measurement system capability analysis:** process capability ratios, process capability using a control chart, gage and measurement system capability studies, setting specification limits, estimating natural tolerance limits of a process; **cumulative sum and exponentially weighted moving average control charts:** principle of CUSUM charts, EWMA charts.

S3712UM:	Population Migration & Urbanization
NQF Level	**7**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
NQF Credits	**16**
Course Assessment:	**50%** of the final mark consisting of a combination (or subset) of tests and quizzes, assignments, and practical reports (at least 5 gradable items).
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	

Course description: **Definition, terminologies concepts in migration studies:** Internal migration (types of internal migration, effect of internal migration), international migration (dimensions of international migration, Effects of international migration, Theories of international Migration), demographic and socio-economic characteristics of migrants, Causes of migration, Contribution of migration to population change.); Life-time migration, Migration streams and counter streams, Return migration, **Sources of migration data**: Sources of migration statistics and quality of migration statistics; **Evaluation and estimation of international migration:** Intercensal component method; Intercensal cohort – component method; Net migration, gross migration (migration turnover) and migration ratios; Migration rates: crude immigration rate, Crude emigration rate, Crude net migration rate, Crude gross migration rate, Graphic techniques of analysis (population turnover), Longitudinal migration; Bases of migration rates, Measurement of mobility; National growth rate method, Residual methods; vital statistics method; Residual method: survival rate method, Place of birth vs place of enumeration statistics, Residence at a fixed past date; Migration selectivity: by sex, by age, by educational level etc. **Migration models:** Ravenstein's Laws of Migration, Zelinsky's Model of Mobility Transition, Clark's Model of Migration, Lee's Intervening Obstacles Model, Decision Ravenstein'spush and pull theory; Lee's Intervening Obstacles theory; Stouffer's Law Of Intervening Opportunities. **Internal migration (Namibian context)**; Urbanization – Trend: levels and patterns, Modernization theory and urbanization, Linkages between migration and urbanization, Manifestation of urbanization and challenges faced by urban centres due to rapid urbanization, Causes, effects and possible solutions of urbanization.

S3712UD:	Demographic Methods & Analysis II
NQF Level	**7**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for one semester.
NQF Credits	**16**
Course Assessment:	**CA** 50% of the final mark) consisting of a combination of the following written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total. Assignments – at least a minimum of 3 notional hours in total Tutorial tests – at least 10 notional hours in total
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	

Course description: **Causes of Death**: Sources of data on deaths; Death registration; Death certification; Cause of death; International Classification of Disease (ICD); Verbal autopsy; Maternal mortality; The Sisterhood method; **Life tables from survival data**: Where data comes from; The form of the data; What to do with the data; Data checks - cleaning the data; Period life tables from longitudinal data; **Multiple decrement and current status life tables**: Notation; The conversion formula; MDLT construction steps; Competing risks; Cause-deleted life tables; Notation & key assumptions; Multiple decrement versus associated single decrement probabilities; A stationary population with multiple decrements; Current status life tables; **Measuring impairment and disability**: What is disability; Sources of data; Measurement tools& Impact; Healthy life expectancy; **Measuring fertility preferences, unintended pregnancy and access to family planning:** Conceptualising fertility decision-making and behaviours; Fertility preferences and intentions; Ideal and desired family size; Sex preferences for children; Male's and matched fertility preferences; Validity and predictive value of reproductive preferences; Measuring unintended pregnancy; Access to family planning; **Measuring sexual behaviour and partnerships in the context of HIV/AIDS:** Typical variations in sexual behaviour; Variation around the world and differences between men and women; Data sources and availability; Key measures: data and methods; Population and individual level measures of sexual behaviour; Problems with data on sexual behaviour; **Quantum and tempo in demographic estimation:** The period TFR and its flaws; Whelpton's age-order specific fertility rates; Tempo distortions in the period TFR; Ryder's translation; The Bongaarts Feeney tempo-adjusted TFR (TFR*); The debate about tempo effects and their adjustments; Recent trends in the tempo-adjusted TFR*; Tempo distortions in period mortality measures; **Parity progression and birth intervals:** Review of cohort PPRs; Parity cohort PPRs; Measures of interval duration; Period parity progression ratios; Projected PPRs.

S3712SA:	Data Processing
NQF Level	**7**
Contact Hours	4 lectures plus 3-hour practical per week/ semester
NQF Credits	**18**
Course Assessment:	**CA 50%** of the final mark, at least two test and two assignments
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	

Course description: **Applications of inferences concerning means and proportions to data; Parametric tests:** t-test, ChiSquare Goodness of Fit and Independence tests, ANOVA tests and Post- hoc tests; **Testing for Assumptions:** Kolmogorov- Smirnov test for Normality, Levene's tests for Equality and Homogeneity of Variance; **Nonparametric tests**: Binomial test, Sign Test, Wilcoxon Signed-Ranks test, Mann- Whitney Test, Kruskal – Wallis test, Friedman's test, Spearman Rank Correlation test; **Application of Linear Regression (modelling) to Data**; **Mini project.**

M.1.6. MODULE DESCRIPTOR FOR QUANTITATIVE FINANCE, DATA SCIENCE AND COMPUTING

G3511EA:	BASIC MICROECONOMICS
NQF Level	5
Contact Hours	4 hours per week for semester
NQF Credits	12
Course Assessment:	50% of the final mark consists of two tests and one assignment.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Introduction – What is economics**: Definitions of economics – Microeconomics and Macroeconomics. **The economic problem**: Production Possibilities Curve; Using resources efficiently; Economic growth; Gains from trade; Economic coordination; How **markets work**: Market and prices; Demand; Supply; Market equilibrium; Predicting changes in price and quantities; Forward Markets. **Elasticity**: Price elasticity of demand; More elasticities of demand; Elasticity of supply. **Markets in action**: Efficiency; Demand and marginal benefit; Supply and marginal benefit; Is the competitive market efficient? Housing markets and rent ceiling; The labour market and the minimum wage; Taxes; Subsidies and quotas; Markets for illegal goods. **Households' choices – Introduction**: Utility and demand; Possibilities, preferences and choices. **Firms and markets**: Organising production; Output costs; Perfect competition; Monopoly; Monopolistic competition; Mark-up pricing. **Market Failure and Government intervention**: Externalities; Public goods and common resources. **Factor market, inequality and uncertainty**: Markets for factors of production; Economic inequality.

G3512EB:	BASIC MACROECONOMICS
NQF Level	5
Contact Hours	4 hours per week for semester
NQF Credits	12
Course Assessment:	Consists of two tests and one assignment
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Measuring Gross Domestic Product:** Gross Domestic Product defined; Measuring Namibian's GDP; Calculating Real GDP; Uses and Limitations of Real GDP. **Economic growth**: Basics of Economic Growth; Calculating Growth rates; Potential GDP; Labor Productivity Growth; Growth Theories, Evidence and Policies. **Monitoring Jobs and Inflation:** Employment and unemployment; Unemployment and Full Employment; The Price level, inflation and deflation; The Consumer Price Index; Measuring the Inflation rate; Real variables in Macroeconomics. **Finance, Saving and Investment:** Financial Institutions and Financial Markets; Loanable Funds Market; Government in the loanable funds Market; Global loanable funds Market. **Money, the Price Level, and Inflation:** What is Money? Depository Institutions; The Namibian Central Bank; How Banks Create Money; The Demand for and Supply of Money; The Money market; The Quantity Theory of Money. **The Exchange Rate and the Balance of Payments:** The Foreign Exchange Market; Currencies and Exchange Rates; Changes in Demand and Supply: Exchange Rate Fluctuations; Financing International Trade; Exchange Rate Policy. **Expenditure Multipliers: The Keynesian Model:** Fixed Prices and Planned Expenditure; Real GDP with a Fixed Price Level; The Multiplier; The Multiplier and the Price Level; The Algebra of the Keynesian Model. **Aggregate Supply and Aggregate Demand**: Aggregate Supply; Aggregate Demand; Explaining Macroeconomic Trends and Fluctuations; Macroeconomic Schools of Thought. **Inflation, Unemployment and the Business Cycle**: Inflation Cycles; Inflation and Unemployment: The Phillips Curve; The short-run and Long run Phillips Curve; The Natural Rate of Unemployment; The Business Cycle. **Fiscal Policy**: The National Budget; Supply Side effects of Fiscal Policy; Fiscal Stimulus. **Monetary Policy**: Monetary Policy Objectives and Framework; Framework for Monetary Policy in Namibia; Executing Monetary Policy; Monetary Policy Transmission; Alternative Monetary Policy Strategies

C3511FF:	FINANCIAL ACCOUNTING 1A
NQF Level	5
Contact Hours	4 hours lecture & 2 tutorials per week for semester
NQF Credits	12
Course Assessment:	50% of the final mark consists of two tests and one assignment.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: The objective of this module is to provide basic knowledge of accounting information systems and equip the students with capability of processing financial transactions in books of accounts and develop financial statements. -Introduction to the conceptual framework for the preparation and presentation of financial statements. Accounting for current- and non-current assets: cash and cash equivalents, trade and other receivables-credit losses and settlement discounts, inventory, property, plant and equipment and other non-current assets. Accounting for current and non-current liabilities. Introduction to VAT (Value-added Tax), correction of errors, adjustments, Introduction to the preparation and presentation financial statements of a sole trader, financial statements of partnerships. Introduction to manufacturing companies, introduction to non-profit organisations and incomplete records.

C3512FF:	FINANCIAL ACCOUNTING 1B
NQF Level	5
Contact Hours	4 hours lecture & 2 tutorials per week for semester
NQF Credits	12
Course Assessment:	(50%): two tests and one assignment
Examination:	**50%** (1 x 3-hour examination paper)

Course description: The detailed contents are as follows: The presentation of financial statements to conform to the requirements of IAS 1; Establishment of a partnership, financial statements, admission and/or retirement of a partner, dissolution, insolvent partner, piecemeal liquidation. Introduction to close corporations covering – formation, operation, introduction to taxation, deregistration and liquidation, accounting records and financial statements, Introduction to companies – formation, operation, introduction to taxation, share and debenture transactions, accounting records and financial statements, deregistration and liquidation. Introduction to the conversions and combinations of various types of enterprises – partnership into a company, partnership into a close corporation, company into a close corporation and vice versa. Introduction to the minimum disclosure requirements in accordance with IFRS and Companies Act 28 of 2004. Introduction to the preparation and presentation of the statement of cash flows to conform to the requirements of IAS 7. Introduction to the analysis and interpretation of financial statements- covering the various methods and techniques used to analyse financial statements.

S3512MQ:	INTRODUCTION TO QUANTITATIVE FINANCE
NQF Level	5
Contact Hours	4 hours lectures per week for semester +1 tutorials per week
NQF Credits	12
Course Assessment:	50% of the final mark consists of three written class tests; lecturer's discretion, these may be supplemented by a suitable take-home assignment and short online quizzes.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Time value of money**; Interest rate measurement; effective and nominal interest rates; present value; equation of value- real rate of interest. **Valuation of annuities**; level payment annuities; PV and FV of an annuity; differing interest and payment period; continuous annuities; Annuities with non-constant payments; increasing and decreasing annuities; yield rates and reinvestment rates. Loan Repayment; Amortization method of loan payment; non-level interest rate; sinking fund method of repayment. Bond Valuation; determination of bond prices; bond prices between coupon dates; amortization of bond; callable bonds; serial bonds and Makeham's formula. Measuring rate of return on investment; net present value- internal rate of return; profitability index; modified internal rate of return; dollar-weighted and time weighted rate of return.

S3512DM:	FUNDAMENTALS OF MACHINE LEARNING
NQF Level	5
Contact Hours	4 lecture periods + 1 practical session per week for one semester
NQF Credits	14
Course Assessment:	Weight **50%** consist of the following: Tests, Quizzes, Students presentations, Assignment portfolios, Basic Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Introduction to Machine Learning:** Basic Machine Learning; Basic ML Business and Technology Drivers; Machine Learning Benefits and Challenges; **Machine Learning Usage Scenarios:** Datasets; Structured, Unstructured and Semi-Structured Data; **Models:** Basic Model Training and Learning; Collecting and Pre-Processing Training Data; **Algorithms:** Basics of Supervised Learning and Unsupervised Learning; SemiSupervised and Reinforcement Learning; **Machine Learning Best Practices**: How Machine Learning Systems Work; Common Machine Learning Mechanisms.

S3611MF:	FINANCIAL DERIVATIVES ANALYSIS
NQF Level	6
Contact Hours	4 hours lectures per week for semester
NQF Credits	14
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Financial derivatives;** introduction; types of derivatives; purpose of financial derivatives -**Forward and futures markets**; delivery and settlement of contracts; types of forward contracts: Equity forwards, bond and interest rate forwards, currency forwards, short- and long-term interest rate futures contracts, stock index futures contracts; pricing and valuation of above forward and futures contracts. **Option markets and contracts;** basic definitions; structure of global option markets; OTC markets and Exchange listed Option markets; Types of options: Financial options, options on futures, commodity options; **principles of options pricing**- Discrete time option pricing: **Binomial model**; The One-Period Binomial Model; The Two-Period Binomial Model; Binomial Put Option Pricing; Binomial Interest Rate Option Pricing. **Continuous time option pricing**; Assumptions of the Model - The Black-Scholes-Merton Formula; Inputs to the Black-Scholes-Merton Model the Effect of Cash Flows on the Underlying; The Critical Role of Volatility. **Swap markets and contracts;** Characteristics of Swap Contracts; Termination of a Swap; global structure and types of swap markets; pricing and valuation of swaps.

S3611MF:	DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS
NQF Level	6
Contact Hours	4 hours lectures per week for semester
NQF Credits	14
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **First order equations**: initial value problems, separable, exact, homogeneous linear equations: integrating factor. **Second order equations**: linear homogeneous with constant coefficients: distinct, complex and repeated roots of the characteristic equation; nonhomogeneous equations; method of underdetermined coefficients and variation of parameters. **Series solution of second order linear equations**. Bessel's equation. **The Laplace transform**: solution of initial value problems, inverse Laplace transform. System of first order linear equations, homogenous linear system with constant coefficients. **Fourier series**: definition, periodic functions, Dirichlet's conditions, full-range and half-range series, determination of Fourier coefficients, Fourier series of even and odd

functions, Fourier series in arbitrary intervals. **Fourier Transforms;** Integral theorem; Sine and cosine transform. **First order partial differential equations**: basic properties of the linear and quasilinear equations. **Linear second order equations in two independent variables**: classification of linear second order equations into parabolic, hyperbolic and elliptic equations. Separation of variables. Example: the one-dimensional wave equation, the vibrating string, boundary conditions associated with the wave equation.

S3611SP:	PROBABILITY THEORY
NQF Level	**6**
Contact Hours	4 hours lectures per week for semester
NQF Credits	**14**
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **More on Random variables:** Distribution functions and their relationships; Quantiles of a continuous distribution; Chebychev's inequality; Moments of random variables; Expectations and variances of random variables; Cumulative distribution function; Moment generating functions of random variables; **Discrete probability distributions** (Bernoulli, Binomial, Poisson, Geometric, Hyper-geometric, Negative Binomial and Multinomial); Expectations and variances of discrete probability distributions; Continuous probability distributions (Uniform, Exponential and Normal); Expectations and variances of continuous probability distributions; **Approximation of distributions** (Normal to Binomial, Normal to Poisson); **Covariance and Correlation**; **Bivariate distributions**: Marginal and Conditional distributions; Independent random variables; **Convergence in probability versus convergence in distribution**: Law of large number and Central Limit Theorem.

S3611MN:	NUMERICAL MATHEMATICS
NQF Level	**6**
Contact Hours	2 lecture hours + 2 practical hours per week for one semester
NQF Credits	**8**
Course Assessment:	Assessment for this module will be **100%** CA based.

Course description: **Representation of numbers in the computer**: Floats, round-off, round-off unit, absolute and relative condition numbers of a problem. **Linear systems:** Norms in R^n, error considerations, Cholesky decomposition, QR decomposition, pivoting The **programming environment**: arithmetic operations, matrix algebra, programming scripts, matrix operators, graphic output, flow control, programming functions. **Programming practicals:** Students write code performing a linear algebra related task and master existing software packages. **Interpolation**: Polynomial interpolation, Lagrange interpolation formula, Neville recursion formula, Newton interpolation, interpolation error, trigonometric interpolation. **Software practicals:** Interpolation in Matlab, Interp1 or similar.

S3612SD:	DISTRIBUTION THEORY
NQF Level	**6**
Contact Hours	2L per week
NQF Credits	**14**
Course Assessment:	Test(s) and quiz(es) – at least a minimum of 3 hours in total, Assignments – at least a minimum of 3, notional hours in total, Tutorial tests – at least 10 notional hours in total.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Sum of independent random variables, further probability distribution functions** (Bivariate Normal, Chi-square, Gamma, Beta, F and t distributions); **Moment-generating functions and Moments**: Bivariate Normal, Chi-square, Gamma, Beta, F and t distributions; **Functions of random variables** (Sum, difference, product and quotient); **Methods of Distribution functions** (distribution of minimum and maximum, sum and differences, products and quotients); **Method of Transformations** (probability integral transform, transformation of discrete random variables, transformation of continuous random variables); **Method of Moment-generating functions** and related generating functions (characteristic functions, factorial moment generating functions of random variables); **Multivariable Transformations Using Jacobians**; **Order Statistics**

S3620DM:	DIGITAL MARKETING, SOCIAL MEDIA & WEB ANALYTICS
Course Title:	**Digital Marketing, social media & Web Analytics**
NQF Level	**6**
Contact Hours	1 lecture hour + 1 practical session per week for one semester
NQF Credits	**8**
Course Assessment:	The weight **50%:** Tests, Quizzes, Students presentations, Assignment portfolios, Basic Machine Learning group project
Examination:	Weight **50%** (1 x 3-hour examination paper). Informal Practical Examination

Course description: **Introduction to Digital Marketing:** Digital Marketing; Social Media Marketing; Search Engine Optimization; Digital Analytics for Marketing Professionals; **Web Analytics:** Interpreting Web Analytics; Digital analysis techniques; data processing using Web and marketing tools, as well as newer methods of using social media data. **Application Programming Interface (API)** services to collect data from different social media sources such as YouTube, Twitter, Flickr etc.

S3602MN:	NUMERICAL ANALYSIS
NQF Level	**6**
Contact Hours	2 lecture hours + 2 practical hours per week for one semester
NQF Credits	**8**
Course Assessment:	The CA **50%** of the final mark consisting of a minimum of 1 (one) test and one programming assignment which should take the form of a mini-project. The CA will be compiled from tests and programming assignments in a **50:50** ratio.
Examination:	**50%** (1 x 2-hour examination paper)

Course description: **Zeros of algebraic equations:** Muller's method, Newton-Horner method; **Linear iterative systems:** Dominant and subdominant eigenvalues, stability and asymptotic, convergence, stability, matrix norms, iterative schemes for linear systems, Jacobi, Gauss-Seidel and relaxation methods. **Numerical solution of eigenvalue problems:** complete matrices, power method, QR algorithm. **Roots of nonlinear equations:** bisection method, secant method, Regula falsi method, Newton-Raphson method. **Discrete dynamical systems:** fixed points thereof, contractions, Jacobian matrix of a vector-valued system. **Numerical solution of algebraic systems:** Isolated and nonsingular solutions, Newton iteration scheme, implementation considerations.

S3660ME:	BUSINESS ETHICS
NQF Level	**6**
Contact Hours	2L per week
NQF Credits	**8**
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Nature of Morality**; Moral versus non-moral standards; **Religion and morality**; Ethical relativism; Normative theories of Ethics: Egoism; Utilitarianism; Kant's ethics; **Justice and Economic distribution**; nature of capitalism; two arguments for capitalism; **corporations and consumers**; ethics and environmental protection; workplace issues; moral choices facing employees.

S3632DA:	ADVANCED DATABASES
NQF Level	**6**
Contact Hours	4 hours lectures per week for 16 weeks and one practical session per week for one semester.
NQF Credits	**16**
Course Assessment:	**CA 50%** of the final mark consisting of a minimum of 3 (three) tests.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: This course includes the following units: Unit 1: Advanced SQL; Unit 2: Stored Procedures and Triggers; Unit 3: Query Optimization; Unit 4: Concurrency and Recovery; Unit 5: Database System Architectures; Unit 6: Data Warehousing; Unit 7: Object-Oriented and Object-Relational Databases; Unit 8: XML and Databases.

S3612DD:	DATA SCIENCE SOLUTION ARCHITECTURE & DESIGN
NQF Level	**6**
Contact Hours	4 lecture hours + 1 practical session per week for one semester.
NQF Credits	**8**
Course Assessment:	**CA** weight **50%:** Tests, Quizzes, Students presentations, Students presentations, Assignment portfolios & Industrial group project
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Data architecture overview:** Typical Business Intelligence and Analytics solutions; traditional and real-time data-consuming methods. **Big Data Analytics Logical Architecture**: Data Sources and Data Acquisition Layers; Storage, Processing and Batch Layers; **Design and Data consuming:** Data components, devices, communication mechanisms, data consuming techniques, transformation, analysis, and presentation. **Data presentation and visualization:** Introduction to Data Visualization; data extract technologies such as Spark and adapters such as Kafka. **Big Data technologies:** Big data such as Hadoop and Spark, enterprise data warehousing (EDW).

S3711MA:	ANALYSIS OF EQUITIES & VALUATION
NQF Level	**7**
Contact Hours	4 hours lectures per week for semester
NQF Credits	**16**
Course Assessment:	The CA **50%** will be compiled from 3 written class tests and short online quizzes at the discretion of the lecturer.
Examination:	**50%** (1 x 2-hour examination paper)

Course description: **Market organization and structure**: assets and contracts; financial intermediaries- positions; primary and secondary security markets. **Security market indices**: equity indices; fixed income indices; use of indices. **Equity securities**; industry and company analysis; **Equity valuation**: PV models; multiplier models; method of comparable; discounted dividend valuation; free cash flow valuation; residual income valuation- estimating justified P/E ratio.

S3711MP:	INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT
NQF Level	**6**
Contact Hours	4 hours lectures per week for semester
NQF Credits	**16**
Course Assessment:	The CA **50%** will be compiled from 3 written class tests and short online quizzes at the discretion of the lecturer.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Introduction to investment setting**; asset allocation and security selection; functioning of security markets; security market indexes and index funds; efficient capital markets; **introduction to portfolio management**; asset pricing models; equity valuation; top-down approach to market, industry and company analysis; equity portfolio management strategies. **Valuation and management of bonds**; global bond market structure; bond yield curves; bond valuation; bond analysis and portfolio management strategies; **derivative markets and securities**; forward, futures and swap contracts; option contracts; **professional portfolio management**; alternative assets; evaluation of portfolio performance; industry ethics.

S3711SR:	REGRESSION MODELS
NQF Level	**7**
Contact Hours	4 lectures plus 3-hours practical per week/ semester
NQF Credits	**18**
Course Assessment:	The CA **50%** will be compiled from 3 written class tests & short online quizzes at the discretion of the lecturer.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Linear models and estimation:** fitting a simple linear model, multiple regression; **Inference:** Statistical inference of linear models; **Regression analysis:** Polynomial and nonlinear regression, Residual analysis, **Multicollinearity and its effects; Diagnostics and remedial measures; Model building:** Enter method, Stepwise procedure, Backward procedure, Forward method; **Model validation**.

S3712MF:	FIXED INCOME ANALYSIS
NQF Level	**7**
Contact Hours	4 hours lectures per week for semester
NQF Credits	**16**
Course Assessment:	The CA **50%** will be written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total, Assignments – at least a minimum of 3 notional hours in total, Tutorial tests – at least 10 notional hours in total.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Fixed income securities; structure of bonds cash flows; callable bonds; puttable bonds; convertible bonds. **Fixed income markets**: Issuance, trading and funding: primary and secondary bond markets ;sovereign bonds ;non-sovereign bonds-quasi-government bonds ;corporate debt ;**fixed income valuation** ;prices and yields ;maturity structure of interest rates ;fixed income risk and return: Interest rate risk on fixed rate bonds ;credit and liquidity risk ;credit analysis models: **Structural Models;** Reduced Form Models; The Term Structure of Credit Spreads; **Introduction to AssetBacked Securities**: The Securitization Process; Residential Mortgage Loans; Residential Mortgage; Backed Securities; Commercial Mortgage; Backed Securities; Collateralized Debt Obligations; Non-Mortgage Asset-Backed Securities; Interest Rate Trees and Arbitrage-Free Valuation; Monte Carlo Method; **Valuation and Analysis:** Bonds with Embedded Options.

S3712MR:	RISK ANALYSIS & MODELLING
NQF Level	**7**
Contact Hours	4hours lectures per week for semester
NQF Credits	**16**
Course Assessment:	The CA **50%** will be written and/or online assessments: Test(s) and quiz(es) – at least a minimum of 3 hours in total, Assignments – at least a minimum of 3 notional hours in total, Tutorial tests – at least 10 notional hours in total.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Basic risk types, measurement and management tools, creating value with risk management, The role of risk management in corporate governance, Enterprise Risk Management (ERM), Financial disasters and risk management failures, **The Capital Asset Pricing Model** (CAPM), Risk-adjusted performance measurement, Multifactor models, Data aggregation and risk reporting, **Ethics and the GARP Code of Conduct**. **Retail credit risk modelling**: PD, LGD, EAD. Corporate & SMEs credit risk modelling: PD, LGD, EAD. Credit rating, events of default, default probabilities. Structural and Reduced form models of credit risk. **Structural models (corporate**): Merton and KMV models. Estimating losses given default. Credit Metrics, Credit Risk, KMV. Stress testing. **Managing credit risk using credit derivatives**. Limitations and risk of credit derivatives. **Combining market and credit risks**. RWA calculations. CAR calculation.

W3780QP:	CWIE
NQF Level	**7**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**24**
Course Assessment:	The endorsed CWIE portfolio shall be evaluated according to a rubric & the shall be noted as completed or not.

Course description: Engage in Cooperative Work Integrated Education through any of the following (or combination) of the following activities: **Internship at an outside organisation/institution/business/research institution; Industrial attachment in an industry; Engage in a community project/engagement; Engage in community outreach; Engage in a simulation of an activity; Execute a project; Engage in product development; Engage in a service of some kind** & Etc.

S3731DA:	DATA MANAGEMENT & ANALYSIS
NQF Level	**7**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**9**
Course Assessment:	4 lecture hours + 1 practical session per week for one semester
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Data analysis for social research: Differences of quantitative and qualitative data analysis; Complementarity of quantitative and qualitative data analysis; Quantitative approaches to analysis; Survey & experimental method; Measurement techniques of quantitative analysis; **Basics of data processing**: Preparation, Cleaning & customization; Exploratory & descriptive methods; Management of non-numerical data, textual analysis, Discourse analysis; Computer software in qualitative research. **Data Analysis techniques:** Correlation; Regression; Forecasting; Classification; including a variety of machine learning methods. **Data Visualization:** dimensionality reduction; context dependent data; streaming data; **Application of data science in cloud environment**, clustering, containers such as Docker and Kubernetes, data adapters. **Data Management:** Planning the data needs of the study, Data collection, Data entry, Data validation and checking, Data manipulation, Data files backup, Data documentation.

S373DA:	DATA SECURITY & DATA PRIVACY
NQF Level	**7**
Contact Hours	**4** lecture hours + 1 practical session per week for one semester
NQF Credits	**18**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Data security overview: data encryption algorithms, data transport protocols, authentication mechanisms; **Usable Security and Privacy:** TrueCrypt usability, Privacy by Design, Comparative Eye Tracking of Experts; **Security and Privacy in Social Networks and Collaborative Systems:** Data governance and transparency; Sharing-Habits Based Privacy Control in Social Networks; Counteracting Active Attacks in Social Network Graphs. **Protection and Privacy of Data and Big Data:** data loss, and theft prevention, identify and mitigate risks by design, ensuring data privacy compliances. **Privacy preserving in data:** Introduction to Data ownership and privacy concepts, understand data protection and rights to information regulations, and data ethics. **Data**

protection legislation and information security technologies; Privacy-preserving analysis for big data using cryptographic tools; Big data security in Internet of Things; Privacy-aware digital forensics.

S3732DL:	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
NQF Level	**7**
Contact Hours	**4** lecture hours + practical session per week for one semester
NQF Credits	**18**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Artificial intelligence overview:** Foundations of Artificial Intelligence; Agents and Environments; **Deep learning:** What is deep learning?; Computer vision; Image data; Recognizing handwritten digits; Natural Language Processing; Sentiment analysis; Classifying machine learning tasks; Bag of words; Limits of machine learning; Spotting bias in machine learning Neural networks; Bayesian neural networks; **Machine Learning Model:** Bayesian modelling and Gaussian processes; Randomized methods; Approximate inference; Variational autoencoders; Regularisation; Model interpretation; GPU optimisation for neural networks. **Applications of machine learning in NLP**: Recurrent neural networks; Backpropagation through time; Long short-term memory; Attention networks; Memory networks; Neural Turing machines; Machine translation; Question answering, Speech recognition; Syntactic and semantic parsing. **Classification**: Decision Tree; Regression, Ensemble Methods, Dimension Reduction.

S3520OI:	OPEN INNOVATIONS IN DATA SCIENCE
NQF Level	**5**
Contact Hours	**1** lecture hour + 1 practical session per week for one semester
NQF Credits	**2**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Running machine learning projects:** Machine learning approaches for business problems, Machine learning and Agile methodology. **Exploring data:** Descriptive statistics, Visualising data, Feature engineering. Machine learning algorithms. **Optimising machine learning**: Model evaluation, assessing underfitting and overfitting, Hyperparameter tuning, Model interpretation. **Deploying basic machine learning solutions:** Lifecycle of machine learning models, Machine learning pipelines and artefacts, Machine learning as a service.

S3512MQ:	INTRODUCTION TO QUANTITATIVE FINANCE
NQF Level	5
Contact Hours	4 hours lectures per week for semester +1 tutorials per week
NQF Credits	12
Course Assessment:	of two tests and one assignment
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Time value of money**; Interest rate measurement; effective and nominal interest rates; present value; equation of value- real rate of interest. **Valuation of annuities**; level payment annuities; PV and FV of an annuity; differing interest and payment period; continuous annuities; Annuities with non-constant payments; increasing and decreasing annuities; yield rates and reinvestment rates. Loan Repayment; Amortization method of loan payment; non-level interest rate; sinking fund method of repayment. Bond Valuation; determination of bond prices; bond prices between coupon dates; amortization of bond; callable bonds; serial bonds and Makeham's formula. Measuring rate of return on investment; net present value- internal rate of return; profitability index; modified internal rate of return; dollar-weighted and time weighted rate of return.

S3520DC:	COMPUTATIONAL PROBLEM SOLVING
NQF Level	5
Contact Hours	One contact hour lecture period and one-hour practical session per week for one semester
NQF Credits	4
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

Course description: **Problem Understanding:** Clear identification of the problem. Establishing background information. Expressing the problem in other forms. Identification of sub problems. Pre-requisites and post-requisites **Data and information:** Determine what data or information is relevant in solving a computational problem. Which set of data is needed as input and which are obtained as output. **Variables:** Specify how to represent data and information in the form of variables. Use different types of variables. Concept of allocation and settlement. Use valid operations on variables. **Algorithmics:** Understanding the algorithm concept. Develop algorithms. Logical sequence, selection, Iteration, operation, inputs and outputs. Algorithm design tools/approaches. Algorithm Evaluation and representation. **Solution Evaluation:** Tracing algorithms to demonstrate solutions. Assessing correctness through testing. Comparing alternative problem solutions.

S3531DP:	PROGRAMMING FUNDAMENTALS I
NQF Level	5
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	14
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Program Development Steps:** Define Understand, Design, Implement, Test and Maintain Programs. **The Structure Theorem and Algorithm Design:** Define Sequences, Selection and Repetition Structures, Design Pseudocode and Flowcharts. **Create Console Applications:** Create Input and Output Programs. **Errors and Debugging:** Define, Identity and Debug Syntax, Semantic and Run-Time Errors. **Variables and Expressions:** Declare variables and Constants, Assign Data to Variables; Use Arithmetic Expressions, Understand the Scope and Lifetime of a Variables. **Creating Graphical User Interface (GUI):** Create Event-Driven Input and Output Programs. **Selection Constructs:** Use If and Switch Statements, Understand Simple, Combined and Nested Selection. **Repetition Constructs:** Use For, While and Do-While Loops, Understand Infinite, Counted and Nested Repetition. **String Manipulation:** Use String Functions to Manipulate Strings. **Composite Data Types:** Declare, Use and Manipulate Arrays, Structures and Lists. **Functions and Methods:** Create Parameterless and Parameterised Methods, Return Results.

