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UNIVERSITY OF NAMIBIA

FACULTY OF AGRICULTURE,ENGINEERING & NATURAL SCIENCES

School of Science

PROSPECTUS 2026

Open your mind

FACULTY OF AGRICULTURE, ENGINEERING & NATURAL SCIENCES

SCHOOL OF SCIENCE

PROSPECTUS

2026

NOTE

Regulations and curricula for 2026 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 School 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 2026.

The fact that particulars of a specific course or field of study have been included in this Faculty/School Prospectus does not necessarily mean that such programme, subject, or course will be offered in 2026 or any consecutive year.

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

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SCHOOL PREAMBLE

The mission of the School of Science is to produce graduates of high calibre 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 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 Six 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 CALENDAR

REGISTRATION AND ACADEMIC ADMINISTRATION DATES

JANUARY 2026	
05 January	**ONLINE REGISTRATION COMMENCES**: All Senior Students (until 30 Jan 2026)
08 January	Institution opens (all administrative staff)
12 January	***REGISTRATION COMMENCES: First year students (freshmen) until (30 Jan 2026)*** ✓ **CORE SEMESTER** (New Curriculum Professional Programmes) commences 21 January ✓ ***CORE SEMESTER (New Curriculum Programme) commences 28 February***
19 January	Professional Programmes Semesters: Lectures commence for FIRST SEMESTER
26 January	**REGISTRATION COMMENCES**: ✓ Postgraduate Students (Masters and Doctorate Degrees) (until 30 Jan 2026) **ACADEMIC ADMINISTRATION** – Application for module(s) exemptions commence ✓ First year student (until 13 February) ✓ Senior students (until 27 March)
30 January	**REGISTRATION ENDS**: ✓ First year students (freshmen) and new curriculum students
02 February	**LATE REGISTRATION Commences** (until 06 February). All first year and senior new curriculum students
06 February	**LATE REGISTRATION ends for**: All first year and senior new curriculum students
13 February	**ACADEMIC ADMINISTRATION** ✓ Last day for module(s) exemption applications – first year students Last day for approval of module(s) and qualification offering types of changes - First year students
27 March	**ACADEMIC ADMINISTRATION** – Application for module(s) exemption ends
27 April	**ACADEMIC ADMINISTRATION** – Last day to change offering types for year modules
20 July	**ACADEMIC ADMINISTRATION** – Addition and cancellation of SECOND SEMESTER modules commence (until 24 July)
24 July	**ACADEMIC ADMINISTRATION** – Addition and cancellation of SECOND SEMESTER modules end
11 September	**ACADEMIC ADMINISTRATION** ✓ Last day to submit outstanding documentation ✓ Last day to change offering types for **SECOND SEMESTER** modules end
08 October	**SPRING GRADUATION**

DUE DATES FOR THE 2026 ACADEMIC YEAR

DATE	ACTIVITY
30 January	Last day to cancel **CORE SEMESTER** modules with 100% credit
13 February	Last day to cancel **CORE SEMESTER** modules with 50% credit
20 February	Last day to cancel **CORE SEMESTER** modules – no credit Last day to cancel **FIRST SEMESTER** modules with 100% credit (Old curriculum students)
13 March	Last day to cancel **FIRS SEMESTER** and year modules with 100% credit (New curriculum students) Last day to cancel **FIRST SEMESTER** modules with 50% credit (Old curriculum students)
13 April	Last day to cancel **FIRST SEMESTER** modules with 50% credit (New curriculum students
27 April	Last day to cancel **FIRST SEMESTER** modules – no credit (All students)
06 July	Last day to cancel YEAR modules with 50% (All students)
10 August	Last day to cancel **SEMESTER 2** modules with 100% (All students)
28 September	Last day to cancel **SEMESTER 2** and YEAR modules – no credit (All students)

GENERAL DUE DATES FOR STUDENTS

GENERAL DUE DATES FOR STUDENTS

DATE	DESCRIPTION
17 January	Last day to apply for remark for the second semester and year modules of First and Second opportunity examinations of November 2023)
18 January	Last day to apply to write promotional examination
18 January	Last day to apply for the retention of continuous assessment (CA) marks
24 January	Last day to approve promotional examinations applications by Schools
09 February	Last day for application of module(s) exemptions – New Curriculum Students
09 February	Last day for approval of module(s) and qualification changes – New Curriculum Students
16 February	Last day for application of module(s) exemptions – Senior Students
16 February	Last day for approval of module(s) and qualification changes – Senior Students
23 February	Last day for approval of module(s) exemptions – New Curriculum Students
08 March	Last day for approval of module(s) exemptions – Senior Students
30 April	Last day to change offering types

A. STRUCTURE AND PERSONNEL OF THE FACULTY

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Senior Lecturer:	Dr. E Simasiku: BSc (UNAM), BSc Hon. (UCT), MSc (Rhodes University) (2014), PhD. (UNAM).
Senior Lecturer:	Dr. J Nakanyala: BA (UNAM), MA (UNAM), Ph.D (UNAM).
Senior Lecturer	Mr K. Hove, B.Sc (MSU), MSc (NUST-Zimbabwe)
Senior Lecturer:	Ms. Ellen Kimaro, BSc + Msc (Varna University)
Lecturer:	Mr. M S Lukubwe: BA(UNAM), MSc (Salzburg, Austria)
Lecturer:	Ms. S N Kosmas: MSc (BUT, Cottbus, Germany); BSc (UNAM)
Lecturer:	Dr. L Rutina: BSc (UB, Botswana); MSc (University of Kent, UK), PhD (NULS, Norway).
Lecturer:	Mr. Jona Heita, BA(UNAM), PGDE (UNAM), MA (CEA) (University of Cologne, Germany).
Lecturer:	Mr. M A Ameya: HDip (UNAM), BSc Hon (UNAM), MSc (UNAM)
Senior technologist	Ms. Eva Kasinda BSc (Hons) (UNAM). Masters of Natural Resources Management (NUST).
Technologist	Mr. Johannes Amutenya BSc (Hons) (UNAM); Diploma in Agriculture, UNAM.

C. QUALIFICATIONS OFFERED BY THE SCHOOL

The school may award the following degrees:

C.1. UNDERGRADUATE PROGRAMMES

C.1.1. DEPARTMENT OF BIOCHEMISTRY, MICROBIOLOGY, & BIOTECHNOLOGY

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BSBY	Bachelor of Science in Biochemistry (NQF Level 7)	3 years full-time
33BSMB	Bachelor of Science in Microbiology (NQF Level 7)	3 years full-time

C.1.2. DEPARTMENT OF ENVIRONMENTAL SCIENCES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BSEB	Bachelor of Science in Ecology and Biodiversity Conservation (NQF Level 7)	3 years full-time
33BEGS	Bachelor of Science in Environmental and Geographical Science (NQF Level 7)	3 years full-time
33BSFR	Bachelor of Science in Forestry and Rangeland (NQF Level 7)	3 years full-time

C.1.3. DEPARTMENT OF PHYSICS, CHEMISTRY & MATERIAL SCIENCE

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BPHY	Bachelor of Science in Physics (NQF Level 7)	3 years full-time
33BCHM	Bachelor of Science in Chemistry (NQF Level 7)	3 years full-time

C.1.4. DEPARTMENT OF COMPUTING, MATHEMATICAL & STATISTICAL SCIENCES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33DSST	Diploma in Applied Statistics (NQF Level 6)	3 years full-time
33DCMP	Diploma in Computing **(OSHAKATI CAMPUS)** (NQF Level 6)	3 years full-time
33BSST	Bachelor of Science in Statistics (NQF Level 7)	3 years full-time
33BSPO	Bachelor of Science in Population Studies (NQF Level 7)	3 years full-time
33BSMM	Bachelor of Science in Mathematics (NQF Level 7)	3 years full-time
33BSQF	Bachelor of Science in Quantitative Finance (NQF Level 7)	3 years full-time
33BSDS	Bachelor of Science in Data Science (NQF Level 7)	3 years full-time
33BCMP	Bachelor of Science in Computing (NQF Level 7)	3 years full-time

C.1.5. DEPARTMENT OF GEO-SCIENCES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BSGY	Bachelor of Science in Geology (NQF Level 7)	3 years full-time

C.1.6. DEPARTMENT OF WILDLIFE MANAGEMENT AND ECOTOURISM STUDIES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BSWM	Bachelor of Sciences in Wildlife and Tourism Management (NQF Level 7)	3 years full-time

C.2. BACHELOR OF SCIENCE HONOURS (LEVEL 8) PROGRAMMES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33BSBH	Bachelor of Science in Biochemistry Honours (NQF Level 8)	1 years full-time
33BSMH	Bachelor of Science in Microbiology Honours (NQF Level 8)	1 years full-time
33HPHY	Bachelor of Science in Physics Honours (NQF Level 8)	1 years full-time
33HBSC	Bachelor of Science in Chemistry Honours (NQF Level 8)	1 years full-time
33HBSM	Bachelor of Science in Material Chemistry Honours (NQF Level 8)	1 years full-time
33HCOS	Bachelor of Science in Computer Science Honours (NQF Level 8)	1 years full-time
33BSHI	Bachelor of Science in Information Technology Honours (NQF Level 8)	1 years full-time
33BHDS	Bachelor of Science in Data Science Honours (NQF Level 8)	1 years full-time
33HMAT	Bachelor of Science in Mathematics Honours (NQF Level 8)	1 years full-time
33BSFH	Bachelor of Science in Financial Mathematics Honours (NQF Level 8)	1 years full-time
33BSQH	Bachelor of Science in Quantitative Risk Management Honours (NQF Level 8)	1 years full-time
33BSSH	Bachelor of Science in Statistics Honours (NQF Level 8)	1 years full-time
33HPOS	Bachelor of Science in Population Studies Honours (NQF Level 8)	1 years full-time
33HFOR	Bachelor of Science in Forestry Honours (NQF Level 8)	1 years full-time
33HEBC	Bachelor of Science in Ecology & Biodiversity Conservation Honours (NQF Level 8)	1 years full-time
33HENM	Bachelor of Science in Environmental Management Honours (NQF Level 8)	1 years full-time
33HGSS	Bachelor of Science in Geospatial Science Honours (NQF Level 8)	1 years full-time
33HSTM	Bachelor of Science in Sustainable Tourism Management Honours (NQF Level 8)	1 years full-time
33HWLM	Bachelor of Sciences in Wildlife Management & Conservation Honours	1 years full-time
33HGEG	Bachelor of Science in Economic Geology Honours (NQF Level 8)	1 years full-time
33HGHE	Bachelor of Science in Hydrogeology & Environmental Geology Honours	1 years full-time
33HGPG	Bachelor of Science in Petroleum Geosciences Honours (NQF Level 8)	1 years full-time
33HGLY	Bachelor of Science in Geology Honours (NQF Level 8)	1 years full-time

C.3. COURSEWORK MASTERS (LEVEL 9) PROGRAMMES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33PARM	Postgraduate Diploma in Applied Research Methods (Level 8)	1 years full-time
33MCHM	Master of Science in Chemistry (NQF Level 9)	2 years full-time
33MPHY	Master of Science in Physics	2 years full-time
33MREP	Master of Science in Renewable Energy (Photovoltaics)	2 years full-time
33MREH	Master of Science in Renewable Energy (Green Hydrogen and Synthetic Fuels)	2 years full-time
33MSIT	Master of Science in Information Technology	2 years full-time
33MSCY	Master of Science in Cybersecurity	2 years full-time
33MBCT	Master of Science in Blockchain Technology	2 years full-time
33MSMA	Master of Science in Mathematics	2 years full-time
33MMFM	Master of Science in Financial Mathematics	2 years full-time
33MSCC	Master of Science in Climate Change and Sustainability	2 years full-time
33MSBD	Master of Science in Biodiversity Conservation and Management	2 years full-time
33MSAG	Master of Science in Applied Geology	2 years full-time
33MSPG	Master of Science in Petroleum Geosciences	2 years full-time

C.4. MASTERS BY THESIS/ MPHIL MASTERS (NQF LEVEL 9) PROGRAMMES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33MPCH	Master of Philosophy in Chemistry	2 years full-time
33MPPH	Master of Philosophy in Physics	2 years full-time
33MPCS	Master of Philosophy in Climate Science	2 years full-time
33MPEB	Master of Philosophy in Environmental Biology	2 years full-time
33MFOR	Master of Philosophy in Forestry	2 years full-time
33MPGI	Master of Philosophy in Geoinformatics	2 years full-time
33MPHG	Master of Philosophy in Human Geography	2 years full-time
33MPPG	Master of Philosophy in Physical Geography	2 years full-time
33MSTM	Master of Philosophy in Sustainable Tourism Management	2 years full-time
33MWMC	Master of Philosophy in Wildlife Management and Conservation	2 years full-time
33MPGS	Master of Philosophy in Geosciences	2 years full-time

C.5. DOCTOR OF PHILOSOPHY (NQF LEVEL 10) PROGRAMMES

CODE	DIPLOMA/DEGREE	MINIMUM DURATION
33DCHM	Doctor of Philosophy in Chemistry	3 years full-time
33DPHY	Doctor of Philosophy in Physics	3 years full-time
33DPCO	Doctor of Philosophy in Computer Science	3 years full-time
33DPMT	Doctor of Philosophy in Mathematics	3 years full-time
33DPFM	Doctor of Philosophy in Financial Mathematics	3 years full-time
33DPST	Doctor of Philosophy in Applied Statistics	3 years full-time
33DPOP	Doctor of Philosophy in Population Studies	3 years full-time
33DPCS	Doctor of Philosophy in Climate Science	3 years full-time
33DPEB	Doctor of Philosophy in Environmental Biology	3 years full-time
33DEGS	Doctor of Philosophy in Forestry	3 years full-time
33DPGI	Doctor of Philosophy in Geoinformatics	3 years full-time
33DPHG	Doctor of Philosophy in Human Geography	3 years full-time
33DPPG	Doctor of Philosophy in Physical Geography	3 years full-time
33DSTM	Doctor of Philosophy in Sustainable Tourism Management	3 years full-time
33DWMC	Doctor of Philosophy in Wildlife Management and Conservation	3 years full-time
33DPGS	Doctor of Philosophy in Geosciences	3 years full-time

The school may award the degree in **Master of Science (MSc) by THESIS** for 2 years full-time and **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.

D. GENERAL REGULATION PERTAINING TO UNDERGRADUATE STUDIES

D.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.