S3532DP:	PROGRAMMING FUNDAMENTALS II
NQF Level	5
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	14
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Procedural Programming Limitations:** Ability to reuse code throughout the program. **Advanced Methods:** Parameterized method, overloading methods, passing parameters by reference, returning a reference from a method **Using Classes and Objects:** Creating a class from which objects can be instantiated, interfaces. **Introduction to Inheritance:** Extending Classes **Exception Handling:** Comparing traditional and object-oriented, handling exceptions **Using Controls:** Understanding controls, examining the ide's automatically generated. **Files and Streams:** Files and the file and directory classes, writing and reading a sequential access file writing data to a sequential access text file, reading from a sequential access text file

S3531DC:	COMPUTING 1A
NQF Level	5
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	14
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Introduction to Computing Concepts:** Data, Information; History of Computing; Computing Disciplines: Computer Science, Information Technology, Information System, Software Engineering, Computer Engineering and its Application Domains. **Internet and World Wide Web:** History of the Internet and World Wide Web, Internet, Intranets, & extranets, World Wide Web (Web web pages, web server, browsers, Internet Service Providers, MAC addresses, Internet Protocol addresses, Uniform Resource Locator, hyperlinks, search engine architecture, web crawling and indexing); **Data Communications:** Data Communication Model, Electronic Communication System Model. **Data Transmission:** Method of Data Transmission -Serial and Parallel, Direction of Data Transmission – Simplex, Half Duplex or Full Duplex; Synchronization Methods – Asynchronous and Synchronous, Analog & Digital Data Transmission; **Transmission Medium:** Wired (Guided) i.e., coaxial, fiber-optic, and twisted pair cables & Wireless (Unguided) Media i.e., Wi-Fi, Bluetooth, and NFC; **Fundamentals of Computer Networking:** Main types of Computer networks (LAN, MAN, WAN); Network topologies (star, bus, ring, mesh, hybrid); Network architecture (Client-server and peer-to-peer); **LAN Technologies**: Wired LAN (Ethernet) and Wireless LAN(Wi-Fi,, Bluetooth); Network Hardware (NIC, hub, switch, router, modem, bridge, gateway); Types of Servers (file, print, email, web & proxy server); **Introduction to Web Design using HTML & CSS3**: *Basics of* HTML standard elements, HTML Sections, Content Grouping, Text-Level Semantics, Embedded Content/media, Tabular Data, HTML Forms; Cascading Style Sheets (CSS): External, Embedded and Inline CSS.

S3532DC:	COMPUTING 1B
NQF Level	5
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	14
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Telecommunication Principles:** Concepts: Bits, Bauds, Bandwidth, Latency and Throughput, Analog and Digital Signals, Noise ; **Modulation and Demodulation:** Analog and Digital Modulation; **Multiplexing & Duplexing:** Techniques i.e. Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM); **Routing and Swithcing:** routing algorithms, optimal path, challenges in routing, Switching Systems in Telecommunication Networks (Circuit Switched Networks, Packet switching, Message Switching). **Network Protocols**: TCP, IP, HTTP, HTTPS, UDP, FTP, SMTP, POP, IMAP, DHCP; Standards and International Bodies; **Error Detection and Correction:** Error classification, Redundance, Methods of Error detection and Error correction; **Security:** CIA (confidentiality, integrity, and availability). Malware (Viruses, Worms, Trojans), Spyware, Adware); Security Threats and Attacks (Ransomware, DoS, Social engineering, Phishing, Hijacking, etc.); Countermeasures: Firewall, VPN, Intrusion Detection System (IDS), Intrusion Prevention System (IPS), Passwords, Encryption, Digital Signature, Digital Certificates, and authentication. **Ethical, Legal, and Social Issues in Computing:** Ethics, Privacy, Copyright, Trademarks, and Intellectual Property Rights.

S3532DI:	INTRODUCTION TO DIGITAL ELECTRONICS
NQF Level	5
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	14
Course Assessment:	**50%** (Minimum of **2** tests and **2** assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: **Fundamental Digital concepts**: Number Systems and Codes; Representation of Numbers in the computer and Computer Arithmetic, different types of Number systems and codes and their conversions**; Combinational Logic Analysis and Design**: logic gates, Boolean algebra, logic simplification, combinational logic functions (including arithmetic circuits, encoders and decoders, multiplexers and demultiplexers, comparators, parity checkers and generators). **Sequential Logic Analysis and Design**: Latches, flip-flops, counters, shift registers. Design of Digital Systems. **Logic gate circuitry**: TTL, CMOS, ECL, logic levels, propagation delay, fan-out, power dissipation, noise margin, logic family interfacing. **Learning and Teaching Enhancement Strategies/Activities.**

S3611MF:	FINANCIAL DERIVATIVES ANALYSIS
NQF Level	6
Contact Hours	4 hours lectures per week for semester
NQF Credits	14
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Financial derivatives;** introduction; types of derivatives; purpose of financial derivatives -**Forward and futures markets**; delivery and settlement of contracts; types of forward contracts: Equity forwards, bond and interest rate forwards, currency forwards, short- and long-term interest rate futures contracts, stock index futures contracts; pricing and valuation of above forward and futures contracts. **Option markets and contracts;** basic definitions; structure of global option markets; OTC markets and Exchange listed Option markets; Types of options: Financial options, options on futures, commodity options; **principles of options pricing**- Discrete time option pricing: **Binomial model**; The One-Period Binomial Model; The Two-Period Binomial Model; Binomial Put Option Pricing; Binomial Interest Rate Option Pricing. **Continuous time option pricing**; Assumptions of the Model - The Black-Scholes-Merton Formula; Inputs to the Black-Scholes-Merton Model the Effect of Cash Flows on the Underlying; The Critical Role of Volatility. **Swap markets and contracts;** Characteristics of Swap Contracts; Termination of a Swap; global structure and types of swap markets; pricing and valuation of swaps.

S3611MF:	**DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS**
NQF Level	6
Contact Hours	4 hours lectures per week for semester
NQF Credits	14
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **First order equations**: initial value problems, separable, exact, homogeneous linear equations: integrating factor. **Second order equations**: linear homogeneous with constant coefficients: distinct, complex and repeated roots of the characteristic equation; nonhomogeneous equations; method of underdetermined coefficients and variation of parameters. **Series solution of second order linear equations**. Bessel's equation. **The Laplace transform**: solution of initial value problems, inverse Laplace transform. System of first order linear equations, homogenous linear system with constant coefficients. **Fourier series**: definition, periodic functions, Dirichlet's conditions, full-range and half-range series, determination of Fourier coefficients, Fourier series of even and odd functions, Fourier series in arbitrary intervals. **Fourier Transforms;** Integral theorem; Sine and cosine transform. **First order partial differential equations**: basic properties of the linear and quasilinear equations. **Linear second order equations in two independent variables**: classification of linear second order equations into parabolic, hyperbolic and elliptic equations. Separation of variables. Example: the one-dimensional wave equation, the vibrating string, boundary conditions associated with the wave equation.

S3620CT:	**COMPUTATIONAL THINKING**
NQF Level	**6**
Contact Hours	**2** contact hours lecture periods and one and a half hours practical session per week for one semester
NQF Credits	**8**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Pillars of computational thinking:** decomposition, pattern recognition, data representation and abstraction, and algorithms. **Expressing and analysing algorithms**: techniques to solve small and large tasks, choose the best algorithm for the specific problem. **Applied computational thinking using a programming language**: express algorithms using a programming language, demonstration problem-solving processes based on computational thinking.

S3631DI:	**INTRODUCTION TO DATABASE SYSTEMS**
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	**16**
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.
Prerequisite	None

Course description: **Introduction to Databases:** Databases and database users, Database systems concepts and architecture **Conceptual Data Modeling and Database Design:** Data Modeling Using the Entity Relationship (ER) Model, The Enhanced Entity Relationship (EER) Model **The Relational Data Model and Sequel Query Language (SQL):** The Relational Data Model and Relational Database Constraints, Introduction to SQL, Complex Queries, Triggers, Views, and Schema Modification, Relational Database Design by ER- and EER-to-Relational Mapping **Database Design Theory and Normalization:** Basics of Functional Dependencies and Normalization for Relational Databases, Relational Database Design Algorithms and Further Dependencies, Database **Programming Techniques**: Introduction to SQL Programming Techniques.

S3622DM:	**DISCRETE MATHEMATICS**
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	**16**
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.

Course description: **Logic and Proofs**. **Basic structures**: sets, functions, sequences. **Induction. Counting. Relations. Graphs. Trees.**

S3420CE:	**COMPUTER ETHICS**
NQF Level	4
Contact Hours	**1** contact hour lecture period and a half hour practical session per week for one semester
NQF Credits	**2**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Introduction to Ethics:** A background of what ethics are in computing and why the need to consider ethics in today's technological landscape. **Intellectual property rights:** Protecting intellectual property, open-source software, and creative commons. **Information privacy:** Preventing information theft and misuse of protection of private information. **Professional ethics:** Ethical conduct for computing professionals. **Current issues**: Fake news, deep fakes, online safety, social media data ownership.

S3631DO:	OBJECT ORIENTED PROGRAMMING I
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	**16**
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.
Prerequisite	**S3532DP** Fundamentals of Programming II

Course description: OOP Design; Classes; Objects and Methods; Interfaces and Abstract classes; Exceptions and I/O Streams; Vectors and Iterators; Introducing Abstract Data (ADT).

S3621DA:	COMPUTER ORGANISATION & ARCHITECTURE
NQF Level	**6**
Contact Hours	2 contact hours lecture periods and one and a half hours practical session per week for one semester
NQF Credits	**16**
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.
Prerequisite	**S3532DI** Introduction to Digital Electronics

Course description: **Introduction to Computer Organization and Architecture**: Computer components; basic organization of computer and block level description of the functional units and key terminologies. **Control unit**: components; Instruction cycle and instruction execution in a classical von Neumann machine. **Instructing a Computer**: CPU Architecture; Register Organization; Instruction formats and data types; basic instruction cycle; Instruction interpretation and Sequencing; addressing modes; instruction set; Case study - instruction sets of MIPS processor; Assembly language programming using MIPS instruction set or machine program sequencing with respect to Microprocessors/Microcontrollers; **Memory Organization:** Introduction to Memory and Memory parameters; classifications of primary and secondary memories; types of RAM and ROM; Allocation policies; Memory hierarchy and characteristics; Cache memory Concept; architecture (L1; L2; L3); mapping techniques; Cache Coherency; Interleaved and Associative Memory; **Virtual Memory:** Concept; Segmentation and Paging; RAID technology; **I/O Organization and Peripherals**: Input/output systems; I/O modules and IO processor; types of data transfer techniques; Programmed I/O; Interrupt driven I/O and DMA; Illustrates I/O interfaces; serial and parallel communication; **Assessing and Enhancing Performance of Computer Systems**: CPU Performance and its Factors; evaluating Performance; trade-offs among various components; such as CPU clock speed; cycles per instruction; memory size; and average memory access time; attributes of a system visible to a programmer or those attributes that have a direct impact on the logical execution of a program; Enhancing Performance – role of Pipeline Processing; **RISC Architecture**: RISC versus CISC; role of pipelining; Specialized Architectures - Multi-core systems; GPU.

S3632DA:	ADVANCED DATABASES
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
NQF Credits	**16**
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.
Prerequisite	None

Course description: This module includes the following units: **Object, Object-Relational, and XML:** Concepts, Models, Languages, and Standards, Object and Object-Relational Databases, XLM: Extensible Markup Language **Query Processing and Optimization**: Strategies for Query Processing, Query Optimization. **Transaction Processing, Concurrency Control, and Recovering:** Introduction to Transaction Processing Concepts and Theory, Concurrency Control Techniques, Database Recovery Techniques. **Distributed Databases, NOSQL Systems, Cloud Computing, and Big Data:** Distributed Database Concepts, NOSQL Databases and Big Data Storage Systems, Big Data Technologies Based on MapReduce and Hadoop. **Advanced Database Models, Systems, and Applications:** Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases

S3631DC:	COMPUTER NETWORKS
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
NQF Credits	**16**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Network architecture:** Packetisation, Protocol layers and services, End-to-end principle, Internet structure. **Link and access technologies:** Multiple access protocols, Sliding window protocols, LANs (Ethernet), Error detection and correction. **Network layer:** IP packet switching, IP addressing and forwarding, Routing. **Network services:** Address assignment (DHCP), Address resolution (ARP), Error reporting and monitoring (ICMP), DNS. **Traffic:** Queuing models, packet dropping models, workloads. **Switch architecture:** Routers and switches. **Transport layer:** Ports, TCP (handshake, windowing, and congestion control), and UDP. **Socket programming:** Sockets, Ports, The Socket API commands. **Security:** Elements of cryptography, Denial-of-service attacks and vulnerabilities at various layers (TCP spoofing, ARP poisoning, DNS cache poisoning), IPsec, DNSsec, SBGP, Firewalls, VPN, Securing TCP. **CyberSecurity:** data security, RSA SecureID and Kerberos, certification authority-based cryptographic.

S3632DO:	OBJECT ORIENTED PROGRAMMING II
NQF Level	**6**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
NQF Credits	**16**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	**S3532DP** Fundamentals of Programming II

Course description: OOP paradigm, concepts (abstract classes, interfaces, inheritance, polymorphism, generic methods and classes, etc.), problem solving; Exception Handling; Strings, characters and regular expressions; Files and Stream; Testing; Generic Collections; Generic classes and methods; Custom generic data structures; GUI components.

W3780QP:	CWIE
NQF Level	**7**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
NQF Credits	**24**
Course Assessment:	The endorsed CWIE portfolio shall be evaluated according to a rubric & the shall be noted as completed or not.

Course description: Engage in Cooperative Work Integrated Education through any of the following (or combination) of the following activities: **Internship at an outside organisation/institution/business/research institution; Industrial attachment in an industry; Engage in a community project/engagement; Engage in community outreach; Engage in a simulation of an activity; Execute a project; Engage in product development; Engage in a service of some kind** & Etc.

S373DA:	DATA SECURITY & DATA PRIVACY
NQF Level	**7**
Contact Hours	**4** lecture hours + 1 practical session per week for one semester
NQF Credits	**18**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Data security overview: data encryption algorithms, data transport protocols, authentication mechanisms; **Usable Security and Privacy:** TrueCrypt usability, Privacy by Design, Comparative Eye Tracking of Experts; **Security and Privacy in Social Networks and Collaborative Systems:** Data governance and transparency; Sharing-Habits Based Privacy Control in Social Networks; Counteracting Active Attacks in Social Network Graphs. **Protection and Privacy of Data and Big Data:** data loss, and theft prevention, identify and mitigate risks by design, ensuring data privacy compliances. **Privacy preserving in data:** Introduction to Data ownership and privacy concepts, understand data protection and rights to information regulations, and data ethics. **Data protection legislation and information security technologies;** Privacy-preserving analysis for big data using cryptographic tools; Big data security in Internet of Things; Privacy-aware digital forensics.

S3732DL:	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
NQF Level	**7**
Contact Hours	**4** lecture hours + practical session per week for one semester
NQF Credits	**18**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**None**

Course description: Artificial intelligence overview: Foundations of Artificial Intelligence; Agents and Environments; **Deep learning:** What is deep learning?; Computer vision; Image data; Recognizing handwritten digits; Natural Language Processing; Sentiment analysis; Classifying machine learning tasks; Bag of words; Limits of machine learning; Spotting bias in machine learning Neural networks; Bayesian neural networks; **Machine Learning Model:** Bayesian modelling and Gaussian processes; Randomized methods; Approximate inference; Variational autoencoders; Regularisation; Model interpretation; GPU optimisation for neural networks. **Applications of machine learning in NLP**: Recurrent neural networks; Backpropagation through time; Long short-term memory; Attention networks; Memory networks; Neural Turing machines; Machine translation; Question answering, Speech recognition; Syntactic and semantic parsing. **Classification**: Decision Tree; Regression, Ensemble Methods, Dimension Reduction.

S3520OI:	OPEN INNOVATIONS IN DATA SCIENCE
NQF Level	**5**
Contact Hours	**1** lecture hour + 1 practical session per week for one semester
NQF Credits	**2**
Course Assessment:	**Weight 50**%, Tests, Quizzes, Presentations, Assignment portfolios, Machine Learning group project
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	**None**

Course description: Running machine learning projects: Machine learning approaches for business problems, Machine learning and Agile methodology. **Exploring data:** Descriptive statistics, Visualising data, Feature engineering. Machine learning algorithms. **Optimising machine learning**: Model evaluation, assessing underfitting and overfitting, Hyperparameter tuning, Model interpretation. **Deploying basic machine learning solutions:** Lifecycle of machine learning models, Machine learning pipelines and artefacts, Machine learning as a service.

S3731DS:	SOFTWARE ENGINEERING
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
NQF Credits	**18**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

Course description: Introduction to software engineering: What is software engineering, attributes of good software, fundamental software activities, types of software applications, software engineering ethics. **Software processes**: Software process models, plan-driven development, process activities, coping with change, process improvement. **Agile software development:** Agile methods, agile development techniques, agile project management, scaling agile methods. **Requirements Engineering:** Types of requirements, functional and non-functional requirements, requirements engineering processes, requirements discovery, requirements elicitation, requirements specification, requirements validation, requirements change. **System Modelling:** Context models, interaction models, structural models, behavioural models, model-driven engineering. **Design and Implementation:** Object-oriented design using the UML, design patterns, implementation issues, open-source development. **Software Testing:** Development testing, test-driven development, release testing, user testing. **Software Evolution:** Evolution processes, legacy systems, software maintenance. **Dependable systems:** Dependability properties, sociotechnical systems, redundancy and diversity, dependable processes. **Project Management:** Project planning, defining deliverables, risk management, managing people, teamwork. **Quality Management:** Software quality, software standards, reviews and inspections, quality management and agile development, software measurement.

S3731DC:	COMPUTER THEORY
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
NQF Credits	**18**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Propositional and Predicate logic**; quantifiers; graphs and trees; algebraic structures; Tautologies, contradictions and contingencies; Proofs; Recursive definitions and recurrence relations; Program correctness; Huffman codes; Algebraic structures; **Theory of Automata**: Deterministic finite Automata and Nondeterministic finite automata; **Formal Languages**: Regular and context-free languages; Regular and contextfree grammars; Regular expressions; ε-closure property; **Formal languages rules and theorem:** Wits rule; Kleen's theorem; Push-down Automata (PDAs) theory; **Pumping lemma theory**; **Push-down Automata** (PDAs) **theo**ry; **Universal Turning theory**: undecidability, Turing machines; recursive and recursively enumerable sets; Church turning thesis; Chomsky hierarchy; computational complexity, space and time complexity of Turing Machines; Relationships, Complexity classes; **Complete problems**: NP-completeness; computability, decidability and tractability.

S3731DD:	DATA STRUCTURE & ALGORITHMS
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
NQF Credits	**18**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Review of object-oriented framework**; Data Objects; Data Structures and Complex Data Structures; List; **Algorithm Analysis**; Sorting; Searching; Advanced Tree Structures; **Hash tables**; Hash function; Re-hashing; Priority Queues (Heaps); **File compression**; Huffman coding; Graphs; **Adjacency Matrix and List**; Connectivity; Topological sort; **Shortest path algorithms**; minimum Spanning Tree; hard or Intractable problems; dynamic Algorithms; dictionaries; traveling Salesman's Problem.

S3732DC:	CYBER SECURITY
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
NQF Credits	**18**
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Introduction to Cyber Security:** Cybersecurity Fundamental Concepts: Risks, Threats, Vulnerabilities; **Principles of Cyber Security Management:** Role and importance of cybersecurity management in an organization. **Steps of a Cyber Attack/Cyber Kill Chain:** Reconnaissance, Weaponization, Delivery, Exploitation, Control and Actions. **Cyber Security attack countermeasures:** Security Technology: Access Controls, Firewalls, VPNs, Intrusion Detection Systems, Intrusion Prevention Systems, Anti-Virus & Anti-Spyware, Sniffers, and Other Security Tools. **Physical & Environmental Security**: Physical Access and Environmental Controls. **Cybersecurity Risk Management:** Cyber Security Risk Identification, Risk Assessment and Risk Control. **Vulnerability Management:** Cybersecurity threats and Vulnerabilities Assessment, Ethical Hacking and Penetration Testing, Tools and Techniques. **Security Planning Strategies:** Security policies, standards, procedures and guidelines; Value and Vulnerabilities of Information assets; National Institute of Standards and Technology (NIST) Cyber Security Framework; Cyber Security Risk Standards: NIST SP800-30, ISO-27005; **Disaster Recovery, Business Continuity & Incident Response planning:** DR/BP/BC/IR/ plans. **Legal, Ethical, and Compliance:** International Laws and Legal Bodies, Ethical codes of conduct for Cybersecurity professionals and their organizations, Issues related to Cybersecurity: Ethical Hacking, Intellectual property, Privacy. **Cryptography:** Cryptographic Algorithms, and Cryptographic Tools.

S3732DW:	WEB & MOBILE PROGRAMMING
NQF Level	**7**
Contact Hours	**2** contact hours lecture periods and a half hours practical session per week for one semester.
NQF Credits	**18**
Course Assessment:	100% Continuous assessment (Tests, Assignments and Practical Projects).
Prerequisite	None

Course description: **Evolution of Web Technologies**: Syntactic web; Social Web; Semantic Web. **Client-Side Programming**: Client-Side Web Frameworks; Document Object Model (DOM); Virtual DOM, Template Engines; Web Components; Component Life-Cycle; **Mixins**; Form Handling and Validation; State Management; Properties and Event; Routing; Reusability and Composition; Ajax and Server Communication. **Client Server Communication**: CORS; XML; JSON; Web-Sockets; Push Notifications. **Server-Side Programming**: Application Programmer Interfaces (APIs); Authentication; Authorization; **Databases**: Using SQL and NoSQL databases; **Cloud-Based Solutions:** Cloud-Based Databases, Server-Less Solutions. **Cross-Platform Native Runtime**: Hybrid Applications. **Device Sensors**: GPS Location; Camera; File System access. **Collaboration Tools and Deployment**: Version Control, Application Store Deployment.

S3722DO:	OPERATING SYSTEMS
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
NQF Credits	**9**
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: **Types of Operating Systems**; Computer System Structures; Operating System Structures; process management (Process Concept, Concurrent Processes, Process Scheduling, Threads, **CPU Scheduling**, Process Synchronization, Deadlocks and Starvation); **memory management** (main Memory Management, Virtual memory Management, File System Implementation); **protection** (goals of Protection, Implementation of Protection, Revocation of Access Rights); **security** (Security Problem, Program Threats, System Threats, Intrusion Detection); **multiple processor systems**; multimedia Operating systems; operating system design; **case study** (linux, windows, Symbian).

S3722DH:	HUMAN COMPUTER INTERACTION
NQF Level	**7**
Contact Hours	**4** contact hours lecture periods and a half hours practical session per week for one semester**.**
NQF Credits	**9**
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments**.**
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisite	None

Course description: Human Aspects of HCI; Guidelines, Principles and Theories of HCI; Usability of Interactive Systems; Interaction Styles; Models and metaphors; Managing the Design Process; predictive and heuristic evaluation of interfaces; HCI with non-traditional interfaces (vision-based interaction, multimodal interaction, ubiquitous computing, augmented and virtual reality, interaction in gaming, mobile interaction);Current Research trends :ubiquitous and context-aware computing; tangible interfaces; haptic interaction; and mobile interfaces.

N. ARTICULATION PROGRAMME FOR COMPUTING

N.1. CRITERIA FOR ADMISSION

1) The applicant must be in possession of EITHER
   a) a BSc degree in Computer Science or related qualification at NQF level 7.
   b) OR
   c) a pre-NQF BSc degree in Computer Science or equivalent qualification from a recognized institution.

2) Students who have completed a double major Bachelor of Science degree in which one of the majors was Computer Science or Information Technology may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

N.1.1. ARTICULATION OPTIONS

This qualification may serve as an entry point to an MSc degree in Information Technology.

N.1.2. MODE OF DELIVERY

The programme is offered on a full-time basis only on the Main Campus of UNAM.

N.1.3. DURATION OF STUDY

The minimum duration of the study is one year, and the maximum duration is two years.

N.1.4. ASSESSMENT CRITERIA

A candidate will be eligible to write the final examination if he/she has obtained the required continuous assessment (CA) mark of 40%. A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the typical modules in this programme and details are further specified under respective module descriptors. Assessment criteria are based on written examinations, written tests, assignments, research reports, oral examinations, and seminar presentations. Attendance of lectures and tutorial classes is compulsory (at least 80%).

N.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted to the Faculty of Science for a second year of registration, a student must have passed a minimum of 64 credits by the end of the first year.

N.1.6. SUMMARY TABLE FOR ALL MODULES IN THE PROGRAMME

Year 1

CODE	COURSE NAME	NQF	CREDITS	CONTACT TIME	Co-requisite / PREREQUISITES
Semester 1					
CMP3821	Network System Security	8	8	2 L +0.5 P / week	
CMP3841	Wireless and Mobile Computing	8	8	2 L +0.5 P / week	
Choose any TWO of the following courses:					
CMP3811	Numerical Methods & Operations Research	8	16	4 L+ 1 P / week	
CMP3851	Distributed Systems	8	16	4 L+ 1 P / week	
COS3871	Artificial Intelligence	8	16	4 L+ 1 P / week	
Total Credits Semester 1					**48**
COS3812	Data warehousing & Data Mining	8	16	4 L+ 1 P / week	
Choose any TWO of the following courses:					
CMP3832	Entrepreneurship & Management of IT Systems	8	16	4 L+ 1 P / week	
CMP3812	Real Time Multimedia	8	16	4 L+ 1 P / week	
CMP3872	Database Programming	8	16	4 L+ 1 P / week	
Total Credits Semester 2					48
Semester 1 & 2					
CMP3880	Research Methodology & Project	8	38	Fortnightly meetings with supervisor	
			TOTAL CREDITS FOR THE PROGRAMME		134

All co- and pre-requisites as indicated in the curriculum framework and the module descriptors in this programme are superseded by the admission requirements indicated under point F.5

N.2. M.SC. INFORMATION TECHNOLOGY (IT) PROGRAMME (22MSCI)

N.2.1. ADMISSION REQUIREMENTS

The applicants will be accepted on the basis of their undergraduate records. The Master of Science in Information Technology programme is open to all Bachelor's degree holders with Computer Science major or Computer related field and with a minimum average pass mark of 60%.

N.2.2. DURATION OF STUDY

The Master of Science in Information Technology is offered through coursework and thesis, extending over two years for full-time students and three years for part-time students. The coursework is conducted during the first academic year of study and is followed by a supervised original research project extending over the second year.

N.2.3. CURRICULUM COMPILATION

The curriculum for the MSc. degree consists of the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of Study in the General Prospectus: Information, Regulations& Fees.

N.2.4. EXAMINATION REGULATIONS

Formal examination will take place at the end of each semester. Examinations will be subject to external assessment. The candidate should pass the formal examinations in the taught courses before registering for the Thesis Course. A candidate who fails any part of his/her Master's Degree Programme and who is allowed to repeat that part may be exempted by Senate, on the recommendations of the Departmental panel of examiners from those courses or components from that part s/he passed.

N.2.5. FORMAT AND EVALUATION OF THESIS WORK

A candidate shall be required to submit a complete report in loose bound form for verification and approval to the concerned supervisors in the following format: Paper size: A4 (International format, 210 x 297 mm) Line space:1.5 Top and Bottom margins: 20mm Left margin: 30mm Right margin: 10 mm Figures/flowchart/circuits/block diagrams: No restrictions. Font size: 12 After the dissertation has been approved by the panel the candidate shall submit at least four bounded copies with the chairman of the department in accordance with the following specifications: Color of the report: White Type of binding: Artvellum or cloth Front page should include: University Logo Title of the Project Title of the Degree Name of the candidate Month and Year The relevant department will retain one copy and two copies will be deposited in the university Library. Unless senate has agreed to the contrary the library copies shall be open to public reference. One copy to the supervisor. The candidate should submit the completed project work in all respects before the end of the academic calendar as announced by the respective department. The candidates will be informed in advance the date, time and the venue of the viva-voce examination. Other regulations and guidelines are same shown in the section (9.4.7) page no. 28 of the general prospectus 2002 are holds good. Concept and Evaluation of Mini Project: Concept of mini project is introduced in each course in order to strengthen the programming skills and ideas to develop the real time project as the time goes. It not only gives the skills but also gives the confidence in the candidates to go ahead with the project developments and practical implementations with different types of tools. The evaluation will be done by a group of examiners constituted by the course co-ordinator. The candidate has to submit a complete project report according to the format given by the respective supervisors. Evaluation also involves the demonstration and viva-voce.

N.2.6. PRACTICALS

Attendance of practical classes is compulsory.

NB: STUDENT MUST PASS ALL COURSES AND PRE/CO-REQUISITES AS LISTED FOR THE PARTICULAR COURSES. THIS SECTION LISTS ALL THE COURSE CODES FOR MSC (IT), FOLLOWED THEREAFTER BY THE COURSE CONTENTS IN THE SAME ORDER.

N.2.6.1. QUALIFICATION: MSC. INFORMATION TECHNOLOGY (IT) PROGRAMME (22MSCI)

N.2.6.1.1 COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

YEAR 1

CODE	COURSE NAME	NQF Level	CREDIT	PRE-REQUISITES	CO-REQUISITES
Semester 1					
UAE5819	Academic Writing for Post Graduate Students	**9**	16	**Must be a Postgraduate student**	
CMP5931	Discrete Mathematics	**9**	16	None	None
CMP5951	Computer Graphics	**9**	16	None	None
CMP5971	Advanced Operating Systems		16	None	None
Semester 2					
CMP5912	Cryptography and Network Security	**9**	16	None	None
CMP5932	Research Methodology & Research Proposal	**9**	16	None	None
CMP5952	AdvancedSoftware Engineering	**9**	16	None	None
CMP5972	Data Communication & Computer Networks	**9**	16	None	None
Total Credit			128		

YEAR 2

CODE	COURSE NAME	NQF Level	CREDIT	PRE-REQUISITES	CO-REQUISITES
CMP5900	Thesis	**9**	**120**	Passed ALL first-year courses	None
Total Credit			**120**		

N.3. MSC IN APPLIED STATISTICS AND DEMOGRAPHY (11MSST)

N.3.1. DEPARTMENTAL REGULATIONS

N.3.1. ADMISSION REQUIREMENTS

The MSc Programme in Applied Statistics and Demography will require a minimum of a BSc, with a **Statistics or Population Studies** Major, in the lower second-class division (60-69%) or an equivalent qualification.

N.3.2. DURATION OF STUDY

The Master of Science in Applied Statistics and Demography cannot be completed in less than two (2) years. The programme must be completed within three (3) years of full-time study.

N.3.3. CURRICULUM COMPILATION

The curriculum for the MSc Applied Statistics and Demography consists of coursework and the writing of a research thesis. Refer to the Regulations for Postgraduate Courses of study in the General Prospectus: Information, Regulations & Fees.

N.3.4. EXAMINATION REGULATIONS

If a student fails, the first semester course he/she may proceed to the next semester. However, he/she must repeat the course in the following year. A minimum of 50% is required to pass each course.

N.3.5. PRACTICALS

All practicals are compulsory.

N.3.6. MSC IN APPLIED STATISTICS AND DEMOGRAPHY (11MSST)

CODE	COURSE NAME	NQF LEVEL	CREDIT	PRE-REQUISITES	CO-REQUISITES
First Semester					
UAE5819	Advanced Academic Writing for Postgraduate Studies	**9**	NCB		None
STS5921	Research Design and Methodology	**9**	12		None
STM5921	Population and Development	**9**	12		None
STM5951	Statistical Computing	**9**	24		None
Second Semester					
STM5932	Multivariate Data Analysis	**9**	24		None
STM5912	Generalized Linear models	**9**	24		None
STM5922	Monitoring and Evaluation	**9**	24	STS5931	None
STM5952	Demographic Methods	**9**	24	STS5931, STM5952	
Total Credits			**180**		
SECOND YEAR COURSES					
STM5900	MSc Thesis		**120**		

N.3.7. QUALIFICATION: MSC APPLIED STATISTICS AND DEMOGRAPHY (11MSST)

YEAR 1

CODE	COURSE NAME	NQF LEVEL	CREDIT	PRE-REQUISITES	CO-REQUISITES
UAE5819	Advanced Academic Writing for Postgraduate Studies	**9**	NCB		None
STS5921	Research Design and Methodology	**9**	12		None
STM5921	Population and Development	**9**	12		None
STM5951	Statistical Computing	**9**	24		None
STS5931	Linear and Generalized Linear models	**9**	24		None
STM5952	Demographic Analysis	**9**	24		None
	ELECTIVES (CHOOSE ANY TWO)				
STM5932	Multivariate Data Analysis	**9**	24		None
STS5972	Statistical Tools for Programme Evaluation	**9**	24		None
STM5972	Analysis of Dependent Data	**9**	24	STS5931	None
STM5952	Advanced Demographic Methods	**9**	24	STS5931, STM5952	
Total Credits			**180**		

YEAR 2

CODE	COURSE NAME	NQF LEVEL	CREDIT	PRE-REQUISITES	CO-REQUISITES
STM5900	MSc Thesis	**9**	120	Passed all first-year courses	None
Total Credits			**120**		

N.4. MSC MATHEMATICS (11MSCM)

N.4.1. REGULATIONS

N.4.2. ADMISSION REQUIREMENTS

The MSc Programme in the Department of Mathematics will require a minimum of a BSc, with a Mathematics Major, in the lower second class division or an equivalent qualification at NQF Level 8. That means applicants will need to have attained an average mark of at least 60% in their undergraduate programme. Students who have completed the old BSc Programme in Mathematics must do all courses of the current fourth year programme in order to gain admission to the MSc Programme.

N.4.3. DURATION OF STUDY

The duration of the MSc in Mathematics is two (2) years for full-time students and three (3) years for part-time students. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

N.4.4. CURRICULUM COMPILATION

The curriculum for the MSc in Mathematics consists of coursework and the writing of a research thesis.The design of the Programme provides candidates with the opportunity to become pure mathematicians or applied mathematicians due to the introduction of options in the second semester of the first year of study. For general regulations for master's programmes, please refer to the Postgraduate Student Guide from the School of Postgraduate Studies, and the General Prospectus: Information, Regulations & Fees.

N.4.5. EXAMINATION REGULATIONS

If a student fails, the first semester course, he/she may proceed to the next semester. However, he/she must repeat the course in the following year. A minimum of 50% is required to pass each course.

N.4.6. SEMINARS

Students are expected to give a seminar presentation as part of their continuous assessment in each course.