D.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.

D.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**.

D.4. PRACTICALS

Attendance of practical sessions is compulsory.

D.5. CURRICULUM

D.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).

D.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.

D.6. STUDENT REGISTRATION

D.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

D.6.2. 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.6.3. UNIVERSITY CORE CURRICULUM COURSE DESCRIPTIONS

U3403FS	SKILLS PORTFOLIO
Code:	U3403FS
NQF Level:	4
Credits:	NCB
Contact hours:	4 lecture periods per week for 14 weeks and one three-hour practical session per week
Course assessment:	**40% CA**: Theory (2 tests and 1 assignment); 10Practicals
Examination	**60%**: 1 x 3 hour theory paper Reflective journal/ portfolio
Compulsory/Elective	Compulsory

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
Code:	U3583AL
NQF Level:	5
Credits:	8
Contact hours:	4 lecture hours per week for one semester
Compulsory/Elective	Compulsory
Course Assessment:	Assessment will be based on Continuous Assessment.

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

U6989LA	ACADEMIC LITERACY FOR POST-GRADUATE STUDENTS
NQF Level:	9
Contact Hours:	4 hours per week
Credits:	16 non-contributing credits
Semester Offered:	*1 or 2*
Course Assessment:	**100% Continuous assessment** (1 test and 1 assignment, 1 academic presentation, 1 text analysis)

Course Description: The intended purpose of the proposed module, "Academic Literacy for Postgraduate Students," is specifically to cater for the academic literacy requirements specific to postgraduate students. The core objective of this module is to empower students with advanced skills in academic discourse that are indispensable for a wide array of academic endeavours. **THE MODULE WILL COVER THE FOLLOWING: Effective Digital Academic Research Methods:** Introduction to advanced digital research methods; Conducting scholarly inquiries using digital databases, academic journals, and online repositories; Evaluating the credibility and reliability of digital sources. **Specialized Academic Vocabulary and Conventions:** In-depth exploration of specialized academic vocabulary; Precision in using academic conventions in both spoken and written communication; Practical exercises and activities to reinforce vocabulary acquisition. **Ethical Academic Conduct:** Understanding and practicing ethical guidelines in scholarly activities; Discussion on plagiarism, proper citation, and academic integrity; Case studies and scenarios emphasizing ethical decision-making. **Synthesis of Ideas from Diverse Sources:** Techniques for synthesizing information from various academic sources; Application of synthesis skills to create cohesive and well-structured academic content; Collaborative exercises to promote diverse perspectives. **Interpretation of Research Data:** Developing skills in interpreting data presented in tables and figures; Understanding graphical representation of research findings; Hands-on exercises for data interpretation and analysis. **Critical Reading and Text Analysis:** Strategies for critical reading and analysis of scholarly texts; Identifying and evaluating arguments, assumptions, and evidence; Application of critical reading skills to enhance comprehension. **Integration of Academic Rhetoric and Style:** Exploring academic rhetoric and stylistic elements in writing; Integrating varied perspectives while maintaining academic style; Peer review sessions focusing on rhetorical effectiveness. **Construction of Academic Texts:** Crafting expository, persuasive, and argumentative academic texts; Structuring academic papers according to genre and purpose; Peer workshops for constructive feedback on text construction. **Effective Use of AI Tools:** Introduction to AI tools for academic purposes; Practical applications of AI in research and writing; Hands-on sessions for using AI tools effectively. **Integration of AI Tools According to Policies:** Understanding university policies and guidelines for AI tool usage; Applying AI tools in academic writing tasks within established frameworks; Compliance with ethical and legal considerations in AI tool integration. **Source Acknowledgment in University Studies:** Importance of proper source acknowledgment in academic writing; Practical guidance on citing sources in various academic contexts; Citation styles and formatting for different disciplines.

U3420CN	NATIONAL & GLOBAL CITIZENSHIP
Code:	U3420CN
Credits:	8
NQF Level:	4
Contact hours:	1 lecture hours per week for one semester
Compulsory/Elective	Compulsory

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
Code:	U3420SE
NQF Level:	4
Credits:	2
Contact hours:	2 lecture hours per week for one semester and Mini-Project after first 3 weeks (10 hours)
Compulsory/Elective	Compulsory

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
Code:	U3583DD
NQF Level:	5
Credits:	8
Contact hours:	4 Lecture hours per week for one semester.
Course Assessment:	Information literacy assignment; Test x 2: **Practical:** Digital proficiency, Data and Media literacy
Compulsory/Elective	Compulsory

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
Code:	U3683AL
NQF Level:	6
Credits:	8
Contact hours:	4 Lecture hours per week for one semester.
Course Assessment:	CA of 2 Tests: **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.

T3602NS	CWIE PREPARATIONS
Module Code:	T3602NS
NQF Level:	6
NQF Credits:	8
Contact Hours:	Up to 2 lectures per week for one semester.
Course Assessment:	CA (100% of the final mark) of tests and quizzes, assignments, and a CWIE portfolio.

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

U3520PJ	PROJECT MANAGEMENT SKILLS
Code:	U3420PJ
NQF Level:	5
Credits:	2
Contact hours:	2 lecture hours per week for one semester and Mini-Project after first 3 weeks (10 hours)
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:	**100% CA** based on weekly project progress reports (50%) & the final project report (50%).
Compulsory/Elective	Compulsory

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
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
Course Assessment:	Assessment will be **100% CA** based on 1 reflective learning essay, 1 problem solving activity.
Compulsory/Elective	Compulsory

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
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
Course Assessment:	Assessment will be **100%** Continuous Assessment.
Compulsory/Elective	Compulsory

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.

W3700IC	CWIE
Module Code:	W3700IC
NQF Level:	7
NQF Credits:	24
Contact hours:	Six (6) weeks in June/July break, 40 hours per week practical sessions = 240 hours
Course Assessment:	**100% CA** of Lecturer Assessment 10%; Daily Logbook (30%); Final Report 25%, Presentation 25%.

Course Description: Laboratories, research institutions and industries 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.

S4820VE	DESIGN THINKING
NQF Level:	8
NQF Credits	8
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	100% CA: Written research proposal= 20%, oral presentation =30%, written research report = 50%)

COURSE DESCRIPTION: **The purpose of this module is to:** develop critical thinking and problem-solving skills. To develop interdisciplinary thought, problem structuring and design thinking skills, inculcating innovation, concept development, applied creativity, prototyping and experimentation. This module consists of two components. ***The first component*** is a two week theory covering the key **concepts of** design thinking, and principles of design thinking, phases of design thinking, **problem structuring methods:** problem clarification and analysis, creative reasoning and innovative offering); **design thinking dimensions**: cognitive (reference to creativity & exploratory issues), social (reference to stakeholder & process issues), strategic (reference to creating value & organisational strategy); **sustainable ecological/environmental design:** green products, natural resource harvesting, durability of materials,waste reduction, water conservation, sustainable building materials, energy efficiency. ***The second component*** is a four-week **project-based practical** where students participate in a real-life project of their choice focusing on sustainable ecological/environmental design in their immediate environment. Students are strictly required to apply the design thinking approach during the project-based practical.

E. DEPARTMENT OF BIOCHEMISTRY, MICROBIOLOGY AND BIOTECHNOLOGY

E.1. BACHELOR OF SCIENCE IN BIOCHEMISTRY (NQF LEVEL 7) 33BSBY (THREE -3- YEARS PROGRAMME)

E.1.1. 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 the availability of places in courses and programmes and is granted based on academic achievement. 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 a minimum **C** grade on the **NSSCO level**.

OR A pass in five different subjects as follows:

- ✓ **Three (3) subjects**, of which **Biology & 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 a minimum **C** grade on the **NSSCO level.**

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

E.1.1.1. 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 a **C** or higher, and additionally, **English, Biology and Chemistry** must be at a minimum of 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 a **C** or higher, and additionally, **English, Biology and Chemistry** must be at a minimum of a **C** on **NSSCO.**

E.1.1.2. 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.

E.1.1.3. ADMISSION REQUIREMENTS FOR EXTENDED ENROLMENT

Applicants who 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:

- ✓ **Two (2)** subjects on **NSSCAS,** of which **Biology** must be included with a minimum **d** average or higher and any other subject with a minimum of e average or higher.
- ✓ **Three (3)** subjects on **NSSCO**, of which two must be **Chemistry and Mathematics** with a minimum **D** average or higher, and a third subject, which must be **English** with a minimum **C**.

E.1.2. MATURE AGE ENTRY (MAE)

In addition to the above, Mature Age Entry (MAE) and Prior Learning Recognition (RPL) may serve 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 or a related field of study.
- ✓ Have 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%**

E.1.3. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through 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 of study or the Extended mode study of this programme.

E.1.4. ASSESSMENT CRITERIA

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

For modules with **CA** and Examination. A combination of CA (50%) and an examination (50%) will be used to assess each of the modules & 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. 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.

E.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

E.1.5.1. 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.

E.1.5.2. 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.

E.1.6. ADVANCEMENT AND PROGRESSION RULES

E.1.6.1. 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**.
- ✓ Year 2 to Year 3: **All first-year credits (131 credits)** in addition to at least **54 credits** of second year.

E.1.6.2. 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 credits** of the second year.
- ✓ Year 3 to Year 4: **All second-year credits** and at least **54 credits** third year.

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%.**

E.1.7. ARTICULATION OPTIONS

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

E.1.7.1. 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.

E.1.8. CURRICULUM FRAMEWORK FOR THE 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	S3511SF	C
S3631CA	Analytical Chemistry I ***OR***	6	16	S3531CG & S3532CG	**E**
S3631BB	Biochemical Signaling	6	16	S3511BB	**E**
Year 2 Semester 2					
S3612BB	Bioenergetics and Enzyme Catalysis	6	14	(S3511BB)	C
S3632BB	Biochemical Techniques	6	16	None	C
S3632CP	Physical Chemistry I ***OR***	6	16	None	**E**
S3612TM	Cell Molecular Biology and Genetics	6	16	(S3502TM)	**E**
S3602BC	CWIE Preparation	6	8	None	C
Total credits			**132**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
W3700BB	Workplace Attachment	7	24	S3602BC	E
W3700BC	Community Engagement	7	24	S3602BC	E
S3700BP	Project-based learning	7	24	S3602BC	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 ***OR***	7	18	S3631CO	**E**
S3731BP	Plant Genomics	7	18	(S3612TM)	**E**
Year 3 Semester 2					
S3712BB	Biotechnology & Biosafety	7	17	None	C
S3702BB	Toxicology	7	9	None	C
S3702BI	Innovation and Bioentrepreneurship	7	8	None	C
S3732CA	Analytical Chemistry II ***OR***	7	18	S3631CA	**E**
S3732BB	Molecular and Structural Genetics	7	18	S3612TM	**E**
Total credits			**128/391**		

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

E.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 the availability of places in courses and programmes and is granted based on academic achievement. **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 enrol for an Extended Programme that will take one year longer.

E.2.1.1. ADMISSION REQUIREMENTS FOR 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:

- ✓ Two **(2)** subjects on **NSSCAS, of which Biology** must be included with a minimum **d** average or higher and any other subject with a minimum of **e** average or higher
- ✓ Three **(3)** subjects **on NSSCO**, of which:
  - ✓ **two must be Chemistry and Mathematics** with a minimum **D** average or higher, and
  - ✓ a third subject, which must be **English with a minimum C**.

E.2.1.2. 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 outlined below, can enrol in the **EXTENDED MODE** of this programme: **EITHER:** a pass in five (5) different subjects with:

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

E.2.2. 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.

E.2.3. MATURE AGE ENTRY (MAE)

In addition to the above, Mature Age Entry (MAE) and Prior Learning Recognition (RPL) may serve 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
- ✓ At least have five years of **work experience** in microbiology or a related field of study 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%**.

E.2.4. RECOGNITION OF PRIOR LEARNING

Another way of entering the programme is through the **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.

E.2.5. 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 the 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.

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.

E.2.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE PROGRAMME

E.2.6.1. 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.

E.2.6.2. 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.

E.2.7. ADVANCEMENT AND PROGRESSION RULES

E.2.7.1. 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

E.2.7.2. 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: **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%.**

E.2.8. ARTICULATION OPTIONS

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

E.2.9. 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.

E.2.10. BACHELOR OF SCIENCE IN MICROBIOLOGY (NQF LEVEL 7) 33BSMB CURRICULUM

YEAR 1

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

YEAR 2

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

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory
W3700BB	Workplace Attachment	7	24	S3602BC	Elective
W3700BC	Community Engagement	7	24	S3602BC	Elective
S3700BP	Project-based learning	7	24	S3602BC	Elective
Year 3 Semester 1					
S3711TM	Microbial Methods and Techniques I	7	18	S3651TM & S3652TM	Compulsory
S3731TM	Microbial Diseases	7	18	S3632TM	Compulsory
S3701TM	Bioprospecting	7	9	None	Compulsory
S3721TM	Phytopathology	7	9	None	Compulsory
Year 3 Semester 2					
S3712TM	Microbial Methods and Techniques II	7	18	S3651TM & S3652TM	Compulsory
S3732TM	Genetic Manipulation of Microorganisms	7	18	S3612TM	Compulsory
S3702BI	Innovation and Bioentrepreneurship	7	8	None	Compulsory
S3722TM	Research Methods	7	8	S3601TM	Compulsory
Total credits			**130/397**		

E.2.11. MODULE EQUIVALENT DURING TRANSITION PHASE FOR BSC IN BIOCHEMISTRY & BSC IN MICROBIOLOGY

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				
MBL3631	Cell Molecular Biology & Genetics	6	16		None - To be offered again		
MIC3631	Microbial Systematics	6	16	S3631TM	Microbial Systematics	6	16
CHM3602	Analytical Chemistry I	6	8				
CHM3612	Organic Chemistry I	6	16		None - To be offered again		
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				
BLG3612	Plant Form & Function	6	16		None - To be offered again		
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				
CHB3731	Bioenergetics and Metabolism	7	16		None - To be offered again		
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		W3700BB S3780BI S3780BP	Workplace Attachment or Project-Based Learning or Community Engagement	7	24
MBG3711	Microbial Genetics	7	16				
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		None - To be offered again		
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.

E.2.12. COURSE DESCRIPTIONS FOR THE BSC IN BIOCHEMISTRY & BSC IN MICROBIOLOGY

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: **100% CA** (role playing, reflective journals, forum discussions and report).

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:	**50%** CA of a combination of Tests, Assignments/Quizzes and Practical reports.
Examination:	1 x 3h Examination Paper **50%**

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 signalling; **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. **Continuous Assessment (50%) and Examination Mark (50%).**

S3502TM:	INTRODUCTION TO GENETICS
NQF Level:	5
NQF Credits:	7
Contact Hours:	2hs lectures per week for **12 weeks** & one **3hs practical session** every two weeks for the semester
Course Assessment:	CA will make up **50%** of a combination of Tests, Assignments, Tutorials, & 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 analysed. The course ends with a concise consideration of microbial genomics and its applications in nature and disease. **Continuous Assessment (50%) and Examination Mark (50%).**

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 & 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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	**CA 50%:** 8 practicals' **(40%], 3 tests [40%]** & **2 assignments [10%]** & 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: 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. Continuous Assessment (50%) and Examination Mark (50%).**

S3620BC	CONTEMPORARY ISSUES & SCIENCE DIPLOMACY
NQF Level:	5
NQF Credits:	8
Contact Hours:	2 contact lecture periods per week for one semester
Course Assessment:	**100% CA** (reflective journals, forum discussions, group projects).
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 **50%** consisting 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:	S3511BB

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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 **50%** 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:	S3522TM & S3512ED

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). **Continuous Assessment (50%) and Examination Mark (50%).**

S3631BB	BIOCHEMISTRY SIGNALLING
NQF Level:	6
NQF Credits:	16
Contact Hours:	4 hours lectures per week for 12 weeks for the semester.
Course Assessment:	CA **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.
Prerequisite:	S3511BB

COURSE DESCRIPTION: This course is designed to study the chemically mediated interactions between species ranging from plants, animals, and microorganisms. It looks at the behaviour 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. Signalling in microorganisms and plants. Regulation of the cell cycle by protein kinases. Oncogenes, tumour 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 signalling and quorum sensing, bioluminescence, toxicity, swarming behaviour. **Continuous Assessment (50%) and Examination Mark (50%).**

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 **50%** consisting 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.
Prerequisite:	S3511SF

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 analyse biological data). **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA 50% 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:	S3512ED

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA 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:	S3512ED

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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 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:	S3522TM & S3512ED

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 behaviour. 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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA 50% consisting 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:	(S3611BB)

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-catalysed reactions, detailed mechanisms of enzyme catalysis**; Enzyme regulation:** genetic control, covalent modification, allosteric regulation, compartmentation. **Continuous Assessment (50%) and Examination Mark (50%).**

S3632BB	BIOCHEMICAL TECHNIQUES
NQF Level:	6
NQF Credits:	16
Contact Hours:	**2 hours lectures** per week for 12 weeks and 3 **hours practical session** every week for the semester.
Course Assessment:	**100%** of Tests, Assignments, and Practical reports.
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 **50%** of Tests, Case studies, and Practical reports.
Examination:	1 x 3h examination paper **(50%)**.
Prerequisite:	3502TM

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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 (50**%)**
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. **Continuous Assessment (50%) and Examination Mark (50%).**

S3602BC	CWIE PREP
NQF Level:	6
NQF Credits:	16
Contact Hours:	Up to 2 lectures per week for one semester.
Course Assessment:	CA **100%** consisting of tests and quizzes, assignments, and a CWIE portfolio.

COURSE DESCRIPTION: Professional behaviour, 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 CWIE portfolio shall be evaluated according to a rubric.
Prerequisite:	S3602BC

COURSE DESCRIPTION: Engage in Cooperative Work Integrated Education through a community project/engagement or a community outreach activity. **The CWIE shall be noted as COMPLETED or NOT.**

W3700BB:	WORKPLACE ATTACHMENT
NQF Level:	7
NQF Credits:	14
Contact Hours:	5 weeks (8-10 weeks in industry)
Course Assessment:	**CA (100%).** comprehensive reports from students.
Prerequisite:	S3602BC

COURSE DESCRIPTION: Laboratories, research institutions and industries 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:	CA **100%** Project report, Oral presentation, or Poster presentation.
Prerequisite:	S3602BC

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:	CA **100%** of Tests, Innovative Project, Report, and Oral Presentations.

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, 3hours practical every other second week for the semester.
Course Assessment:	CA **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
Prerequisite:	S3611BB

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA **50%** 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:	(S3612TM)

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. **Continuous Assessment (50%) and Examination Mark (50%).**

S3751BB	BIOCHEMICAL BASIS OF DISEASES
NQF Level:	7
NQF Credits:	17
Contact Hours:	2 hours lectures per week for 14 weeks & **3hours practical** every other week for the semester.
Course Assessment:	CA **50%** of the 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:	(S3711BB)

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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 **50%** 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:	CA **50%** of the 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:	S3612TM

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 & **3hours** practical every second week for the semester
Course Assessment:	CA **50%** 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.

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA will make up **100%** of a combination of Tests, Assignments, Practical reports, and Presentations.
Prerequisite:	S3651TM & S3652TM

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:	S3632TM

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. Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA 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

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:	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

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. **Continuous Assessment (50%) and Examination Mark (50%).**

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:	CA will make up **100%**: tests; graded practical reports, assignment, Weekly quizzes
Prerequisite:	S3651TM & S3652TM

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:	CA **100%** of a combination of Tests, Innovative Project and Report, and Oral Presentations.

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 (**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:	S3612TM

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. **Continuous Assessment (50%) and Examination Mark (50%).**

S3722TM	RESEARCH METHODS
NQF Level:	7
NQF Credits:	8
Contact Hours:	2 lecture periods per week for one semester
Course Assessment:	CA **100%** of the 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: S3601TM

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.

E.3. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS (NQF LEVEL 8) 33BSBH

E.3.1. PROGRAMME PURPOSE

The purpose of this qualification is to provide students with competencies in Biochemistry and related fields, together with other important skills relevant to the 4th & 5th Industrial Revolution. Challenges of global relevance, such as communicable and non-communicable diseases, plant and animal diseases, Intellectual Property Rights (IPR), and Genetically Modified Organisms (GMOs) are addressed in various modules, including Immunology, Bioinformatics, Advanced Molecular & Cell Biology, and Industrial Pharmaceutical Biotechnology. Students will get the opportunity to apply biochemistry knowledge to health, agriculture, biotechnology, cosmetics, and clinical biochemistry.

E.3.2. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science Honours in Biochemistry, the applicant must be in possession of either:

- ✓ A BSc degree in Biochemistry (NQF level 7) from the University of Namibia or an equivalent qualification from a recognized institution of higher education

OR

- ✓ Pre-NQF BSc degree in Biochemistry or any equivalent qualification from a recognized institution.
- ✓ Students who have completed a double major BSc degree with Biochemistry may be required to register for several undergraduate modules for **non-degree purposes** to gain admission into this programme.

E.3.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be made based on additional criteria, such as equity considerations or a high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

E.3.4. ARTICULATION OPTIONS

This qualification may articulate into a master's degree in Biochemistry or a related field of study at NQF level 9.

E.3.5. 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 the 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.
- ✓ 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.

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

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 76 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

E.3.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 131 credits, and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

E.3.8. CAREER OPPORTUNITIES

Career opportunities include Biochemists; Biotechnologists; Innovators/Entrepreneurs; Researchers/Scientists; Educators/Tutors; Laboratory technologists/assistants; Consultants/Sales consultants of science-based products. Positions in various sectors, i.e., Food, Water, Agriculture, Environment, Municipality, and NGOs.

E.3.8.1. BACHELOR OF SCIENCE IN BIOCHEMISTRY HONOURS (NQF LEVEL 8) 33BSBH CURRICULUM

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880BR	Research Proposal	8	14	None	Compulsory
S4880BD	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4883BR	Research Project	8	8	None	Compulsory
S4811BB	Bioinformatics	8	20	None	Compulsory
S4831BB	Advanced Molecular and Cell Biology	8	18	None	Compulsory
S4821BS	Scientific Communications	8	9	None	Compulsory
Year 1 Semester 2					
S4883BR	Research Project	8	8	None	Compulsory
S4832BT	Trends in Biochemistry	8	18	None	Compulsory
S4822BB	Biochemistry of Immunity	8	10	None	Compulsory
S4852BB	Industrial Pharmaceutical Biotechnology	8	18	None	Compulsory
Total credits			**131**		

E.4. BACHELOR OF SCIENCE IN MICROBIOLOGY HONOURS (NQF LEVEL 8) 33BSMH

E.4.1. PROGRAMME PURPOSE

The purpose of this qualification is to provide students with 4th and 5th Industrial Revolution skills in microbiology, including techniques to study the structure, components, and processes of microorganisms. This programme will enable students to apply their knowledge of microbiology to solve societal problems such as agricultural, medicinal, water, biotechnology, environmental, and industrial.

E.4.2. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science Honours in Microbiology**, the applicant must be in possession of either: a **BSc degree in Microbiology (NQF level 7**) from the University of Namibia or an equivalent qualification from a recognised institution of higher education. **OR pre-NQF BSc degree in Microbiology** or any equivalent qualification from a recognized institution. Students who have completed a **double major BSc degree with Microbiology** may be required to register for several undergraduate modules for non-degree purposes to gain admission into this programme.

E.4.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

E.4.4. ARTICULATION OPTIONS

This qualification may articulate into a **Master's degree in Microbiology** or a related field of study at NQF level 9.

E.4.5. 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 the 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.
- ✓ 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.

E.4.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of **76 credits** by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

E.4.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year programme.

E.4.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of number of **136 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

E.4.9. BACHELOR OF SCIENCE IN MICROBIOLOGY HONOURS (NQF LEVEL 8) 33BSMH CURRICULUM

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880BR	Research Proposal	8	14	None	Compulsory
S4880BD	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4883BR	Research Project	8	8	None	Compulsory
S4811BB	Bioinformatics	8	20	None	Compulsory
S4821TB	Microbial Biofertilizers & Pesticides	8	10	None	Compulsory
S4811TE	Environmental Microbiology	8	20	None	Compulsory
Year 1 Semester 2					
S4883BR	Research Project	8	8	None	Compulsory
S4822TE	Emerging & Infectious Diseases	8	10	None	Compulsory
S4832TT	Trends in Microbiology	8	18	None	Compulsory
S4852TF	Food Microbiology	8	20	None	Compulsory
Total credits			**136**		

E.4.10. MODULE EQUIVALENT DURING TRANSITION: BSC IN BIOCHEMISTRY HONOURS & BSC IN MICROBIOLOGY HONOURS

OLD CURRICULUM				NEW CURRICULUM			
Module code	**Module name**	**NQF**	**Credits**	**Module**	**Module name**	**NQF**	**Credits**
None				**S4880BD**	Design thinking	8	8
CHM3810	Research Projects	8	32	**S4880BR**	Research Proposal	8	14
BLG3810				**S4883BR**	Research Project	8	16
CHM3801	Instrumental Analysis II	8	8		None (To be offered again)		
CHM3811	Organic Chemistry III	8	16		None (To be offered again)		
CHP3811	Wastewater Treatment	8	8		None (To be offered again)		
CHM3821	Natural Product Chemistry I	8	8		None (To be offered again)		
CHC3821	Clinical Biochemistry	8	8		None (To be offered again)		
CHB3831	Bioinformatics for Biochemistry	8	16	**S4811BB**	Bioinformatics	8	20
CHN3842	Health and Nutritional Biochemistry	8	8		None (To be offered again)		
CHC3832	Chemical Xenobiotics & Toxicology	8	8		None (To be offered again)		
CHB3842	Biotechnology, Micro & Nanotechnology	8	18		None (To be offered again)		
CHB3862	Industrial Pharmaceutical Biotechnology	8	8		None (To be offered again)		
CHM3822	Natural Product Chemistry II	8	8		None (To be offered again)		
CHP3842	Medicinal Chemistry II	8			None (To be offered again)		
MIC3862	Medical Bacteriology	8	8		None (To be offered again)		
CHP3822	Environmental Chemistry II	8	8		None (To be offered again)		
None				**S4831BB**	Advanced Molecular & Cell Biology	8	18
None				**S4821BS**	Scientific communications	8	9
None				**S4832BT**	Trends in Biochemistry	8	18
None				**S4822BB**	Biochemistry of Immunity	8	10
MBL3801	Bioinformatics	8	8	S4811BB	Bioinformatics	8	20
	None			S4811TE	Environmental Microbiology	8	20
	None			S4821TB	Microbial Biofertilizers and Pesticides	8	10
MIC3831	Environmental & Industrial Microbiology	8	16				
MIC3811	Mycology	8	16		None (to be offered again)		
MIC3800	Internship	8	8				
	None			S4822TE	Emerging & Infectious Diseases	8	10
	None			S4832TT	Trends in Microbiology	8	18
				S4852TF	Food Microbiology	8	20
MBL3812	Immunology	8	16				
MIC3842	Virology	8	8				
MIC3862 OR	Medical Bacteriology OR	8	8		None (to be offered again)		
MOL3822	Applied Genetics	8	8				
MIC3852 OR	Parasitology OR	8	8				
MIC3872	Developmental Biology	8	16				

E.4.11. COURSE DESCRIPTIONS FOR THE BSC IN BIOCHEMISTRY HONOURS & BSC IN MICROBIOLOGY HONOURS

S4880BR	RESEARCH PROPOSAL
NQF Level:	8
NQF Credits:	14
Contact Hours:	4 hours of lectures per week for the semester
Course Assessment:	**100%** CA, constituted by 65% Tests, 35% Assignments, Oral & Poster presentations.
Examination:	No Examination
Prerequisite:	None

COURSE DESCRIPTION: The purpose of this module is to: Provide students with knowledge of theoretical aspects of scientific principles that are followed to conduct research, analyse and interpret data, and communicate scientific results properly. **Ethics of Research and Plagiarism**. **The scientific method:** Logic and scientific, natural observations, asking questions and formulation of hypotheses, Predictions, Types of hypotheses (null, alternative, research); **Chemostatics Topics:** Handling experimental data; Processing and reporting; Significant tests; Regression analysis; Validation of experimental data (quality control); Optimization of parameters; **Use of existing literature:** Using the internet and the university library; Finding and using literature references; Citation of references; **Writing a literature review:** Report Writing; Oral presentation using state-of-the-art equipment; Presenting results as posters.