N.4.7. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

COURSE CODE	COURSE / NAME	NQF Level	CREDITS	PREREQUISITES	CO-REQUISITES
SEMESTER 1					
UAE5819	Academic Writing for Post Graduate Students	**9**	NCB	None	None
MAT5901	Mathematical Modeling	**9**	12	None	None
MAT5921	Advanced Analysis	**9**	12	None	None
MAT5951	Differential Geometry	**9**	24	None	None
SEMESTER 2: OPTION A (PURE MATHEMATICS)					
MAT5922	Research Methodology	**9**	12	None	None
MAT5902	Graph Theory	**9**	12	None	None
MAT5932	Topics in Topology	**9**	24		
MAT5942	Algebraic Topology	**9**	12	None	None
MAT5972	Topics in Algebra	**9**	24	None	None
Total Credit			**156**		
SEMESTER 2: OPTION B (APPLIED MATHEMATICS)					
MAT5922	Research Methodology	**9**	12	None	None
MAA5902	Stochastic Differential Equations	**9**	12	None	None
MAA5912	Mathematical Biology	**9**	24		
MAA5942	Dynamical Systems	**9**	12	None	None
MAA5972	Topics in Finance	**9**	24	None	None
Total Credit			**156**		

COURSE CODE	COURSE / NAME	NQF Level	CREDITS	PREREQUISITES	CO-REQUISITES
SEMESTER 1					
MAT5931	Measure Theory and Integration	**9**	24		None
MAT5950 or MAA5950: MSc Thesis		**9**	96	Passed ALL first-year courses	

N. PHD MATHEMATICS (11DPSC)

This doctorate programme in Mathematics is a **registered** qualification with the Namibian Qualification Authority (NQA).

N.5.1. REGULATIONS

N.5.2. ADMISSION REQUIREMENTS

The entry requirements for PHD Mathematics are the possession of a NQF level 9 master's degree from a recognized institution as well as a well-written concept note developed together with a prospective supervisor in the Department of Mathematics.

N.5.3. DURATION OF STUDY

The duration of the programme is normally three (3) years for full-time students and four (4) years for part-time students.

N.5.4. ADDITIONAL INFORMATION

Additional information can be found in the prospectus of the Centre for Postgraduate Studies

N.6. COMPUTING COURSE EQUIVALENTS

OLD MODULES	NEW MODULES
CMP3511 Programming Fundamentals I	CMP3511 Programming Fundamentals I
CMP3512 Programming Fundamentals II	CMP3512 Programming Fundamentals II
CMP3521 Fundamentals of Digital Electronics	CMP3531 Introductions to Digital Electronics
CMP3532 Computer Organization	No exact equivalence. To be repeated.
CME3512 Introduction to Web Design	CIT3512 Fundamentals of Information Technology II
CME3511 Introduction to Information Technology	CIT3511 Fundamentals of Information Technology I
CMP3641 Software Engineering I	CIT3611 Computer Networks I
CMP3611 Introduction to Database Systems	CMP3611 Introduction to Database Systems
CMP3622 Advances Databases	COS3632 Advanced Databases
CMP3671 Mathematics for Computer Science I	CMP3651 Mathematics for Computer Science
CMP3672 Mathematics for Computer Science II	No exact equivalence. To be repeated.
CMP3631 Object Oriented Programming	COS3611 Object Oriented Programming I
CMP3691 Object Oriented Programming I	COS3611 Object Oriented Programming I
CMP3692 Object Oriented Programming	COS3612 Object Oriented Programming II
CME 3611 Telecommunications	CIT3632 Telecommunications
CMP3632 Foundations of Data Communications	CIT3652 Computer Organization and Architecture
CME3612 Networking and Emerging Technologies	No exact equivalence. To be repeated.
CMP3652 Software Engineering II	CIT3612 Computer Networks II
CMP3612 Data Structures and Algorithms	COS3612 Object Oriented Programming II
CMP3701 Research Methodology I	No exact equivalence. To be repeated.
CMP3721 Computer Networks	CIT3711 Advanced Computer Networks
CMP3741 Computer Theory	CMP3711 Computer Theory
CMP3761 Computer Architecture	CIT3771 System Administration and Maintenance
CMP3771 Artificial Intelligence	No exact equivalence. To be repeated.
CME3731 Introduction to Network Security	CIT3731 Information Security
CMP3702 Research Methodology II	CMP3752 Research Methodology
CMP3712 Internet Technologies and Applications	CMP3712 Internet Technologies and Applications
CMP3742 Human Computer Interaction and Computer Eth	COS3712 Human Computer Interaction
CMP3762 Computer Graphics	SCIT3732 Platform Technologies
CMP3722 Operating Systems	COS3732 Operating Systems
CME3732 Advanced Web Programming	CMP3772 Web Design and Programming
CMP3819 Software Project Management	CMP3819 Software Project Management
CMP3831Operations Research	CMP3811 Numerical Methods and Operations Research
CMP3802 Field Attachment	CMP3832 Entrepreneurship and Management of IT Systems
CMP3821 Network Systems Security	CMP3821 Network Systems Security
CMP3841 Wireless and Mobile Computing	CMP3841 Wireless and Mobile Computing
CMP3822 Data Warehousing and Data Mining	COS3812 Data Warehousing & Data Mining
CMP3812 Real Time Multimedia	CMP3812 Real Time Multimedia
CMP3872 Database Programming	CMP3872 Database Programming

No exact equivalence. To be repeated offered in for repeaters.

N.7. STATISTICS AND POPULATION STUDIES COURSE AND CURRICULUM DESCRIPTIONS

STS3851 OPERATIONAL RESEARCH

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**.
Examination **60%** (1x3hour Examination paper).
Pre-requisite: STS3772
Compulsory/Elective: Compulsory
Contact hour: 4 lectures plus 1 hour tutorial per week/one semester

Course Description: Decision Analysis: Types of decision problems; Decision-making under uncertainty: basic concepts; Ways of expressing outcomes: Payoffs and opportunity losses, Characterizing the uncertainty in decision problems, Solving decision problems using the expected payoff criterion and the expected utility criterion, Classifying decision makers by their utility functions; Revising state of nature probabilities: Decision trees; Bayes' rule: solving decision problems using posterior probabilities; Deterministic EOQ Inventory models; Introduction: type of inventory models, costs involved, Assumptions, Basic Economic Order Quality model: assumptions, derivation, determination of EOQ when holding cost, the effect of a non-zero lead time, power-of-two ordering policies; Probabilistic inventory models: Basic concepts: single-period models, the concept of marginal analysis, Discrete versus continuous demands; Deterministic dynamic programming (Network models): Basic concepts; Network models: minimal-spanning tree technique, maximal-flow technique, shortest-route technique.

STS3831 STOCHASTIC PROCESSES

NQF Level: 8
NQF Credits: 16
Course assessment: (at least two test and two assignments) **40%**.
Examination **60%** (1x3hour Examination paper).
Pre-requisite: STS3692
Contact hour: 4 lectures plus 1 hour tutorial per week/one semester

Course Description: Conditional Probability and conditional expectations; Elements of Stochastic Processes: Definition, Stationarity, finite –dimensional distributions, versions and modification; Markov Chains in discrete time and Markov Chains in continuous time: The basic limit theorem of Markov chains and applications, Classification of states, Limiting probabilities, Branching processes; The Poisson Processes: Counting process, Compounding stochastic processes Queuing processes; Gaussian distribution: for variables, vectors and processes; Brownian motion and Branching Processes: Definition, Gaussian construction, independence of increments Geometric Brownian motion, Brownian Bridge and Ornstein-Uhlenbeck process.

STS3871 SURVIVAL ANALYSIS

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3 hour Examination paper).
Pre-requisite: STS3671
Contact hour: 4 lectures plus 1 hour tutorial per week/one semester

Course Description: Concepts in Survival Analysis; Nature of survival data: common assumptions, censoring and truncation, Calendar time and study time; Functions that describe survival: some commonly used survival functions, fully parametric and nonparametric methods; Introduction to standard statistical software for analysing time-to-event data; Survival curves: Lifetables, Kaplan-Meier curves, Why linear or logistic curves won't work; Comparison of survival curves: Log-rank test-Use and assumptions; Design issues in time-to-event data: Designing time to event studies, Choice of end-point; Sample size calculation; Parametric survival modelling; Types of models: Exponential, Weibull, Lognormal and loglogistic models; Testing parameters: likelihood ratio test, Wald test and Akaike Information criteria; Cox's Regression models; Proportional hazard models, Hazard ratios, risk and survival times, Hypothesis test and confidence intervals, Binary and Continuous predictors, Interaction/confounding/Mediation, Adjusting survival curves for comparison.

STS3812 MULTIVARIATE DISTRIBUTION THEORY

NQF Level: 8
NQF Credits 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3hour Examination paper).
Pre-requisite: STS3692 and STS3771
Contact hour: 4 lectures plus 1 hour tutorial per week/one semester

Course Description: Basic matrix theory: Basic concepts of matrix theory such as their operations, rank and inverse, special matrices and their properties; Multivariate Normal Distribution: Definition and properties of multivariate normal Distribution, Moment-generating function of multivariate normal variate; Moments: population mean vector and covariance matrix; Marginal and conditional distribution in multivariate context, Quadratic forms in relation to chi-square distribution; Transformations: Random Vectors Estimation of the population and covariance matrix; Inference about the mean vectors: one or two samples cases: Hotelling's - statistic and tests on the mean vector if the covariance matrix is unknown, Test on the mean difference between two means from independent multivariate normal distributions when the covariance matrix is known (i.e. Chi-square statistic) and it is unknown (i.e. -statistic); Correlation: Estimation of population mean vector and correlation matrix, Distribution and tests associated with the Pearson correlation coefficient.

STS3872 **TIME SERIES ANALYSIS & FORECASTING**

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3hour Examination paper).
Pre-requisite: STS3772
Contact hour: 4 lectures plus 3 hour practical per week/one semester

Course Description: Components of time series: Long-term trend, Seasonal variations, Cyclical variations, Irregular variations; Time series Models: Multiplicative models, Additive models; Trend Analysis: Method of least squares, Method of moving average; Measuring seasonal effect: Specific seasonal indices, Typical seasonal indices; Measuring cyclical effects: Residual method; Smoothing techniques; The Forecasting Context: Basic Forecasting Tools, Time Series Decomposition, Exponential Smoothing Methods, Simple Regression, Multiple Regression, The Box-Jenkins Methodology for ARIMA Models; Advanced Forecasting Models: Regression with ARIMA Errors, Dynamic Regression Models, Intervention Analysis, State Space Models, Neural Networks, Forecasting the Long-term, Mega trends, Analogies, Scenarios, Judgmental Forecasting and Adjustments, Accuracy of Judgmental Forecasts; Judgmental Biases and their Limitations; Combining Statistical and Judgmental Forecasts; Using Forecasting Methods in Practice; Implementing Forecasting: uses, advantages, and Limitations.

STS3832 **STATISTICAL QUALITY CONTROL**

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3hour Examination paper).
Pre-requisite: STS3692 and STS3771
Contact hour: 4 lectures plus 3 hour practicall per week/one semester

Course Description: Quality improvement in modern Business: Dimensions of quality, Quality philosophy and management strategies: Total quality, Quality standards and Registrations, Six sigma; Statistical Methods used in Quality improvements: Describing variation, Important distribution of note, Inference about Process Quality; Methods and philosophy of Statistical Process Control: Chance and assignable cause of Quality variation, statistical basis of control charts: sample size and sampling, rational subgroups, analysis and patterns on control charts, rules for control charts; Control charts for variables: Simple control charts for variables, charts for individual measurements, Operating characteristic functions, application; Control charts for attributes: Properties of charts, charts for fraction nonconforming, charts for nonconformities (defects), choice between attributes and variable control charts; Process and measurement system capability analysis: Process capability ratios, Process capability using a control chart, Gage and measurement system capability studies, setting specification limits, estimating natural tolerance limits of a process; Cumulative sum and exponentially weighted moving average control charts: Principle of Cusum charts, EWMA charts.

POP3892 **INDIRECT ESTIMATION**

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3 hour Examination paper).
Prerequisite: POP3731 and POP3732
Contact hour: 4 lectures plus 3-hour practical per week/one semester.

Course Description: Definition of indirect techniques in demographic estimation, need for indirect estimation; Demographic Models: Estimation of fertility based on information on children ever born; Estimation of adult survivorship probabilities from information on orphanhood and widowhood; Estimation of child mortality from information on children ever born and children surviving.

SOS3860 **SOCIOLOGY OF GENDER & SEXUALITY**

NQF Level: 8
NQF Credits: 16
Course assessment: Continuous assessment (at least two test and two assignments) **60%**;
Examination **40%** (1x3hour Examination paper).
Prerequisite: Admission to the fourth-year level
Contact hour: 4 lectures per week/one semester

Course Description: Testing sociological theories of structuralist orientation and of agency, the course will exemplify both approaches: the ways in which societies socialize individuals into gendered identities and roles and the ways in which individuals appropriate and re-construct them; Sociological schools in the conceptualization of gender, i.e. origins of biological sex, origins and strands of feminism; Feminist analysis of Namibian society, women's movement in Namibia; Sexuality i.e. sexual identities, sexual cultures, sexual rights, friendship and intimate relationship; Reproductive health and HIV/AIDS, safe motherhood, contraception, abortion; Concepts of masculinity, construction of masculinities in Namibian society, masculinity and gender-based violence; Gender policies and developmental organizations in Namibia, i.e. Women in Development (WID), Women and development (WAD), Gender and Development (GAD), policy approaches of state and civil society; Gender and economy, i.e. poverty, empowerment, labour market and work place, gender division of labour, job and salary discrimination; Gender and culture, i.e. education, media, cultural traditions and commodified culture; Gender and social culture, i.e. gender stratification, gender and class; Gender and politics, i.e. women and power, women in politics, the legal framework for the promotion of gender equality.

POP3831 **MONITORING & EVALUATION TECHNIQUES**

NQF Level 8
NQF Credits 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3hour Examination paper).
Contact hour: 4 lectures per week/one semester
Course Description: Definitions and Concepts: Monitoring, evaluation; Types and Methods; Familiarizes students in different types of program evaluation, including needs assessment, formative research, process evaluation, monitoring of outputs and outcomes, impact assessment, and cost analysis; Students gain practical experience through a series of exercises involving the design of a conceptual framework, development of indicators, analysis of computerized service statistics, and development of an evaluation plan to measure impact; Covers experimental, quasi-experimental, and non-experimental study designs, including the strengths and limitations of each.

POP3852 **POPULATION PROJECTIONS**

NQF Level 8
NQF Credits 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%;**
Examination **60%** (1x3hour Examination paper).
Prerequisite POP3732
Contact hour: 4 lecture per week/one semester
Course Description: Introducing population projection, the need for population forecast, Basic methods of population projection and applications, the mathematical method, the limitations of the mathematical method; The component method of population projection: the principles of the method, the details of the method, the use of broader age groups, data requirements; Population projections in the Namibian context.

POP3872 **POPULATION MIGRATION & URBANIZATION**

NQF Level 8
NQF Credits 16
Course assessment: Continuous assessment (at least two test and two assignments) **40%**;
Examination **60%** (1x3hour Examination paper).
Prerequisite POP3732
Compulsory/Elective Compulsory
Contact Hours 4 lectures per week/one semester
Course Description: Definition and terminologies in migration studies; International migration: Sources of data, quality of statistics; Evaluation and estimation of international migration; Intercensal component method; Intercensal cohort – component method; Net migration, gross migration (migration turnover) and migration ratios; Migration rates: crude immigration rate, Crude emigration rate, Crude net migration rate, Crude gross migration rate; Contribution of migration to population change; Graphic techniques of analysis (population turnover); Life-time migration; Migration streams and counter streams; Return migration; Longitudinal migration; Bases of migration rates; Sources of migration statistics; Measurement of mobility; National growth rate method; Residual methods; vital statistics method; Residual method: survival rate method, Place of birth vs place of enumeration statistics, Residence at a fixed past date; Migration selectivity: by sex, by age, by educational level etc. Causes of migration, Ravenstein'spush and pull theory; Lee's Intervening Obstacles theory; Other theories; Other consequences of migration at the place of origin and at the place of destination. Internal migration (Namibian context); Urbanization – Trend: levels and patterns, Modernization theory and urbanization, Linkages between migration and urbanization, Manifestation of urbanization and challenges faced by urban centres due to rapid urbanization.

POP3880 **RESEARCH METHODOLOGY & PROJECT**

NQF Level: 8
NQF Credits: 38
Course assessment: Continuous assessment **100%** (Oral presentation **20%** and Project report **80%**
(Internal assessment **40%** and External assessment **40%**))
Prerequisite: Registered as a fourth year students
Compulsory/Elective Compulsory
Contact hour: 2 lectures per week/two semesters
Course Description: **Research Methodology**: Planning and Designing a Research Study; General Types of Research Designs and Approaches; Data Collection, Assessment Methods, and Measurement Strategies; Data Preparation, Analyses, and Interpretation; Ethical Considerations in Research; Disseminating Research Results and Distilling Principles of Research Design and Methodology.
Research Project: A final year project on a selected topic demonstrating the applications of relevant demographic and statistical methods culminating in a project report. The module runs throughout the two semesters. Students work under supervision of a member of the academic staff of the department. When possible, students may be attached to relevant industries/institutions etc.

STS3880 **RESEARCH METHODOLOGY & PROJECT**

NQF Level: **8**
NQF Credits: **38**
Course assessment: Continuous assessment 100% (Oral presentation 20% and Project report 80% (Internal assessment **40%** and External assessment **40%**))
Prerequisite: Registered as a fourth-year student
Compulsory/Elective Compulsory
Contact hour: 2 lectures per week/two semesters
Course Description: **Research Methodology**: Planning and Designing a Research Study; General Types of Research Designs and Approaches; Data Collection, Assessment Methods, and Measurement Strategies; Data Preparation, Analyses, and Interpretation; Ethical Considerations in Research; Disseminating Research Results and Distilling Principles of Research Design and Methodology. **Research Project**: A final year project on a selected topic demonstrating the applications of relevant demographic and statistical methods culminating in a project report. The module runs throughout the two semesters. Students work under

supervision of a member of the academic staff of the department. When possible, students may be attached to relevant industries/institutions etc.

POP3810	RESEARCH PROJECT
NQF Level:	8
NQF Credits:	32
Course assessment:	Continuous assessment **100%** (Oral presentation **20%** and Project report **80%** (Internal assessment **40%** and External assessment **40%**))
Prerequisite:	Registered as a fourth year students and POP3731
Compulsory/Elective	Compulsory
Contact hour:	2 lectures per week/two semesters

Course Description: A final year project on a selected topic demonstrating the applications of relevant demographic and statistical methods culminating in a project report. The course runs throughout the two semesters. Students work under supervision of a member of the academic staff of the department. When possible, students may be attached to relevant industries/institutions etc.

STS3810	RESEARCH PROJECT
NQF Level:	8
NQF Credits:	32
Course assessment:	**100%** (Oral presentation **20%** and Project report **80%** (Internal assessment **40%** and External assessment 40%))
Pre-requisite:	Registered as a fourth-year students and STS3732
Contact hour:	2 lectures per week/two semesters

Course Description: A final year project on a selected topic demonstrating the applications of relevant statistical methods culminating in a project report. The course runs throughout the two semesters. Students work under supervision of a member of the academic staff of the department. When possible students may be attached to relevant industries/institutions and so on.

N.8. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

UAE5819	ADVANCED ACADEMIC WRITING FOR POST GRADUATE STUDIES
NQF Level:	9
Contact hours:	4 lecture periods per week and 1 practical session per week for one semester
Credits:	24
Course Assessment:	**CA**: (1 x 3 hour exam paper)
Prerequisites:	Must be a postgraduate student.

Content: This course is a post-graduate course designed to empower students with skills and knowledge to access and critique academic sources and to synthesize information from these sources to assist them in the substantiation and development of their own claims when writing an academic paper in their respective fields of specialization. Additionally, this course will empower students with the capacity to undertake the challenges of academic writing by exposing them to the different rhetorical and stylistic elements typical of academic texts. Finally, students will be introduced to the American Psychological Association (APA) writing style and will be equipped with the necessary skills to format an academic paper in APA style.

STM5911	RESEARCH DESIGN & METHODOLOGY
NQF Level:	9
Contact hours:	4 lectures per week for one semester
NQF Credits:	24
Course Assessment:	Continuous assessment **(50%);** 1x3 hour examination paper **(50%)**
Pre-requisites:	Admission Requirements

Content: Types of research; Formulation of a research problem: identification of researchable topics, formulation of objectives, problem statement, research questions, hypotheses etc; Literature review: citation and referencing, plagiarism, Research designs: Sample Surveys, Censuses, Experiments, desk review, etc Research methodology: target population, units of enquiry, sampling designs, data source and collection methods, measurement instruments, questionnaire design principles, piloting research tool, field administration, Data management (Understanding and measuring survey quality (process quality and outcome quality; data quality; total survey error and classification of sources of errors; reliability and validity); Data analysis methods; Ethical considerations; Developing a research proposal; Report writing: structure, language, presentation of figures and tables, interpretation of results; Writing courses: Microsoft Word, Latex, etc; Appropriate communication skills: design of presentation materials, presentation skills.

STS5921	RESEARCH METHODOLOGY
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	**CA:** 50% (40% from at least 2 tests and seminar presentation 10%),
Examination:	**50%** (3 hours exam paper)

Course description: The module aims to introduce students to methods that to scientific and administrative structure that supports investigators from diverse backgrounds and to have skills that will allow them to provide high-quality consultation in research design and biostatistical analysis. **Study Design and Proposal Development**: Choosing a research topic; Formulating study aims and objectives; Formulate wording of testable hypotheses and associated primary aims; Suggest an optimal study design; Search and evaluate related published literature on planned measures for adequate evidence of reliability and validity; Determine the needed sample size or estimated power and write this up; Write the statistical analysis plan for the protocol; Respond to relevant parts of a critique by reviewers of the protocol; **Implementation and Study Conduct**: Review proposed data collection instruments and other measures for reliability, validity, and suitability for the planned data analysis; Establish coding rules with data entry staff, such as handling of missing data and invalid responses on questionnaires; Respond to questions about methodology, including protocol irregularities and changes; **Data Management and Data analysis**: Identifying and setting up appropriate systems for research data management; Audit data for completeness and validity; Plan, direct, interpret, and report any interim analysis, and advise on changes; Plan, direct, interpret, and report the final data analysis; Present and explain analytic results to co-investigators and project

team; **Presentation/Publication**: Design and direct preparation of tables and publication graphs; Core issues in scientific writing: collaborate in writing papers, abstracts, presentations; Review data accuracy and interpretation of inferential statistics in all reports of study methods and results; Respond to journal referees with written comments and/or additional analyses or data.

STM5921 **POPULATION & DEVELOPMENT**

NQF Level: 9
Contact hours: 2 lectures per week for one semester
NQF Credits: 12
Course Assessment: Continuous assessment **(50%);** 1x2 hour examination paper **(50%)**
Prerequisites: Admission Requirements
Content: Population trends: world trend, levels and differentials; implication of fertility and mortality; the role of migration in world population trends; demographic-economic interrelationship; the world population "explosion" "momentum"; marriage trends and the birth rate contemporary marriage trends in the West. Determinants and consequences of population trends; Causes and consequences of world demographic change. Population Policies and Development: development theory and policy, relationships between economic and demographic growth, effectiveness of population policies; Sexual and reproductive health programmes and policies; the 1965, 1969, 1974, 1984, and 1994 World Population Conferences. HIV epidemic in Africa and its impact on populations., the socio-economic consequences of HIV/AIDS; migration and urbanization; Demographic inputs for development: Integration of demographic variables into sectoral and regional/local planning, Design and evaluation of population projects and programs with emphasis on decentralization.

STM5951 **STATISTICAL COMPUTING**

NQF Level: 9
Contact hours: 4 lab-based lectures per week for one semester
NQF Credits: 24
Course Assessment: Continuous assessment **(50%);** 1x3 hour examination paper **(50%)**
Pre-requisites: None
Content: Introduction to statistical and demographic software; Data entry (Database creation, variable definition, etc); Manipulation and management of data; Summarizing data numerically and graphically; Statistical procedures including formal tests of hypotheses of interest

STS5951 **STATISTICAL THEORY**

NQF Level: 9
Contact Hours: 42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits: 24
Course Assessment: CA: 50% (40% from at least 2 tests and seminar presentation 10%), Exam 50% (3 hours exam paper)
Prerequisites: None
Course description: Point and Interval Estimation: Maximum Likelihood Estimators: Method of Moments Estimators; MSE and Bias; Exponential Families, UMVUEs, and the FCRLB; Confidence Regions Sufficient Statistics: Statistics and Sampling Distributions; Minimal Sufficient Statistics; Testing Statistical Hypotheses: Hypothesis Tests and Power; Exponential Families, the Neyman-Pearson Lemma, and UMP Tests; Likelihood Ratio Tests; Bayesian Inference: Bayes Estimators; Credible Intervals; Conjugate Priors; Noninformative Priors; Hierarchical Bayes and Empirical Bayes; Multiparameter models, normal with unknown mean and variance, the multivariate normal distribution, multinomial models; Posterior simulation and integration; Markov Chain Simulation; Large Sample Theory: Types of Stochastic Convergence; Tools for Proving Large Sample Results; Asymptotic Normality of Maximum Likelihood Estimators; Model Selection: Likelihood-Based Model Selection; Bayesian Model Selection; Prediction: Plug-in prediction; Likelihood prediction; Bayesian prediction; Assessment of predictions.

STS5931 **LINEAR AND GENERALIZED LINEAR MODELS**

NQF Level: 9
Contact Hours: 42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits: 24
Course Assessment: **CA:** 50% (40% from at least 2 tests and seminar presentation 10%), Exam 50% (3 hours exam paper)
Prerequisites: None
Course description: Exponential family of distributions; Generalized Linear Models: Model Fitting and Inference; Binary Logistic regression; Regression models for nominal and ordinal outcomes; Regression with count outcomes; Regression for time series; Doubly Bounded Continuous Variables: Zero- and One-Inflated Models; Finite Mixture Models; Models for Censored and Truncated Variables.

STS5961 **EPIDEMIOLOGY**

NQF Level: 9
Contact Hours: 42 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits: 12
Course Assessment: CA: 50% (40% from at least 2 tests and seminar presentation 10%), Exam 50% (3 hours exam paper)
Prerequisites: Admission Requirements
Course description: Fundamental issues: Measuring disease; Measuring the risk factor; Causality: Assessing risk factors: Risk and relative risk; Odds and odds ratio; Relative risk or odds ratio; Prevalence studies; Testing association; Risk factors measured at several levels; Attributable risk; Rate and relative rate; Measures of difference; Confounding and interaction: The concept of confounding; Identification of confounders; Assessing confounding; Standardisation; Mantel–Haenszel methods; The concept of interaction; Dealing with interaction; Study designs: Ecological design; Cross-section; Case-control; Cohort Studies and Intervention Studies; Meta-analysis: Reviewing evidence; Systematic review; A general approach to pooling; Investigating heterogeneity; Pooling tabular data; Individual participant data; Dealing with aspects of study quality; Publication bias; Advantages and limitations of meta-analysis; Risk scores and clinical decision rules: Association and prognosis ; Risk scores from statistical models; Quantifying discrimination ; Calibration; Recalibration; The accuracy of predictions; Assessing an extraneous prognostic variable; Reclassification; Validation; Presentation of risk scores.

STM5952 **DEMOGRAPHIC ANALYSIS**

NQF Level: 9
Contact hours: 4 lectures per week for one semester
NQF Credits: 24
Course Assessment: Continuous assessment **(50%);** 1x3 hour examination paper **(50%)**
Prerequisites: Departmental Entry Requirements
Content: Demographic Analysis: Fertility analysis, Nuptiality, Morbidity, Mortality analysis, Internal and international migration analysis, Geographical distribution of population, urbanization, Evaluation of demographic data, Population structure and dynamics and its economic and social determinants and consequences. The Life table: Population estimates and projections Approaches to measuring maternal mortality: Civil registration systems; Sisterhood methods, Orphanhood method.

STM5912 **GENERALIZED LINEAR MODELS**

NQF Level: 9
Contact hours: 4 lectures per week for one semester
NQF Credits: 24
Course Assessment: Continuous assessment **(50%)**; 1x3 hour examination paper **(50%)**
Prerequisites: Departmental Entry Requirements
Content: Principles of model fitting; Exponential family of distributions; Generalized Linear Models: Estimation and inference with Normal, Binomial and Poisson error distributions; Binary responses and Logistic regression (odds ratios); Contingency tables (Relative risk, Goodness of fit) and Log-linear models; Residual analysis and diagnostic measures. Multilevel models

STM5932 **MULTIVARIATE DATA ANALYSIS**

NQF Level: 9
Contact hours: 4 lectures per week for one semester
NQF Credits: 24
Course Assessment: Continuous assessment **(50%)**; 1x3 hour examination paper **(50%)**
Prerequisites: Departmental Entry Requirements
Content: Applications of Discriminant analysis, Principal Component analysis, Factor analysis
Cluster Analysis; MANOVA, Canonical Correlation; Interpretation of results from statistical analyses; Imputation of missing data.

STM5922 **MONITORING & EVALUATION**

NQF Level: 9
NQF Credits: 12
Contact hours: 2 lectures per week for one semester
Course Assessment: Continuous assessment **(50%);** 1x2 hour examination paper **(50%)**
Prerequisites: Departmental Entry Requirements
Content: The importance of monitoring as a management tool; Comparison between Monitoring and Evaluation; key uses of M&E information; The role of government departments in promoting useful M&E systems; Steps to Developing an M&E System; Integration of population variables in development planning; Evaluation methods of programmes; Monitoring techniques of programmes; Operational research; Assessing Data Quality: Primary and Secondary Statistical Data; Defining evaluation questions; Data collection; indicator development.

STS5982 **LONGITUDINAL DATA ANALYSIS**

NQF Level: 9
Contact Hours: 42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits: 18
Course Assessment: CA: 50% (40% from at least 2 tests and seminar presentation 10%), Exam 50% (3 hours exam paper)
Prerequisites: None
Course description: Nature of longitudinal studies, Advantages of Longitudinal Studies; Challenges of Longitudinal Data Analysis; Some General Notation; Data Layout; ANOVA Approaches to Longitudinal Data: Single-Sample Repeated Measures ANOVA; Multiple-Sample Repeated Measures ANOVA; MANOVA Approaches to Longitudinal Data: MANOVA for Repeated Measurements; Mixed-Effects Regression Models for Continuous Outcomes: Random Intercept; Random Slope and Trend; Mixed-Effects Polynomial Regression Models: Curvilinear Trend Model; Orthogonal Polynomials; Covariance Pattern Models: Covariance Pattern Models; Model Selection; Mixed Regression Models with auto-correlated errors; Generalized Estimating Equations (GEE) Models; Mixed-Effects Regression Models for Binary Outcomes; Mixed-Effects Regression Models for Ordinal Outcomes; Mixed-Effects Regression Models for Nominal Data; Mixed-effects Regression Models for Counts; Mixed-Effects Regression Models for Three-Level Data; Missing Data in Longitudinal Studies.

STS5992 **CLINICAL TRIAL DESIGNS & SAMPLING**

NQF Level: 9
Contact Hours: 42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits: 18
Course Assessment: CA: 50% (40% from at least 2 tests and seminar presentation 10%), Exam 50% (3 hours exam paper)
Prerequisites: None
Course description: Concepts and designs of clinical trials: controlled and uncontrolled clinical trials; historical controls; protocol; placebo; randomisation; blind and double blind trials; ethical issues; protocol deviations; Size of trials considerations: Study Design, Hypothesis Testing, Primary Study End Point, Expected Response Test vs. Control, Clinical Important/Meaningful Difference/Margin, Level of Significance, Power, Drop-out rate, Unequal Treatment Allocation; Multiplicity and meta-analysis: interim analyses; multi-centre trials; combining trials; Cross-over trials; Survey Methodology: Classification of Surveys, Total Survey Error Common Survey Sampling Techniques, Frames, Framing Effects, and Survey Responses; Complex survey sampling: stratification, clustering, weighting, multistage/multiphase sampling; Regression models for survey data: Complexity of modelling survey data; Multistage, Multiphase, and Repetitive Sampling: case-control sampling, case-cohort sampling; Sampling from Inadequate Frames: Domain Estimation, Post-stratification, Estimation from Multiple Frames, Small Area Estimation; Incomplete Data: Non-sampling Errors, Nonresponse, Callbacks Weight Adjustments, Use of Super-population Models, Adaptive Sampling and Network Sampling, Imputation, Unmatched, matched, and counter-matched case-control designs.

STM5900	THESIS
NQF Level:	9
NQF Credits:	120
Pre-requisites:	All first-year courses
Course Assessment:	**100%** Thesis

Content: A student will be expected to choose a topic under the guidance of a supervisor and undertake research. Students will be expected to demonstrate key research steps including information gathering, analysis and interpretation. They will be expected to demonstrate statistical and demographic techniques to a real research problem.

N.9. MODULE DESCIPTORS MSC IN MATHEMATICS

MAT5901	MATHEMATICAL MODELING
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (2 hours examination paper)
Prerequisites:	None

Course description: The course is taught under the MATLAB environment. Differential equations: simple models, exact differential equations, the first order linear differential equation, growth processes, decay process, mixing processes, miscellaneous modeling problems. Numerical methods: the Euler method, the predicator-corrector method, the MATLAB suite of differential equation integrator, error propagation, stiff differential equations, system of differential equations, higher order equations, event location. Linear transformations: linearity. Matrices: matrix algebra, the matrix of a linear transformation, a fundamental isomorphism, inverses, changes of basis. linear systems: examples, diagonalization, similar matrices, characterization of 2 x 2 matrices, numerical methods, complex eigenvalues, defective eigenvalues. Application of linear systems: mathematical theories of love, population models, mathematical theories of war. Discrete models: recurrence relations, systems of recurrence relations.