S4883BR	RESEARCH PROJECT
NQF Level:	8
NQF Credits:	16
Contact Hours:	3 hours a week for 1 & 2 semesters
Course Assessment:	**100% CA:** research proposal: **20%,** oral presentation report: **20%,** written research report: **60%.**

COURSE DESCRIPTION: The purpose of this module is to: Provide students with theoretical and practical aspects of scientific principles that are followed to successfully conduct research, analyse and interpret data, and communicate scientific results effectively. An independent project carried out in small groups, under the supervision of a member of staff. Topics will be given to students at the beginning of the first semester. The work will extend over the two semesters and as a guide, should occupy the equivalent of one whole day per week. The practical work must be completed within six weeks before the second semester ends and must be submitted by two weeks before the end of the second semester. The completed report is expected to be between 25-35 pages long and will be examined by the supervisor, one internal examiner and one external examiner; and will be defended by an oral examination.

S4831BB	ADVANCED MOLECULAR AND CELL BIOLOGY
NQF Level:	8
NQF Credits:	18
Contact Hours:	4 hours of lecture periods per week for the semester
Course Assessment:	CA of **3 tests** (**80%**). **Assignment (mini project)** average counts **20%**.
Examination:	3-hour examination at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: The purpose of this module is to: Introduce students to novel molecular and genomics technologies to address questions in the biological sciences and/or biotechnology. **Principles and applications of novel molecular and genomics technologies**: Recombinant DNA and other novel technologies to address questions in the biological sciences and/or biotechnology. The following topics will be covered: **Regulation of gene expression:** importance of differential gene expression in the development of living organisms, components involved in regulation of gene expression at initiation of transcription, regulation at the level of transcription, post transcriptional control, factors affecting the expression of a gene. **Gene expression profiling**: methods and applications of single cell transcriptomics in living organisms, high throughput sequencing, qRT-PCR, mining and visualising functional genomic/transcriptomic/proteomic data. **Genome editing systems**: Zinc Finger nuclease, TALEN (Transcription Activator-Like Effector Nucleases).

S4811TE	ENVIRONMENTAL MICROBIOLOGY
NQF Level:	8
NQF Credits:	20
Contact Hours:	4hrs lecture periods and one 3hrs practical sessions per week for the semester.
Course Assessment:	**CA 50%** a minimum of **3 tests**; **Practical Mark:** average counts **50%** towards the CA mark.
Examination:	1 x 3hr examination at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: The purpose of this module is to: enable students to think broadly about the role microorganisms in the world, their impacts on our own lives and to realize their immense importance to our world. **Environmental microbiology**: the role of microorganisms in the Environment. **Terrestrial Environment: soils**. Soil microorganism associations with plants. **Marine Environment and Freshwater Environment**. Sewage treatment: Conventional sewage and wastewater treatment; anaerobic digesters; constructed wetlands; septic tanks. Analysis of water purity and waterborne pathogens. Indicator organisms, biocontrol, Baculovirus as a control agent, biomining, bioremediation, bio stimulation, bioaugmentation. The harvesting of bioenergy and production of biofuels. Biofilms and their importance in the environment. **Final Mark: 50% CA mark and 50% Examination mark.**

S4821BS	SCIENTIFIC COMMUNICATIONS
NQF Level:	8
NQF Credits:	9
Contact Hours:	2 hours of lecture periods per week for the semester
Course Assessment:	**100%** CA of **3 independent study reports** or one portfolio (**80%**). ***One presentation (20%)***.

COURSE DESCRIPTION: Use of oral presentations and displays to communicate science effectively. The following topics will be covered: **General science communication:** different types of plagiarism and how to avoid plagiarism; Identify different audiences of scientific information; role of governments, industry, and other stakeholders in communicating science; consequences of scientific research/information if communicated poorly; application of best writing practices including topic sentences and paragraph structure, passive vs. active voice, etc. **Academic science communication:** How scientific research is published (including the peer review process); scientific argument/claim supported by scientific evidence; providing feedback on peers' writing. **Scientific presentations, and visual materials:** best oral presentation practices: eye contact, pace, gesture, content, visual aids, rehearsing; delivering oral presentation using visual aids that is clear, audible, well-rehearsed, and suitable for the audience; incorporating graphics and multimedia elements into presentations; delivering presentation using software (such as powerpoint & keynote) that is clear, audible, well-rehearsed, and suitable for the audience.

S4811BB	BIOINFORMATICS
NQF Level:	8
NQF Credits:	20
Contact Hours:	4hrs lecture periods per week and one 3-hour practical session every week for the semester.
Course Assessment:	CA consists of **3 tests (70%),** practical (**20%),** and assignment (**10%**).
Examination:	3-hour examination at the end of the semester, which counts **50%** towards the final mark.

COURSE DESCRIPTION: Topics include Analysis of DNA, RNA and protein sequences in databases: access to sequence data and literature; Key bioinformatics websites such as GenBank, NCBI, Entrez, UniGene, etc.; **Sequence alignment:** homology, similarity, identity, multiple sequence alignment, evolution of life. **Scoring matrices:** PAM and BLOSUM, Needleman and Wunsch algorithm, Smith-Waterman algorithm; **BLAST** (expect value, bit scores, BLAST search strategies, advanced BLAST search (PSI-BLAST and MEGA BLAST), word size, threshold); **Statistical significance of pairwise alignment**. **Gene analysis of RNA and protein:** Introduction to RNA and mRNA; Analysis of gene expression approaches including cDNAs, SAGE and DNA

microarrays; protein analysis; pitfalls in cDNAs, SAGE and DNA microarrays, experimental design of microarrays, RNA preparation and probe preparation. **Final Mark: 50% CA mark and 50% Examination mark.**

S4821TB	MICROBIAL BIOFERTILIZERS & PESTICIDES
NQF Level:	8
NQF Credits:	10
Contact Hours:	2hrs lecture periods per week & 3hrs practical sessions every other week for the semester
Course Assessment:	**CA 50%:** minimum of 2 tests; at least 1 graded assignment and graded laboratory reports.
Examination:	1 x 3hr examination at the end of the semester and counts **50%** towards the final mark.

COURSE DESCRIPTION: Understanding the Role of Beneficial Microbes in Agriculture: Understanding the Role of Beneficial Microbes in Agriculture, Overview of Beneficial Microbes Utilized as Biofertilizers and Biopesticides. **Biofertilizers: Types of Biofertilizers:** Bacterial, Cyanobacterial, and Fungal Biofertilizers, Application Methods and Considerations for Using Biofertilizers in Sustainable Agriculture. **Biopesticides** Microbial Insecticides: The Role of Beneficial Microbes in Controlling Pests, Advantages of Using Biopesticides Over Chemical Pesticides in Sustainable Agriculture. **Sustainable Agriculture Practices:** Importance of Sustainable Agriculture in Modern Farming Practices, The Role of Beneficial Microbes in Promoting Sustainable Agriculture and Reducing Environmental Impact, an assessment of how beneficial microbes contribute to sustainable agriculture and mitigate environmental impacts. **Case Studies and Research:** Real-World Examples of Successful Applications of Beneficial Microbes as Biofertilizers and Biopesticides, Case studies showcasing the effective implementation of beneficial microbes in agricultural settings, Research Advancements in the Field of Beneficial Microbes for Sustainable Agriculture, A review of recent scientific advancements and research in the utilization of beneficial microbes for sustainable agriculture. **Final Mark: 50% CA mark and 50% Examination mark.**

S4832BT	TRENDS IN BIOCHEMISTRY
NQF Level:	8
NQF Credits:	18
Contact Hours:	2hrs lectures periods per week for the semester.
Course Assessment:	**100% CA** consisting of a minimum of 3 study reports ***(or 1 report & 1 test)***, which counts **80% CA** & at least 1 presentation, which counts **20%** towards the CA mark.
Examination:	No Examination

COURSE DESCRIPTION: The purpose of this module is to: to review topical research results from recent scientific publications. Students will be asked to perform literature review, write reports, present and conduct seminars from recent scientific publications in biochemistry research (topics may change). **Learning and Teaching Strategies/Activities**
The module will be offered as a blended online and face-to-face learning mode, and learning will be facilitated through the following teaching activities: **Consultations and discussions:** 2 hours face-to-face/online consultations per week and independent literature surveys. **Reports, Group Discussions & Seminars:** Students will produce written reports and conduct seminars based on recent scientific publications in biochemistry on specific topics. **Final Mark: 100% CA.**

S4832TT	TRENDS IN MICROBIOLOGY
NQF Level:	8
NQF Credits:	18
Contact Hours:	4hrs lectures periods for the semester.
Course Assessment:	**100% CA** of presentations, quizzes, oral PowerPoint presentations, posters, and mini projects.
Examination:	No Examination

COURSE DESCRIPTION: The purpose of this module is to: Bridge the gap between microbiology and related field's principles/theories and real-life applications as revealed in current and trending events, discoveries, discussion points and research articles. This module will be facilitated in an alternating manner by all microbiology lecturers. It is mainly a student self-directed learning of key events, discoveries, discussion points and research articles in microbiology, molecular biology and related disciplines of the current year or time in point. Selected trending topics or journal articles based on previously studied principles/theories and of that year or time in point will be discussed. For instance, the SARS-COV2 pandemic in 2019/20. During the first discussion, an overview of the topic is considered. In the second discussion, the students take the major role, e.g., presentation of papers pertinent to the topic. Students will be guided into skills such as oral communication of research findings, data review of the scientific literature and critical analysis of research publications. **Final Mark: 100% CA.**

S4852BB	INDUSTRIAL PHARMACEUTICAL BIOTECHNOLOGY
NQF Level:	8
NQF Credits:	18
Contact Hours:	4hrs lectures periods per week for the semester.
Course Assessment:	**CA 50%:** minimum of **2 tests; 50%:** at least 2 graded assignments which may include presentations.
Examination:	3hr examination at the end of the semester and counts **50%** towards the final mark.
Prerequisite:	None

COURSE DESCRIPTION: The purpose of this module is to: introduce students to the industrial application of biotechnology in medical, pharmaceutical, and environmental sectors. **Biotechnology and Medicine:** Diagnostics, Therapeutics, Gene Therapy, Stem Cells, Implanters, 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:** Gene Pharming (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. **Final Mark: 50% CA mark and 50% Examination mark.**

S4852TF	FOOD MICROBIOLOGY
NQF Level:	8
NQF Credits:	20
Contact Hours:	4hrs lecture periods and one 3hrs practical sessions per week for the semester
Course Assessment:	A minimum of **3 tests**, which count **60%** & **Practical Mark:** average counts **40%** towards the CA.
Examination:	3hr examination at the end of the semester and counts **50%** towards the final mark.
Prerequisite:	None

COURSE DESCRIPTION: The purpose of this module is to: introduce students to the science of food and industrial microbiology. **General principles of food microbiology**; biology and epidemiology of foodborne microorganisms of public health significance, including bacteria, yeasts, fungi, protozoa and viruses, and food spoilage microorganisms; the microbiology of food preservation and food commodities; fermented and microbial foods; principles and methods for the microbiological examination of foods; micro biological quality control, and quality schemes, sterilization, introduction to fermenters, production of amino acids and vitamins food additives(L- glutamic acid, vitamin B12), yeast/ mushrooms, production of fermented foods. **Final Mark: 50% CA mark and 50% Examination mark.**

S4822BB	BIOCHEMISTRY OF IMMUNITY
NQF Level:	8
NQF Credits:	10
Contact Hours:	4hrs lecture periods per week and one 3hrs practical session every other week for the semester.
Course Assessment:	**CA 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
Prerequisite:	None

COURSE DESCRIPTION: This module cover components and functions of the immune system including molecules, cells, tissues and organs that make up the innate and adaptive immune systems. Cellular signalling and protein structure will be covered. Specificity of immune responses to viral infection, bacterial and helminth immunity will be covered. Vaccination to boost immunity. Dysregulation of immune processes associated with human disease including autoimmunity, allergy, metabolic disease and cancer. How antibodies and other components of the immune system can be utilized for diagnosis, therapy and research. Immunogenetics: antigen recognition by the innate immune system and inherited immune deficiencies. Complement system (classical pathway, alternative pathway, lectin pathway), major histocompatibility complex. 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. Immunology techniques including cell culture, ELISA, immuno-blotting, tissue extraction, flow cytometry, bacterial killing assays and binding/signalling assays. **Final Mark: 50% CA mark and 50% Examination mark.**

S4822TE	EMERGING AND INFECTIOUS DISEASES
NQF Level:	8
NQF Credits:	10
Contact Hours:	2hrs lecture periods per week & 3hrs practical sessions every other week for the semester
Course Assessment:	**CA 50%:** minimum of 2 tests; at least 1 graded assignment & and/ one mini-project presentations.
Examination:	1 x 3hr examination at the end of the semester and counts **50%** towards the final mark.
Prerequisite:	None

COURSE DESCRIPTION: Microbes that cause disease are called pathogens. This course considers: **Host-microbe interactions**: Principles of disease and epidemiology; Microbial mechanisms of pathogenicity; **Host defences**: innate immunity; adaptive immunity; antimicrobial drugs; **Microbe-animal interactions in infection and disease**: Pathogenic Gram-positive cocci and bacilli; pathogenic Gram-negative cocci and bacilli; mycoplasmas, rickettsia, chlamydia, spirochetes, and vibrio; pathogenic fungi; pathogenic DNA and RNA viruses; viroids and prions; the course will examine strategies to produce vaccines that enable immunity to viral infection. **Emerging diseases**: this section will focus case studies on any diseases that are currently or have recently had or may have a significant impact on society. **Final Mark: 50% CA mark and 50% Examination mark.**

E.5. MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY (33MSBY)

E.5.1. PROGRAMME PURPOSE

The purpose of this qualification is to provide students with the opportunity to independently carry out research and obtain specialization in relevant areas of biochemical sciences. The qualification further seeks to provide the industrial and academic markets with qualified and specifically well-trained professional biochemists. Specifically, this programme will provide more students with knowledge, skills, and competence in the science of Biochemistry at MSc NQF Level 9 to develop Namibia's own human resources and capacity in the field of Biochemistry.

E.5.2. ADMISSION REQUIREMENTS

To qualify for entry into the **Master of Science in Industrial Biochemistry**, a candidate must hold a Bachelor of Science Honours Degree at **NQF Level 8 in BSc in Biochemistry** from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least **60% average**. The **MSc in Industrial 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.***

E.5.3. ADDITIONAL SELECTION CRITERIA

- ✓ Students with relevant work experience in Biochemistry or related field of study will have an added advantage.
- ✓ Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelors honours for MSc qualification.