MAT5921	ADVANCED ANALYSIS
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (2 hours examination paper)

Course description: Metric spaces, normed linear spaces: continous linear mappings between normed linear spaces, product of normed vector spaces, Banach spaces and Hilbert spaces. Differentiation in Banach spaces: integration of regulated functions, the derivative, properties of the derivative, chain rule, mean value inequality, the second derivative, derivative of higher order, Taylor's formula, partial derivatives, differentiation under the integral sign, differentiation of sequences, the inverse function theorem, the implicit function theorem.

MAA5902	STOCHASTIC DIFFERENTIAL EQUATIONS
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (2 hours examination paper)

Course description: Introduction, Ito integrals, The formula and the martingale representation, stochastic differential equations, the filtering problem, diffusions: basic properties, other topics in diffusion theory, applications to boundary value problems, application to optimal stopping, application to stochastic control, application to mathematical finance.

MAT5951	DIFFERENTIAL GEOMETRY
NQF Level:	9
Contact Hours:	70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits:	24
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (3 hours examination paper)
Prerequisites:	Admission Requirements

Course description: **Curves in R^n:** regular curves, parameter transformation, arc length, Frenet frame, Frenet equations, curvature functions. Plane and space curves. **Surfaces in R^3:** the fundamental forms, curves on surfaces, principle curvature, Gauss curvature and mean curvature, curvature lines, asymptotic directions, developable surfaces, the Gauss equations, the Codazzi-Mainardi equations, Theorema egregium. Vector fields and covariant differentiation, parallel translation, geodesics, surfaces of constant curvature.

MAT5922	RESEARCH METHODOLOGY
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	**50%** CA (Supervisor's Evaluation); **50%** Departmental Evaluation

Course description: The course is designed to equip students with the know-how of conducting mathematical research, and the writing up of a mathematical article. Lectures include presentation of a typical research paper in mathematics, and combing through a selection of journal articles for relevant information on a mock topic. Due attention is given to the various forms in which mathematical results are presented namely, propositions, lemmas, corollaries, and theorems – along with the methods of proof. Each student is given a research topic, tasked to write up a mock mathematical paper on that topic, and present the paper in a seminar. Emphasis is not on coming up with new results, but on the ability to conduct independent study and presenting it clearly.

MAT5902	GRAPH THEORY
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50% (**2 hours examination paper)
Prerequisites:	None

Course description: Graphs and subgraphs, subgraph spanned by a set of vertices, order and size of a graph, isomorphic graphs, paths, walks, trails, cycles, circuits, connected components, bipartite graphs and their characterization, trees and forests, spanning trees, Hamilton cycles, Euler circuits, existence of Euler circuits, planar graphs, Euler's polyhedron theorem, Kuratowski's theorem, vector spaces and matrices associated with graphs, Menger's theorem, Hall's theorem and applications, factors of a graph. Tutte's 1 –factor theorem.

MAT5942	ALGEBRAIC TOPOLOGY
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (2 hours examination paper)
Prerequisites:	None

Course description: Free abelian groups, subgroups of free abelian groups. Singular homology groups: construction, homomorphism induced by a continuous mapping, homotopic mappings, homotopy properties of induced homomorphism, relative homology groups, homology groups of cells and spheres, Brouwer fixed point theorem, continuous nonzero tangent vector fields on a sphere, homology of finite graphs, homology of compact surfaces, the Mayer-Vietoris exact sequence, the Jordan– Brouwer separation theorem, the relation between the fundamental group and the first homology group.

MAT5932	TOPICS IN TOPOLOGY
NQF Level:	9
Contact Hours:	70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits:	24
Course Assessment:	**CA: 50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (3 hours examination paper)
Prerequisites:	None

Course description: Weak Topology, strong topology and the quotient topology. **Further separation axioms:** regularity, complete regularity, Tychonoff property, Urysohn property, normality, complete normality, perfect normality. **Variants of compactness:** Lindelof property, pseudocompactness, countable compactness, σ- compactness, paracompactness (needs star-refinements), and the localization of these properties. **Product Spaces:** The product of the sets, projection maps, product topology, continuous functions, product of the Hausdorff spaces, product of connected spaces, Tychonoff's Theorem, and its equivalence to the Axiom of Choice. **Compactifications:** Definition, Alexandroff's one– point compactification, Stone-Ćech compactification, real-compactification. **Uniform spaces:** uniformities, uniform spaces, preuniformities, preuniform spaces (entourage approach and cover approach), metric uniform spaces, uniform topology, uniform continuity, quasi-uniform spaces.

MAA5912	MATHEMATICAL BIOLOGY
NQF Level:	9
Contact Hours:	70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits:	24
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (3 hours examination paper)
Prerequisites:	None

Course description: Mathematical Biology is an interdisciplinary area in which mathematical concepts, techniques, and models are applied to a variety of problems in developmental biology and biomedical sciences. Continuous population models for single species, insect outbreak model (Spruce Budworm), harvesting a single natural population, discrete population models for single species, bifurcation analysis – leading to chaos, plane autonomous systems of ODEs, linear stability theory, non-linear conservative systems, non-linear systems: the use of polar coordinates, continuous population models for interacting species, models for predator – prey, the principle of competitive exclusion, modeling infectious diseases transmission/spreading by ODEs, the S-I-R model, the S-I-R endemic model, the vaccination/control model, enzyme kinetics, other types of complex systems.

MAA5942	DYNAMICAL SYSTEMS
NQF Level:	9
Contact Hours:	42 hours (2 lecture periods per week and 1 practical session per week for one semester)
Credits:	12
Course Assessment:	CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination	**50%** (2 hours examination paper)
Prerequisites:	None

Course description: Bifurcations: bifurcation from a steady solution, stationery bifurcation, Hopf bifurcation; bifurcation from a periodic solution, saddle-node (or fold) bifurcation, transcritical bifurcation. Dynamical systems classification, orbits and invariant sets, the Poincare map, stability of fixed points, Lyapunov's method, Newton's equation. Planar dynamical systems and examples form ecology and electrical engineering, Poincare-Bendixson Theorem. Attracting sets, Lorenz equation. Discrete dynamical systems and chaos, logistic equation, fixed and periodic points, Sarkovskii's Theorem, Cantor sets and the tent map, strange attractors and fractal sets.

MAT5972 **TOPICS IN ALGEBRA**

NQF Level: 9
Contact Hours: 70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits: 24
Course Assessment: CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination **50%** (3 hours examination paper)
Prerequisites: None

Course description: Jordan-Holder theorem, direct product of a family of groups, the basis theorem for finitely generated groups, soluble and nilpotent groups. Commutative rings: prime ideals and maximal ideals, the radicals. Field theory: field extensions, algebraic and transcendental elements, algebraic field extensions, splitting fields, the algebraic closure of a field, normal field extensions, finite fields, automorphism of a field extension, separability, the Galois group of a field extension, Galois theory of equations, solutions of equations by radicals.

MAA5972 **TOPICS IN FINANCE**

NQF Level: 9
Contact Hours: 70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits: 24
Course Assessment: CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination **50%** (3 hours examination paper)
Prerequisites: None

Course description: Econometrics: introduction to financial econometrics, univariate & bivariate statistics, simple regression, multiple regression, relaxing the classical assumption, model selection criteria & diagnostic testing, asymptotic (large sample) theory, stability and time –varying parameters, non –linear regression, qualitative response model, simulation method. Fixed income models: continuous time models for arbitrage-free pricing of interest rates derivatives, bonds, yields , the construction of yield curves, short rates models, yield curve models, forward measures, caps, floors, swaps, swaptions, bond options, LIBOR market model. Credit risk modeling and management: credit risk modeling, valuation, and hedging emphasizing underlying economic, probabilistic, statistical concepts. Point processes and their compensators. Structural, incomplete information and reduced form approaches. Single name products: corporate bond, equity options, credit and equity default swaps, forwards and swaptions. multiname modeling: index and tranche swaps and options, collateralized debt obligations. dynamic asset pricing theory: optimal portfolio choice and asset pricing.

MAT5931 **MEASURE THEORY AND INTEGRATION**

NQF Level: 9
Contact Hours: 70 hours (4 lecture periods per week and 1 practical session per week for one semester)
Credits: 24
Course Assessment: CA: **50%** (40% from at least 2 tests and seminar presentation 10%),
Examination **50%** (3 hours examination paper)
Prerequisites: None

Course description: **Measure theory:** rings, algebras, sigma–algebras and Dykin systems, contents and premeasures, the Lebesgue premeasured, extension of a premeasured to a measure, the Lebesgue-Borel measure, and the Lebesgue measure. **Integration theory:** measurable functions, step functions, the integral of nonnegative measurable functions, theorem of B. Levi, integrable functions, null sets, Fatou lemma, dominated convergence theorem, Lebesgue and Riemann integrals, measure with density, Radon-Nikodym theorem.

MAT5950/ MAA5950 **MSC THESIS**

NQF Level: 9
Contact Hours: Minimum one year
Credits: 96

Course Assessment: **100%** Rules and regulations of UNAM apply. The thesis will be examined by two experts in the area of specialization, at least one of which should be external. The thesis is assessed as a piece of original work and requires an extensive literature survey and synthesis, appropriate theoretical or survey work, and an in-depth analysis and discussion of results therein. Seminar presentation: 10%; Thesis examination: 90%.

Prerequisites: A pass in all courses is required before the students start with the research projects.

Course description: The student will be required to undertake research activities in a selected topic of mathematics and to submit a thesis. Students will work under supervision on a research of their own choice which will enable the application of theoretical and analytical knowledge developed in course work to a substantive problem relevant to their area of specialization. Depending on the research topic the Department will confer the following degrees:

- MSc Mathematics with special research topic in Pure Mathematics
- MSc Mathematics with special research topic in Applied Mathematics

N.10. MASTER OF SCIENCE INFORMATION TECHNOLOGY (IT) COURSE DESCRIPTIONS

CMP5931 DISCRETE MATHEMATICS

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment: Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Examinations 50%
Course Description: To extend student's mathematical ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems. The concepts and notations from discrete mathematics are useful to study or describe objects or problems in computer algorithms and programming languages. Content: Discrete models, Concepts of sets and functions, foundations, finite series logic, propositional logic, predicate logic, principles of counting, permutations and combinations, induction and recursion, Concepts of Ail.

CMP5951 COMPUTER GRAPHICS

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Examinations 50%
Course description: Computer graphics have revolutionalized movie and printing techniques, improved human-computer interfaces, and drive new applications such as computerized photography, art, games, simulations, and mechanical design.
Content: Overview of graphics systems, OpenGL, output primitives, attributes of output primitives, two dimensional geometric transformations and viewing, graphical user interfaces and Interactive input methods, three dimensional concepts, three dimensional object representations, computer animation, color models and color applications.

CMP5971 ADVANCED OPERATING SYSTEMS

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment: Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Examinations 50%
Course description: Thecourse equips studentswith the knowledge of managing different operating systems
Content: Different types of OS, Operating System Structures, Process Management: Threads, CPU Scheduling, Process Synchronization, Deadlocks, Memory Management: Main Memory, Virtual Memory, Storage Management, Protection and Security, Distributed Systems.

CMP5912 CRYPTOGRAPHY & NETWORK SECURITY

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Examinations 50%
Course description: Deals with the main security threats to communications networks such as X-25, Internet, mobile communications, broadband, local area networks and wide area networks. The course establishes certain security mechanisms that avoid or diminish the threats. It introduces students to specific cryptographic techniques that guarantee security in certain applications: e-mail, e-commerce, and web access.
Content: Introduction: OSI security architecture, classical encryption techniques, cipher principles, evaluation criteria foe AES-AES cipher, triple DES. Public key cryptography: key management, Diffie-Hellman key exchange, number theory, confidentiality using symmetric encryption, and RSA. Message authentication and hash function: message authentication codes, security of hash functions and MACs, MD5 message digest algorithm, secure hash algorithm, authentication protocols, and digital signature standards. Network security: Kerberos, X.509 authentication service, electronic mail, security, PGP, S/MIME, IP security, and web security. System level security: intrusion detection, password management, viruses, worms, firewalls.

CMP5932 RESEARCH METHODOLOGY & RESEARCH PROPOSAL

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment 100% Continuous Assessment
Course description: This course introduces the student to Postgraduate research. It aims to ensure that candidates are able to design and formulate appropriate postgraduate research projects, as well as to present their work, in preparation for the course CMP5900, Thesis. The course focuses on topics that are crucial to writing research proposals, conducting research, and preparation of theses. Candidates will be expected to do a number of presentations, which will enable them to develop confidence in presenting research results and to think carefully about the research approaches and methodologies that they adopted. Content: Research Skills – search skills, writing skills, presentation skills; Conducting literature review; Research methodology; Research techniques; Developing research instruments; Carrying out research; Analysis of research results; presentation of results; validity of conclusions.

CMP5952 ADVANCED SOFTWARE ENGINEERING

NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 24
Course Assessment Continuous Assessment **50%** (Minimum of 2 tests and 2 assignments) and Examinations **50%**
Course description: The course equips students with the knowledge of designing and building workable software systems
Content: Software – the process and its management, project management: software metrics, estimation, planning, system and software requirement analysis; Computer System analysis, analysis fundamentals, structured analysis, object-oriented analysis and data modeling, design and implementation of software, ensuring, verifying and maintaining software integrity; the role of automation.

CMP5972	DATA COMMUNICATION & COMPUTER NETWORKS
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	24
Course Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Examinations 50%

Course description: The course is designed to provide the computer candidates with a working knowledge of data communications, computer networks and open systems. The course includes basic terminology and concepts in data communications, telecommunication protocols, transmission techniques and computer network architecture alternatives.
Content: Introduction to data communications, fundamentals of communications, data transmission coding and framing, data switching, hardware media and network software, reference models, network standardization, complete study of OSI reference models, designing.

CMP5900	THESIS
NQF level:	9
Contact hours:	Weekly meetings, the frequency of which may be agreed with supervisors.
Credits:	120
Course Assessment:	100% A comprehensive research proposal is to be submitted to senate through the faculty. In addition, every candidate shall submit a thesis in accordance with the guidelines stipulated in the Postgraduate Student Guide, to be examined by at least two specialists approved by Senate. At least one of these specialists must be external to UNAM.

Prerequisites: Successful completion of all the Courses in the first year of study
Course description/ Content: Each candidate shall undertake a research project during the year, supervised by an approved supervisor. The research topic may come from the current ICT/Telecommunication technological challenges, in view to provide solutions. Candidates must submit periodic written reports about the research findings to their supervisors and hold regular discussions with their supervisors. Candidates are also required to participate in research seminars where they present any breakthroughs made in the research for the benefit and.

N.11. BACHELOR OF SCIENCE IN CHEMISTRY COURSE DESCRIPTIONS 11BSAC - ARTICULATION

AND

N.12. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS: 11BSAB - ARTICULATION

CHM3821	NATURAL PRODUCT CHEMISTRY I
NQF Level	8
NQF Credits	8
Contact Hours	2 lecture periods per week for one semester; 1 practical session per week for 7 weeks.
Continuous Assessment	minimum of two tests which counts **80%** and laboratory component **20%**.
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	**CHM3752** (Organic Chemistry II), **CHM3702** (Instrumental Analysis I)

Course Description: This course explores the basic biosynthesis pathway of secondary metabolites. We will learn how natural products are normally classified according to their biosynthetic origins and chemical properties. A special emphasis will be placed on chemical structure and how it affects the physiological function of various natural products. The following will be covered. **Topics include:** Classification of natural products. Primary and secondary metabolites; NMR techniques in biosynthesis studies (^{13}C-NMR, isotope incorporation). Polyketide pathway: fatty acids, cyclization of polyketides to aromatics, skeletal types of polyketides. The shikimic acid pathway: biosynthesis of shikimic acid and aromatic amino acids, biosynthesis of phenylpropanoids and other metabolites from the shikimate pathway. Isoprenoids: biosynthesis of mevalonic acids, monoterpenes, sesquiterpenes, diterpernes, sesterterpenes, triterpenes, tetraterpenes and steroids.

CHB3831	BIOINFORMATICS FOR BIOCHEMISTRY
NQF Level	8
NQF Credits	16
Contact Hours	4 lecture periods per week and 1 practical session per week for one semester
Continuous Assessment	**(**minimum of three tests which counts 80% and laboratory component 20%).
Examination:	1x3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	**CHB3731** (Bioenergics and metabolism), **MBL3631** (Cell Molecular Biology and Genetics)

Course Descriptor: The development of rapid DNA sequencing techniques has led to an information revolution in molecular biology. Computer based technologies are therefore applied and employed in the management and analysis of such biological data. This course is a hand-on and inactive course in which students will acquire knowledge on information networks, the World Wide Web as a tool and resource for molecular biology. They will gain skills and knowledge in using these resources in sequence and structure analysis. The various genomic and proteomic databases and the levels of stored data will be discussed and applied in depth. This will lead to the identification of characteristic profiles, protein families, evolutionary relationships, etc. the module will also include the design of PCR and oligonucleotide primers for cloning and mutagenesis as well as identifying open-reading frames (ORFs) in nucleotide sequences. The course will consist of lectures, student presentations and assignments.

CHM3801	INSTRUMENTAL ANALYSIS II
NQF Level	8
NQF Credits	8
Contact Hours	2 lecture periods per week for one semester; 1 practical session per week for 7 weeks.
Continuous Assessment	minimum of two tests which counts 80% and laboratory component 20%.
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHM3702 (Instrumental Analysis I)

Course Descriptor: Separation methods; solvent extraction; introduction to chromatographic methods of separation; general description of chromatography. GC, GLC, LC, TLC, HPLC; qualitative and quantitative analysis by chromatography; high performance liquid chromatography, column efficiency and chromatographic mobile phases; partition chromatography; adsorption chromatography ion-exchange chromatography; size exclusion chromatography; planar chromatography; ^{13}CNMR

spectra and ^{1}HNMR: 1-dimensional NMR (DEPT, NOE), 2 dimensional NMR (COSY, HETCOR, NOESY) theory, experimental methods and interpretation of spectra.

CHM3811	ORGANIC CHEMISTRY III
NQF Level	8
NQF Credits	16
Contact Hours	4 lecture periods per week for one semester; 1 practical session per week for one semester.
Continuous Assessment	minimum of three tests which counts 68%, laboratory component 20% and Quiz 12%.
Examination:	1x3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	**CHM3752** (Organic Chemistry II)

Course Descriptor: Enolates: tautomerism, racemisation, halogenations, haloform reaction, Aldol reactions, Claisen-Schmidt reactions, addition to α,β-unsaturated systems. Carboxylic acids and their derivatives: preparations and reactions of acids, acyl chlorides, acid anhydrides, esters, lactones, amides and imides, lactams. β-dicarbonyl compounds: Claisen condensations, crossed Claisen condensations, "active hydrogen" syntheses, direct alkylations of esters and nitriles, simple and conjugate additions to α,β-unsaturated systems, Mannich reactions; Amines: preparations, reactions, Hofmann and Cope elimination reactions. Phenols: physical properties, preparations, O-reactions, C-reactions, rearrangements, nucleophilic aromatic substitutions. Selected examples of multistep synthesis of organic compounds.

CHM3810	RESEARCH PROJECT
NQF Level	8
Contact Hours:	2 consultation periods per week for one semester
NQF Credits	32
Continuous Assessment	1 Oral presentation counts 30%, Consultation & efforts counts 20%, 1 Project report counts 50% **Final: 100% CA.**
Prerequisite	Passin all third-year courses and at least one statistics course

Course Descriptor: An independent project carried out in small groups, under the supervision of a member of staff. Topics will be given to students before the end of the first semester. The work will extend over the term and as a guide, should occupy the equivalent of one whole day per week. The practical work must be completed by six weeks before the session ends and must be submitted by two weeks before the session end. The completed report is expected to be between 25-35 pages long and will be examined by the supervisor and one external examiner and will be defended by an oral exam.

CHC3821	CLINICAL BIOCHEMISTRY
NQF Level	8
NQF Credits	8
Contact Hours:	2 lecture periods per week for one semester and 1 practical session per week for 7 weeks.
Continuous Assessment	minimum of two tests which counts 80% and laboratory component 20%.
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHB 3731, CHP3741, CHP3721

Course Descriptor: Biochemistry of Hormones: Blood and Transport Proteins, Hemostasis and Thrombosis. Bioenergetics and Oxidative Metabolism. Anaerobic Metabolism of Glucose in the Red Cell. Carbohydrate Storage: Synthesis in Liver and Muscles; obesity. Biosynthesis of Cholesterol in Liver. Special Liver Function. Muscle: Energy Metabolism and Contraction. Glucose Homeostasis and Fuel Metabolism. Water and Electrolyte Balance: Kidney Function. Diseases of the Lung and Kidneys: The Control of Acid-Base Balance. Calcium and Bone: osteoporosis; Metabolism. Neurochemistry. Neurotransmitters: psychosis and other nervous disorders Pathology: scientific investigation of the biology of human disease, 'Genes and the cell in health and disease' and 'Infection, Inflammation and immunity, Histochemistry, Immunocytochemistry. Oncology: Biochemical and molecular basis of cancer: Cell Cycle, Programmed Cell death, multistage nature of cancer, including the roles of the environment and somatic mutation, explore the known genetic mechanisms leading to cancer, Discuss approaches to targeted therapies for different cancers, current advances in HIV testing, diagnosis and treatment

CHM3831	PHYSICAL CHEMISTRY III
NQF Level	8
Contact Hours:	4 lecture periods per week for one semester, 1 tutorial session per week for one semester and 1 practical session per week for one semester
NQF Credits	16
Continuous Assessment	**(**minimum of three tests which counts 60%, laboratory component 20%, Quiz 10% and Assignments 10%).
Examination:	1x3hr examination; **Final:** 50% CA mark and **50% Examination mark**.
Prerequisite	CHM 3631 (Physical Chemistry I), MAT3611 (Calculus I)

Course Descriptor: Failures of classical mechanics and the birth of quantum mechanics. Wave and particle nature of light and electron.Postulates of quantum mechanics.Schrödinger equation and application to simple model systems.Hydrogen atom and multi-electron atoms.Vibrational spectroscopy of diatomic and simple polyatomic molecules.Microwave spectroscopy.Electronic spectroscopy. Calculation of thermodynamic properties from partition functions.

CHP3811	WASTEWATER TREATMENT
NQF Level	8
NQF Credits	16
Contact Hours	4 lecture periods per week for one semester; 1 practical session per week for one semester.
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHP3701 (Water Analysis), CHP3711 (Environmental Chemistry I)

Course Descriptor: The principles of coagulation, flocculation, sedimentation, filtration, biological treatment, solids handling, disinfection, and advanced treatment processes are presented. Physical and Chemical Processes for Water and Wastewater treatment. Biological Processes for Water and Wastewater treatment, characteristics, domestic versus industrial wastewater. Types of industries and their wastewater, Sampling of wastewater Analysis of industrial wastewater. Examples of wastewater from different industries, BOD, COD, Toxicity, Heavy metals, Dissolved, suspended solids. Uses of water in industry.Cooling, conveying, process,

boilers, water heaters, etc. Pretreatment of water for industrial use, Water pretreatment processes as sources of wastewater (Reverse Osmosis, softening, desalination, etc). Pretreatment of waste waters: equalization, settling, coagulation, filtration, pH adjustment, neutralization, flocculation, grit removal, treatment for sewer discharges, treatment for reuse. Agricultural reuse options, Community reuse options, Industrial reuse options. Chemical wastewater treatment: Coagulation, flocculation, precipitation, heavy metals removal, Oxidation, chlorination, other processes. Physical waste water treatment: Reverse Osmosis, Activated charcoal, distillation / evaporation, Biological wastewater treatment, Elementary Microbiology. **Nano technology in wastewater treatment: Nano filtration, shapes of nano particles.**

CHP3822	ENVIRONMENTAL CHEMISTRY II
NQF Level	8
Contact Hours	2 lecture periods per week for one semester
NQF Credits	8
Continuous Assessment	(minimum of two tests which counts 70%, Student led discussions contributes 15%, Paper Review Proposalcontributes 5%, Paper Reviewcontributes 5% and Paper peer Review contribute 5%.
Examination:	**Final: 50%** CA mark and **50%** Examination mark
Prerequisite	Environmental Chemistry I (CHP3711)

Course Descriptor: Climate in the Spotlight: Spectrum of Scientific Opinion, Greenhouse Gases: An overview of the role of Carbon dioxide and Methane, Carbon dioxide reservoirs, Climate cycles: Determining the past climates, Climate change and Political realm, Relationships between Technological Innovation and Climate Change, Physical and Social Impacts of Climate Change, Climate Change Adaptation strategies, Implications of the introduction of new technologies for Adaptation and Sustainability, Current international efforts to address climate change.

CHP3842	MEDICINAL CHEMISTRY II
NQF Level	8
NQF Credits	8
Contact Hours	2 lecture periods per week for one semester; 1 practical session per week for 7 weeks
Continuous Assesment	**(**minimum of three tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite:	CHM3811 (**co-requisite**), CHP3741 (**prerequisite**), CHP3721 **prerequisite)**

Course Descriptor: Disease targeting, Assay Systems and Models (e.g., Knock-out Mice); molecular modelling; stereoselective synthesis; structural analysis of drugs; combinatorial synthesis; physico-chemical aspects and principals of drug action; anti-infective agents; anti-viral agents; antibacterial agents; cardiovascular agents; case studies: drug and drug targets in the pathogenesis of selected infectious diseases (malaria, HIV/AIDS, tuberculosis) and non-infectious diseases (cancer).

CHB3862	INDUSTRIAL PHARMACEUTICAL BIOTECHNOLOGY
NQF Level	8
NQF Credits	8
Contact Hours:	2 lecture periods per week for one semester and 1 practical session per week for 7 weeks
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHP3721 **(**Drug discovery and development), CHB3722 (Transmission of Genetic Information)

Course Descriptor: Biotechnology and Medicine: Diagnostics, Therapeutics, Gene Therapy, Implantates, Medical Devices, Technology, Complex Traits; **Molecular Pharma-Biotechnology,** Bioinformatics, Biological Systems and Models, Assay Systems, High-throughput Screening, Automation, Combinatorial Synthesis: Chemistry, Biology, and Biotechnology, Genotyping: Genetic Pre-Disposition, and Heterogeneity, Sequencing, Pharmaco-Genomics **Pharmaceutical Production:** GenePharming (Animals and Plants); Vitamins , Amino Acids, Proteins, Antibiotics, Biocatalysis, Natural Compounds, Recovery/(Bio-) Processing, Chemical–Biotechnological Syntheses, Gene Therapy Vectors/Systems, Production: Safety, Efficacy, Consistency, and Specificity, Registration; **Environment:** Pharmaceuticals and the Environment; Biological Containment; Physical/Chemical Containment, Process-Integrated Environmental Protection, Waste/Effluent Treatment and Recycling

CHN3842	HEALTH AND NUTRITIONAL BIOCHEMISTRY
NQF Level	8
NQF Credits	8
Contact Hours:	2 lecture periods per week for one semester and 1 practical session per week for 7 weeks
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	Bioenergics and Metabolism (CHB3731), Medicinal Chemistry (CHP3741)

Course Descriptor: The following topics are covered: Digestion and Absorption: digestive tract, secretion of digestive materials, stimulation of digestive system, molecules important to digestion and absorption, digestion of biomolecules. **Nutrients that resist** or **escape digestion**: resistance of proteins to digestion, carbohydrates that escape digestion, dietary fibers, microorganisms and digestion, malabsorption syndromes. **Obesity**: types of fat, techniques for measuring fat, signaling pathways for regulating adipocyte formation and genetic factors in obesity. **Diet and Cancer**: cancer of the large bowel, genetic changes that result in cancer, RAS and MAP kinase signaling pathway, mutations in the RAS gene and cancer, Cadherin proteins and Epidemiology of diet and colon cancer, Vitamins and inorganic nutrients.

CHM3822	NATURAL PRODUCT CHEMISTRY II
NQF Level	8
NQF Credits	8
Continuous Assessment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHM3752 (Organic Chemistry II); **Co-requisite:** CHM3801 (Instrumental Analysis II)
Contact Hours	2 lecture periods per week for one semester; 1 practical session per week for 7 weeks

Course Description: This is the continuation of natural products chemistry I. In this course, the student will be provided with sound knowledge on principles and techniques involved in the extraction and isolation of chemical constituents from natural sources and

how to determine their structures. **Topics include:** classification of alkaloids; alkaloids derived from ornithine, lysine, tyrosine, and tryptophan; pseudoalkaloids; metabolites of mixed biosynthetic origin: metabolites derived from acetate and mevalonate; metabolites derived from shikimate and mevalonate; metabolites derived from acetate and shikimate; and metabolites derived from tryptophan and mevalonate. Extraction and purification of natural products: Phytochemical screening for different classes/groups of natural products. Bioassay-directed isolation of natural products. Determine the chemical structure of isolated compounds by applying IR, UV, one- and two-dimensional NMR and mass spectroscopy techniques.

CHB3842	**BIOTECHNOLOGY, MICRO AND NANOTECHNOLOGY**
NQF Level	8
NQF Credits	8
Contact Hours:	2 lecture periods per week for one semester and 1 practical session per week for 7 weeks.
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final:** 50% CA mark and **50%** Examination mark.
Prerequisite	Transmission of Genetic information (CHB3722)

Course Descriptor: Introduction to "omics"; **Genomics**: techniques-genomic libraries and analysis, southern blots, applications. **Proteomics:** definitions, concepts of protein expression and analysis, Techniques-SDS PAGE gels, Western blots, applications. **Transcriptomics:** definitions, Techniques- cDNA libraries and analysis, Northern blots, applications. **Metabolomics:** Techniques-metabolic pathways and analysis. **Cytomics**: Biochemical processes at the cellular; **Agricultural Biotechnology:** Technology Studies: Pesticide producing crops; Herbicide-tolerant transgenic crops; Insect-resistance transgenic crops. **Micro- and Nanotechnologies for Medicine**: Scope, principles and techniques of nanotechnology; preparation of nano particles and their properties, application of nanotechnology in biotechnology: Oligonucleotide microarray, 'lab-on-a-chip' nanocomposites; Cellular Cloning; Tissue Engineering (Organ Cultivation); Food **Biotechnology:** Enzyme application in food and feed; probiotics - prebiotics and nutraceuticals.

CHM3802	**INORGANIC CHEMISTRY III**
NQF Level	8
Contact Hours:	2 lecture periods per week for one semester and 1 practical session per week for 7 weeks
NQF Credits	8
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHM3751 (Inorganic Chemistry II), CHM3752 (Organic Chemistry II)

Course Descriptor: Organometallic chemistry: organometallic compounds of d block elements with emphasis to iron complexes; Physical and chemical properties of organometallic compounds; Reactivity of coordinated cyclopentadienyl and cyclobutane ligands. Transition metal carbonyls: metal clusters, bonding and synthesis; Catalysis involving organometallic compounds.

CHM3812	**INDUSTRIAL CHEMISTRY II**
NQF Level	8
Contact Hours	4 lecture periods per week for one semester and 1 practical session per week for one semester
NQF Credits	16
Continuous Assesment	**(**minimum of three tests which counts 80% and laboratory component 20%).
Examination:	1x3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHM3712 (Physical Chemistry II); CHM3761 (Industrial Chemistry I)

Course Descriptor: Petroleum industry: technologies and equipments of producing petrochemicals including ethylene, propylene, aromatics. **Fluid mechanics:** fluid statics and its applications; fluid-flow phenomena; Basic equations of fluid flow; Flow of incompressible fluids in conduits and thin layers; Flow past immersed bodies; transportation of fluid. **Heat transfer and its applications:** heat transfer by conduction in solids; principles of heat flow in fluids; heat transfer to fluids without phase change; heat transfer to fluids with phase change; radiation heat transfer; heat-exchange equipment and its applications. **Mass transfer and its applications:** equilibrium-stage operations; distillation: flash distillation, continuous distillation, operating lines, design and operating characteristics of plate columns, enthalpy balances for fractionating columns.

CHC3832	**CHEMICAL XENOBIOTICS & TOXICOLOGY**
NQF Level	8
NQF Credits	16
Contact Hours	4 lectureperiods per week; 1 practical session per week forone semester
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHP3701 (Water Analysis), CHP3711 (Environmental Chemistry I)

Course Descriptor: this module is designed to study the interactions between environmental contaminants and living organisms. It looks at the behavior of xenobiotics into living organisms particularly the biotransformation reactions and reactive species formation and it also looks at the effects that chemical xenobiotics can cause on biological processes.
Content: Chemical Xenobiotics: Classification and behavious. Bioaccumulation and biomagnification of xenobiotics. Behavior of xenobiotics into living organisms: absorption, distribution, biotransformation, toxic effects and elimination. The fate and impact of synthetic and natural molecules in the environment. Important pollutants will be used as case studies to illustrate the principles. Principles of toxicology; chemical and biochemical mechanism; pesticide toxicity. Analysis of specific health and environmental impact of hazardous waste.

CHC3822	**PETROLEUM CHEMISTRY**
NQF Level	8
NQF Credits	8
Contact Hours	2 lectureperiods per week; 1 practical session per week for 7 weeks.
Continuous Assesment	**(**minimum of two tests which counts 80% and laboratory component 20%).
Examination:	1x2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHM3752 (Organic ChemistryII), CHM3761 (Industrial Chemistry I), CHM3712 (Physical Chemistry II)

Course Descriptor: Introduction: native materials and classification, properties and fractional composition. **Petroleum analysis**: structure of petroleum; physical, thermal, electrical, optical, spectroscopic, chromatographic and molecular methods. **Refining processes**: dewatering and desalting, thermal methods, catalytic methods, reforming, isomerization, alkylation and polymerization processes. **Cracking processes**: thermal cracking, catalytic cracking, hydrocracking. **Distillation**: equipment and calculation. **Product improvement**: deasphalting and dewaxing, hydrotreatign and desulfurization, reforming and isomerization, petrochemical. **Applications of Nano technology in Petroleum industry.**

CHM3880	RESEARCH METHODOLOGY & PROJECT
NQF Level	8
Contact Hours:	2 consultation periods per week for one semester
NQF Credits	38
Continuous Assessment	1 Oral presentation counts 30%, Consultation & efforts counts 20%, 1 Project report counts 50% **Final: 100%** CA
Prerequisite	Pass in all level 7 modules

Course Descriptor: An independent project carried out in small groups, under the supervision of a member of staff. Topics will be given to students before the end of the first semester. The work will extend over the term and as a guide, should occupy the equivalent of one whole day per week. The practical work must be completed by six weeks before the session ends and must be submitted by two weeks before the session end. The completed report is expected to be between 25-35 pages long and will be examined by the supervisor and one external examiner and will be defended by an oral exam. There shall be a short, block-course based, where the essentials of Research Methodology will be taught.

CHM 3532	CHEMISTRY FOR LIFE SCIENCES
NQF Level	5
NQF Credits	16
Contact Hours	4 lecture periods per week; 1 practical session per week for one semester.
Continuous Assesment	(minimum of 3 tests which counts 75% and laboratory component 15%).
Examination:	1 x 3hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	Faculty Entry Requirements

Course Descriptor: This course is designed for students that have insufficient background in chemistry and for non-chemistry majors .It is an introduction to topics in general and organic chemistry, and biochemistry. The following will be covered:
Classification of Matter: Mixtures and Pure substances; Physical States of Matter; Physical and Chemical Properties. Extensive and Intensive properties. Measurements: Units, Significant figures; Precision and Accuracy, Factor Label Method. Atomic structure and the Periodic table; Electron configuration; Physical and Chemical properties as predicted from groups. Ionic compounds and Molecular compounds: Writing chemical formulae and naming of ionic and molecular compounds. Average Atomic Mass. The Mole Concept; Percent Composition, Empirical formula and Molecular formula. Stoichiometry: limiting reagent, percent yield. Solutions: electrolytes and nonelectrolytes, aqueous solutions, ionic equations; concentrations: percent concentration; molarity, molality; dilution of solutions; structure and solubility. Types of bonds; Lewis structures; Resonance structures; Molecular geometry: the VSEPR model, Polarity of molecules. Acid-base equilibrium: properties of acids and bases; relations of acids and bases, self ionisation of water; strengths of acids
and bases; the pH scale; hydrolysis of salts; buffers; acid-base titration. Introduction to organic chemistry: organic compounds; structural formulae and conformations; functional groups; Classes of hydrocarbons: alkanes, cycloalkanes: alkanes; alkenes and alkynes; oxidation and reduction; addition reactions; stereo-isomerism. Alcohols, phenols, thiols, ethers: organic compounds of oxygen; common alcohols and phenols. Carboxylic acids and esters, amines and amides: Introduction to carbohydrates, lipids and porphyrins.

CHE 3742	INORGANIC CHEMISTRY FOR EDUCATORS I
NQF Level	7
NQF Credits	16
Contact Hours	4 lecture periods per week; 1 practical session per week for one semester.
Continuous Assesment	(minimum of 2 tests which counts 80% and laboratory component 20%).
Examination:	1 x 2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	PHY 3511, PHY 3512, PHY 3651, MAT 3511, MAT 3512

Course Descriptor: This course covers the chemistry of transition metals. This means the student would have been equipped with adequate background from the chemistry of main group elements. With such a background the student will be in a position to follow the chemistry of transition metals. The following topics will be covered: The brief introduction to the chemistry of alkali and alkaline earth elements (groups 1 and 2); reactivity with hydrogen, oxygen, halogens, water, and liquid ammonia; Classification of oxides, and their reaction with water; Pblock elements (groups 13 to 18): Reactivity with oxygen and halogens; The hydrides of P block elements; Hydrolysis and ammonolysis of P-block halides. Delocalized multiple bonding. S-block elements. In-depth studies of chemical bonding (valence bond theory (VBT), shapes of molecules and hybridization, molecular orbital theory (MOT) in diatomic and polyatomic molecules) and Bonding-Application of VBT; CFT; LFT, MOT; Introduction to transition metal chemistry (d-block elements): transition metal complexes (constitution, nomenclature, isomerism, classification of ligands); Reaction Mechanisms and rate of reactions; Ligand substitution; Dissociative and Associative mechanisms; redox and photochemical reactions in transitional complexes; Molecular symmetry: symmetry elements; plane of symmetry; proper and improper axes; principal axis; point of inversion; classification of molecules into point groups. Introduction to organometallic chemistry of s-block elements (magnesium and lithium).

CHE 3862	INORGANIC CHEMISTRY FOR EDUCATORS II
NQF Level	8
NQF Credits	8
Contact Hours	2 lecture periods per week; 1 practical session per week for 7 weeks
Continuous Assesment	minimum of 2 tests which counts **80%** and laboratory component **20%.**
Examination:	1 x 2hr examination; **Final: 50%** CA mark and **50%** Examination mark.
Prerequisite	CHE 3742 (Inorganic Chemistry for Educators 1)

Course Descriptor: This course deals with the organometallic chemistry which is a hybrid discipline comprising the knowledge of

inorganic and organic chemistry. The following topics will be covered: Organometallic chemistry: organometallic compounds of d block elements with emphasis to iron complexes; Physical and chemical properties of organometallic compounds; Reactivity of coordinated cyclopentadienyl and cyclobutane ligands. Transition metal carbonyls: metal clusters, bonding and synthesis; Catalysis involving organometallic compounds. Chemistry of f-block elements; Nuclear Chemistry.

CHE3622 **ORGANIC CHEMISTRY FOR EDUCATORS**

NQF Level: 8
NQF Credits: 8
Continuous Assessment: 50% (minimum 2 tests, **80%**; laboratory component **20%**
Examination 50%: (1 x 2-hour paper)
Prerequisite: **CHM3511** (Chemistry 1A), **CHM3512** (Chemistry 1B)
Contact Hours: 2 lecture periods per week for 13 weeks, 1 practical session for 7 weeks

Course Description: This course is a survey of the chemistry of carbon compounds, their nomenclature, physical properties, structure and reactions with an introduction to reaction mechanisms and stereochemistry. The following topics will be covered: Alkanes and cycloalkanes: nomenclature, physical properties, bond rotation, conformations, ring strain, bicyclic and polycyclic alkanes, synthesis and reactions of alkanes; Alkenes and alkynes: physical properties and synthesis (Zaytsev's Rule), addition reactions: nucleophilic substitutions, elimination reactions; Radical reactions: free radicals, halogenation of alkanes, chain reactions; Stereochemistry: stereoisomers, enantiomers, chirality, diastereomers, meso compounds, optical activity. Alkyl halides: physical properties, synthesis, reactions; Alcohols and ethers: physical properties, synthesis, reactions

N.13. CHEMISTRY MODULE EQUIVALENTS

OLD MODULE		NEW/REVISED MODULE	
CHM3511	Chemistry IA	**CHM3511**	Chemistry IA
CHM3512	Chemistry IB	**CHM3512**	Chemistry IB
CHM3611	Inorganic Chemistry I	**CHM3611**	Inorganic Chemistry I
CHM3631	Physical Chemistry I	**CHM3631**	Physical Chemistry I
CHB3611	Biochemistry I	**CHB3612**	Biomolecules and Catalysis
CHM3602	Analytical Chemistry I	**CHM3602**	Analytical Chemistry I
CHM3612	Organic Chemistry I	**CHM3651**	Organic Chemistry I
CHB3612	Biochemistry II	**CHB3612**	Biochemistry II
CHM3701	Inorganic Chemistry II	**CHM3751**	Inorganic Chemistry II
CHM3711	Organic Chemistry II	**CHM3752**	Organic Chemistry II
CHM3721	Analytical Chemistry II	**CHM3721**	Analytical Chemistry II
CHM3761	Industrial Chemistry I	**CHM3761**	Industrial Chemistry I
CHM3702	Instrumental Analysis I	**CHM3702**	Instrumental Analysis I
CHM3712	Physical Chemistry II	**CHM3712**	Physical Chemistry II
CHB3701	Biochemistry III	**CHB3722**	Transmission of Genetic Information
CHM3722	Research Methodology	**CHM3722**	Research Methodology
CHM3811	Organic Chemistry III	**CHM3811**	Organic Chemistry III
CHM3831	Physical Chemistry III	**CHM3831**	Physical Chemistry III
CHM3801	Instrumental Analysis II	**CHM3801**	Instrumental Analysis II
CHM3812	Industrial Chemistry II	**CHM3812**	Industrial Chemistry II
CHB3822	Natural Product Chemistry II	**CHB3822**	Natural Product Chemistry II
CHB3821	Natural Product Chemistry I	**CHB3821**	Natural Product Chemistry I
CHM3802	Inorganic Chemistry III	**CHM3802**	Inorganic Chemistry III
CHM3810/CHB3810	Research Projects	**CHM3810/ CHB3810**	Research Projects
CHM3841	Physical Inorganic Chemistry		No equivalent
CHM3842	Advanced Topics in Chemistry		No equivalent
CHM3832	Molecular Spectroscopy	**CHM3832**	Molecular Spectroscopy
CHB3732	Medical Biochemistry	**CHB3732**	Medical Biochemistry
CHB3801	Nutritional Biochemistry	**CHB3801**	Nutritional Biochemistry
CHB3831	Bioinformatics for Biochemistry	**CHB3831**	Bioinformatics for Biochemistry
CHB3832	Professional Training in Biochemistry		NONE
CHB3812	Environmental Biochemistry	**CHB3812**	Environmental Biochemistry
CHB3852	Advanced Topics in Biochemistry		NONE

OLD CURRICULUM

Q. OLD CURRICULUM

Students registering for old curriculum programmes in 2023 should refer to 2023 Prospectus.
The School's 2023 Prospectus will phase out in 2025.

Q.1. OLD QUALIFICATIONS OFFERED BY THE SCHOOL UNDER OLD CURICCULUM

The School may award the following Undergraduate degrees:

Q.2. UNDERGRADUATE PROGRAMMES

Q.2.1 BIOCHEMISTRY, MICROBIOLOGY, & BIOTECHNOLOGY DEPARTMENT

CODE	DEGREE	MINIMUM DURATION
11BCAC	Bachelor of Science in Applied Biochemistry Honours Biomedical	4 years full-time
11BCAB	Bachelor of Science in Applied Biochemistry Honours Environmental	4 years full-time
11BMBL	Bachelor of Science in Microbiology Honours	4 years full-time
11BSAB	Bachelor of Science in Biochemistry Honours	1 year full-time
11BMBA	Bachelor of Science in Microbiology Honours	1 year full-time
POSTGRADUATE PROGRAMME		
11MSIB	Master of Science in Industrial Biochemistry	2 years full-time
11MMBL	Master of Science Microbiology	2 years full-time
11MASC	Master of Science (by Thesis only)	2 years full-time
11DPSC	Doctor of Philosophy	3 years full-time

Q.2.2 DEPARTMENT OF ENVIRONMENTAL SCIENCES CODE

CODE	DEGREE	MINIMUM DURATION
17HDNR	Diploma in Natural Resources Management	3 years full-time
11BMBL	Bachelor of Science in Environmental Biology (Honours)	4 years full-time
17BSIE	Bachelor of Science in Integrated Environmental Science (Honours)	4 years full-time
13BGIS	Bachelor of Science in Geo-Information Science (Honours)	4 years full-time
	(Specialization: Geography and Environmental Studies or Biology)	
11BEBA	Bachelor of Science in Environmental Biology (Honours) - (Articulation)	1 year full-time
POSTGRADUATE PROGRAMME		
11 MSCE	Master of Science in Biodiversity Management	2 years full-time
11MASC	Master of Science (by Thesis only)	2 years full-time
11DPSC	Doctor of Philosophy	3 years full-time

Q.2.3 COMPUTER, MATHEMATICAL & STATISTICAL SCIENCE

CODE	DEGREE	MINIMUM DURATION
11BSCM	Bachelor of Science in Mathematics Honours-Physics	4 years full-time
11BSMC	Bachelor of Science in Mathematics Honours-Computer Science	4 years full-time
11BSMS	Bachelor of Science in Mathematics Honours-Statistics	4 years full-time
11BFMA	Bachelor of Science in Financial Mathematics Honours	4 years full-time
22BSCO	Bachelor of Science in Computer Science Honours	4 years full-time
22BSIT	Bachelor of Science in Information Technology Honours	4 years full-time
11BSCS	Bachelor of Science in Statistics Honours	4 years full-time
11BSPO	Bachelor of Science in Population Studies Honours	4 years full-time
22DCMP	Diploma in Computer Science **(OSHAKATI CAMPUS)**	2 years full-time
11BSMA	Bachelor of Science in Mathematics Honours	1 year full-time
11BSSA	Bachelor of Science in Statistics Honours	1 year full-time
11BSAP	Bachelor of Science in Population Studies Honours	1 year full-time
22BSCT	Bachelor of Science in Computer Science Honours	1 year full-time
POSTGRADUATE PROGRAMME		
11MSCM	Master of Science Mathematics	2 years full-time
11MASC	Master of Science (by Thesis only)	2 years full-time
22MSCI	Master of Science Information Technology	2 years full-time
22MASC	Master of Science (by Thesis only)	2 years full-time
11MASC	Master of Science (by Thesis only)	2 years full-time
11MSSB	Master of Science Biostatistics	2 years full-time
11MSST	Master of Science Applied Statistics and Demography	2 years full-time
11DPSC	PhD in Applied Statistics	3 years full-time
11DPSC	Doctor of Philosophy (by Thesis only)	3 years full-time
11DPSC	PhD in Population Studies	3 years full-time
22DPSC	Doctor of Philosophy	3 years full-time

Q.2.4 GEO-SCIENCE DEPARTMENT – SOUTHERN CAMPUS (KEETMANSHOOP)

CODE	DEGREE	MINIMUM DURATION
11BSCG	Bachelor of Science in Geology Honours	4 years full-time
11BSGA	Bachelor of Science in Geology Honours	1 year full-time
11MSGL	Master of Science in Applied Geology	2 years full-time
11MSPG	Master of Science in Petroleum Geology	2 years full-time
11MASC	Master of Science (by Thesis only)	2 years full-time
11DPSC	Doctor of Philosophy	3 years full-time

Q.2.5 PHYSICS, CHEMISTRY & MATERIAL SCIENCE DEPARTMENT

CODE	DEGREE	MINIMUM DURATION
11BPHY	Bachelor of Science in Physics Honours A1: Mathematics slant	4 years full-time
11BPCO	Bachelor of Science in Physics Honours A2: Computer Science slant	4 years full-time
11BPCH	Bachelor of Science in Physics Honours C: Chemistry	4 years full-time
11BSCC	Bachelor of Science in Chemistry Honours Medicinal	4 years full-time
11BSEC	Bachelor of Science in Chemistry Honours Environmental	4 years full-time
11BSGC	Bachelor of Science in Chemistry Honours Geochemistry	4 years full-time
11BSAC	Bachelor of Science in Chemistry Honours	4 years full-time
11BSPA	Bachelor of Science in Physics Honours **(Articulation)**	1 year full-time
11BSAC	Bachelor of Science in Chemistry Honours **(Articulation)**	1 year full-time
11MSPH	Master of Science Physics	2 years full-time
11MSCC	Master of Science Chemistry	2 years full-time
11MSRM	Master of Science in Renewable Energy Materials	2 years full-time
11MSRP	Master of Science in Renewable Energy Photovoltaics	2 years full-time
11MSNU	Master of Science in Nuclear Science (not on offer in 2022)	2 years full-time
11MASC	Master of Science (by Thesis only) (only Chemistry)	2 years full-time
11DPSC	Doctor of Philosophy	3 years full-time

Q.2.6 DEPARTMENT OF WILDLIFE MANGENT AND TOURISM STUDIES - KATIMA MULILO CAMPUS

CODE	DEGREE	MINIMUM DURATION
17BSWM	Bachelor of Science in Wildlife Management & Ecotourism (Hons)	4 years full-time
13BATM	Bachelor of Arts in Tourism Management (Hons)	4 years full-time
13BTHS	Bachelor of Art in Tourism: Heritage Studies (Hons)	4 years full-time
11MSIB	Master of Science in Wildlife Management & Ecotourism	2 years full-time
11DPSC	Doctor of Philosophy	3 years -time

Q.2.7. OTHER OLD QUALIFICATION CODES

OLDCODE	MAJOR/MINOR	DEGREE	MINIMUM DURATION
11BEGL	Environmental Biology / Geology	Bachelor of Science Honours	4 years full-time
11BEGH	Environmental Biology Geography	Bachelor of Science Honours	4 years full-time
11BMIC	Micro Biology/ Chemistry	Bachelor of Science Honours	4 years full-time
11BMIB	Micro Biology/ Biochemistry	Bachelor of Science Honours	4yearsfull-time
11BMOC	Molecular Biology/Chemistry	Bachelor of Science Honours	4 years full-time
11BMOB	Molecular Biology/Biochemistry	Bachelor of Science Honours	4 years full-time
11BCHP	Chemistry/Physics	Bachelor of Science Honours	4 years full-time
11BCHB	Chemistry/Biology	Bachelor of Science Honours	4 years full-time
11BCHG	Chemistry/Geology	Bachelor of Science Honours	4 years full-time
11BCBB	Biochemistry/ Biology	Bachelor of Science Honours	4 years full-time
11BCBC	Biochemisty/ Chemistry	Bachelor of Science Honours	4 years full-time
11BCMI	Computer Science/Information Technology	Bachelor of Science Honours	4 years full-time
11BCMM	Computer Science/Mathematics	Bachelor of Science Honours	4 years full-time
11BCMS	Computer Science/Statistics	Bachelor of Science Honours	4 years full-time
11BGLY	Geology	Bachelor of Science Honours	4 years full-time
11BMAS	Mathematics/Statistics	Bachelor of Science Honours	4 years full-time
11BMAC	Mathematics/Computer Science	Bachelor of Science Honours	4 years full-time
11BMAP	Mathematics/Physics	Bachelor of Science Honours	4 years full-time
11BPHM	Physics/Mathematics	Bachelor of Science Honours	4 years full-time
11BPHG	Physics/ Geology	Bachelor of Science Honours	4 years full-time
11BPHC	Physics/ Computer Science	Bachelor of Science Honours	4 years full-time
11BPHH	Physics/ Chemistry	Bachelor of Science Honours	4 years full-time
11BSTC	Statistics/Computer Science	Bachelor of Science Honours	4 years full-time
11BSTP	Statistics/ Population Studies	Bachelor of Science Honours	4 years full-time
11BSTM	Statistics/Mathematics	Bachelor of Science Honours	4 years full-time
11BSTE	Statistics/ Economics	Bachelor of Science Honours	4 years full-time
11BPGE	Population Studies/Geography	Bachelor of Science Honours	4 years full-time
11BPST	Population Studies/Statistics	Bachelor of Science Honours	4 years full-time
11BPSO	Population Studies/Sociology	Bachelor of Science Honours	4 years full-time
11BSCI		Bachelor of Science	4 years full-time

R. PART-TIME COURSE/DISTANCE EDUCATION

The School of Science does not offer a part-time curriculum. Some courses may be offered in the evening due to the time - table division. Prospective students should contact the Faculty Officer/Head of Department for further information. Part-time studies see Faculty Prospectus: Centre for External studies.

S. GENERAL INFORMATION

All general information as well as the general examination dates and the dates for registration appear in the General Information and Regulations Prospectus.

T. DEPARTMENT OF BIOLOGICAL SCIENCES

T.1. DEPARTMENTAL REGULATIONS

T.1.1. ADMISSION REQUIREMENTS

To register for the **B.Sc Environmental Biology Honours** or **B.Sc Microbiology Honours degree** programmes a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (Ordinary or Higher) or a recognized equivalent qualification.
English is a compulsory subject and should have been obtained as a **second language** at NSSC (O level) with a **minimum C symbol** or **English** as a **first language** at NSSC (O level) with a **minimum D symbol**.
In addition to the above, admission to the **Bachelor of Science Honours**course requires at least a **symbol C** on NSSC or equivalent qualification in **Mathematics**; at least a **symbol C** on NSSC or equivalent qualification in **Biology** and at least a **symbol C** on NSSC or equivalent qualification in **Physical Sciences**.

A candidate should obtain a minimum of **25 points** on the **UNAM evaluation point scale** in his/her **five best subjects** (of which the above mentioned subjects must be included) to be admitted to undergraduate studies. **Obtaining the minimum number of points however, does not necessarily ensure admission**. **Admission is based on places available in courses, subjects and programs and is awarded on the basis of merit.**

Admission can also be considered for candidates who qualify through the **Mature Age Entry Scheme** upon successful completion of the relevant examinations as set out in the general regulations.

T.1.2. RE-ADMISSION REGULATIONS

To be re-admitted to the Faculty of Science for a particular year of registration, a student must have passed the minimum number of courses required as indicated below:

- ★ **4** courses (equivalent to **64** credits) by the end of the **first year**; 2 of these courses (equivalent to **32** credits) must be non-core
- ★ **8** courses (equivalent to **128** credits) by the end of the **second year**
- ★ **15** courses (equivalent to **240** credits) by the end of the **third year**
- ★ **23** courses (equivalent to **368** credits) by the end of the **fourth year**

A student will not be **re-admitted** into the Faculty if he/she has not passed the above courses.

T.1.3. PASS REQUIREMENTS

T.1.3.1. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least **two thirds** of the courses of the curriculum for a specific year have been passed. If a student passed only **one third** of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases **prerequisites** for courses have to be passed before a student can proceed to register for courses that require prerequisites.

1. From Year **1** to Year **2**
   At least **7** courses (equivalent to **112** credits) prescribed for Year **1**
2. From Year **2** to Year **3**
   All **first year** courses plus at least **6** courses (equivalent to **96** credits) prescribed for Year **2**
3. From Year **3** to Year **4**
   All **second year** courses plus at least **5** courses (equivalent to **80** credits) prescribed for Year **3**

T.1.3.2. MAXIMUM NUMBER OF COURSES PER YEAR

No student will be allowed to register for more than **12** courses per year

T.1.4. COMPULSORY REQUIREMENTS

Lab coats are **compulsory** for practical sessions for all students.
Students pursuing **B.Sc. Honours in Environmental Biology** must DO and PASS the course **Field Ecology (SEBF3800)**. Failure to take part in these field-based courses will disqualify students from sitting the theory examination of the specific **co-requisite** courses.

T.1.5. WEIGHTING OF CA AND EXAM MARKS

- Unless otherwise indicated, the relationship between the **CA** mark and the Examination mark is **40:60.**

T.1.6. BACHELOR OF SCIENCE IN ENVIRONMENTAL BIOLOGY HONOURS – 11BEBL

YEAR 1

CODE	COURSE	NQF	PRE-REQUISITES	CREDITS	CO-REQUISITES
Year 1 Semester 1					
CSI3580	Contemporary Social Issues	**5**		8	None
MAT3511	Basic Mathematics	**5**		16	None
CLC3509	Computer Literacy	**5**		8	None
LCE3419	English Communication & Study Skills	**5**		16	None
BLG3511	Introduction to Biology	**5**		16	None
GLY3521	Introduction to Physical Geology	**5**		8	None
PHY3501	Physics for Life Sciences	**5**		8	None
Year 1 Semester 2					
MAT3512	Pre-Calculus	**5**		16	None
LEA3519	English for Academic Purposes	**5**		16	None
STS3522	Introduction to Statistics	**5**		8	None
CHM3532	Chemistry for Life Sciences	**5**		16	None
BLG3512	Diversity of Life	**5**		16	None
GLY3502	Introduction to Earth Systems	**5**		8	None
Total Credits				**160**	

YEAR 2

CODE	COURSE	NQF	PRE-REQUISITES	CREDITS	CO-REQUISITES
Year 2 Semester 1					
BLG3611	Animal Form and Function	**6**	BLG3511, BLG3512	16	None
MBL3631	Cell Molecular Biology and Genetics	**6**	BLG3511& BLG3512,	16	None
BLG3621	Biometrics I	**6**	STS3522	8	BLG3622
EBL3631	Introduction to Ecology	**6**	BLG3511& BLG3512	16	None
GLY3621	Introduction to Hydrology	**6**	MAT3512 &GLY3521	8	None
Year 2 Semester 2					
BLG3612	Plant Form and Function	**6**	BLG3511& BLG3512	16	None
MBL3632	Introduction to Microbiology	**6**	BLG3511& BLG3512	16	None
BLG3622	Biometrics II	**6**	STS3522	8	BLG3621
EBL3632	Ecological Field Techniques	**6**	BLG3511& BLG3512	16	None
GHE3682	Social Geography	**6**	None	8	None
Total Credits				**128**	

Year 3

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
Year 3 Semester 1					
BLG3701	Microbial Ecology	**7**	MBL3632, MBL3631	8	None
EBL3751	Aquatic Ecology	**7**	EBL3631	16	None
EBL3721	Biosystematics I	**7**	BLG 3611, BLG3612	8	None
EBL3771	Conservation Biology and Biodiversity	**7**	EBL3631	16	None
EBL3741	Ecological systems and climate change	**7**	EBL3631	8	None
GIS3711	Geographic Analysis and Techniques	**7**	GHE3682	16	None
Year 3 Semester 2					
EBL3712	Ecosystem Ecology	**7**	EBL3631	16	None
EBL3752	Ecophysiology	**7**	BLG 3611& BLG3612	16	None
EBL3722	Biosystematics II	**7**	BLG 3611, BLG3612	8	None
BLG3702	Research Methodology	**7**	BLG3621&BLG3622	8	None
GIS3732	Geographic Information Systems	**7**	GIS3711	16	None
Total Credits				**136**	

YEAR 4

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
Year 4 Semester 1					
BLG3810	Research Project	**8**	BLG3702	32	None
EBF3800	Field Ecology	**8**	EBL3771, EBL3751 EBL3712 & EBL3752	16	EBL3871,EBL3812 EBL3851,EBL3841, EBL3852
EBL3841	Integrated Natural Resources Management I	**8**	EBL3712& EBL3771	8	EBL3871
EBL3871	Population Ecology	**8**	EBL3771& EBL3712	16	None
EBL3851	Biogeography	**8**	EBL3712	16	None
Year 4 Semester 2					
EBL3852	Integrated Natural Resources Management II	**8**	EBL3712& EBL3771	16	EBL3841
EBL3802	Disturbance & Restoration Ecology	**8**	EBL3712& EBL3771	8	None
EBL3812	Behavioural Ecology	**8**	EBL3712 or EBE3772	16	None
EBL3822	Entomology	**8**	EBL3722	8	None
Total Credits				**136**	

T.1.7. BACHELOR OF SCIENCE IN MICROBIOLOGY HONOURS – 11BMBL

YEAR 1

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
YEAR 1 SEMESTER 1					
CSI3580	Contemporary Social Issues	**5**		8	None
MAT3511	Basic Mathematics	**5**		16	None
CLC3509	Computer Literacy	**5**		8	None
LCE3419	English Communication & Study Skills	**5**		16	None
BLG3511	Introduction to Biology	**5**		16	None
CHM3511	Chemistry 1A	**5**		16	None
PHY3501	Physics for Life Sciences	**5**		8	None
YEAR 1 SEMESTER 2					
MAT3512	Pre-Calculus	**5**		16	None
LEA3519	English for Academic Purposes	**5**		16	None
STS3522	Introduction to Statistics	**5**		8	None
CHM3512	Chemistry 1 B	**5**		16	CHM3511
BLG3512	Diversity of Life	**5**		16	None
Total Credits				**160**	

YEAR 2

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
YEAR 2 SEMESTER 1					
BLG3611	Animal Form and Function	**6**	BLG3512, BLG3511	16	None
MBL3631	Cell Molecular Biology and Genetics	**6**	BLG3511&BLG3512,	16	None
BLG3621	Biometrics I	**6**	STS3522	8	BLG3622
MBL3611	Microbial Systematics	**6**	BLG3512	16	MBL3632
CHM3651	Organic Chemistry I	**6**	CHM3511&CHM3512	16	None
YEAR 2 SEMESTER 1					
BLG3612	Plant Form and Function	**6**	BLG3511&BLG3512	16	None
MBL3632	Introduction to Microbiology	**6**	BLG3511&BLG3512	16	MBL3611
BLG3622	Biometrics II	**6**	STS3522	8	BLG3621
CHB3632	Biomolecules and Catalysis	**6**	CHM3511& CHM3512	16	CHM3651
Total Credits				**128**	

YEAR 3

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
YEAR 3 SEMESTER 1					
BLG3701	Microbial Ecology	**7**	MBL3632, MBL3611	8	None
MBL3771	Physiology	**7**	BLG 3611, BLG3612	16	None
MBG3711	Microbial Genetics	**7**	MBL3632, MBL3631	16	None
CHB3731	Bioenergetics and Metabolism	**7**	CHB3632	16	None
MBL3701	Recombinant DNA Technology	**7**	MBL3631& MBL3632	8	None
YEAR 3 SEMESTER 1					
MBL3712	Biotechnology	**7**	MBL3631	16	MBL3701,MBG3711
MBL3732	Genetics	**7**	MBL3631& MBL3632	16	MBG3711
CHM3752	Organic Chemistry II	**7**	CHM3651	16	None
BLG3702	Research Methodology	**7**	BLG3621& BLG3622	8	None
CHB3722	Transmission of Genetic Information	**7**		8	None
Total Credits				**128**	

YEAR 4

CODE	COURSE	NQF	PRE-REQUISITES	CREDIT	CO-REQUISITES
YEAR 4 SEMESTER 1					
BLG3810	Research Project	**8**	BLG3702	32	None
MIC3831	Environmental & Industrial Microbiology	**8**	MBL3701	16	None
MIC3811	Mycology	**8**	MBG3711	16	MIC3842,MIC3852,
MBL3801	Bioinformatics	**8**	MBL3732	8	None
YEAR 4SEMESTER 1					
MIC3800	Internship	**8**	BLG3702	8	None
MBL3812	Immunology	**8**	MBG3711	16	MIC3842,
MIC3842	Virology	**8**	MBG3711	8	MIC3811,
MIC3862 **or** MOL3822	Medical Bacteriology **or** Applied Genetics	**8**	MBG3711MBG3711, MBL3701, MBL3712, MBL3732	8	MIC3811 **or** MIC 3811
MIC3852 **or** MIC3872	Parasitology **or** Developmental Biology	**8**	MBG3711, MBL3732 **or** MBE3771, MBL3771	16	MIC3811, MIC3862 **or** None
Total Credits				**128**	

U. DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

U.1. DEPARTMENTAL REGULATIONS

U.1.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of this qualification is to provide students with an all-round view between the disciplines of Chemistry, Biochemistry and other applied fields. Holders of this qualification will be able to operate at the interface of geochemistry, chemistry and biochemistry with medical or environmental applications.

The biochemistry component is designed to provide students with the knowledge on the structure, composition, chemical components and processes of living systems including plants, insects, viruses, microorganisms, and mammals to explain how and why chemical reactions occur. Topics include how living things obtain energy from food, the chemical basis of heredity, industrial application of biochemistry, drug design and development, biotechnology, micro-and nanotechnology and what fundamental changes occur in disease state. Students will get an opportunity to apply biochemistry knowledge in fields such as medicine, food science, pharmacology, physiology, microbiology, and clinical chemistry. Enzymes kinetics and mechanisms are covered in detail. Metabolic pathways are examined from thermodynamic and regulatory perspectives.

The chemistry component is designed in such a way that holders of these qualifications will be able to operate at the interface of geochemistry, medical chemistry and environmental chemistry. This will immensely contribute towards the local knowledge base necessary for industrialization of Namibia. Graduates of these qualifications can look forward to successful careers as entrepreneurs or take employment in the education, public or private sectors especially in fields like Mmining, Medicine, Analytical Laboraroties, etc. where a balanced Chemistry knowledge is important.

The department seeks to facilitate students' progression towards fulfilling and exciting careers in academia, industry, and/or government and also to develop their skills as future leaders in science and the society. Successful candidates can be successful entrepreneurs or take up employment in the education, public or private sectors, especially in fields like Mining, Industrial Manufacturing, Forensics, Medicine, etc where a balanced Chemistry/Biochemistry knowledge is important.

U.1.2. ADMISSION REQUIREMENTS

To register for Bachelor of Science in Chemistry Honours or Bachelor of Science in Biochemistry Honours degree programme a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (ordinary or higher) or a recognised equivalent qualification. English is a compulsory subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum **C symbol** or English as a First Language at NSSC (O level) with a minimum D symbol. In addition at least a **C symbol** on NSSC or equivalent qualification in **Mathematics and Physical Science (Chemistry and Physics)** is required. A candidate should obtain a minimum of 25 points on the UNAM Evaluation Point Scale in his/her five (5) best subjects (of which **Mathematics, English, Physical Science (Chemisty and Physics) and Biology** must be included) to be admitted to undergraduate studies (Refer to the General Admission Criteria for Undergraduate Programmes in the General Information and Regulations Yearbook). Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on availability of places and is awarded on the basis of merit.
The Faculty reserves the right to subject candidates to additional selection procedures before admission. Admission can also be considered for persons who qualify through the **Mature Age Entry Scheme** upon successful completion of the relevant examinations as set out in the General Regulations (in the General Information and Regulations Yearbook). A special application form is available for this purpose. Such candidates may also be required to pass a Faculty entry test before admission is considered.

U.1.3. ASSESSMENT CRITERIA

All practical sessions are compulsory. Tutorial sessions are compulsory in the courses where they are offered. To qualify for the supplementary examination, the student needs a final mark of between **45 – 49%**, and a subminimum of **40%** examination mark. The final mark is composed of **50%** continuous assessment mark and **50%** examination mark. In their final year, all students are required to do a research project.