E.5.4. ARTICULATION OPTIONS

This qualification may articulate into a **PhD degree in Biochemistry** or related field of study.

E.5.5. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules with Continuous Assessment (CA) and Examination: The final mark for each module shall be calculated using a ratio of continuous assessment (50%) and a written examination (50%). 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. Assessment criteria are based on written examinations, written tests, assignments, laboratory practical, mini-projects, portfolios, research reports, oral examinations, and seminar presentations. The thesis shall be assessed, and candidates are expected to secure a minimum of 50% mark in their thesis as per the current post-graduate Studies guidelines. **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.

E.5.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted into the Master of Science in Industrial Biochemistry, a full-time student must have obtained at least:

- ✓ 72 credits at the end of the 1st year of registration
- ✓ 120 credits at the end of the 2nd year of registration
- ✓ The programme must be completed in a maximum of three (3) years.

To be re-admitted into the Master of Science in Industrial Biochemistry, a part-time student must have obtained at least:

- ✓ 24 credits at the end of the 1st year of registration
- ✓ 72 credits at the end of the 2nd year of registration
- ✓ 120 credits at the end of the 3rd year of registration
- ✓ The programme must be completed in a maximum of four (4) years.

E.5.7. ADVANCEMENT & PROGRESSION RULES

- ✓ A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework.
- ✓ A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining 120 credits of the coursework.

E.5.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits**, a pass in U6983LA Academic Literacy for Postgraduate Students, and have met all other relevant UNAM requirements. Master's by coursework students must present a paper on their own research work at a conference before graduation as outlined in the Higher Degrees Policy.

E.5.9. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN INDUSTRIAL BIOCHEMISTRY (33MSBY)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6983LA	Academic Writing for Postgraduate Students	9	16	
S6911BB	Research Methodology and Biostatistics	9	24	Compulsory
S6931BB	Advanced Nutritional and Health Biochemistry	9	24	Compulsory
S6901BB	Enzymology and Protein Engineering	9	12	Compulsory
Year 1 Semester 2				
S6912BB	Advanced Biochemical Techniques	9	24	Compulsory
S6932BB	Advanced Bioinformatics	9	24	Compulsory
S6902BB	Biosafety & Project Management ***OR***	9	12	Elective
S6922BB	Environmental Toxicology & Management	9	12	Elective
Year 2 Semester 1 & 2				
S6953BT	Thesis **(Pass in all year 1 modules)**	9	120	Compulsory
Total credits for this programme			**240**	

E.5.10. MODULE EQUIVALENT: MSC IN INDUSTRIAL BIOCHEMISTRY & MPil IN BIOCHEMISTRY (33MSBT)

OLD CURRICULUM				NEW CURRICULUM			
Module	**Module name**	**NQF**	**Credits**	**Module**	**Module name**	**NQF**	**Credits**
CHM5921	Research Methodology & Project Proposal	9	12		None – to be offered again	9	24
CHB5921	Enzymology & Enzyme Technology	9	12	S6901BB	Enzymology	9	12
CHB5941	Nutrition, Metabolism & Cell signalling	9	12				
CHB5961	Neurobiochemistry & Clinical Biochemistry	9	12				
CHB5962	Strategic Resource Management	9	12				
CHB5942	Biochemistry Seminars	9	12		**NONE (TO BE OFFERED AGAIN)**		
CHB5902	Bioinformatics & Industrial Biotechnology	9	12				
CHM5962	Instrumental Methods & Techniques in Biochemical Analysis	9	12				
CHC5942	Environmental Toxicology & Management	9	12	S6922BB	Environmental Toxicology & Management	9	12
CHM5900	Thesis			**S6953BT**	Thesis		

E.6. MASTER OF SCIENCE IN MICROBIOLOGY (33MSMB)

E.6.1. ADMISSION REQUIREMENTS

To qualify for entry into the Master of Science in Microbiology, a candidate must hold a Bachelor of Science Honours Degree at NQF Level 8 in Microbiology from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

E.6.2. ADDITIONAL SELECTION CRITERIA

- ✓ Students with relevant work experience in Microbiology or related field of study will have an added advantage.
- ✓ Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelors honours for MSc qualification.

E.6.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD degree in Microbiology** or related field of study.

E.6.4. DURATION OF STUDY

This Master of Microbiology is offered through coursework, 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.6.5. ASSESSMENT CRITERIA

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

For modules with Continuous Assessment (CA) and Examination:

- ✓ The final mark for each module shall be calculated using a ratio of CA **(50%)** and a written examination **(50%).**
- ✓ 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.
- ✓ Assessment criteria are based on written examinations, written tests, assignments, laboratory practical, mini-projects, portfolios, research reports, oral examinations, and seminar presentations.
- ✓ The thesis shall be assessed, and candidates are expected to secure a minimum of 50% mark in their thesis as per the current post-graduate Studies guidelines.

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.

E.6.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the Master of Science in Microbiology, a fulltime student must have obtained at least:

- ✓ 72 credits at the end of the 1st year of registration.
- ✓ 120 credits at the end of the 2nd year of registration.
- ✓ The programme must be completed in a maximum of three (3) years.

To be re-admitted into the Master of Science in Microbiology, a part-time student must have obtained at least:

- ✓ 24 credits at the end of the 1st year of registration.
- ✓ 72 credits at the end of the 2nd year of registration.
- ✓ 120 credits at the end of the 3rd year of registration.
- ✓ The programme must be completed in a maximum of four (4) years.

E.6.7. ADVANCEMENT AND PROGRESSION RULES

- ✓ A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework.
- ✓ A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining 120 credits of the coursework.

E.6.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits**, a pass in U6983LA Academic Literacy for Postgraduate Students, and have met all other relevant UNAM requirements. Master's by coursework students must present a paper on their own research work at a conference before graduation as outlined in the Higher Degrees Policy.

E.6.9. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN MICROBIOLOGY (33MSMB)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6983LA	Academic Writing for Postgraduate Students	9	16 **(non-contributing) ***	
S6901TB	Biostatistics and Research Methodology	9	12	Compulsory
S6911TB	Microbial Evolution and Biodiversity	9	24	Compulsory
S6931TB	Microbial Principles and Processes	9	24	Compulsory
Year 1 Semester 2				
S6912TB	Microbes and Diseases	9	24	Compulsory
S6922TB	Bioprospecting and Bioentrepreneurship	9	12	Compulsory
S6932TB	Environmental Microbiology and Biotechnology	9	24	Compulsory
Year 2 Semester 1 & 2				
S6953BT	Thesis **(Pass in all year 1 modules)**	9	120	Compulsory
Total credits for this programme			**240**	

E.7. MASTER OF PHILOSOPHY IN BIOCHEMISTRY (33MSBT)

E.8. MASTER OF PHILOSOPHY IN MICROBIOLOGY (33MSMT)

To be eligible for this **MPhil programme**, the candidate must have completed a **Bachelor's Honours Degree at NQF level 8 in Biochemistry/ Microbiology** or equivalent qualification from a recognised higher education institution, with an average of at least **60%.** Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA). **Candidates must submit a detailed research proposal that highlights their proposed area of research, objectives, methodology, and a review of existing literature.** The research proposal will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

E.8.1. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or a high score/percentage obtained in the **Bachelor's honours** for MPhil qualification.

E.8.2. ARTICULATION OPTIONS

This qualification may articulate to a **PhD in Biochemistry/ Microbiology** or a related field of study.

E.8.3. ASSESSMENT CRITERIA

Assessment will be done based on examination of the **THESIS** as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of **50% marks** in their thesis work. In addition to the thesis, candidates must appear for a **Viva Voce (oral examination)** conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the MPhil programme.

E.8.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission **(ANNEX 19B**).

E.8.5. ADVANCEMENT & PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the **Annexe 3A** (for students) and **Annexe 3B** (for supervisors).

E.8.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits** and who have met all other relevant UNAM requirements.

E.8.7. CURRICULUM FRAMEWORK FOR THE MASTER OF PHILOSOPHY IN BIOCHEMISTRY (33MSBT)

E.8.8. CURRICULUM FRAMEWORK FOR THE MASTER OF PHILOSOPHY IN MICROBIOLOGY (33MSMT)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6983LA	Academic Writing for Postgraduate Students	9	16	
Year 1 & 2				
S6983BT/ **S6983BM**	Thesis	9	240	Compulsory
Total Credits			**240**	
Total credits for this programme			**240**	

E.8.9. MODULE EQUIVALENT: MSC IN MICROBIOLOGY (33MSMB) & MPhil IN MICROBIOLOGY (33MSBT)

OLD CURRICULUM				NEW CURRICULUM			
Module	**Module name**	**NQF**	**Credits**	**Module**	**Module name**	**NQF**	**Credits**
UAE5819	Academic writing for Postgraduate students	9	24	U6983LA	Academic Literacy for Postgraduate Students	9	16
MMB5941	Research Methodology & Project Proposal writing. Computing Techniques and Bioinformatics	9	12	S6901TB	Biostatistics &Research Methodology	9	12

MMB5922	Microbial Evolution	9	12	S6911TB	Microbial Evolution and Biodiversity	9	24
MMM5931	Climate Change and Microbial Diversity	9	12				
MMM5911	Microbial Principles and Processes	9	24	S6931TB	Microbial Principals and Processes	9	24
MMM5931	Clinical Microbiology and Diagnosis	9	24	S6912TB	Microbes and Diseases	9	24
MMF5911	Food Microbiology	9	24				
MMF5921	Food Safety	9	12				
MMB5941	Bio Prospecting & Entrepreneurship in Microbiology	9	12	S6922TB	Bioprospecting &Bioentrepreneurship	9	12
MME5911	Environmental Biotechnology	9	24	S6932TB	Environmental Microbiology and Biotechnology	9	24
MME5912	Wastewater Microbiology	9	24				
MMB5900	Thesis	9	120	S6953BM	Thesis	9	120

E.8.9.1. COURSE DESCRIPTIONS FOR THE DEPARTMENTAL POSTGRADUATE MODULES

S6911BB	RESEARCH METHODOLOGY AND BIOSTATISTICS
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods and 3hrs practical per week for the semester.
Continuous Assessment	**100% CA** from which **20% is Statistics** component.

Course Descriptor: The purpose of this module is to provide students with theoretical and practical skills to conduct, analyse, present and communicate research work. **Introduction to Research Methodology. Scientific Writing**: Effective writing strategies for journal articles and publications, Paragraph structure, Digital resources, Working with original sources. **Reference Management Software:** Mendeley, RefWorks, Zotero, EndNote, etc. Introduction to research and **data collection methods**: both qualitative and quantitative. **Ethics and Plagiarism**. The student will write a **comprehensive research proposal** for MSc research on a topic of interest, supervised by an academic researcher. The evaluation will be done at departmental level. **Mini literature review projects** in prospective fields of research, extensive literature review under guidance of chosen supervisor(s), **writing and presentation of a Research Proposal** as per UNAM regulations. **Biostatistics:** handling experimental data, processing, and reporting, e.g., significant tests. **Analysis of variance (ANOVA)**: Concept of analysis of variance and covariance of data for single factor, multi-factor, one-way and multi-classified experiments. **Regression analysis methods. Experimental design:** need for designing experiments, characteristics of a good design. **Basic principles of designs**-randomization, replication, and local control. Completely randomized design, randomized block design; Factorial experiments (symmetrical and asymmetrical), Confounding in symmetrical factorial experiments. **Nonparametric tests:** Kruskal –Wallis and Friedman's tests; Wilcoxon-Mann-Whitney U-test; Chi-square test for goodness of fit and test for independence of attributes. **Introduction to SPSS, JASP and DATA tab**. Use of Software packages for Summarization and tabulation of data; **Descriptive statistics**; **Graphical representation of data; Exploratory data analysis**.

S6901TB	BIOSTATISTICS AND RESEARCH METHODOLOGY
NQF Level	9
NQF Credits	12
Contact Hours	2hrs lecture periods per week and 3hrs practical session every other week for the semester.
Continuous Assessment	**50%:** minimum of **2 tests**; at least 4 graded **practical reports**.
Examination:	1 x 2-hour theory paper.

Course Descriptor: The purpose of this module will enable students to develop a project proposal incorporating scientific methodologies and with bio-statistical skills related to microbiology research. In this module the following content will be covered: Research design; project planning, Proposal writing; problem analysis. **Biostatistics:** handling experimental data, processing, and reporting, e.g., significant tests. **Analysis of variance (ANOVA)**: Concept of analysis of variance and covariance of data for single factor, multi-factor, one-way and multi-classified experiments. **Regression analysis methods. Experimental design:** need for designing experiments, characteristics of a good design. **Basic principles of designs**-randomization, replication, and local control. Completely randomized design, randomized block design; Factorial experiments (symmetrical and asymmetrical), Confounding in symmetrical factorial experiments. **Nonparametric tests:** Kruskal –Wallis and Friedman's tests; Wilcoxon-Mann-Whitney U-test; Chi-square test for goodness of fit and test for independence of attributes. **Introduction to SPSS, JASP and DATA tab**. Use of Software packages for Summarization and tabulation of data; **Descriptive statistics**; **Graphical representation of data; Exploratory data analysis**. **Bioinformatics:** 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, modelling whole genome circuits, genomics and medical case studies

S6901BB	ENZYMOLOGY AND PROTEIN ENGINEERING
NQF Level	9
NQF Credits	12
Contact Hours	2hrs lecture periods per week & 3hrs practical sessions every other week for the semester
Continuous Assessment	50%, comprises assignments, presentations & written tests.
Examination:	1 x 3h Examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is to expand on the structure of enzymes and nomenclature; synthesis of enzymes, enzyme technology and applications. **Enzymes -** Analysis of peptides and proteins, End group analysis of peptides, Solution phase peptide synthesis; **Enzymes are proteins; Database of protein structures; How enzymes work; Enzymes and Enzyme Inhibitors** - Inhibition of hydrolases and peptidases, ACE inhibitors, **E.C. Enzyme nomenclature; Isozymes; Enzyme**

Technology - Large scale production and purification of enzymes, enzyme reactors, enzyme modifications for bioassays, immobilization of enzymes by chemical and physical methods, Effect of partition on kinetics and on changes in pH and hydrophobicity. **Applications -** enzymes as biocatalysts in synthetic chemistry, applications of enzymes in biopharmaceuticals, fermentation technology, biochemical engineering, food technology, medicines, etc. Reaction Engineering and Process Technology i.e. in bioanalysis, refining of food, washing powder, textile treatment and transformation of chemicals**. Synzymes -** enzyme electrodes and biosensors, Enzyme Engineering.