U.1.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

Minimum requirements for re-admission into the Faculty of Science
To be re-admitted to the Faculty of Science for a particular year of registration, a student must have passed the minimum number of courses required as indicated below:

- **64** credits of total **160** credits by the end of the first year (about 40%); 2 of these courses (equivalent to **32** credits) must be **non-core**
- **8** full courses (equivalent to **128** credits of **288** cumulative credits) by the end of the **second year** (about 45%)
- **15** full courses (equivalent to **240** credits of **424** cumulative credits) by the end of the **third year** (about 57%)
- **24** full courses (equivalent to **384** credits of **544** cumulative credits) by the end of the **fourth year** (about 69%)

U.1.5. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least 2/3 of the courses of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases, prerequisites for courses have to be passed before a student can proceed to register for courses.

- **From year 1 to year 2:** At least **7** full courses (equivalent to **112** credits of **160** credits at level **5**) prescribed for year **1**.
- **From year 2 to year 3:** All first year courses plus at least **5** full courses (equivalent to **80** credits of **128** credits at level **6**).
- **From year 3 to year 4:** All second year courses plus at least **5** full courses (equivalent to **80** credits of **128** credits at level **7**).

U.1.6. REQUIREMENTS FOR QUALIFICATION AWARD

To be awarded a Bachelor's degree Honours by the Faculty, a student must pass all the courses prescribed in the programme including the electives. The qualification will be awarded to students who have obtained a total number of **544** credits in this programme.

U.1.7. BACHELOR OF SCIENCE IN CHEMISTRY HONOURS MEDICINAL: 11BSCC

YEAR 1

COURSE CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 1 Semester 1					
CHM3511	Chemistry 1A		16		None
MAT3511	Basic Mathematics		16		None
LCE3419	English Communication and Study Skills		16		None
CLC3509	Computer Literacy		8		None
PHY3511	Physics for Physical Sciences I		16		None
BLG3511	Introduction to Biology		16		None
Year 1 Semester 2					
CHM3512	Chemistry 1B		16		CHM3511
MAT3512	Precalculus		16		None
LEA3519	English for Academic Purposes		16		None
CSI3580	Contemporary Social Issues		8		None
STS3522	Introduction to Statistics		8		None
BLG3512	Diversity of Life		16		None
Total Credits			**168**		

Year 2

COURSE CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 2 Semester 1					
CHM3611	Inorganic Chemistry I		16	CHM3511,CHM3512	None
CHM3631	Physical Chemistry I		16	CHM3511,CHM3512 MAT3511, MAT3512	None
CHM3651	Organic Chemistry I		16	CHM3511,CHM3512	None
MAT3611	Calculus I		16	MAT3512	None
Year 2 Semester 2					
PHY3512	Physics for Physical Sciences II		16		PHY3511
CHM3602	Analytical Chemistry I		8	CHM3511;CHM3512	None
CHB3632	Biomolecules and Catalysis		16	CHM3511;CHM3512;	CHM3651
MBL3632	Introduction to Microbiology		16	BLG3511; BLG3512	None
Total Credits			**120**		

YEAR 3

COURSE CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 3 Semester 1					
CHM3761	Industrial Chemistry I		8	CHM3611;CHM3651	None
CHM3751	Inorganic Chemistry II		16	CHM3611 MAT3512	None
CHM3721	Analytical Chemistry II		8	CHM3602	None
CHB3731	Bioenergetics and Metabolism		16	CHB3632	None
CHP3721	Drug Discovery and Development		8	CHM3651	None
CHP3741	Medicinal Chemistry I		8	CHM3651	CHP3721
CHB3741	Biochemical Analysis		8	CHB3632	None
MBG3711	Microbial Genetics		16	MBL3632	None
Year 3 Semester 2					
CHM3752	Organic Chemistry II		16	CHM3651	None
CHM3702	Instrumental Analysis I		8	CHM3602 CHM3651	None
CHM3712	Physical Chemistry II		16	CHM 3631,MAT3611	None
CHM3722	Research Methodology		8	Pass second year	None
CHB3722	Transmission of Genetic Information		8	CHB3632	None
CHB3742	Biosafety, Bioethics and Intellectual property Rights		8	None	CHB3731
Total Credits			**152**		

YEAR 4

COURSE CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 4 Semester 1					
CHM3801	Instrumental Analysis II		8	CHM3702	None
CHM3811	Organic Chemistry III		16	CHM3752	None
CHM3831	Physical Chemistry III		16	CHM3631; MAT3611	None
CHM3810	Research Project		32	Pass all third year modules	None
CHM3821	Natural Product Chemistry I		8	CHM3752,CHM3702	None
Year 4 Semester 2					
CHM3812	Industrial Chemistry II		16	CHM3712;CHM3761	None
CHM3802	Inorganic Chemistry III		8	CHM3751,CHM3752	None
CHM3822	Natural Product Chemistry II		8	CHM3752,	CHM3801
CHP3842	Medicinal Chemistry II		8	CHP3741, CHP3721	CHM3811
MIC3862	Medical Bacteriology		8	MBG3711	None
Total Credits			**128**		

U.1.8. BACHELOR OF SCIENCE IN CHEMISTRY HONOURS ENVIRONMENTAL CHEMISTRY APPLICATION: 11BSEC

Students opting for ENVIRONMETAL CHEMISTRY application must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 1 Semester 1					
CHM3511	Chemistry 1A	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
LCE3419	English Communication and Study Skills	**5**	16		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
BLG3511	Introduction to Biology	**5**	16		None
Year 1Semester 2					
CHM3512	Chemistry 1B	**5**	16		CHM3511
MAT3512	Precalculus	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS3522	Introduction to Statistics	**5**	8		None
BLG3512	Diversity of Life	**5**	16		None
Total Credits			**168**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 2 Semester 1					
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511,CHM3512	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511,CHM3512 MAT3511, MAT3512	None
CHM3651	Organic Chemistry I	**6**	16	CHM3511,CHM3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
CHP3621	Radiochemistry	**6**	8	CHM3511;CHM3512	None
Year 2 Semester 2					
PHY3512	Physics for Physical Sciences II	**6**	16		PHY3511
CHM3602	Analytical Chemistry I	**6**	8	CHM3511;CHM3512	None
GLY3502	Introduction to Earth Systems	**5**	8		None
MBL3632	Introduction to Microbiology	**6**	16	BLG3511;BLG3512	None
Total Credits			**120**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 3 Semester 1					
CHM3761	Industrial Chemistry I		8	CHM3611, CHM3651	None
CHM3751	Inorganic Chemistry II		16	CHM3611, MAT3512	None
CHM3721	Analytical Chemistry II		8	CHM3602	None
CHP3701	Water Analysis		8	CHM3602	None
CHP3711	Environmental Chemistry I		16	CHP3621	None
MBG3711	Microbial Genetics		16	MBL3632	None
Year 3 Semester 2					
CHM3752	Organic Chemistry II		16	CHM3651	None
CHM3702	Instrumental Analysis I		8	CHM3602, CHM3651	None
CHM3712	Physical Chemistry II		16	CHM3631, MAT3611	None
CHM3722	Research Methodology		8	Pass Second year	None
GLY3632	Crystallography & Mineral Chemistry		16	MAT3512 **&** CHM3512	None
Total Credits			**136**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 4 Semester 1					
CHM3801	Instrumental Analysis II		8	CHM3702	None
CHM3811	Organic Chemistry III		16	CHM3752	None
CHM3831	Physical Chemistry III		16	CHM3631; MAT3611	None
CHM3810	Research Project		32	Pass all 3rd year modules	None
Year 4 Semester 2					
CHP3811	Wastewater Treatment		16	CHP3701, CHP3711	None
CHM3812	Industrial Chemistry II		16	CHM3712 CHM3761	None
CHM3802	Inorganic Chemistry III		8	CHM3751, CHM3752	None
CHP3822	Environmental Chemistry II		8	CHP3711	None
Total Credits			**120**		

U.1.9. BACHELOR OF SCIENCE IN CHEMISTRY HONOURS GEOCHEMISTRY CHEMISTRY APPLICATION: 11BSGC

Students opting for a GEOCHEMISTRY application must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	Credits	PRE-REQUISITE	CO-REQUISITE
Year 1 Semester 1					
CHM3511	Chemistry 1A	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
LCE3419	English Communication & Study Skills	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
GLY3521	Intro. To Phys. Geol. & Surface Proc.	**5**	8		None
Year 1 Semester 2					
CHM3512	Chemistry 1B	**5**	16		CHM3511
MAT3512	Precalculus	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS3522	Introduction to Statistics	**5**	8		None
GLY3502	Intro. To Earth Systems	**5**	8		None
Total Credits			**152**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 2 Semester 1					
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511, CHM 3512	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511, CHM3512, MAT3511, MAT3512	None
CHM3651	Organic Chemistry I	**6**	16	CHM3511, CHM3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
GLY3600	Field Geology I	**6**	8	GLY3521	None
Year 2 Semester 2					
PHY3512	Physics for Physical Sciences II	**6**	16	**None**	PHY3511
CHM3602	Analytical Chemistry I	**6**	8	CHM3511; CHM3512	None
GLY3632	Crystallography & Mineral Chemistry	**6**	16	MAT3512/CHM3512	None
GLY3662	Introduction to Petrology	**6**	8	GLY3521	None
GLY3642	Introduction to Geochemistry	**6**	8	MAT3512;GLY3521 &CHM3512	None
Total Credits			**128**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 3 Semester 1					
CHM3761	Industrial Chemistry I	**7**	8	CHM3611;CHM3651	None
CHM3751	Inorganic Chemistry II	**7**	16	CHM3611 MAT3512	None
CHM3721	Analytical Chemistry II	**7**	8	CHM3602	None
GLC3700	Field Geology	**7**	8	GLY3521; GLY3662	None
GLY3761	Regional Geology of Namibia	**7**	8	GLY3521	None
GLY3711	Mineralogy	**7**	16	GLY3632;CHM3512;PHY3601	None
Year 3 Semester 1					
CHM3752	Organic Chemistry II	**7**	16	CHM3651	None
CHM3702	Instrumental Analysis I	**7**	8	CHM3602 CHM3651	None
CHM3712	Physical Chemistry II	**7**	16	CHM 3631,MAT3611	None
CHM3722	Research Methodology	**7**	8	Pass second year	None
GLY3782	Exploration Geochemistry & Geostatistics	**7**	8	GLY3642	None
GLC3712	Chemical Metallurgy	**7**	16	GLY3662 & GLY3611	None
Total Credits			**136**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
Year 1 Semester 1					
CHM3801	Instrumental Analysis II	**8**	8	CHM3702	None
CHM3811	Organic Chemistry III	**8**	16	CHM3752	None
CHM3831	Physical Chemistry III	**8**	16	CHM 3631;MAT3611	None
CHM3810	Research Project	**8**	32	**Pass all 3rd year modules**	None
Year 1 Semester 1					
GLC3821	Geochemical Analysis	**8**	8	GLY3662; GLC3700	None
GLY3801	Industrial Minerals and Gemstones	**8**	8	GLY3711	None
CHM3812	Industrial Chemistry II	**8**	16	CHM3712, CHM3761	None
CHM3802	Inorganic Chemistry III	**8**	8	CHM3751,CHM3752	None
CHC3822	Petroleum Chemistry	**8**	8	CHM3752,CHM3761 &CHM3712	None
Total Credits			**120**		

U.1.10. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS WITH BIOMEDICAL APPLICATION: 11BCAC

QUALIFICATION: BSC IN BIOCHEMISTRY HONOURS 11BCAC

Students opting for a BIOMEDICAL application must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHM3511	Chemistry 1A	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
LCE3419	English Communication and Study Skills	**5**	16		None
PHY3501	Physics for Life Sciences 1	**5**	8		None
CLC3509	Computer Literacy	**5**	8		None
BLG3511	Introduction to Biology	**5**	16		None
CHM3512	Chemistry 1B	**5**	16		CHM3511
MAT3512	Precalculus	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS3522	Introduction to Statistics	**5**	8		None
BLG3512	Diversity of Life	**5**	16		None
Total credits			**160**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511, CHM3512	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511, CHM3512 MAT3511, MAT3512	None
CHM3651	Organic Chemistry I	**6**	16	CHM3511, CHM3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
STS3621	Statistics for Life Sciences I	**6**	8	STS3522	None
CHB3632	Biomolecules and Catalysis	**6**	16	CHM3511 CHM3512	CHM3651
MBL3632	Introduction to microbiology	**6**	16	BLG3511 BLG3512	None
CHM3602	Analytical Chemistry I	**6**	8	CHM3511; CHM3512	None
Total credits			**112**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHB3731	Bioenergetics and Metabolism	**7**	16	CHB3632	None
CHB3741	Biochemical Analysis	**7**	8	CHB3632	None
CHM3721	Analytical Chemistry II	**7**	8	CHM3602	None
MBG3711	Microbial Genetics	**7**	16	MBL3632	None
CHP3721	Drug Discovery and Development	**7**	8	CHM3651	None
CHP3741	Medicinal Chemistry I	**7**	8	CHM3651;	CHP3721
CHB3722	Transmission of Genetic Information	**7**	8	CHB3632	None
CHM3752	Organic Chemistry II	**7**	16	CHM3651	None
CHM3702	Instrumental Analysis I	**7**	8	CHM3602,CHM3651	None
CHM3712	Physical Chemistry II	**7**	16	CHM 3631, MAT3611	None
CHM3722	Research Methodology	**7**	8	Pass second year	None
CHB3762	Innovation and Entrepreneurship	**7**	8	CHP3721, CHB3741	None
CHB3742	Biosafety, Bioethics & Intellectual property Rights (IPR)	**7**	8	None	CHB3731
Total credits			**136**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHB3831	Bioinformatics	**8**	16	CHB3711, MBL3631	None
CHM3801	Instrumental Analysis II	**8**	8	CHM3702	None
CHM3810	Research Project	**8**	32	**Pass all 3rd year modules**	None
CHM3821	Natural Product Chemistry I	**8**	8	CHM3752,CHM3702	None
CHM3811	Organic Chemistry III	**8**	16	CHM3752	None
CHC3821	Clinical Biochemistry	**8**	8	CHP3721,CHP3731,CHB3731	None
CHB3842	Biotechnology, Micro & Nanotechnology	**8**	8	CHB3722	None
CHB3862	Industrial Pharmaceutical Biotechnology	**8**	8	CHB3722, CHP3721	None
CHM3822	Natural Product Chemistry II	**8**	8	CHM3752	CHM3801
CHP3842	Medicinal Chemistry II	**8**	8	CHP3741, CHP3721	CHM3811
MIC3862	Medical Bacteriology	**8**	8	MBG3711	None
CHN3842	Health and Nutritional Biochemistry	**8**	8	CHB3731, CHP3741	None
Total credits			**136**		

U.1.11. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS WITH ENVIRONMENTAL APPLICATION: 11BCAB

QUALIFICATION: BSC IN BIOCHEMISTRY HONOURS 11BCAB

Students opting for an ENVIRONMENTAL application must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHM3511	Chemistry 1A	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
LCE3419	English Communication and Study Skills	**5**	16		None
PHY3501	Physics for Life Sciences 1	**5**	8		None
CLC3509	Computer Literacy	**5**	8		None
BLG3511	Introduction to Biology	**5**	16		None
CHM3512	Chemistry 1B	**5**	16		CHM3511
MAT3512	Precalculus	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS3522	Introduction to Statistics	**5**	8		None
BLG3512	Diversity of Life	**5**	16		None
Total credits			**160**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511, CHM 3512	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511, CHM3512 MAT3511, MAT3512	None
CHM3651	Organic Chemistry I	**6**	16	CHM3511, CHM3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
STS3621	Statistics for Life Sciences I	**6**	8	STS3522	None
CHP3621	Radiochemistry	**6**	8	CHM3511 CHM3512	None
CHB3632	Biomolecules and Catalysis	**6**	16	CHM3511 CHM3512	CHM3651
MBL3632	Introduction to Microbiology	**6**	16	BLG3511 BLG3512	None
CHM3602	Analytical Chemistry I	**6**	8	CHM3511; CHM3512	None
Total credits			**120**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHB3731	Bioenergetics and Metabolism	**7**	16	CHB3632	None
CHB3741	Biochemical Analysis	**7**	8	CHB3632	None
CHM3721	Analytical Chemistry II	**7**	8	CHM3602	None
MBG3711	Microbial Genetics	**7**	16	MBL3632	None
CHP3701	Water Analysis	**7**	8	CHM3602	None
CHP3711	Environmental Chemistry I	**7**	16	CHP3621	None
CHB3722	Transmission of Genetic Information	**7**	8	CHB3632	None
CHM3752	Organic Chemistry II	**7**	16	CHM3651	None
CHM3702	Instrumental Analysis I	**7**	8	CHM3602 CHM3651	None
CHM3712	Physical Chemistry II	**7**	16	CHM 3631, MAT3611	None
CHM3722	Research Methodology	**7**	8	Pass second year	None
CHB3762	Innovation and Entrepreneurship	**7**	8	CHP3721, CHB3741	None
Total credits			**136**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITE	CO-REQUISITE
CHB3831	Bioinformatics for Biochemistry	**8**	16	CHB3711, MBL3631	None
CHM3801	Instrumental Analysis II	**8**	8	CHM3702	None
CHM3810	Research Project	**8**	32	**Pass all 3rd year modules**	None
CHP3811	Wastewater Treatment	**8**	16	CHP3701, CHP3711	None
CHP3822	Environmental Chemistry II	**8**	8	CHP3711	None
CHB3842	Biotechnology, Micro &Nanotechnology	**8**	8	CHB3722	None
CHB3862	Industrial Pharmaceutical Biotechnology	**8**	8	CHB3722, CHP3721	None
CHC3832	Chemical Xenobiotics and Toxicology	**8**	16	CHP3711, CHP3701	None
Total credits			**112**		

V. SCHOOL OF COMPUTING

V.1. DIPLOMA IN COMPUTER SCIENCE (22DCMP)

V.1.1. REGULATION PERTAINING TO DIPLOMA STUDIES

V.1.1.1. ADMISSION REQUIREMENTS

To qualify for admission to the undergraduate Diploma at the University of Namibia, a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (ordinary or higher) or a recognized equivalent qualification, obtained in not more than two examination sittings with a minimum of **22 points** in five subjects on the UNAM Evaluation Scale. English is a compulsory subject and should have been obtained on a First or second Language Ordinary Level with **symbol D** or higher. **In addition to the University requirements, candidates wishing to register for a Diploma in Computer Science also need to have obtained a minimum of a D-symbol in NSSC Mathematics, or equivalent qualification.**Obtaining the minimum number of points, however, **does not necessarily ensure admission**. **Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit**. The Faculty reserves the right to subject the candidate to additional selection procedures.
Admission can also be considered for persons who qualify through the Mature Age Entry Scheme upon successful completion of the relevant examinations as set out in the General Information and Regulations Prospectus. A special application form is available for this purpose. Such candidates may also be required to pass a Faculty entry test before admission is granted.

V.1.1.2. DURATION OF STUDY

The Diploma in Computer Science cannot be completed in less than two (**2**) years. All students registering for this qualification must complete their studies within three (**3**) years of full-time study, unless special permission is granted for this period to be exceeded.

V.1.1.3. MODE OF DELIVERY

The Diploma in Computer Science is a **full-time** programme. The programme comprises of a total credit of **256** and it is at Namibian Qualification Framework (NQF) level 5. The year 1 courses are at NQF level 4 whereas the year 2 courses are at NQF level 5.

V.1.1.4. EXAMINATION REGULATIONS

A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of **40%** in a particular course. Examination will be administered at the end of each semester. For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees.

V.1.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION

To be re-admitted to the Diploma programme, a student must have passed the minimum number of courses required as indicated below:

- **3** courses (equivalent to **48** credits) by the end of the first year;
- **2** of these courses (equivalent to **32** credits) must be **non-core**.
- **8** full courses (equivalent of **128** credits) by the end of the second year

V.1.1.6. ADVANCEMENT AND PROGRESSION RULES

A student advances to the second academic year of study when at least **6 courses (96 credits**) of the curriculum for a first year have been passed.

F.1.1.7. MAXIMUM NUMBER OF COURSES PER YEAR

Students can register for all first year courses and thereafter, no more than 10 courses in any academic year.

V.1.1.8. ARTICULATION ROUTE

Successful completion of this diploma serves as an entry point to the Bachelor of Science in Information Technology Honours, Bachelor of Science in Information Systems Honours and for the Bachelor of Science in Computer Science Honours. Students who successfully complete the Diploma in Computer Science will be exempted from the following courses in the first year of study:

SUBJECT PASSED	COURSE TO BE EXEMPTED
CLC3509 Computer Literacy	CLC3509 Computer Literacy
CMP2571 Programming I	CMP3511 Programming Fundamentals I
CMP2572 Programming II	CMP3512 Programming Fundamentals II
CMP2552 Network Administration	CIT3521 Fundamentals of Information Technology I
LEG2410 English for General Communication	LCE3419 English Communication & Study Skills
CSI3580 Contemporary Social Issues	CSI3580 Contemporary Social Issues

V.1.1.9. QUALIFICATION: DIPLOMA IN COMPUTER SCIENCE (22DCMP)

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
LEG2410	English for General Communication	**4**	32		None
CLC3509	Computer Literacy	**4**	8		None
CMP2411	Introduction to Computer Systems	**4**	16		None
CMP2421	Principles of Information Systems	**4**	8		None
STD2431	Basics of Statistics	**4**	16		None
CSI3580	Contemporary Social Issues	**4**	8		None
MAT2432	Introduction to Mathematics	**4**	8		None
CMP2412	Programming Principles	**4**	16		CMP2421
CMP2432	Information Systems Management	**4**	16		CMP2421
Total Credits			**128**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
CMP2511	Fundamentals of Database Systems	**5**	16	CMP2411	None
CMP2531	Fundamentals of System Administration	**5**	16	CMP2411	None
CMP2551	Fundamentals of Computer Networks	**5**	16	CMP2411	None
CMP2571	Programming I	**5**	16	CMP2412	None
CMP2512	Database management	**5**	16	CMP2411	CMP2511
CMP2532	System Administration	**5**	16	CMP2411	CMP2531
CMP2552	Network Administration	**5**	16	CMP2411	CMP2551
CMP2572	Programming II	**5**	16	CMP2412	CMP2571
Total Credits			**128**		

F.2. DEGREE PROGRAMMES

F.2.1. REGULATION PERTAINING TO THE DEGREE PROGRAMMES

F.2.1.1. ADMISSION REQUIREMENTS

To register for an undergraduate degree programme in the Faculty of Science, a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (ordinary or higher) or a recognised equivalent qualification.

English is a **compulsory** subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum **C** symbol or English as a First Language at NSSC (O level) with a minimum **D** symbol. In addition to the above, admission to the Bachelor of Science in Statisitics or Population Studies Honours programme requires at least a symbol **C** on NSSC or equivalent qualification in **Mathematics**.
A candidate should obtain a minimum of **25** points on the UNAM Evaluation Point Scale in his/her five **(5)** best subjects (of which Mathematics and English must be included) to be admitted to this degree programme (Refer to the **General Admission Criteria for Undergraduate Programmes** in the **General Information and Regulations Yearbook**). Obtaining the minimum number of points, however, **does not necessarily ensure admission as it is based on places available in the programme and is awarded on the basis of merit.** Nevertheless, exemption rules for students who have completed a Diploma in Computer Science should apply.

Admission can also be considered for persons who qualify through the Mature Age Entry Scheme upon successful completion of the relevant examinations as set out in the **General Information and Regulations Prospectus**. Such candidates may also be required to pass a Departmental entry test before admission is granted.

In addition to the Faculty of Science entry requirements, students wishing to register for the degree programmes offered by the School of Computing will be expected to pass a School Entry Selection test. This test is an aptitude test and will in no way affect students that are coming from backgrounds without Computer Studies as a subject. The test is normally given before registration, to enable students who do not qualify to select other programmes.
Please read this section in conjunction with the academic conditions stipulated in the **General Information and Regulations Prospectus**.

F.2.1.2. DURATION OF STUDY

The Bachelor of Science in Computer Science Honours, Bachelor of Science in Information Systems Honours and the Bachelor of Science in Information Technology Honours degree programme cannot be completed in less than four (4) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

F.2.1.3. MODE OF DELIVERY

The Bachelor of Science in Information Technology Honours, Bachelor of Science in Information Systems Honours and the Bachelor of Science in Information Technology Honours programme is offered on a full-time mode. The mode of delivery consists of a combination of lectures, tutorials, lab practicals, research projects and industrial attachments. In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment marks. Attendance of practical and tutorial classes is compulsory for all courses that have these components.

F.2.1.4. ASSESSMENT CRITERIA

Unless otherwise indicated, the relationship between the CA mark and the Examination mark is **50:50**.All taught modules will be assessed using a combination of continuous assessment (50%) and an examination (50%) mark. Continuous assessment will consist of a subset of the following, depending on the module: class tests, assignments, presentations, practical/laboratory demonstrations and reports. All examinable modules will have an examination administered at the end of each semester. Only candidates who obtained the required minimum continuous assessment mark of 40% will be eligible to write the examinations.

F.2.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION

To be re-admitted to the Bachelor of Science in Computer Science / Information Systems / Information Technology Honours degree programme for a particular year of registration, a student must have passed the minimum number of courses as indicated below:

- 4 courses (equivalent to 64 credits) by the end of the first year; 2 of these courses (equivalent to 32 credits) must be non-core,
- 8 courses (equivalent to 144 credits) by the end of the second year,
- 15 courses (equivalent to 240 credits by the end of the third year, and
- 23 courses (equivalent to 368 credits) by the end of the fourth year

F.2.1.6. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least 2/3 of the courses of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases, prerequisites for courses have to be passed before a student can proceed to register for courses that require prerequisites.

- From **year 1 to 2:** At least **7** modules (equivalent to **112** credits) prescribed for year 1.
- From **year 2 to 3:** All first-year modules plus at least **5** modules (equivalent to **80** credits) prescribed for year 2.
- From **year 3 to 4:** All second-year modules plus at least **5** modules (equivalent to **80** credits) prescribed for year 3.

F.2.1.7. MAXIMUM NUMBER OF COURSES PER YEAR

Full-time students can register for all first year courses and thereafter, no more than **12** courses in any academic year.

F.2.1.8. ARTICULATION ROUTE

The Bachelor of Science in Computer Science Honours, Bachelor of Science in Information Systems Honours and the Bachelor of Science in Information Technology Honours qualifications serve as an entry point to the Master of Science in Information Technology, provided that a student graduates with a minimum of a lower second class (60-69% average).

F.3. BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY Honours, CURRICULUM AND PRE-REQUISITES

QUALIFICATION: Bachelor of Science in Information Technology Honours (22BSIT)

Students opting for a Bachelor of Science in Information Technology must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 1 Semester 1					
LCE3419	English Communication & Study Skills	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
CMP3511	Programming Fundamentals I	**5**	16		None
CIT3511	Introductions to Digital Electronics	**5**	16		None
CIT3521	Fundamentals of Information Technology I	**5**	8		None
Year 1 Semester 2					
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
CMP3512	Programming Fundamentals II	**5**	16		CMP3511
MAT3512	Pre-calculus	**5**	16		None
STS3522	Introduction to Statistics	**5**	8		None
CIT3512	Fundamentals of Information Technology II	**5**	16		CIT3521
Total Credits			**160**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
Year 2 Semester 1					
CMP3611	Introduction to Database Systems	**6**	16	CMP3512	
COS3611	Object Oriented Programming I	**6**	16	CMP3512	
CIT3631	Discreet Mathematics Concepts	**6**	16	MAT3512 & MAT3511	
CIT3611	Computer Networks I	**6**	16	CIT3511	
Year 2 Semester 2					
COS3632	Advanced Databases	**6**	16	CMP3511	CMP3611
COS3612	Object Oriented programming II	**6**	16	CMP3511& CMP3512	COS3611
CIT3632	Telecommunications	**6**	16	CIT 3521& CIT3511	CIT3631
CIT3612	Computer Networks II	**6**	16	CIT 3511	CIT3611
Total Credits			**128**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
Year 3 Semester 1					
CIT3711	Advanced Computer Networks	**7**	16	CIT3612 and CIT3632	
CMP3731	Software Engineering	**7**	16	CMP3512 COS3612	
CIT3731	Information Security	**7**	16	CIT3612 & CIT3611	
CIT3771	Systems Administration and Maintenance	**7**	16	CIT3512 and CIT3612	
Year 3 Semester 2					
CMP3712	Internet Technologies and Applications	**7**	16	CIT3632 & CIT3612	
COS3712	Human Computer Interaction	**7**	16	COS3612	CMP3731
CMP3752	Research Methodology	**7**	16	STS 3522 & COS3612	
CIT3732	Platform Technologies	**7**	16	CIT3632 &CIT3612	CIT3711
Total Credits			**128**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
CIT3810	Research Project	**8**	32	**Pass all 3rd Year Courses**	None
CMP3821	Network System Security	**8**	8	CIT3612&COS3731orCIT3711	None
CMP3841	Wireless and Mobile Computing	**8**	8	CIT3612&COS3731or CIT3711	None
CIT3811	IT Project Management	**8**	16	CMP3712& CMP3731	None
	Choose any ONE of the following TWO courses:				
CMP3851	Distributed Systems	**8**	16	CIT3612	None
COS3871	Artificial Intelligence	**8**	16	CMP3512, COS3612& CIT3631 OR CMP3711	None
CMP3832	Entrepreneurship & Management of IT Systems	**8**	16	COS3712	None
	Choose any TWO of the following courses:				
CMP3852	Expert Systems	**8**	16	CIT3631 & COS3712	COS3871
CMP3812	Real Time Multimedia	**8**	16	CMP3731,CIT3612	None
CIT3812	Cloud Computing	**8**	16	COS3632 & CIT3711	None
Total Credits			**128**		

F.4. BACHELOR OF SCIENCE IN COMPUTER SCIENCE Honours, CURRICULUM AND PREREQUISITES

QUALIFICATION: Bachelor of Science in Computer Science Honours (22BSCO)

Students opting for a Bachelor of Science in Computer Science Honours must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
Year 1 Semester 1					
LCE3419	English Communication & Study Skills		16		None
CLC3509	Computer Literacy		8		None
MAT3511	Basic Mathematics		16		None
CMP3511	Programming Fundamentals I		16		None
CIT3511	Introductions to Digital Electronics		16		None
CIT3521	Fundamentals of Information Technology I		8		None
Year 1 Semester 2					
LEA3519	English for Academic Purposes		16		None
CSI3580	Contemporary Social Issues		8		None
MAT3512	Precalculus		16		None
CMP3512	Programming Fundamentals II		16		CMP3511
CIT3512	Fundamentals of Information Technology II		16		CIT3521
STS3522	Introduction to Statistics		8		None
Total credits			**160**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
Year 2 Semester 1					
CMP3611	Introduction to Database Systems	**6**	16	CMP3512	None
COS3611	Object Oriented Programming I	**6**	16	CMP3512	None
CMP3651	Mathematics for Computer Science	**6**	16	MAT3511 & MAT3512	None
CIT3611	Computer Networks I	**6**	16	CIT3511	None
Year 2 Semester 2					
COS3632	Advanced Databases	**6**	16	CMP3511	CMP3611
COS3612	Object Oriented programming II	**6**	16	CMP3511 & CMP3512	COS3611
CIT 3612	Computer Networks II	**6**	16	CIT3511	CIT3611
CIT3652	Computer Organization & Architecture	**6**	16	CIT3511 & CIT3512	None
Total credits			**128**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
CMP3711	Computer Theory	**7**	16	CMP3651& COS3612	None
CMP3731	Software Engineering	**7**	16	COS3612	None
COS3731	Emerging Technologies	**7**	16	CIT3611 & CIT3612	None
COS3711	Data Structures and Algorithms	**7**	16	COS3612	None
COS3732	Operating Systems	**7**	16	COS3612 & CIT3652	COS3711
COS3712	Human Computer Interaction	**7**	16	COS3612	CMP3731
CMP3752	Research Methodology	**7**	16	COS3612 & STS3522	None
CMP3772	Web Design & Programming	**7**	16	COS3612 & COS3632	None
Total Credits			128		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PREREQUISITES	COREQUISITES
CMP3810	Research Project	**8**	32	Pass all third year	None
CMP3821	Network System Security	**8**	8	CIT3612 & COS3731 or CIT3711	Network System Security
CMP3841	Wireless and Mobile Computing	**8**	8	CIT3612&COS3731 or CIT3711	Wireless and Mobile Computing
	Choose any TWO of the following courses:				
CMP3811	Numerical Methods & Operations Research	**8**	16	CMP3651	None
CMP3851	Distributed Systems	**8**	16	CIT3612 & COS3711	None
COS3871	Artificial Intelligence	**8**	16	CMP3512, COS3612& CIT3631 OR CMP3711	None
COS3812	Data warehousing & Data Mining	**8**	16	COS3632 & COS3711	None
	Choose any TWO of the following courses:				
CMP3832	Entrepreneurship & Management of IT Systems	**8**	16	COS3712	None
CMP3812	Real Time Multimedia	**8**	16	CIT3611, CIT3612 & COS3731/CMP3712	None
CMP3872	Database Programming	**8**	16	CMP3772, COS3632 & COS3612	None
Total Credits			**128**		

F.5. BACHELOR OF SCIENCE IN INFORMATION SYSTEMS, CURRICULUM AND PREREQUISITES

QUALIFICATION: Bachelor of Science in Information Systems Honours (22BSIS)
Students opting for a Bachelor of Science in Information Systems Honours must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF Level	CREDITS	PREREQUISITES	COREQUISITES
Year 1 Semester 1					
LCE3419	English Communication & Study Skills	**5**	16	None	None
CLC3509	Computer Literacy	**5**	8	None	None
MAT3511	Basic Mathematics	**5**	16	None	None
CMP3511	Programming Fundamentals I	**5**	16	None	None
CIS3521	Foundations of Information Systems I	**5**	8	None	None
Year 1 Semester 2					
MPP3572	Principles of Management	**5**	16	None	None
LEA3519	English for Academic Purposes	**5**	16	None	None
CSI3580	Contemporary Social Issues	**5**	8	None	None
MAT3512	Precalculus	**5**	16	None	None
CMP3512	Programming Fundamentals II	**5**	16	None	CMP3511
CIS3512	Foundations of Information Systems II	**5**	16	None	CIT3521
STS3522	Introduction to Statistics	**5**	8	None	None
Total credits			**160**		

YEAR 2

CODE	COURSE NAME	NQF Level	CREDITS	PREREQUISITES	COREQUISITES
Year 2 Semester 1					
CMP3611	Introduction to Database Systems	**6**	16	CMP3512	None
COS3611	Object Oriented Programming I	**6**	16	CMP3512	None
MBO3671	Organizational Behaviour A	**6**	16	CMPP3579	None
CIS3611	System Analysis and Design I	**6**	16	CIS3512	None
Year 2 Semester 2					
COS3632	Advanced Databases	**6**	16	CMP3511	CMP3611
COS3612	Object Oriented programming II	**6**	16	CMP3511 & CMP3512	COS3611
MBO3672	Organizational Behaviour B	**6**	16	None	CMBO3671
CIS3612	System Analysis and Design II	**6**	16	None	CIS3611
Total credits			**128**		

YEAR 3

CODE	COURSE NAME	NQF Level	CREDITS	PREREQUISITES	COREQUISITES
Year 3 Semester 1					
CIS3711	Enterprise Systems	**7**	16	CIS3612	None
CMP3731	Software Engineering	**7**	16	CIS3612	None
MRE3781	Entrepreneurship A	**7**	12	CMBO3671	None
COS3711	Data Structures and Algorithms	**7**	16	COS3612	None
Year 3 Semester 2					
COS3712	Human Computer Interaction	**7**	16	COS3612	SCMP3731
CIS3732	Business Process Management	**7**	16	CMBO3671	
CMP3752	Research Methodology	**7**	16	STS3522	COS3712
MRE3782	Entrepreneurship B	**7**	12	None	CMRE3781
Total Credits			**120**		

YEAR 4

CODE	COURSE NAME	NQF Level	CREDITS	PREREQUISITES	COREQUISITES
Year 4 Semester 1					
CMP3810	Research Project	**8**	32	Pass all third year	None
CIS3811	Business Intelligence	**8**	16	CIS3732	None
CIS3801	IT Audits and Controls	**8**	8	CIS3732	None
CIS3851	IS Project Management	**8**	16	CMP3731 & COS3711	None
CIS3821	IS Strategy, Management & Acquisition	**8**	8	CIS3711	None
Year 4 Semester 2					
CIT3822	IT Security and Risk Management	**8**	8	CIS3711	None
CMP3832	Entrepreneurship & Management of IT Systems	**8**	16	COS3712	None
COS3812	Data warehousing & Data Mining	**8**	16	COS3632 & COS3711	None
CIS3822	IS Innovation and new Technologies	**8**	8	CMRE3782	None
Total Credits			**160**		

G. DEPARTMENT OF GEOLOGY

Geology is the science about our planet Earth; it involves the analysis of the Earth's structure, composition, and its evolution through Earth History. Geology is a science under the umbrella of Geosciences; it is a relevant discipline in the understanding of Earth Materials and Earth Processes. These encompass natural resources including ores, energy resources such as hydrocarbons, building material, and water.