S6931BB	ADVANCED NUTRITIONAL AND HEALTH BIOCHEMISTRY
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions (mini project) every week for the semester
Continuous Assessment	**50%:** minimum of 3 tests; at least 1 case study and at least 4 graded practical reports.
Examination:	1 x 3h Examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is to study the diseases associated with metabolism of different biomolecules, digestion and absorption and relate human nutrition to the maintenance of health and the prevention of diseases. **Disorders of Carbohydrate Metabolism** - Diabetes mellitus, glucose and galactose tolerance tests, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, glycogen storage diseases, pentosuria, galactosemia. **Inborn Errors of metabolism** – Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyhan syndrome, sickle cell anaemia, histidinemia. **Digestive diseases** and **Gut Microbiome** – Maldigestion, malabsorption, creatorrhoea, diarrhoea and steatorrhoea. **Disorders of Lipids** – Plasma lipoproteins, cholesterol, triglycerides and phospholipids in health and disease, hyperlipidaemia, hyperlipidaemia, hyperlipoproteinemia, Gaucher's disease, Tay-Sach's and Niemann-Pick disease, ketone bodies, Abetalipoproteinemia. **Disorders of liver and kidney** – Jaundice, fatty liver, normal and abnormal functions of liver and kidney. Inulin and urea clearance. **Genetic diseases. Cancer**: cellular growth control, carcinogens, and cancer therapy. Pyrimidine nucleotides and chemotherapy. Structure of proteins and protein aggregates in degenerative diseases. Collagen, collagenopathies, and diseases of mineralization. **Iron metabolism**: Iron-deficiency anaemia and iron overload. Gluconeogenesis and fasting hypoglycemia. Fatty acids, Ketone bodies, and ketoacidosis. Triglycerides and hypertriglyceridemia. Cholesterol metabolism and hypercholesterolemia. Diabetes. **Viruses and emerging diseases**: replication, DNA viruses, RNA viruses, retroviruses. **Plasma proteins**: synthesis, albumin, fibrin, thrombin, serum enzymes in diagnosis. Biochemical diagnosis of diseases by enzyme assays.

S6911TB	MICROBIAL EVOLUTION AND BIODIVERSITY
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions every week for the semester
Continuous Assessment	50%, which comprises laboratory reports, written tests and assignments.
Examination:	1 x 3h examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is to outline the phylogeny of microbial pathogens and measuring the impacts of climate change as it relates to various ecosystem functions that are directly influenced by microbial diversity. With advancements in genome sequencing, we are better equipped to understand the interactions within microbial ecosystems and the ensuing evolutionary processes in microbial populations. Microbial evolution is at the heart of our understanding of the origins of new microbial disease pandemics including SARS, bird flu, Ebola, and COVID-19. **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. **Theme 2: Climate change versus climate variability:** Climate change and health – the effect of climate change on the pathology and spread of diseases such as malaria. Effect of climate change on the diversity, distribution and abundance of microorganisms and on microbial processes. 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.

S6931TB	MICROBIAL PRINCIPLES AND PROCESSES
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions every week for the semester
Continuous Assessment	**50%**, minimum of **3 tests**; one presentation and at least **8 graded** practical reports.
Examination:	1 x 3h examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is to develop a detailed comprehension of advanced current principles and processes of Microbiology. The module deals with an advanced and detailed inquiry of microbial principles, processes and applications. **Topics include: The chemistry of microbiology:** chemistry of cellular components and chemistry of microbiology. **Microorganisms and Microbiology**: cell structure and function in bacteria and archaea; microbial locomotion; tools of the laboratory and methods for studying microorganisms; microbial metabolism and pathways; microbial nutrition, ecology, culture and growth; mathematical considerations in microbiology; molecular biology of microorganisms; controlling microbial growth in the body and antimicrobial drugs; microbial genetics; and recombinant DNA technology and genetic engineering of microorganisms.

S6912BB	ADVANCED BIOCHEMICAL TECHNIQUES
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions (mini project) every week for the semester
Continuous Assessment	50%, which comprises laboratory reports, written tests and assignments.
Examination:	1 x 3h examination paper at the end of the semester

Course Descriptor: The purpose of this module is to provide students with hands-on experience in a range of advanced techniques employed in biochemistry, molecular technologies and biochemical analysis. 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-labelled DNA and RNA probes, synthetic oligonucleotide probes, expression of cloned genes in cultured cells, screening expression with antibodies and oligonucleotides, genome editing using CRISPR-Cas 9 technology, DNA sequencing; **Third-generation sequencing technologies (TGS):** Pacific Biosciences (PacBio), Single-Molecule Real Time (SMRT) sequencing and Nanopore Sequencing Technologies. **Application of recombinant technology:** production of insulin, drugs, vaccines, diagnostic probe of genetic diseases, gene therapy, production of transgenic plants with improved qualities like insect and drought resistance and nutritional enrichment, conventional and non-conventional techniques of plant hybridization, Agrobacterium-induced transformation using wild-type and engineered strains. **Cell Culture and Antibody Technology:** discovery, direct DNA uptake into protoplasts; flow cytometric analysis for ploidy, 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**. Advanced techniques to be addressed in this module include mammalian cell culturing techniques for drug flow cytometry, enzyme linked immunosorbent assays (ELISAs) in drug discovery and biomarker identification, **Molecular approaches to varietal profiling**: seed quality testing, transformation technology for modifying plant metabolism and modern breeding perspectives and strategies in a commercial context.

S6902BB	BIOSAFETY & PROJECT MANAGEMENT
NQF Level	9
NQF Credits	12
Contact Hours	2hrs lecture periods per week & 3hrs practical session every other week for the semester
Continuous Assessment	50%, which comprises laboratory reports, written tests and assignments.
Examination:	1 x 3h examination paper at the end of the semester

Course Descriptor: The purpose of this module is to introduce students to theories, concepts, and techniques in resource management of projects and organisations. Topics include definitions and classifications of projects. **Objectives in project management** - time, costs, quality; aspects of entrepreneurship development; 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 organizational structure can create and destroy markets**. Focus on innovation from an organizational 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 organizations and markets. **Consumer's attitudes and risk assessment:** Risk assessment and avoidance; general principles; Assessing the impact of genetically modified crops. **Breeders' rights:** the impact of genetically modified organisms and environmental monitoring, biological safety conventions, environmental risk assessments and management. **Biosafety and biosecurity:** Bio-safety containment facilities, biohazards, genetically modified organisms (GMOs), living modified organisms (LMOs), biological waste management, Biosafety for human health and environment designing and management of laboratory and culture room. **Biosecurity:** definition, pillars of biosecurity, biosecurity risk assessment. Bioethics: human interaction with its environment, **bioethical issues,** and their solutions, living organisms' rights. **Regulatory Affairs:** Regulation, national and international guidelines of Biosafety, rDNA guidelines, Regulatory requirements for drugs and Biologics of Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

S6932BB	ADVANCED BIOINFORMATICS
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week and 3hrs practical sessions for the semester
Continuous Assessment	50%, which comprises laboratory reports, written tests and assignments.
Examination:	1 x 3h examination paper at the end of the semester

Course Descriptor: The purpose of this module is to enable students to apply advance bioinformatics tools in management and analysis of DNA, RNA and protein sequencing approaches. Computer based technologies are therefore applied and employed in the management and analysis of such biological data. The various genomic and proteomic databases and the levels of stored data will be discussed and applied in depth. **Topics include** tools in Bioinformatics: web-based bioinformatics applications, online analysis tools & servers, exploration of databases like NCBI, EBI Stanford MB Workbench, DDBJ, PDB, TIGR, SWISS-PROT, Homology Tools –BLAST, FASTA, SSEARCH, Multiple Alignment-CLUSTALW & PHYLIP, Molecular visualization software-Swisspdb viewer, Rasmol Gene Prediction Software- Genescan, McPromoter, Protein, Modelling software-SWISSMODEL. **Functional and Comparative Genomics, Transcriptomics, Proteomics:** Theory and algorithms in Bioinformatics; Genomes to Systems; Biocomputing; modelling of motifs and cis-regulatory modules; identification of transcription factor binding sites; gene finding; transcriptome quantification and assembly; RNA sequence and structure modelling; modelling biological sequence evolution; large-scale and whole-genome sequence alignment; modelling the evolution of cellular networks and genotype analysis and association studies; Protein Structure & Purification, Visualization & prediction of protein structure, methods used in protein structure prediction (e.g. PROSITE< PRODOM); Genome assembly; Alignment of next-generation sequencing data; Evaluation of RAPD fragments patterns for **phylogeny analysis;** 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. **Metabolic pathways**: Gene ontology (GO) analysis – functional analysis of sets of genes. Structure-based drug design. Conventional and non-conventional techniques of plant hybridization (e.g., microarray).

S6922BB	ENVIRONMENTAL TOXICOLOGY & MANAGEMENT
NQF Level	9
NQF Credits	12
Contact Hours	2hrs lecture periods per week for the semester & 3hrs practical every other week for the semester
Continuous Assessment	50%, which comprises laboratory reports, written tests and assignments.
Examination:	1 x 3h examination paper at the end of the semester

Course Descriptor: The purpose of this module is to: Give an advanced understanding of uptake and distribution of environmental pollutants in an organism and how pollutants can affect molecular, cellular and organismal processes. **Scope and Introduction:** basic terminologies, environmental toxicology vs ecotoxicity, importance of environmental toxicity. **Principles of environmental toxicology:** environmental exposure/toxic dose, undesired effects, toxicity testing methods, mechanisms of toxic action**. Environmental Changes and Environmental health**: impact of global environmental changes, global climate changes, air pollution, water pollution and soil contamination. **Nature and burden of Environmental Diseases**: consequences of damaged DNA in the induction of mutations and development of cancer; **Environmental Pollution and Regulatory Agencies**: Impacts of environmental pollutions, regulatory concerns, environmental health laws and agencies. **Fate and transport of toxicants in the environment**: movement in the environment, distribution into living organisms. **Bioaccumulation of persistent environmental toxicants:** bioconcentration and estimation of its potential. **Metabolism/Biotransformation of Xenobiotics:** Characteristics of cytochrome P450 enzymes, catalytic activities and cellular locations, antioxidant enzymes. **Persistent toxic substances**: Chemical vs environment persistence, persistent pollutants of global criteria. **Biological toxic agents**: pathogenic microbial agents (bacteria, fungi, viruses and parasites), toxins from microorganism, plants and animals and their impacts. **Occupation toxicology/workplace hazards**: occupational diseases, occupational health and safety laws, legislations- of occupation health, exposure limit values. **Human health aspects of ecotoxicity**: relevance to aquatic, wildlife and hazardous waste toxicology, biological risk assessment. **Environmental health risk assessment**: health risk assessment activities, animal toxicity studies, past and current perspectives on human exposure assessment. **Environmental health risk characterization**: Health risk measures, uncertainty and safety factors, health risk communication. Biodegradation Using Natural Microbial Communities; Changing Environmental Conditions to Stimulate Biodegradation.

S6912TB	MICROBES AND DISEASES
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions every week for the semester
Continuous Assessment	**50%**, minimum of **3 tests**; one presentation and at least **8 graded** practical reports.
Examination:	1 x 3h examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is to evaluate the role of microorganisms in infection and disease. **Microorganisms and disease**: microbial diseases of the respiratory tract, urogenital tract; gastrointestinal tract; skin surface; the nervous system; the cardiovascular and lymphatic systems; antimicrobial resistance and antimicrobial resistance; One health concept. **Host defences**: innate immunity; adaptive immunity; practical applications of immunology; antimicrobial drugs; Microbe-animal interactions in infection and disease; pathogenic DNA and RNA viruses; viroids and prions; **Microbial contamination and spoilage of different foods** - Contamination of foods from natural habitats (green plants, fruits, animals, sewage, soil, water, air) and handling and processing. Principles of food protection (asepsis, maintenance of anaerobic conditions, use of high and low temperature, drying, use of food additives, radiation). **Food Toxicology**: **Microbial toxins** - Microbial toxins (endotoxin and exotoxin) and toxoids, source and chemistry of microbial toxins in contamination of food grains and food products. Microbial food-borne poisoning, infections and intoxication. Food additives as toxicants. - **Food hygiene principals** - Food sanitation, microbiological criteria and food safety, Food safety objectives (FSO). Hazard analysis critical control points (HACCP), handling of recombinant food products; Detection of various methods of food toxicity.
Food Safety: Risk analysis. Food Safety in Food Chain (From Farm to Folk), Food Authenticity and Food defence

S6932TB	ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY
NQF Level	9
NQF Credits	24
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions every week for the semester
Continuous Assessment	50% of at least **8** assessed practicals **[40%]**, 3 tests **[55%]** and 2 assignments/quizzes **[5%]).**
Examination:	1 x 3h examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is designed to familiarize students with interactions among the microorganisms and their role in the environment and biotechnology. **Theme 1: Microbial Interactions and their role in the environment:** Mobilization and immobilisation 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. **Theme 2: 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. **Theme 3**: **Bioremediation and Biodegradation of Pollutants and recalcitrant compounds**: Principles of Bioremediation, 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 4**: **Sources and typical characteristics of wastewater:** Domestic wastewater, industrial wastewater (food and beverage industry, chemical industry, tanneries, textile industry etc), agricultural run-off. **Theme 5: 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. Necessary adaptations of a sewage treatment plant for the treatment of various industrial wastewater, focusing on the microbiological processes in such plants such as the use of microorganisms for toxicity testing. Reclamation of wastewater for drinking water production and microbial aspects and processes in drinking water treatment and distribution. **Theme 6**: **Environmental consequences of not treating wastewater**: eutrophication in surface water, groundwater contamination, pollution with pathogens, toxic chemicals in water, and 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 7**: Operational procedures and their importance to microbial processes, such as the sludge retention time, hydraulic retention time, sludge loading rate, Feed ratios etc.

S6922TB	BIOPROSPECTING AND BIO ENTREPRENEURSHIP
NQF Level	9
NQF Credits	12
Contact Hours	4hrs lecture periods per week & 3hrs practical sessions every week for the semester
Continuous Assessment	50% of written practical assignments and at least **3 tests** during the semester.
Examination:	1 x 2hours examination paper at the end of the semester **(Examination 50%).**

Course Descriptor: The purpose of this module is equipping students with skills in microbial bioprospecting and establishing a bio-based start-up company. The content of this module 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 endophytic 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 module 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 module will be assessed by means of a simulated grant application for the development of a hypothetical microbiological/biotechnological venture.

S6953BT	THESIS
NQF Level	9
NQF Credits	120
Contact Hours	Blended consultations with supervisor(s) on regular bases
Co-requisite	Pass in all year 1 modules is required before a student can start with the research project.

Course Descriptor: The purpose of this module is to enable students to develop deeper knowledge, understanding, and capabilities within the scope of research study. Students will present their findings in a written thesis. Poster and seminar presentations are encouraged. This module 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 enable students to acquire in-depth practical training under the supervision of experienced research staff and help develop their capacity for independent investigation and report writing. Most projects are laboratory-based although some data review, computer-based projects may be available. This is carried out for a minimum period of 1 year for full-time students or 2 years for part-time students.

E.9. DOCTOR OF PHILOSOPHY IN BIOCHEMISTRY (33PHBY)

For admission requirements, please see E.10.1.1/2

E.10. DOCTOR OF PHILOSOPHY IN MICROBIOLOGY (33PHMD)

E.10.1. ADMISSION REQUIREMENTS

To be eligible for this PhD programme, the candidate must have completed a Master's Degree at NQF level 9 in Biochemistry/ Microbiology or equivalent qualification from a recognised higher education institution, with an average of at least 60%. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA). Along with the application, candidates must submit a detailed research proposal that highlights their proposed area of research, objectives, methodology, and a review of existing literature. The research proposal will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

E.10.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the master's for PhD qualification.

E.10.3. ARTICULATION OPTIONS

N/A as this is the highest qualification in this field of study.

E.10.4. ASSESSMENT CRITERIA

Assessment will be done based on examination of the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of 50% marks in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

E.10.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of **the University's Higher Degrees Policy, Rules, and Regulations**, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission **(ANNEX 19B).**

E.10.6. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the **Annex 3A** (for students) and **Annex 3B** (for supervisors).

E.10.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **360 credits** and who have met all other relevant UNAM requirements.

E.10.8. CURRICULUM FRAMEWORK: SUMMARY TABLE FOR ALL MODULES IN THE PROGRAMME

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
S7093BD/S7093BT	Dissertation	10	360	Compulsory
Total Credits			**360**	
Total credits for this programme			**360**	

E.10.9. COURSE DESCRIPTIONS FOR THE DEPARTMENTAL POSTGRADUATE MODULES

S7093BD	**DISSERTATION**
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module: train students to be effective research scientists by developing deeper knowledge, understanding, and capabilities in a subject area and relevant field. Students will present their findings in the form of a written thesis or peer reviewed published articles. Poster and seminar presentations are required at various levels of the candidates training. This module 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 ability for independent investigation and report writing. Research work is carried out for a minimum period of 3 years for full time students or 6 years for part time students.

F. DEPARTMENT OF ENVIRONMENTAL SCIENCE

F.1. BACHELOR OF SCIENCE IN ECOLOGY & BIODIVERSITY CONSERVATION - 33BSEB

F.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:

F.2.1.1. 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.

F.2.1.2. 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 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.

F.2.1.3. 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%.**

F.2.1.4. 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.

F.2.2. 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:

F.2.2.1.1. 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.

F.2.2.2. 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.

F.2.3. ADVANCEMENT AND PROGRESSION RULES

F.2.3.1. 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

F.2.3.2. 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.2.4. 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.

F.2.5. 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).

F.2.6. BACHELOR OF SCIENCE IN ECOLOGY & BIODIVERSITY CONSERVATION (NQF LEVEL 7) 33BSEB

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	PRE-REQUISITES	COMPULSORY
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
S3502TM	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	CREDITS	PRE-REQUISITES	COMPULSORY
Year 2 Core Semester 1					
U3683AL	Academic Literacy II	6	8	None	COMPULSORY
U3420PJ	Project Management	4	2	None	COMPULSORY
U3420RT	Entrepreneurship	4	2	None	COMPULSORY
U3520TH	Critical thinking	5	2	None	COMPULSORY
U3420SE	Sustainability and environmental awareness	4	2	None	COMPULSORY
S3600EM	Marine Ecology	6	8	None	COMPULSORY
Year 2 Semester 1					
S3611EA	Animal Form and Function	6	16	S3511BB & 3512ED	COMPULSORY
S3611EB	Biostatistics	6	16	S3511SF	COMPULSORY
S3601EF	Freshwater Ecology	6	8	S3511EE	COMPULSORY
S3611ET	Ecological Field Techniques	6	16	S3511EE & S3512ED	COMPULSORY
Year 2 Semester 2					
S3612EP	Plant Form and Function	6	16	S3511BB & S3512ED	COMPULSORY
S3632EE	Ecosystem Ecology	6	16	S3611ET	COMPULSORY
S3632EC	Conservation Biology and Biodiversity	6	16	S3611ET	COMPULSORY
S3602EV	CWIE PREP	6	8	None	COMPULSORY
Total credits			**136**		

YEAR 3

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

F.3. BACHELOR OF SCIENCE IN ENVIRONMENTAL AND GEOGRAPHICAL SCIENCES - 33BEGS

F.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 the undergraduate **BSc in Environmental and Geographical Sciences programme** shall be:

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

Candidates must have 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 a minimum **C**' at NSSCO level.

Candidates who 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 enrol for the Extended Enrolment of this programme that will take one year longer.

F.3.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES BEFORE 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued before 2021 (only) and who have 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.

F.3.2. ALTERNATE PATHWAYS TO ADMISSION

F.3.2.1.1. 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 cover 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%.**

F.3.2.1.2. 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. **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.

F.3.3. 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, marginalised groups, and regional representation.

F.3.4. 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:

F.3.4.1. 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.

F.3.4.2. 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.

F.3.5. 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.

F.3.5.1. 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%.

F.3.5.2. 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

F.3.6. 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.

F.3.7. 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.

F.3.8. BACHELOR OF SCIENCE IN ENVIRONMENTAL & GEOGRAPHICAL SCIENCE (NQF LEVEL 7) – 33BEGS

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	Comp-C/Elect-E
Core Semester 1					
U3403FS	Skills Portfolio	4	0	None	COMPULSORY
U3583AL	Academic Literacy I	5	8	None	COMPULSORY
U3583DD	Digital Literacy	5	8	None	COMPULSORY
S3420EL	Laboratory and Field Safety	4	2	None	COMPULSORY
U3420CN	National and Global Citizenship	4	2	None	COMPULSORY
U3420EM	Ethics and Morality	4	2	None	COMPULSORY
U3420SE	Sustainability and environmental awareness	4	2		COMPULSORY
Year 1 Semester 1					
S3531VA	Introduction to Environmental Science	5	12	None	COMPULSORY
S3511SF	Fundamentals of Statistics	5	12	None	COMPULSORY
S3511EE	Introduction to Ecology	5	14	None	COMPULSORY
S3511VD	Introduction to GIS and Remote Sensing	5	14	None	COMPULSORY
Year 1 Semester 2 [Electives: choose between S3512ED & S3512VH; & choose either S3512EC & S3532VH]					
S3512ED	*Diversity of Life*	*5*	*14*	*None*	*ELECTIVE*
S3512VH	*Human Environment*	*5*	*14*	*None*	*ELECTIVE*
S3512EC	*Climatology*	*5*	*14*	*None*	*ELECTIVE*
S3512VG	*Geomorphology*	*5*	*14*	*None*	*ELECTIVE*
S3532VH	*Hydrology*	*5*	*14*	*None*	*ELECTIVE*
S3572VM	Mathematics for Environmental Sciences	5	12	None	COMPULSORY
S3532CL	Chemistry for Life Sciences	5	14	None	COMPULSORY
Total credits			**130**		

YEAR 2

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

YEAR 3

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

F.4. BACHELOR OF SCIENCE IN FORESTRY AND RANGELAND MANAGEMENT - 33BSFR

F.4.1. 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 the undergraduate **BSc in Ecology & Biodiversity Conservation** programme shall be:

F.4.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

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

Five different subjects are as follows:

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

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

F.4.1.2. 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 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 a **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.

F.4.2. ALTERNATE PATHWAYS TO ADMISSION

F.4.2.1. 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.

F.4.2.2. 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.4.3. 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, marginalised groups and regional representation.

F.4.4. 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:

F.4.4.1. 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.

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

F.4.4.2. 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.

F.4.5. 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.

F.4.5.1. 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)**

F.4.5.2. 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

F.4.6. REQUIREMENTS FOR QUALIFICATION AWARD

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

F.4.7. MODULE EQUIVALENTS DURING TRANSITION PHASE

The new curriculum will be implemented on a year-by-year basis starting in 2023 and will be fully implemented in 2025. **The Bachelor of Science in Forestry and Rangeland Management** is a transformation of 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 years 1-3 of the previous BSc IES.

F.4.8. 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	**Compulsory**
U3583AL	Academic Literacy I	5	8	None	**Compulsory**
U3583DD	Digital Literacy	5	8	None	**Compulsory**
U3420CN	National and Global Citizenship	5	2	None	**Compulsory**
U3420CN	Ethics and Morality	5	2	None	**Compulsory**
S3420EL	Laboratory and Field Safety	4	2	None	**Compulsory**
U3420SE	Sustainable Environmental Awareness	5	2	None	**Compulsory**
Year 1 Semester 1					
S3511SF	Fundamentals of Statistics	5	12		**Compulsory**
S3511BB	Foundations of Biochemistry & Biology	5	14		**Compulsory**
S3511VD	Introduction to GIS and Remote Sensing	5	14		**Compulsory**
S3511EE	Introduction to Ecology	5	14		**Compulsory**
Year 1 Semester 2					
S3512EC	Climatology	5	14		**Compulsory**
S3572VM	Mathematics for Environmental Science	5	12		**Compulsory**
S3532CL	Chemistry for Life Science	5	14		**Compulsory**
S3502TM	Introduction to Genetics	5	7		**Compulsory**
S3502EW	Water Resource Management	5	7		**Compulsory**
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	**Compulsory**
U3420PJ	Project Management	6	2	None	**Compulsory**
U3420RT	Entrepreneurship	6	2	None	**Compulsory**
U3520TH	Critical thinking	6	2	None	**Compulsory**
U3520LP	Leadership	6	2	None	**Compulsory**
S3620VE	Environmental Justice and Ethics	6	8	None	**Compulsory**
Year 1 Semester 1					
S3621VS	Soil Science	6	8		**Compulsory**
S3611EB	Biostatistics	6	16		**Compulsory**
S3611VP	Introduction to programming with Python	6	16		**Compulsory**
S3611EF	Forest and Rangeland Flora	6	16		**Compulsory**
Year 1 Semester 2					
S3612EA	Angiosperm Physiology	6	16	BCY 3511	**Compulsory**
S3612EF	Forest and Rangeland Field Study Methods	6	16	EBC 3531	**Compulsory**
W3780ZE	CWIE preparation	6	8		**Compulsory**
S3612ES	Silvicultural Practices	6	16	None	**Elective**
S3612EW	Wildlife Management in Rangeland & Forests	6	16	None	**Elective**
Total credits			**136**		

YEAR 3

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory-C/Elective-E
Core Semester 1 (CHOOSE 1 MODULE FROM THE 3 ELECTIVES BELOW)					
W3730EN	Internship	5	24		**Elective**
S3710EC	Community Engagement	5	24		**Elective**
W3750EP	Project/ Product Based Learning	5	24		**Elective**
Year 1 Semester 1 (CHOOSE 1 MODULE FROM THE 2 ELECTIVES BELOW)					
S3751VS	Spatial Analysis and Cartography	7	18	EGS 3511	**Compulsory**
S3711EN	*Natural Resource Economics*	*7*	*18*	*None*	***Elective***
S3711EB	*Community-based Management of Forest and Rangeland Resources*	*7*	*18*	*None*	***Elective***
S3711ER	Research methods	7	18	None	**Compulsory**
Year 1 Semester 2					
S3712EG	Natural Resource Governance	7	16		**Compulsory**
S3712EF	Forest and Rangeland Protection	7	16		**Compulsory**
S3702EA	Agroforestry for Drylands	7	9		**Compulsory**
S3702ES	Sustainable Management of Forest and Rangelands	7	9		**Compulsory**
Total credits			**128**		

F.4.9. MODULE EQUIVALENTS

CODE	OLD MODULE	CREDITS	LEVEL	CODE	NEW MODULE	CREDITS	LEVEL
EBL3631	Introduction to Ecology	16	6	S3511EE	To be offered		
BLG3621	Biometrics I	8	6		To be offered		
BLG3622	Biometrics II	8	16		To be offered		
BLG 3611	Animal Form & Function	16	6	S3611EA	Animal Form & Function	16	6
EBL3632	Ecological Field Techniques	16	6	S3611ET	Ecological Field Techniques	16	6
BLG3612	Plant Form & Function	16	6	S3612EP	Plant Form & Function	16	6
EBL3712	Ecosystem Ecology	16	7	S3632EE			
EBL3771	Conservation Biology & Biodiversity	16	7	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	S3752EE	Ecophysiology	18	7
EBL3871	Population Ecology	8	16		None		
EBL3851	Biogeography	8	16		None		
	None			S4842WL	Conservation Genetics	8	10
EBL3841	Integrated Natural Resources Management I	8	8	None	None		
EBL3852	Integrated Natural Resources Management II	8	16	None	None		
EBL3802	Disturbance and Restoration Ecology	8	8	S4872ER	Restoration Ecology	8	20
	None			S4821VS	Strategic Land-use Planning	8	10
EBL3812	Behavioural Ecology	8	16	S4852EB	Behavioural Ecology	8	20
	None			S4811EM	Molecular Systematics	8	20
EBL3800	Field Ecology	8	4		None		
	None			S4831EA	Advanced Biostatistics	8	20
GSP3840	Spatial Analysis and Planning II				None		
GSO3860	GIS and Local Planning				None		
	None			S4822PG	Project Management	10	
GIS3800	Project Management				None		
GPS3841	Geoinformation in Practice				None		
GPS3810	Research Project in Geo-information Science	32					
BLG3810	Research Project	32					
GHE3810	Research project in Geography and Environmental Studies			S4810ER	Research Project	30	
GIS3859	Geoinformation Work Integrated Learning	16			None		
GSP3800	Environmental Management and Governance	16			None		
GSP3820	Spatial Planning	16			None		
GHR3801	Remote Sensing (half-course)	8			None		
GHR3822	Applied Spatial Analysis	8			None		
GHT3800	Tourism Studies	16			None		
GHE3800	Political Geography	16			None		
GHE3820	Themes in Advanced Geography and Environmental Studies	16		S4810ER	Research Project	30	
	None			S4832VE	Environmental System Analysis & Monitoring	20	
GHE3899	Field work	16			None		
GHE3810	Research project in Geography and Environmental Studies	32		S4810ER	Research Project	30	
	None			S4811VD	Waste management	20	
	None			S4831VE	Strategic Environmental Assessment	20	
ENV 3891	Environment Pollution Control	12					
ENE 3882	Environmental Impact Assessment	12					
ENP 3882	Environmental Planning and Management	12			**No equivalent module is to be offered again**		

ENV 3801	Watershed Management	8					
GSP3800	Environmental Management and Governance	16			None		
	None			S4831RE	Remote Sensing and Earth Observation	20	
	None			S4851VS	Machine Learning for Spatial Data	20	

F.4.10. DEPARTMENT OF ENVIRONMENTAL SCIENCE COURSE DESCRIPTIONS

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; 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** 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 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:	**100%** continuous assessment (min 4 tests and 4 assignments). Minimum module pass mark: 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 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** 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, 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** 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** 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** 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** 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** 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** 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 effects 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** 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 characteristics, 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** 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 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** 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** 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** 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** 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** 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** 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** 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** 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** 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 americana.*

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 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 50%** of 8 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 **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:	**50%** CA of 4 practical (40%); 2 tests (40%); 2 assignments (10%) & 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.