Geology extends into environmental science as far as the pollution of our environment, in particular that of soils and groundwater is concerned. In addition geology is linked with engineering, as construction on and within the ground needs to consider the mechanics of bedrocks and soils. Geohazards, in particular landslides, earthquakes and volcanic eruptions, form another discipline under the umbrella of geosciences.

Geology is a professional career, where graduates become members of the professional organizations in the countries that they will be employed. As such the standard of the graduands are expected to meet the high standards in industry. This requires that students acquire a sound background in natural sciences, in particular chemistry, physics and mathematics, but do also participate in field trips. Practical competences will be learned and sharpened in the field. These practical competences of the graduands are highly valued, and therefore we expect all our students to take a keen interest in the field trip aspect of the geology curricula.

The field work activity varies from 1-3 day trips to 1-4 weeks during semester breaks and at the end of the year. Students should note that field trips are physically strenuous and all students participating in field trips are therefore required to be medically fit for outdoor activities. In addition students will be required to purchase certain items essential for field work and outdoor activities in remote areas.

The department of geology offers coursework programmes for Bachelor of Science Geology Honours, Master of Science in Applied Geology (with Major in Exploration & Economic Geology, or Major in Environmental Geology & Hydrogeology), and Master of Sciene in Petroleum Geology.

The BSc Geology Honours qualification is a comprehensive geoscience degree that allows graduates to enter a professional career. The Master of Science qualifications are more advanced and specialized in the respective fields of the curricula.

In addition to the taught BSc and MSc programmes the geology department offers MSc and PhD degrees by research (thesis only).

G.1. BSC GEOLOGY HONOURS 11BSCG

G.1.1. REGULATIONS

G.1.1.1. Admission Requirements

To register in the BSc Geology Honours Degree, a candidate must hold a valid NSSC-O or NSSC-A certificate or equivalent with passes in at least five subjects which add up to **25 points**, calculated using the UNAM specified scale. In addition to the above requirements, the candidate must have at least a **'C' symbol in English**, a **'C' symbol in Physical Sciences** and a **'C' symbol in Mathematics** on NSSC or equivalent qualification. **First year students are required to pass a departmental selection test before admission** to the BSc Geology Honours program.

Mature age entrants will gain admission as per UNAM mature age entry regulations contained in the General Prospectus: Information, Regulations and Fees.

Field trips to various places of geological interest are an integral part of the geology curriculum and students are therefore required to be **medically fit for outdoor activities**.

G.1.1.2. Minimum Requirements for Re-admission into the Faculty

To be re-admitted to the Faculty of Science for a particular year of registration, a student must have passed the minimum number of courses required as indicated below:

- ★ 4 courses (equivalent to **64 credits**) by the end of the first year; 2 of these courses (equivalent to 32 credits) be **non-core** (30%)
- ★ 9 courses (equivalent to **144 credits**) by the end of the second year (45%)
- ★ 16 courses (equivalent to **256 credits**) by the end of the third year (57%)
- ★ 24 courses (equivalent to **384 credits**) by the end of the fourth year (69%)

G.1.1.3. Advancement and Progression rules

From Year 1 to Year 2: To progress to the second (2nd) year of study, all first year students registered for the B.Sc. Geology Honours program must pass all the first (1st) year level courses 10+1/2 courses (equivalent to **168 credits**). In exceptional cases, students who have failed first year courses may be allowed by the Department to progress to second year, depending on their overall performance which should be outstanding.

From Year 2 to Year 3: In order to advance to the third (3rd) year level of study, a student must have passed all first year courses and at least 2/3 of the prescribed second year courses, i.e. 6 courses (equivalent to **96 credits**). Furthermore, students may not register for third year level courses without the necessary pre-requisites for such courses.

From Year 3 to Year 4: In order to advance to the fourth (4th) year level of study, a student must have passed all second year courses and at least 2/3 of the prescribed third year courses, i.e. 6 courses (equivalent to **96 credits**). Furthermore, students may not register for fourth year level courses without the necessary pre-requisites for such courses.

G.1.1.4. Assessment

Unless otherwise indicated, assessment is based on a written examination and continuous assessments (CA) with a **60 (exam):40 (CA)** weighting for each course. Continuous assessment is based on tests, assignments, field studies, industrial attachment, laboratory practicals and seminar presentations. The final-year master thesis is based on a research project. A minimum of **50% is required to pass each course** and a student is **required to attend 80% of all lectures and practicals**.

G.1.1.5. Change into the BSc Geology Honours Programme

Only science students who study towards a BSc Physics Honours Degree with Geology Electives or a BSc Chemistry Honours Degree with Geology Electives shall be eligible to change to the BSc Geology Honours Programme subject to the following conditions:

1. Change is only possible directly after the first year of study in the Science Faculty.
2. The candidate must have successfully completed the first year of study by having cleared all 1st year courses within one academic year.
3. The academic record of the first year of study must be outstanding (65% minimum).
4. The availability of space in the B.Sc. Geology Honours program which is limited by the student numbers in the Geology Department.
5. Final approval of the change will be made by the Geology Department.

In 2017 geology minor students or other students who have already enrolled for a degree in the Science and Engineering Faculty will not be allowed to change to the geology program.

G.1.1.6. Graduation

This qualification will be awarded to candidates who have cleared all prescribed courses giving cumulative **544 credits**. This includes passing the compulsory field geology courses and the research project and relevant elective courses. The Geology Department shall recommend all successful candidates who should graduate with a BSc Geology Honours Degree.

G.1.1.6 Curriculum Bachelor of Science in Geology Honours 11BSCG

Students opting for BSc Geology Honours must take all of the following courses:

YEAR 1

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITES	CO-REQUISITES
CLC3509	Computer Literacy	**5**	8		None
LCE3419	English Communication & Study skills	**5**	16		LEA3519
CHM3511	Chemistry 1A	**5**	16		CHM3512
PHY3511	Physics for Physical Sciences I	**5**	16		PHY3512
GLY3521	Introduction to Physical Geology & Surface Processes	**5**	8		GLY3502
MAT3511	Basic Mathematics	**5**	16		
CSI3580	Contemporary Social Issues	**5**	8		
GLY3502	Introduction to Earth Systems	**5**	8		GLY3521
CHM3512	Chemistry 1B	**5**	16		CHM3511
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
MAT3512	Pre-Calculus	**5**	16		MAT3511
LEA3519	English for Academic Purposes	**5**	16		LCE3419
STS3522	Introduction to Statistics	**5**	8		None
Total Credits			**168**		

YEAR 2

CODE	COURSE NAME	NQF Level	CREDITS	PRE-REQUISITES	CO-REQUISITES
MAT3611	Calculus I	**6**	16	MAT3512	None
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511 & CHM3512	None
GLY3621	Introduction to Hydrology	**6**	8	MAT3512 & GLY3521	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511 & CHM3512, MAT3511 & MAT3512	None
MAT3612	Calculus II	**6**	16	MAT3512	None
GLY3612	Stratigraphy & Geological Mapping	**6**	16	GLY3521	None
GLY3632	Crystallography & Mineral Chemistry	**6**	16	MAT3512 & CHM3512	None
GLY3642	Introduction to Geochemistry	**6**	8	MAT3512 & GLY3521 & CHM3512	None
GLY3662	Introductory Petrology	**6**	8	GLY3521	None
GLY3600	Field Geology I	**6**	8	GLY3521	None
Total Credits			**128**		

YEAR 3

CODE	COURSE NAME	NQF Level	CREDITS	PRE–REQUISITES	CO-REQUISITES
GLY3741	GIS	**7**	8	GLY3612	None
GLY3711	Mineralogy	**7**	16	GLY3632 &CHM3512	None
GLY3721	Plate Tectonics	**7**	8	GLY3612	None
GLY3751	Sedimentology	**7**	16	GLY3612 & GLY3662	None
GLY3761	Regional Geology of Namibia	**7**	8	GLY3521	None
GLE3701	Environmental & Engineering Geology I	**7**	8	GLY3642 & GLY3621	None
GLY3702	Hydrogeology I	**7**	8	GLY3621 & GLY3642	None
GLY3712	Structural Geology I	**7**	16	GLY3612 & MAT3612& GLY3600	None
GLY3732	Igneous & Metamorphic Petrology	**7**	16	GLY3662 & GLY3642 & GLY3600	None
GLY3762	Research Methodology	**7**	8	GLY3600	None
GLY3782	Exploration Geochemistry & Geostatistics	**7**	8	GLY3642	None
GLY3700	Field Geology II	**7**	8	GLY3600	None
Total Credits			**128**		

YEAR 4

CODE	COURSE NAME	NQF	CREDITS	PRE–REQUISITES	CO-REQUISITES
GLE3821*OR	Environmental & Engineering Geology II **OR**	**8**	8	GLE3701 **OR**	NONE
GLY3801*	Industrial Mineral Gemstones	**8**	8	GLY3711	NONE
GLY3831	Economic Geology	**8**	16	GLY3711 & GLY3721	None
GLY3871* OR	**Igneous & Metamorphic Petrogenesis (option1) OR**	**8**	8	GLY3732 & GLY3711	None
GLY3811* OR	**Coal, Gas & Petroleum (option 2) OR**	**8**	16	GLY3751	None
GLY3812*	**Hydrogeology II (option 3)**	**8**	16	GLY3702	None
GLY3832	Exploration Geology and Geophysics	**8**	16	GLY3712	None
GLY3822	Remote Sensing	**8**	8	GLY3712	None
GLY3862	Structural Geology II	**8**	8	GLY3712 & GLY3700	None
GLY3810	Research Project	**8**	32	All third year courses	GLY3820
GLY3800	Field Geology III	**8**	8	GLY3700	None
GLY3820	Field Geology for Research	**8**	8	All third year courses	GLY3810
Total Credits			**120**		

*** ELECTIVE COURSE**

From 2016 year four (4) of the revised the **11BSCG** curriculm is phased in. Year four (4) of the 11BSCG curriculum includes compulsory and elective courses summing up to a total of **120** credits. **From 2016 onwards students chose one of the following 3 options of the elective courses:**

1. **GLY3871 Igneous & Metamorphic Petrogenesis** plus any other half course of the elective courses (GLE3821 or GLY3801)
2. **GLY3811 Coal, Gas & Petroleum** plus any other half course of the elective courses (GLE3821 or GLY3801)
3. **GLY3812 Hydrogeology II** plus any other half course of the elective courses (GLE3821 or GLY3801). It is recommended to take GLE3821 Environmental & Engineering Geology II

H. DEPARTMENT OF MATHEMATICS

H.1. DEPARTMENTAL REGULATIONS

To register for a B.Sc. in Mathematics Honours, a candidate needs to have obtained at least a C-symbol in NSSC Mathematics. To register for a B.Sc. in Financial Mathematics Honours, a candidate needs to have obtained at least a B-symbol in NSSC Mathematics. English is a compulsory subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum C symbol or English as a First Language at NSSC (O level) with a minimum D symbol. In addition, a minimum C symbol in Physical Science is required for a candidate choosing the Physics Stream.
A candidate should obtain a minimum of 25 points on the UNAM Evaluation Point Scale in his/her five (5) best subjects (of which Mathematics and English must be included) to be admitted to undergraduate studies (Refer to the General Admission Criteria for Undergraduate Programmes in the General Information and Regulations Yearbook). Obtaining the minimum number of points, however, does not necessarily ensure admission. Admission is based on places available in courses, subjects and programmes and is awarded on the basis of merit.

H.1.1. DURATION OF STUDY

A student should be able to complete this programme in a minimum of four (4) years.

H.1.2. ASSESSMENT CRITERIA

A combination of continuous assessment (50%) and an examination (50%) will be used to assess each of the typical courses in this programme. Continuous assessment will consist of a subset of the following, depending on the course needs: class tests, assignments (in the form of reports), seminar presentations and research projects.

H.1.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE DEPARTMENT/FACULTY

To be re-admitted into the faculty for a particular year of registration, a student must have passed the minimum number of courses as indicated below:

- **4 courses** (equivalent to **64** credits) by the end of the **first year**; **2** of these courses (equivalent to **32 credits**) must be **non-core**,
- **8 courses** (equivalent to **144** credits) by the end of the **second year**,
- **15 courses** (equivalent to **240** credits by the end of the **third year**, and
- **23 courses** (equivalent to **368** credits) by the end of the **fourth year**.

H.1.4. ADVANCEMENT AND PROGRESSION RULES

A student advances to when at least **2/3** of the courses of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases, prerequisites for courses have to be passed before a student can proceed to register for such courses.

- From year **1** to **2**: At least **7** courses (equivalent to **112** credits) prescribed for year 1.
- From year **2** to **3**: All first-year courses plus at least **6** courses (equivalent to **96** credits) prescribed for year **2**.
- From year **3** to **4**: All second-year courses plus at least **5** courses (equivalent to **80** credits) prescribed for year **3.**

H.1.5. MAXIMUM NUMBER OF COURSES THAT MAY BE TAKEN PER YEAR

A student may not take more than the equivalent of **12 full courses** per year.

H.1.6. REQUIREMENTS FOR AWARD OF QUALIFICATION

This qualification will be awarded to candidates credited with a minimum of **544 credits** - out of which **48** are from UNAM core courses, **368** are from Mathematics courses and **112** from elective courses from **Physics**, **Computer Science** or **Statistics** (the **actual numbers depending on the stream** chosen).

H.2.BACHELOR OF SCIENCE IN MATHEMATICS HONOURS

The design of the BSc in Mathematics Honours programme incorpotes a major in Mathematics and electives from **Physics**, or **Computer Science** or **Statistics**.

H.2.1.MATHEMATICS HONOURS, ELECTIVES, CURRICULUM AND PREREQUISITES

H.2.1.1. QUALIFICATION: Bachelor of Science in Mathematics Honours PHYSICS STREAM

Students opting for Physics stream must take all of the following courses: 11BSCM

YEAR 1

CODE	COURSE NAME	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
Year 1 Semester 1					
LCE3419	English Communication & Study Skills	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices and Complex Numbers	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
Year 1 Semester 2					
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS3532	Introduction to Probability	**5**	16		None
MAT3512	Precalculus	**5**	16		None
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
Total Credit			**144**		

YEAR 2

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 2 Semester 1					
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
MAT3641	Numerical Methods with MATLAB	**6**	8	MAT3521	None
PHY3601	Optics	**6**	8	PHY3512 and MAT3512	None
PHY3651	Mechanics and Waves	**6**	16	PHY3511 and MAT3512	None
STS3611	Probability Theory	**6**	16	STS3532 and MAT3512	None
Year 2 Semester 2					
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	16	MAT3511 **OR** MAT3512 **&** MAT3521	None
MAT3642	Ordinary Differential Equations	**6**	8	MAT3521 & MAT3512	None
PHY3612	Electromagnetism	**6**	16	PHY3512 and MAT3512	None
PHY3622	Electronics	**6**	8	PHY3512 and MAT3512	None
Total Credit			**136**		

YEAR 3

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 3 Semester 1					
MAT3731	Real Analysis I	**7**	16	MAT3611 and MAT3612	None
MAT3711	Linear Algebra I	**7**	16	MAT3611**or** MAT3612 &MAT3661**&**MAT3652	None
MAT3701	Numerical Analysis I	**7**	8	MAT3611 or MAT3612 **&** MAT3641	None
MAT3781	Elements of Set Theory	**7**	8	(MAT3611 or MAT3612) and MAT3661	None
MAT3761	Research Methodology	**7**	8	MAT3661	None
PHY3711	Electrodynamics	**7**	16	PHY3612 and MAT3612	None
Year 3 Semester 2					
MAT3732	Real Analysis II	**7**	16	MAT3611 and MAT3612	None
MAT3712	Linear Algebra II	**7**	16	MAT3611**or**MAT3612 **&**MAT3661**&** MAT3652	None
MAT3742	Vector Analysis	**7**	8	MAT3611 and MAT3612	None
MAT3722	Number Theory	**7**	8	(MAT3611 or MAT 3612) and MAT 3661	None
MAT3752	Partial Differential Equations	**7**	16	MAT3611 or MAT3612 and MAT3642	None
Total Credit			**136**		

YEAR 4

CODE	COURSE / NAME	NQF	CREDITS	PREREQUISITES	CO-REQUISITES
Year 4 Semester 1					
MAT3810	Research Project	**8**	32	**Pass all mathematics courses up to Year 3**	None
MAT3811	General Topology	**8**	16	MAT3731 or MAT3732	None
MAT3871	Numerical Analysis II	**8**	16	MAT3701 or MAT3732	None
MAT3851	Complex Analysis I	**8**	16	MAT3731 or MAT3732	None
Year 4 Semester 2					
MAT3822	Normed Vector Spaces	**8**	8	MAT3731**or**MAT3732 **&** MAT3711**or**MAT3712	None
MAT3802	Category Theory	**8**	8	MAT3781	None
MAT3872	Algebra	**8**	16	MAT3711 or MAT3712	None
MAT3852	Complex Analysis II	**8**	16	MAT3731 or MAT3732	None
Total Credit			**128**		

H.2.1.2. QUALIFICATION: Bachelor of Science in Mathematics Honours: COMPUTER SCIENCE STREAM

Students opting for **Computer Science Stream** must take all of the following courses: **11BSMC**

YEAR 1

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 1 Semester 1					
LCE3419	English Communication & Study Skills		16		None
MAT3511	Basic Mathematics		16		None
CLC3509	Computer Literacy		8		None
MAT3501	Analytic Geometry		8		None
MAT3521	Matrices and Complex Numbers		8		None
CMP3511	Programming Fundamentals I		16		None
Year 2 Semester 2					
LEA3519	English for Academic Purposes		16		None
CSI3580	Contemporary Social Issues		8		None
STS3532	Introduction to Probability		16		None
MAT3512	Precalculus		16		None
CMP3512	Programming Fundamentals II		16		CMP3511
Total Credit			**144**		

YEAR 2

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 2 Semester 1					
MAT3611	Calculus I	**5**	16	MAT3512	None
MAT3661	Sets and Logic	**5**	8	MAT3511	None
MAT3641	Numerical Methods with MATLAB	**5**	8	MAT3521	None
CMP3611	Introduction to Database Systems	**5**	16	CMP3512	None
COS3611	Object Oriented Programming I	**5**	16	CMP3512	None
Year 2 Semester 2					
MAT3612	Calculus II	**5**	16	MAT3512	None
MAT3652	Elementary Linear Algebra	**5**	16	MAT3511**or** MAT3512 **&**MAT3521	None
MAT3642	Ordinary Differential Equations	**5**	8	MAT3521 & MAT3512	None
COS3632	Advanced Databases	**5**	16	CMP3511	CMP3611
COS3612	Object Oriented Programming II	**5**	16	CMP3511& CMP3512	COS3611
Total Credit			**136**		

YEAR 3

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 3 Semester 1					
MAT3731	Real Analysis I	**7**	16	MAT3611 and MAT3612	None
MAT3711	Linear Algebra I	**7**	16	(MAT 3611 or MAT3612) and MAT3661 and MAT3652	None
MAT3701	Numerical Analysis I	**7**	8	(MAT3611 or MAT3612)& MAT3641	None
MAT3781	Elements of Set Theory	**7**	8	(MAT3611 or MAT3612) & MAT3661	None
MAT3761	Research Methodology	**7**	8	MAT3661	None
COS3711	Data Structures and Algorithms	**7**	16	COS3612	None
Year 3 Semester 2					
MAT3732	Real Analysis II	**7**	16	MAT 3611 and MAT3612	None
MAT3712	Linear Algebra II	**7**	16	(MAT3611 or MAT3612) & MAT3661 and MAT3652	None
MAT3742	Vector Analysis	**7**	8	MAT3611 and MAT3612	None
MAT3722	Number Theory	**7**	8	(MAT3611 or MAT3612) & MAT3661	None
MAT3752	Partial Differential Equations	**7**	16	(MAT3611 or MAT3612) & MAT3642	None
Total Credit			**136**		

YEAR 4

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
Year 4 Semester 1					
MAT3810	Research Project	**8**	32	**Pass all mathematics courses up to Year 3**	None
MAT3811	General Topology	**8**	16	MAT3731 or MAT3732	None
MAT3871	Numerical Analysis II	**8**	16	MAT3701 or MAT3732	None
MAT3851	Complex Analysis I	**8**	16	MAT3731 or MAT3732	None
Year 4 Semester 2					
MAT3822	Normed Vector Spaces	**8**	8	MAT3731 or MAT3732 & MAT3711 or MAT3712	None
MAT3802	Category Theory	**8**	8	MAT3781	None
MAT3872	Algebra	**8**	16	MAT3711 or MAT3712	None
MAT3852	Complex Analysis II	**8**	16	MAT3731 or MAT3732	None
Total Credit			**128**		

H.2.1.1. QUALIFICATION: Bachelor of Science in Mathematics Honours: STATISTICS STREAM

YEAR 1: Students opting for Statistics Stream must take all of the following courses: 11BSMS

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
LCE 3419	English Communication & Study Skills	**5**	16		None
MAT3511	Basic Mathematics	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices and Complex Numbers	**5**	8		None
STS3531	Descriptive Statistics	**5**	16		None
YEAR 1 SEMESTER 2					
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
STS 3532	Introduction to Probability	**5**	16		None
MAT3512	Precalculus	**5**	16		None
MAF3532	Basic Financial Mathematics	**5**	16		None
Total Credit			**144**		

YEAR 2

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
YEAR 2 SEMESTER 1					
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
MAT3641	Numerical Methods with MATLAB	**6**	8	MAT3521	None
STS3611	Probability Theory	**6**	16	STS3532 & MAT3512	None
STS3671	Statistical Methods	**6**	16	STS3532	None
YEAR 2 SEMESTER 2					
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	16	MAT3511or MAT3512 & MAT3521	None
MAT3642	Ordinary Differential Equations	**6**	8	MAT3521 & MAT3512	None
STS3652	Fundamentals of Statistical Computing	**6**	16	STS3531	None
STS3672	Distribution Theory	**6**	16	STS3532	STS3611**&**MAT3611
Total Credit			**136**		

YEAR 3

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
YEAR 3 SEMESTER 1					
MAT3731	Real Analysis I	**7**	16	MAT3611 & MAT3612	None
MAT3711	Linear Algebra I	**7**	16	MAT3611or MAT3612 and MAT3661 & MAT3652	None
MAT3701	Numerical Analysis I	**7**	8	MAT3611or MAT3612 and MAT3641	None
MAT3781	Elements of Set Theory	**7**	8	MAT 3611 or MAT3612 & MAT3661	None
MAT3761	Research Methodology	**7**	8	MAT3661	None
STS3771	Statistical Inference	**7**	16	STS3671	None
YEAR 3 SEMESTER 2					
MAT3732	Real Analysis II	**7**	16	MAT3611& MAT3612	None
MAT3712	Linear Algebra II	**7**	16	MAT 3611 or MAT3612 & MAT3661 & MAT3652	None
MAT3742	Vector Analysis	**7**	8	MAT3611 &MAT3612	None
MAT3722	Number Theory	**7**	8	(MAT3611 or MAT 3612)&MAT3661	None
MAT3752	Partial Differential Equations	**7**	16	(MAT3611 or MAT3612) & MAT3642	None
Total Credit			**136**		

YEAR 4

CODE	COURSE / NAME	NQF LEVEL	CREDITS	PREREQUISITES	CO-REQUISITES
YEAR 4 SEMESTER 1					
MAT3810	Research Project	**8**	32	**Pass all mathematics courses up to Year 3**	None
MAT3811	General Topology	**8**	16	MAT3731 or MAT3732	None
MAT3871	Numerical Analysis II	**8**	16	MAT3701 or MAT3732	None
MAT3851	Complex Analysis I	**8**	16	MAT3731 or MAT3732	None
YEAR 4 SEMESTER 2					
MAT3822	Normed Vector Spaces	**8**	8	MAT3731**or**MAT3732**&**MAT3711**or**MAT 3712	None
MAT3802	Category Theory	**8**	16	MAT 3781	None
MAT3872	Algebra	**8**	16	MAT 3711 or MAT 3712	None
MAT3852	Complex Analysis II	**8**	16	MAT 3731 or MAT 3732	None
Total Credit			**128**		

H.3. BACHELOR OF SCIENCE IN FINANCIAL MATHEMATICS HONOURS 11BFMA

Students enrolled in the B.Sc. in **FINANCIAL MATHEMATICS** Honours programme must take all of the following courses:

YEAR 1

CODE	COURSE	NQF LEVEL	CREDITS	PRE- REQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
LCE3419	English Communication & Study Skills	**5**	16		
MAT3511	Basic Mathematics	**5**	16		
CLC3509	Computer Literacy	**5**	8		
MAT3501	Analytic Geometry	**5**	8		
MAT3521	Matrices and Complex Numbers	**5**	8		
EMI3571	Basic Microeconomics	**5**	16		
LEA3519	English for Academic Purposes	**5**	16		
YEAR 1 SEMESTER 2					
CSI3580	Contemporary Social Issues	**5**	8		
MAT3512	Precalculus	**5**	16		
MAF3532	Basic Financial Mathematics	**5**	16		
MAF3552	Mathematical Statistics	**5**	16		
EMA3572	Basic Macroenomomics	**5**	16		
Total Credits			**160**		

YEAR 2

CODE	COURSE	NQF LEVEL	CREDITS	PRE-COREQUISITES	CO-REQUISITES
YEAR 2 SEMESTER 1					
MAT3611	Calculus I	**6**	16	MAT3512	None
STS3611	Probability theory	**6**	16	MAF3552	None
MAT3641	Numerical Methods with MATLAB	**6**	8	MAT3521	None
MAF3651	Financial Mathematics I	**6**	16	MAF3532	None
MAF3671	Economics I	**6**	16	EMA3572 & EMI3571	None
YEAR 2 SEMESTER 2					
MAT3612	Calculus II	**6**	16	MAT3512	None
MAF3652	Financial Mathematics II	**6**	16	MAF3532	None
MAF3672	Economics II	**6**	16	EMA3572 & EMI3571	None
STS3672	Distribution theory	**6**	16	MAF3552	STS3611 & MAT3611
Total Credits			**144**		

YEAR 3

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 3 SEMESTER 1					
MAT3731	Real Analysis I	**7**	16	MAT3611& MAT3612	None
MAF3751	Assets and Liabilities	**7**	16	MAF 3651&MAF3652	None
MAT3701	Numerical Analysis I	**7**	8	MAT3611**or** MAT3612 **&**MAT3641	None
MAF3771	Differential Equations & Integral Transforms	**7**	16	MAT3611or MAT3612	None
STS3771	Statistical Inference	**7**	16	MAF3552	None
YEAR 3 SEMESTER 2					
MAT3732	Real Analysis II	**7**	16	MAT3611& MAT3612	None
MAF3762	Mathematical Modeling	**7**	8		MAF3771
MAF3782	Financial Modeling	**7**	8		MAF3771
MAF3732	Risk Theory	**7**	16	MAF3651 &MAF3652	None
MAF3742	Programming	**7**	8	MAT3641	None
MAF3722	Research Methodology	**7**	8	STS3611 and STS3632	None
Total Credits			**136**		

YEAR 4

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 4 SEMESTER 1					
MAF3881	Elements of Dynamical Systems	**8**	8	MAF3751& MAF3732	None
MAF3831	Risk Management	**8**	16	MAF3751& MAF3732	None
STS3831	Stochastic Processes	**8**	16	STS3672 &MAF3732	None
MAF3821	Mathematical Methods	**8**	8	MAF3671& MAF3672	None
MAF3810	Research Project	**8**	32	**Pass all courses up to 3rd year**	None
YEAR 4 SEMESTER 2					
MAF3812	Stochastic Calculus and Finance	**8**	16	MAF3751 &MAF3732	None
MAF3842	Operations Research	**8**	8	STS3672 &MAF3732	None
MAT3871	Numerical Analysis II	**8**	16	MAT3701or MAT3732	None
MAF3862	International Business Finance	**8**	8	MAF3732 & MAF3751	None
Total Credits			**128**		

I. DEPARTMENT OF PHYSICS

I.1. DEPARTMENTAL REGULATIONS

To register for a BSc. in Physics Honours, a candidate needs to have obtained at least a **C-symbol** in both NSSC **Mathematics and NSSC Physical Science** (or equivalent qualifications). **English** is a **compulsory** subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum C symbol or English as a First Language at NSSC (O level) with a minimum D symbol. A candidate should obtain a minimum of 25 points on the UNAM Evaluation Point Scale in his/her five (5) best subjects (of which Physics, Mathematics and English must be included) to be admitted to undergraduate studies (Refer to the **General Admission Criteria f**or **Undergraduate Programmes** in the **General Inf**o**rmation and Regulations Yearbook**). Obtaining the minimum number of points, however, **does not necessarily ensure admission.** Admission is based on places available in courses, subjects and programmes and is awarded based on merit.

I.1.1. DURATION OF STUDY

A student should be able to complete this programme in a minimum of four (4) years.

I.1.2. ASSESSMENT CRITERIA

A combination of continuous assessment (**50%**) and an examination (**50%**) will be used to assess each of the typical courses in this programme. Continuous assessment will consist of a subset of the following, depending on the course needs: class tests, reports (practical-, project-, research-, etc.) and assignments.

I.1.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE DEPARTMENT/FACULTY

To be re-admitted into the faculty for a year of registration, a student must have passed the minimum number of courses as indicated below:

- **4** courses (equivalent to **64** credits) by the end of the first year; **2** of these courses (equivalent to **32 credits**) must be non-core,
- **8** courses (equivalent to **144** credits) by the end of the **second year**,
- **15** courses (equivalent to **240** credits by the end of the **third year**, and
- **23** courses (equivalent to **368** credits) by the end of the **fourth year**.

I.1.4. ADVANCEMENT AND PROGRESSION RULES

A student advances to when at least **2/3** of the courses of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any courses of the following year. In all cases, prerequisites for courses must be passed before a student can proceed to register for such courses.

- From year **1** to **2**: At least **7** courses (equivalent to **112** credits) prescribed for year **1**.
- From year **2** to **3**: All **first-year** courses plus at least **6** courses (equivalent to **96** credits) prescribed for year **2**.
- From year **3** to **4**: All **second-year** courses plus at least **5** courses (equivalent to **80** credits) prescribed for year **3.**

I.1.5. MAXIMUM NUMBER OF COURSES THAT MAY BE TAKEN PER YEAR

A student may not take more than the equivalent of **12** full courses per year.

I.1.6. REQUIREMENTS FOR AWARD OF QUALIFICATION

This qualification will be awarded to candidates credited with a minimum of 544 credits (out of which 48 are from UNAM core courses, 376—384 are from physics courses and prescribed mathematics courses and 112—120 credits from elective courses from other subjects (the actual numbers depending on the stream chosen).

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I.1.7. PHYSICS PROGRAMME, CURRICULUM & PREREQUISITES

Four elective "streams" are possible: Stream A1 that combines **Mathematics** and **Computer Science** electives with a **Mathematics** slant, Stream A2 that combines **Mathematics** and **Computer Science** electives with a **Computer Science** slant and Stream C that allows **Chemistry** electives. No new registrations for Stream B that allows **Geology** Electives will be accepted for 2020.

I.1.8. PHYSICS PROGRAMME, CURRICULUM & PREREQUISITES – STREAMS A1, A2, B & C

I.1.8.1. QUALIFICATION: Bachelor of Science in Physics Honours

YEAR 1 Students opting for **Stream A1 (Mathematics slant)** must take all the following courses **(11BPHY)**

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
LCE3419	English Comunication & Study Skills	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices & Complex Numbers	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
CMP3511	Programming Fundamentals I	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
CMP3512	Programming Fundamentals II	**5**	16		CMP3511
Total Credits			**160**		
PHY3651	Mechanics & Waves	**6**	16	PHY3511, MAT3512	None
PHY3601	Optics	**6**	8	PHY3512, MAT3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
MAT3641	Numerical Methods with MATLAB	**6**	8	MAT3521	None
COS3611	Object Orientated Programming I	**6**	16	CMP3512	None
PHY3612	Electromagnetism	**6**	16	PHY3512, MAT3512	None
PHY3622	Electronics	**6**	8	PHY3512, MAT3512	None
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3642	Ordinary Differential Equations	**6**	8	MAT3521, MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	16	(MAT3511**or** MAT3512), MAT3521	None
Total Credits			**136**		

YEAR 3

CODE	COURSE	NQF	CREDIT	PREREQUISITES	CO/PRE
PHY3711	Electrodynamics	**7**	16	PHY3612, MAT3612	None
PHY3701	Thermodynamics & Kinetic Theory	**7**	8	PHY3651, MAT3612	None
PHY3741	Computational Physics	**7**	8	CMP3511 or CMP3512 or MAT3641	None
MAT3731	Real Analysis I	**7**	16	MAT3611, MAT3612	None
MAT3711 **OR**	Linear Algebra I **OR**	**7**	16	(MAT3611 **or** MAT3612), MAT3661, MAT3652 **OR**	
MAT3701 **&** MAT3781	Numerical Analysis & Elements of Set Theory			(MAT3611 **or** MAT3612), MAT3641, MAT3661	None
PHY3742	Analytical Mechanics	**7**	8	PHY3651, MAT3612	None
PHY3752	Modern Physics	**7**	16	PHY3651 **or** PHY3612	None
PHY3722	Research Methodology	**7**	8	Any **2**:PHY3651,PHY3612 **OR** (PHY3601**&**PHY3622)	None
MAT3752 **OR**	Partial Differential Equations **OR**	**7**	16	(MAT3611 **or** MAT3612) & MAT3642 **OR**	None
MAT3732	Real Analysis II **OR**	**7**	16	(MAT3611 **or** MAT3612) & MAT3642 **OR**	None
MAT3712	Linear Algebra II	**7**	16	MAT3611 **or** MAT3612 **OR** (MAT3611 **or** MAT3612), MAT3661, MAT3652	None
MAT3742	Vector Analysis	**7**	8	MAT3611 or MAT3612	None
Total Credits			**120**		

YEAR 4

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
Year 4 Semester 1					
PHY3811	Quantum Mechanics	**8**	16	PHY3742, PHY3752	None
PHY3831	Statistical Mechanics	**8**	16	PHY3651, PHY3701	None
PHY3809	Advanced Electrodynamics	**8**	8	PHY3711	None
PHY3821	Plasma Physics	**8**	8	PHY3711	None
Year 4 Semester 2					
PHY3812	Solid State Physics	**8**	16	PHY3701, PHY3752	None
PHY3802	Nuclear Physics	**8**	8	PHY3752 or PHE3751	None
PHY3822	Optics & Laser Physics	**8**	8	PHY3601, PHY3651, PHY3711	None
PHY3842	Astrophysics	**8**	8	PHY3752	None
REP3802	Aspects of Renewable Energy Physics	**8**	8	PHY3701, PHY3752	None
PHY3810	Research Project	**8**	**32**	**All** 3rd-year courses	None
Total Credits			**128**		

I.1.8.2. Bachelor of Science in Physics Honours

YEAR 1 Students opting for **Stream A2 (Computer Science slant)** must take all the following courses **(11BPCO)**

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
LCE3419	English Comunication & Study Skills	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices & Complex Numbers	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
CMP3511	Programming Fundamentals I	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
CMP3512	Programming Fundamentals II	**5**	16		CMP3511
Total Credits			**160**		

YEAR 2

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
PHY3651	Mechanics & Waves	**6**	16	PHY3511, MAT3512	None
PHY3601	Optics	**6**	8	PHY3512, MAT3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
COS3611	Object Orientated Programming I	**6**	16	CMP3512	None
PHY3612	Electromagnetism	**6**	16	PHY3512, MAT3512	None
PHY3622	Electronics	**6**	8	PHY3512, MAT3512	None
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3642	Ordinary Differential Equations	**6**	8	MAT3521, MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	16	MAT3511**or** MAT3512, MAT3521	None
COS3612	Object Orientated Programming II	**6**	16	CMP3511, CMP3512	COS3611
Total Credits			**144**		

YEAR 3

CODE	COURSE	NQF	CREDIT	PREREQUISITES	COREQUISITES
PHY3711	Electrodynamics	**7**	16	PHY3612, MAT3612	None
PHY3701	Thermodynamics & Kinetic Theory	**7**	8	PHY3651, MAT3612	None
PHY3741	Computational Physics	**7**	8	CMP3511**or** CMP3512 **or** MAT3641	None
MAT3711 **OR**	Linear Algebra I **OR**	**7**	16	(MAT3611 **or** MAT3612), MAT3661, MAT3652 **OR**	None
MAT3731	Real Analysis I	**7**	16	MAT3611, MAT3612	None
CMP3731	Software Engineering	**7**	16	COS3612	None
PHY3742	Analytical Mechanics	**7**	8	PHY3651, MAT3612	None
PHY3752	Modern Physics	**7**	16	PHY (3651 or PHY3612)	None
PHY3722	Research Methodology	**7**	8	**Any 2:** PHY3651, PHY3612 **or** (PHY3601 **&** PHY3622)	None
COS3712 **OR**	Human Computer Interaction **OR**	**7**	16	COS3612 **OR**	CMP3731 **OR**
MAT3712 **OR**	Linear Algebra II **OR**	**7**	16	(MAT3611 **or** MAT3612), MAT3661, MAT3652 **OR**	
MAT3732	Real Analysis II	**7**	16	MAT3611 **or** MAT3612	None
Total Credits			**112**		

YEAR 4

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
PHY3811	Quantum Mechanics	**8**	16	PHY3742, PHY3752	None
PHY3831	Statistical Mechanics	**8**	16	PHY3651, PHY3701	None
PHY3809	Advanced Electrodynamics	**8**	8	PHY3711	None
PHY3821	Plasma Physics	**8**	8	PHY3711	None
PHY3812	Solid State Physics	**8**	16	PHY3701, PHY3752	None
PHY3802	Nuclear Physics	**8**	8	PHY3752 or PHE3751	None
PHY3822	Optics & Laser Physics	**8**	8	PHY3601, PHY3651, PHY3711	None
PHY3842	Astrophysics	**8**	8	PHY3752	None
REP3802	Aspects of Renewable Energy Physics	**8**	8	PHY3701, PHY3752	None
PHY3810	Research Project	**8**	**32**	**All** 3rd-year courses	None
Total Credits			**128**		

J. DEPARTMENT OF STATISTICS AND POPULATION STUDIES

J.1.DIPLOMA PROGRAMMES

J.1.1. REGULATION PERTAINING TO DIPLOMA STUDIES

J.1.1.1. ADMISSION REQUIREMENTS

To qualify for admission to the Diploma in Applied Statistics, an applicant shall satisfy any one of the following minimum requirements:

a) A Namibian Senior Secondary Certificate (NSSC) or equivalent, obtained in not more than two examination sittings with a minimum of **22 points** in **5** subjects on the UNAM Evaluation Scale. **English** is a compulsory subject and should have been obtained on a First or second Language Ordinary Level with symbol **D** or higher. A symbol **D** or higher in **Mathematics** is also required.

b) Mature age entry (based on the results from the entry test)

J.1.1.2. DURATION OF STUDY

The Diploma in Applied Statistics cannot be completed in less than **two (2) years**. The Diploma must be completed within three **(3) years** of **full-time** study, unless special permission is granted for this period to be exceeded.

J.1.1.3. MODE OF DELIVERY

The Diploma in Applied Statistics is a **full-time** programme offered in the evening, so as to allow full-time working candidates to attend lectures. The programme comprises of a total credit of **256** and it is at Namibian Qualification Framework (NQF) level 5. The year 1 courses are at NQF level 4 whereas the year 2 courses are at NQF level 5.

J.1.1.4. EXAMINATION REGULATIONS

For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees. A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of **40%**. Examination will be administered at the end of each semester.

J.1.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION

To be readmitted to the Diploma programme, a student must have passed the minimum number of courses required as indicated below:

- **3 courses** (equivalent to **48 credits**) by the end of the first year; **2** of these courses (equivalent to **32** credits) must be **non-core**.
- **8** full courses (equivalent of **128 credits**) by the end of the second year

J.1.1.6. ADVANCEMENT AND PROGRESSION RULES

A student advances to the second academic year of study when at least **6** courses (equivalent to a minimum of **96** credits) of the curriculum for a first year have been passed.

J.1.1.7. MAXIMUM NUMBER OF COURSES PER YEAR

Students can register for all first year courses and thereafter, no more than **10** courses in any academic year.

J.1.1.8. ARTICULATION ROUTE

After successful completion of the Diploma, students may continue to the degree programs in Statistics or Population Studies.

QUALIFICATION: DIPLOMA IN APPLIED STATISTICS (11DSST)

CODE	COURSE TITLE	NQF LEVEL	CREDIT	PRE-REQUISITE	CO-REQUISITES
CLC3509	Computer Literacy	**5**	8		None
STD2431	Basics of Statistics	**4**	16		None
STD2411	The Statistical System	**4**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
LEG2410	English for General Communication	**4**	32		None
STD2412	Index Numbers and Time series	**4**	16		None
MAT2432	Introduction to Mathematics	**4**	16		None
STD2452	Sampling concepts in Survey work	**4**	16		None
Total Credits			128		

CODE	COURSE TITLE	NQF LEVEL	CREDIT	PRE-REQUISITE	CO-REQUISITES
STD2551	Basic Data Processing	**5**	16	STD2452	None
STS3532	Introduction to Probability	**5**	16	STD2431	None
STD2511	Statistical Methods and Techniques	**5**	16	STD2431	None
EMI3571	Basic Micro Economics	**5**	16		None
LEA3519	English for Academic Purposes	**5**	16		None
STD2552	Basic Statistical Modeling	**5**	16	STD2432	None
STD2512	Basic Demography & Epidemiology	**5**	16	STD2411	None
EMA3572	Basic Macro Economics	**5**	16		None
Total Credits			128		

J.1.1.9. DIPLOMA COURSE EQUIVALENTS

Old Courses		**New Courses**	
STD2431	Basics of Statistics	STD2431	Basics of Statistics
STD2411	The Statistical System	STD2411	The Statistical System
STD2412	Index Numbers and Time series	STD2412	Index Numbers and Time series
STD2432	Introduction to Mathematics	**MAT2432**	**Introduction to Mathematics**
STD2452	Sampling concepts in Survey work	STD2452	Sampling concepts in Survey work
STD2551	Basic Data Processing	STD2551	Basic Data Processing
STD2531	Probability	**STS3532**	**Introduction to Probability**
STD2511	Statistical Methods and Techniques	**STD2511**	**Statistical Methods and Techniques**
STD2532	Statistical Modeling	**STD2552**	**Basic Statistical Modeling**
STD2512	Basic Demography and Epidemiology	STD2512	Basic Demography and Epidemiology

POPULATION STUDIES

COURSE PASSED		**EXEMPTION**	
STS3532	Introduction to Probability	**STS 3532**	Introduction to Probability
STD 2512	Basic Demography and Epidemiology	**POP3512**	Fundamentals of Population Theory
LEG2410	English for General Communication	**LCE3419**	English Communication & Study Skills
CLC3509	Computer Literacy	**CLC3509**	Computer Literacy
CSI3580	Contemporary Social Issues	**CSI3580**	Contemporary Social Issues

J.2.DEGREE PROGRAMMES

J.2.1. REGULATION PERTAINING TO THE DEGREE PROGRAMMES

J.2.1.1. ADMISSION REQUIREMENTS

To register for a Bachelor of Science in Statistics or Population Studies Honours degree programme a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (ordinary or higher) or a recognised equivalent qualification. English is a **compulsory** subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum **C** symbol or English as a First Language at NSSC (O level) with a minimum **D** symbol. In addition to the above, admission to the Bachelor of Science in Statisitics or Population Studies Honours programme requires at least a symbol **C** on NSSC or equivalent qualification in Mathematics.

A candidate should obtain a minimum of **25** points on the UNAM Evaluation Point Scale in his/her five **(5)** best subjects (of which Mathematics and English must be included) to be admitted to this degree programme (Refer to the **General Admission Criteria f**or **Undergraduate Programmes** in the **General Information and Regulations Yearbook**). Obtaining the minimum number of points, however, **does not necessarily ensure admission as it is based on places available in the programme and is awarded on the basis of merit.** Nevertheless, exemption rules for students who have completed a Diploma in Applied Statistics should apply.

Admission can also be considered for persons who qualify through the Mature Age Entry Scheme upon successful completion of the relevant examinations as set out in the **General Information and Regulations Prospectus**. A special application form is available for this purpose. Such candidates may also be required to pass a Faculty entry test before admission is granted (See the Faculty of Science Admission Requirements). Please read this section in conjunction with the academic conditions stipulated in the **General Inf**or**mation and Regulations Prospectus**.

J.2.1.2. DURATION OF STUDY

The Bachelor of Science in Statistics or Population Studies Honours degree programme cannot be completed in less than four (4) years. However, it must be completed within a period of six (6) years of full-time study, unless special permission is granted for this period to be exceeded.

J.2.1.3. MODE OF DELIVERY

The programmes are offered during the day on full-time basis. Each programme comprises of a total credit of 544 and it is at Namibian Qualification Authority (NQA) level 8.

a) Class Attendance

In order to be admitted to examinations, students are required to attend at least 80% of the lectures and to complete the required elements that make up the continuous assessment mark (Refer to the **General Information and Regulations Prospectus**).

b) Practical and tutorials

Attendance of practical and tutorial classes is compulsory for all courses that have these components.

J.2.1.4. ASSESSMENT CRITERIA

Students will be assessed by writing assignments, tests, practicals, projects and examinations. Examinations in particular will be internally moderated for year 1 and year 3 and externally moderated for year 2 and year 4. To qualify for the Examination a student should obtain a minimum of 40% continuous assessment mark and to qualify for the Supplementary/Special Examination a student should have a minimum final mark of 45% with a minimum of 40% from Examination. Examination will be administered at the end of each semester.

J.2.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION

To be re-admitted to the Bachelor of Science in Statistics or Population Studies Honours degree programme for a particular year of registration, a student must have passed the minimum number of courses as indicated below:

- **4** courses (equivalent to **64** credits) by the end of the first year; **2** of these courses (equivalent to **32** credits) must be **non-core**,
- **8** courses (equivalent to **144** credits) by the end of the second year,
- **15** courses (equivalent to **240** credits by the end of the third year, and
- **23** courses (equivalent to **368** credits) by the end of the fourth year.

J.2.1.6. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least 2/3 of the modules of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any modules of the following year. In all cases, prerequisites for modules have to be passed before a student can proceed to register for modules that require prerequisites.

- ★ **From year 1 to year 2:**
  At least **8** modules (equivalent to a minimum of **128** credits) prescribed for year 1.
- ★ **From year 2 to year 3:**
  All first year modules plus at least **6** modules (equivalent to a minimum of **86** credits) prescribed for year 2.
- ★ **From year 3 to year 4:**
  All second year modules plus at least **6** modules (equivalent to a minimum of **86** credits) prescribed for year 3.

J.2.1.7. MAXIMUM NUMBER OF COURSES PER YEAR

A part-time student can only register for **75%** of the prescribed courses in any given academic year. Full-time students can register for all first year courses and thereafter, no more than **10** courses in any academic year.

J.2.1.8. ARTICULATION ROUTE

These qualifications serve as an entry point to the Master of Science in Applied Statistics and Demography when a student graduates with a minimum of a lower second class (**60-69%** average). In addition, a student joining the Bachelor of Science in Statistics or Population Studies Honours degree after completing the Diploma in Applied Statistics from the University of Namibia or any equivalent qualification may be exempted from certain year 1 courses of the degree program. The courses are as follows:

J.4. STATISTICS AND POPULATION STUDIES NEW CURRICULUM &PREREQUISITES

J.4.1 QUALIFICATION: B.Sc. Statistics Honours 11BSCS

YEAR 1 Students opting for a Bachelor of Science in Statistics Honours degree must take all of the following courses:

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
LCE3419	English Communication & Study Skills	**5**	16		None
STS3531	Descriptive Statistics	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
MAT 3521	Matrices & Complex Numbers	**5**	8		None
MAT3501	Analytical Geometry	**5**	8		None
YEAR 1 SEMESTER 2					
LEA3519	English for academic Purpose	**5**	16		None
CSI 3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
STS3532	Introduction to Probability	**5**	16		None
MAF 3532	Basic Financial Mathematics	**5**	16		None
Total			**144**		

YEAR 2 SEMESTER 1					
STS3611	Probability Theory	**6**	16	STS3532, MAT3512	None
STS3671	Statistical Methods	**6**	16	STS3532	None
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
MAT3641	Numerical Methods with MATLAB	**6**	8	MAT3521	None
MAF3651	Financial Mathematics I	**6**	16	MAF3532	None
YEAR 2 SEMESTER 2					
STS3652	Fundamentals of Statistical Computing	**6**	16	STS3531	None
MAT3612	Calculus II	**6**	16	MAT 3512	None
STS3672	Distribution Theory	**6**	16	STS3532	STS3611 & MAT3611
MAT3652	Elementary Linear Algebra	**6**	16	Any full Mathematic course at first year and MAT3521	None
Total			**144**		

YEAR 3

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 3 SEMESTER 1					
STS3741	Non-Parametric & Categorical Statistics	**7**	8	None	None
STS3771	Statistical Inference	**7**	16	STS3671	None
STS3731	Sampling Techniques	**7**	16	STS3531	None
MAT3711	Linear Algebra I	**7**	16	(MAT3611 or MAT3612) and MAT3661 and MAT3652	None
YEAR 3 SEMESTER 2					
STS3732	Data processing	**7**	16	STS3652	STS3771
STS3752	Experimental Design and Analysis of Variance	**7**	16	STS3672	STS3771
MAT3712	Linear Algebra II	**7**	16	(MAT3611 or MAT3612) and MAT3661 and MAT3652	None
STS3702	Research and Survey Methods	**7**	8	None	None
STS3772	Linear Models	**7**	16	STS3671	STS3771
Total			**128**		

YEAR 4

CODE	COURSE	NQF	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 4 SEMESTER 1					
STS3871	Survival Analysis	**8**	16	STS3671	None
STS3851	Operational research	**8**	16	STS3772	None
STS3810	Research Project	**8**	32	Registered as a fourth year students and STS 3732	None
YEAR 4 SEMESTER 2					
STS3831	Stochastic Processes	**8**	16	STS3672, STS3771	None
STS3812	Multivariate Distribution Theory	**8**	16	STS3672, STS3771	None
STS3872	Time series and forecasting	**8**	16	STS3772	None
STS3832	Statistical Quality Control	**8**	16	STS3672, STS3771	None
Total			**128**		

J.4.2. QUALIFICATION: B.SC. IN POPULATION STUDIES HONOURS 11BSPO

Students opting for a Bachelor of Science Honours in Population Studies degree must take all of the following courses:

YEAR 1

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
LCE3419	English Communication & Study Skills	**5**	16		None
STS3531	Descriptive Statistics	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
YEAR 1 SEMESTER 2					
LEA3519	English for academic Purpose	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
STS3532	Introduction to Probability	**5**	16		None
POP3512	Fundamentals of Population Theory	**5**	16		None
Total			**128**		

YEAR 2

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 2 SEMESTER 1					
POP3631	Official Statistics and National Statistical Systems	**6**	16	None	None
POP3611	Introduction to Demography	**6**	16	None	None
STS3611	Probability Theory	**6**	16	STS3532, MAT3512	None
STS3671	Statistical Methods	**6**	16	STS3532	None
SOG3671	Social Problems: Learning to Conceptualize and Implement Research	**6**	16	None	None
YEAR 2 SEMESTER 2					
STS3652	Fundamentals of Statistical Computing	**6**	16	STS3531	None
POP3612	Epidemiological Methods	**6**	16	None	None
SOG3632	Sociology of Development	**6**	16	None	None
POP3632	Fundamentals of Population and Development	**6**	16	POP3512	None
Total			**144**		

YEAR 3

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 3 SEMESTER 1					
POP3731	Fundamentals of Data Processing	**7**	16	STS3652	None
STS3731	Sampling Techniques	**7**	16	STS3531	None
GIS3711	Geographical Analysis & Techniques	**7**	16	None	None
STS3741	Non-Parametric & Categorical Statistics	**7**	8	None	None
POP3711	Demographic Methods I	**7**	16	POP3611	None
YEAR 3 SEMESTER 2					
GIS3732	Geographical Information System	**7**	16		HGIS3711
SOG3732	Social Research Methods	**7**	16	None	None
POP3732	Demographic Methods II	**7**	16	POP3611	POP3711
STS3772	Linear Models	**7**	16	STS3671	None
STS3702	Research and Survey Methods	**7**	8	None	None
Total			**144**		

YEAR 4

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 4 SEMESTER 1					
SOS3860	Sociology of Gender and Sexuality	**8**	8	Admission to the 4th year level	None
POP3810	Research Project	**8**	32	Registered as a fourth year students and POP3731	None
POP3831	Monitoring & Evaluation Techniques	**8**	16	None	None
STS3871	Survival Analysis	**8**	16	STS3671	None
YEAR 4 SEMESTER 2					
POP3872	Population Migration and Urbanization	**8**	16	POP3732	None
POP3852	Population Projections	**8**	16	POP3732	None
POP3812	Indirect Estimation	**8**	16	POP3731, POP3732	None
Total			**128**		

J.4.3 QUALIFICATION: B.SC. IN STATISTICS HONOURS 11BSSA

Students opting for a Bachelor of Science in Statistics degree must take all of the following courses, all at 4th year level:

YEAR 1

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
STS3871	Survival Analysis	**8**	16	None	None
STS3851	Operational research	**8**	16	None	None
STS3880	Research Methodology and Project	**8**	38	None	None
STS3831	Stochastic Processes	**8**	16	None	None
YEAR 1 SEMESTER 2					
STS3812	Multivariate Distribution Theory	**8**	16	None	None
STS3872	Time series and forecasting	**8**	16	None	None
STS3832	Statistical Quality Control	**8**	16	None	None
Total			**134**		

J.4.4. QUALIFICATION: B.SC. IN POPULATION STUDIES HONOURS 11BSAP

Students opting for a Bachelor of Science Honours in Population Studies degree must take all of the following courses, at 4th year level:

YEAR 1

CODE	COURSE	NQF LEVEL	CREDITS	PRE-REQUISITES	CO-REQUISITES
YEAR 1 SEMESTER 1					
SOS3860	Sociology of Gender and Sexuality	**8**	8	None	None
POP3880	Research Methodology and Project	**8**	38	None	None
POP3831	Monitoring & Evaluation Techniques	**8**	16	None	None
STS3871	Survival Analysis	**8**	16	None	None
YEAR 1 SEMESTER 1					
POP3872	Population Migration and Urbanization	**8**	16	None	None
POP3852	Population Projections	**8**	16	None	None
POP3812	Indirect Estimation	**8**	16	None	None
Total			**134**		

I.1.8.3. QUALIFICATION: Bachelor of Science in Physics Honours

Students opting for Stream B (Geology Electives) must take all the following courses (11BPGL)

NOTE: No new students will be registered into this stream for 2021 – only existing senior students will be allowed to complete.

YEAR 1

CODE	COURSE	NQF	CREDIT	PREREQUISITES	COREQUISITES
YEAR 1 SEMESTER 1					
LCE3419	English Comunication & Study Skills	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices & Complex Numbers	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
CMP3511	Programming Fundamentals I	**5**	16		None
GLY3521	Introduction to Physical Geology & Surface Processes	**5**	8		GLY3502
YEAR 1 SEMESTER 2					
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
GLY3502	Introduction to Earth Systems	**5**	8		GLY3521
Total Credits			**160**		

CODE	COURSE	NQF	CREDIT	PREREQUISITES	COREQUISITES
YEAR 2 SEMESTER 1					
PHY3651	Mechanics & Waves	**6**	16	PHY3511, MAT3512	None
PHY3601	Optics	**6**	8	PHY3512, MAT3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
GLY3621	Introduction to Hydrology	**6**	8	MAT3512, GLY3521	
YEAR 2 SEMESTER 2					
PHY3612	Electromagnetism	**6**	16	PHY3512, MAT3512	None
PHY3622	Electronics	**6**	8	PHY3512, MAT3512	None
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3642	Ordinary Differential Equations	**6**	16	MAT3521, MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	8	MAT3511**or** MAT3512,MAT3521	None
GLY3662	Introductory Petrology	**6**	8	GLY3521	None
GLY3612	Stratigraphy & Geological Mapping	**6**	16	GLY3521	None
Total Credits			**144**		

PHY3711	Electrodynamics	**7**	16	PHY3612, MAT3612	None
PHY3701	Thermodynamics & Kinetic Theory	**7**	8	PHY3651, MAT3612	None
PHY3741	Computational Physics	**7**	8	CMP3511**OR**CMP3512**OR**MAT3641	None
MAT3731 **OR**	Real Analysis I **OR**	**7**	16	MAT3611, MAT3612	None
MAT3711	Linear Algebra I	**7**	16	(MAT3611 **OR** MAT3612),MAT3661,MAT3652	None
GLY3721	Plate Tectonics	**7**	8	GLY3621	None
GLY3761	Regional Geology of Namibia	**7**	8	GLY3521	None
PHY3742	Analytical Mechanics	**7**	8	PHY3651, MAT3612	None
PHY3752	Modern Physics	**7**	16	PHY3651 **or** PHY3612	None
PHY3722	Research Methodology	**7**	8	Any **2**: PHY3651,PHY3612 **or** (PHY3601 **&** PHY3622)	None
GLY3712	Structural Geology I	**7**	16	GLY3612, MAT3612	None
Total Credits			**112**		

YEAR 4 SEMESTER 1					
PHY3811	Quantum Mechanics	**8**	16	PHY3742, PHY3752	None
PHY3831	Statistical Mechanics	**8**	16	PHY3651, PHY3701	None
PHY3809	Advanced Electrodynamics	**8**	8	PHY3711	None
PHY3821	Plasma Physics	**8**	8	PHY3711	None
YEAR 4 SEMESTER 2					
PHY3812	Solid State Physics	**8**	16	PHY3701, PHY3752	None
PHY3802	Nuclear Physics	**8**	8	PHY3752 or PHE3751	None
PHY3822	Optics & Laser Physics	**8**	8	PHY3601,PHY3651,PHY3711	None
PHY3842	Astrophysics	**8**	8	PHY3752	None
REP3802	Aspects of Renewable Energy Physics	**8**	8	PHY3701, PHY3752	None
PHY3810	Research Project	**8**	32	**Pass all 3rd-year courses**	None
Total Credits			**128**		

I.1.8.4. BACHELOR OF SCIENCE IN PHYSICS HONOURS

Students opting for Stream C (Chemistry Electives) must take all the following courses (11BPCH)

YEAR 1

CODE	COURSE	NQF	CREDIT	PREREQUISITES	COREQUISITES
YEAR 1 SEMESTER 1					
LCE3419	English Comunication & Study Skills	**5**	16		None
CLC3509	Computer Literacy	**5**	8		None
MAT3511	Basic Mathematics	**5**	16		None
MAT3501	Analytic Geometry	**5**	8		None
MAT3521	Matrices & Complex Numbers	**5**	8		None
PHY3511	Physics for Physical Sciences I	**5**	16		None
CHM3511	Chemistry 1A	**5**	16		None
YEAR 1 SEMESTER 2					
LEA3519	English for Academic Purposes	**5**	16		None
CSI3580	Contemporary Social Issues	**5**	8		None
MAT3512	Precalculus	**5**	16		None
PHY3512	Physics for Physical Sciences II	**5**	16		PHY3511
CHM3512	Chemistry 1B	**5**	16		None
Total Credits			**160**		
YEAR 2 SEMESTER 1					
PHY3651	Mechanics & Waves	**6**	16	PHY3511, MAT3512	None
PHY3601	Optics	**6**	8	PHY3512, MAT3512	None
MAT3611	Calculus I	**6**	16	MAT3512	None
MAT3661	Sets and Logic	**6**	8	MAT3511	None
CHM3611	Inorganic Chemistry I	**6**	16	CHM3511, CHM3512	None
CHM3631	Physical Chemistry I	**6**	16	CHM3511, CHM3512, MAT3511, MAT3512	None
YEAR 2 SEMESTER 2					
PHY3612	Electromagnetism	**6**	16	PHY3512, MAT3512	None
PHY3622	Electronics	**6**	8	PHY3512, MAT3512	None
MAT3612	Calculus II	**6**	16	MAT3512	None
MAT3642	Ordinary Differential Equations	**6**	8	MAT3521, MAT3512	None
MAT3652	Elementary Linear Algebra	**6**	16	(MAT3511**or**MAT3512),MAT3521	None
Total Credits			**144**		
YEAR 3 SEMESTER 1					
PHY3711	Electrodynamics	**7**	16	PHY3612, MAT3612	
PHY3701	Thermodynamics & Kinetic Theory	**7**	8	PHY3651, MAT3612	
MAT3731 **OR** MAT3711	Real Analysis I **OR** Linear Algebra I	**7**	16	MAT3611, MAT3612 **OR** (MAT3611**or**MAT3612),MAT3661, MAT3652	None
CHM3751	Inorganic Chemistry II	**7**	16	CHM3611, MAT3512	
YEAR 3 SEMESTER 2					
PHY3742	Analytical Mechanics	**7**	16	PHY3651, MAT3612	
PHY3752	Modern Physics	**7**	16	PHY(3651 or PHY3612)	
PHY3722	Research Methodology	**7**	8	Any **2**: PHY3651, PHY3612 **or** (PHY3601 **&** PHY3622)	
CHM3712	Physical Chemistry II	**7**	16	CHM 3631, MAT3611	
Total Credits			**112**		
YEAR 4 SEMESTER 1					
PHY3811	Quantum Mechanics	**8**	16	PHY3742, PHY3752	
PHY3831	Statistical Mechanics	**8**	16	PHY3651, PHY3701	
PHY3809	Advanced Electrodynamics	**8**	8	PHY3711	
PHY3821	Plasma Physics	**8**	8	PHY3711	
YEAR 4 SEMESTER 2					
PHY3812	Solid State Physics	**8**	16	PHY3701, PHY3752	
PHY3802	Nuclear Physics	**8**	8	PHY3752 or PHE3751	
PHY3822	Optics & Laser Physics	**8**	8	PHY3601, PHY3651, PHY3711	
PHY3842	Astrophysics	**8**	8	PHY3752	
REP3802	Aspects of Renewable Energy Physics	**8**	8	PHY3701, PHY3752	None
PHY3810	Research Project	**8**	**32**	**All** 3rd-year courses	
Total Credits			**128**		

I.1.8.5. Bachelor of Science in Physics Honours Articulation

Students registering for the Physics articulation programme (11BSPA) must take all the following courses:

YEAR 1 – 11BSPA

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
PHY3811	Quantum Mechanics	**8**	16	None	None
PHY3831	Statistical Mechanics	**8**	16	None	None
PHY3809	Advanced Electrodynamics	**8**	8	None	None
PHY3821	Plasma Physics	**8**	8	None	None
PHY3812	Solid State Physics	**8**	16	None	None
PHY3802	Nuclear Physics	**8**	8	None	None
PHY3822	Optics & Laser Physics	**8**	8	None	None
PHY3842	Astrophysics	**8**	8	None	None
REP3802	Aspects of Renewable Energy Physics	**8**	8	PHY3701, PHY3752	None
PHY3880	Research Methodology & Project	**8**	38	None	None
Total Credits			**134**		

I.1.9. PHYSICS SERVICE COURSES

CODE	COURSE	NQF LEVEL	CREDIT	PREREQUISITES	COREQUISITES
PHY3501	Physics for Life Sciences I	**8**	8	None	None
PHE3751	Modern Physics for Educators	**8**	16	PHY3511,PHY3512,MAT3511,MAT3512	None
PHY3402	Physics for Radiographers	**8**	8		None
PHY3532	Physics for Life Sciences II	**8**	16	None	PHY3501
PHE3642	Electricity and Magnetism	**8**	8	PHY3512, MAT3511, MAT3512	None
Total Credit			**56**		