F.5. BACHELOR OF SCIENCE IN FORESTRY HONOURS (33HFOR)

F.5.1. ADMISSION REQUIREMENTS

A Bachelor of Science in **Forestry and Rangeland Management (NQF Level 7)** from the University of Namibia or equivalent qualification from recognised institution.

F.5.2. ADDITIONAL SELECTION CRITERIA

An entry test shall be used to select students when there too many students that qualify for admission and a reduced number of applicants need to be selected. Students who score the highest in the entry test will be selected. If there shall be ties in entry scores, and the number of students to be admitted still needs to be reduced, the students who have the highest average scores in their Bachelor degree will be selected. However, gender, regional representation and equity shall be taken into consideration for final selection.

F.5.3. ARTICULATION OPTIONS

Graduates from this programme may enrol for **Masters programmes in forestry, environmental management** and related areas.

F.5.4. ASSESSMENT CRITERIA

Most Modules in this programme will be assessed through a combination of continuous assessment (CA) and an examination at the end of the semester, while a few Modules are based on 100% formative assessment (see programme structure). A minimum Mark of 50% is required to pass a 100% CA module. 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 respective Modules. The CA will make up 50% while the Examination will make up 50% of the final mark of the Module. Duration of examinations will be for 3 hours for full Modules (20 credits) and 2 hours (10 credits) for half Modules. Students must attain a minimum CA mark of 40% to qualify to write the examination. A minimum final mark of 50% is required to pass each Module. Notwithstanding the above, a subminimum of at least 40% will apply to the Exam Mark, unless otherwise stated in the individual module descriptor.

F.5.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted to this programme, a student must have successfully completed 70 credits (equivalent to three and half modules) by the end of the first year of registration. The programme must be completed in a maximum of two years.

F.5.6. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

F.5.7. DURATION OF STUDY

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

F.5.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **136 credits** and who have met the requirement of compulsory and elective sections.

F.5.9. 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.5.10. 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 % attendance of practical classes is required.

F.5.11. CURRICULUM FTAMEWORK FOR THE BACHELOR OF SCIENCE IN FORESTRY HONOURS (33HFOR)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880EP	Research Proposal	8	14	None	Compulsory
S4820VE	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4811ES	Silviculture	8	20	None	Compulsory
S4811EF	Forest Inventory and Management	8	20	None	Compulsory
S4841EU	Urban Forestry	8	10	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Year 1 Semester 2					
S4832EF	Forestry and Value-Chain Development	8	20	None	Compulsory
S4812EF	Forest Ecosystem Services	8	18	None	Compulsory
S4822ER	Project Management	8	10	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Total credits			**136**		

S4880EP:	RESEARCH PROPOSAL
NQF Level:	8
NQF Credits:	14
Contact Hours:	3 hours practical per week for one semester
Course Assessment:	100% on CA, constituted by 90% written assignments, & 10% Oral presentations.
Examination:	No examination

COURSE DESCRIPTION: **Ethics of Research and Plagiarism**. **The scientific method:** Logic and scientific, natural observations, asking questions and formulation of hypotheses, Predictions, Types of hypotheses (null, alternative, research); **Handling experimental data**; Processing and reporting; **Significance tests**; parametric and non-parametric tests. **Use of existing literature:** Using the internet and the university library; Finding and using literature references; Citation of references; **Writing a literature review:** Report Writing; Oral presentation using state-of-the-art equipment.

S4883ER:	RESEARCH PROJECT
NQF Level:	8
NQF Credits:	16
Contact Hours:	3 hours practical per week for one semester
Course Assessment:	100% CA: research proposal (20%), oral presentation (30%), written research report (50%)
Examination:	No examination

COURSE DESCRIPTION: This module is designed to develop the research skills of students through the completion of a research project on an approved topic. Students will be expected to develop and submit a written research proposal with the guidance of the supervisor; collect and analyze data using appropriate statistical tests; present the findings both orally and in the form of a journal article (though not a requirement to pass the course).

S4811ES:	SILVICULTURE
NQF Level:	8
NQF Credits:	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	50% CA of practical & field reports, group presentations, individual assignments and tests.
Examination:	1x 3 hours Theory Examination paper **(50%).**

COURSE DESCRIPTION: **Introduction:** definition of terms and concepts in silviculture; forms and composition of forest stands; factors affecting the selection of a silvicultural system; applicable silvicultural systems in drylands. **Forest establishment:** community woodlots; private plantations; introduction and promotion of enclosures for encouraging natural forest regeneration; long term evaluation of enclosures; production of seedlings and vegetative propagation; coppicing; planting – direct seeding or transplanting. **Forest management:** natural dryland forests; ecology and management of dryland forests; selection of trees and shrubs suitable Namibia and other similar drylands; harvesting methods of trees and other forest products and challenges; allowable cut from enclosures and natural forests; weed control; protection of forests and trees; thinning and pruning. **Silviculture of selected indigenous and exotic trees:** techniques of growing and managing different indigenous and exotic trees under various ecosystems and for different products and services. **Tree and forest improvement:** theory and practice of forest and trees sustainable improvements. **50% CA mark and 50% Examination mark.**

S4811EF:	FOREST INVENTORY AND MANAGEMENT
NQF Level:	8
NQF Credits:	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	**50%** CA of practical & field reports, group presentations, individual assignments and tests.
Examination:	1x 3 hours Theory Examination paper **(50%).**

COURSE DESCRIPTION: **Sampling designs used in forestry**: simple random; systematic; cluster; multi-stage and stratified sampling. **Determination of stand or whole forest parameters:** basal area; canopy cover; stand volume and estimation of allowable cut for a specific planning period taking into account recruitment rate and growth increment. **Presentation of inventory data:** data capture forms; frequency tables; figures, bar charts and pie chart to display inventory data. **Design, preparation and execution of a forest inventory:** preparation of equipment and personnel; choice of sampling techniques; execution logistics. **Forest management concepts:** sustainability; growth and yield; forest stocking; rotation; allowable cut; operational planning and strategic planning. **Role of management plans in forestry:** guiding management; certification purposes; monitoring effects of management. **Preparation of management plans for a particular community or state forest:** objectives of management; planning period; gathering relevant data; writing up the plan. **50% CA mark and 50% Examination mark.**

S4841EU:	URBAN FORESTRY
NQF Level:	8
NQF Credits:	10
Contact Hours:	2 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	**50%** CA of practical & field reports, group presentations, individual assignments and tests.
Examination:	1x 2 hours Theory Examination paper **(50%).**

COURSE DESCRIPTION: **Types of urban forests and other tree formations:** definition of urban forestry; parks; botanical gardens; avenue plantings; potted trees and shrubs. **Purpose, benefits and costs of urban forests and trees:** ecological, social, cultural and economic aesthetic benefits; risks associated with forests and trees in urban areas; costs of urban forestry. **Planning and designing of urban forests and avenue planting:** physical planning policy and legislation; institutional framework governing urban land use; planning tools and expertise; purpose of the urban forest; design selection; site selection; landscaping. **Selection of shrub and tree species for urban forestry:** target benefits; climatic and edaphic considerations; risk associated with a species; invasiveness; growth rate; exotic versus indigenous species. **Establishment and management of urban forests:**

raising or sourcing of planting stock; protection and irrigation of newly planted stock; silvicultural management of urban forests and trees. **50% CA mark and 50% Examination mark.**

S4832EF:	FORESTRY AND VALUE CHAIN DEVELOPMENT
NQF Level:	8
NQF Credits:	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	**50%** CA of practical & field reports, group presentations, individual assignments and tests.
Examination:	1x 3 hours Theory Examination paper **(50%).**

COURSE DESCRIPTION: **Introduction to Forestry Industries:** Definition and scope of forestry industries and value addition, Historical perspective of forestry industries, Global trends and their relevance to Namibia. **Economic importance of forestry resources:** Value Addition in Forestry, Concept and importance of value addition, Examples of value-added forest products in Namibia e.g. wood carving, furniture, firewood, charcoal and NTFPs. Case studies of successful forest based value addition initiatives in Namibia. **Forest Product Processing and Manufacturing:** Concept of value chain: actors, mapping and upgrading. Primary and secondary processing techniques. Technologies used in wood processing, with specific focus on technologies available in Namibia and wood products available in Namibia. Technologies for processing Non-timber forest products in Namibia and their industrial applications. **Forest environmental services** as forest products and their contribution to biodiversity conservation, climate regulation and mitigation as well as hydrological cycle in dryland forests.

Supply Chain Management in Forestry: Overview of the forestry supply chain, Logistics and transportation of forest products, Quality control and assurance in forest product supply chains, Economic and Market Analysis, Market demand and supply for forest products, Pricing strategies and market dynamics, Export opportunities and challenges for forest products. **Market system of forest based industries:** National and international policies affecting forestry industries, Legal aspects of forestry and forest product trade, Environmental regulations and compliance, Forest product certification and compliance to Sustainable Forest Practices, Environmental impact assessment in forestry industries. Procedures for establishing associations for forest based product trade. **Innovation and Technology in Forestry:** Emerging technologies in forestry industries, Research and development in value addition, Role of biotechnology in forestry industries. **Business and Entrepreneurship in Forestry:** Starting and managing a forestry-based business, Financing options for forestry projects, Entrepreneurship opportunities in value-added forest products. **Future prospects for forestry industries,** challenges and barriers to value addition, Strategies to overcome challenges and promote industrial growth. **50% CA mark and 50% Examination mark.**

S4832EF:	FORESTS ECOSYSTEM SERVICES
NQF Level:	8
NQF Credits:	18
Contact Hours:	4 lecture periods per week for one semester**.**
Course Assessment:	**50%** CA of practical & field reports, group presentations, individual assignments &tests.
Examination:	1x 3 hours Theory Examination paper **(50%).**

COURSE DESCRIPTION: **Introduction:** definition of climate change; causes, global effort to address climate change; adaption and mitigation of climate change. **Climate change impacts on forest ecosystems:** impacts; models on climate change impacts on forests; implications on livelihoods. **Adapting forests to climate change:** conservation of biological diversity and genetic variation to enhance forest resilience; reducing emissions from deforestation and land degradation, Forest management practices etc. **Mitigating climate change through forests:** Carbon sequestration in forests; biomass; renewable energy, conservation of existing forests and forest expansion, agriculture, forestry and other land use (AFOLU) or land use, land use changes and forestry (LULUF). **Climate change policy in Namibia**: Sectoral requirements; adequacy of this policy with respect to forest management, Nationally Determined Contribution to Climate Change e.g. adaptation and mitigation requirements. **Opportunities in the forest sector arising from climate change:** in Namibia; SADC; global opportunities. **50% CA mark and 50% Examination mark.**

S4822ER:	PROJECT MANAGEMENT
NQF Level:	8
NQF Credits:	10
Contact Hours:	2 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	**100%:** 3 practical assignment reports (40%), 2 tests (30%), & 2 seminar presentation (30%).
Examination:	No Examination.

COURSE DESCRIPTION: **Project life cycle:** The nature of organizations, phases of project life cycle, project management process groups as well as the procurement process. **Strategic Planning, Scope, and Project Charter:** Strategic planning, scope of a project and project charter. **Human factor and Communication:** Efficient use of personnel in a project, the human factor, communication planning. **Budgeting and project costing:** Cost management, project resources and cost management, cost control and Earned Value management. **Time management:** The work breakdown structure (WBS), activity sequencing and network diagram, Gantt charts for time management. **Risk and Change management:** Understanding risk management, Quality risk analysis, strategies to respond to risk, change management. **100% Continuous Assessment (CA) mark and No Examination mark.**

F.6. BACHELOR OF SCIENCE IN ECOLOGY & BIODIVERSITY CONSERVATION HONOURS (33HEBC)

F.6.1. ADMISSION REQUIREMENTS

BSc in Ecology and Biodiversity Conservation (NQF Level 7) from the University of Namibia, or equivalent qualification.

F.6.2. ADDITIONAL SELECTION CRITERIA

- ✓ The Department will ensure that gender considerations are taken into account in compliance with the Affirmative Action and Gender empowerment policies.
- ✓ Enrolment into this programme will also prioritise regional representation.
- ✓ Principles of equity will be applied to address the socially and economically disadvantaged as well as applicants living with physical disabilities.
- ✓ In the event of there being too many students who qualify for admission and a reduced number of applicants need to be selected, a programme-specific entrance test shall be administered, and successful applicants will be admitted based on their performance in the entry test, until the required number is fulfilled.

F.6.3. ARTICULATION OPTIONS

This qualification may articulate into the **MSc Biodiversity Conservation & Management** related field of study at **NQF level 9**.

F.6.4. ASSESSMENT CRITERIA

Most Modules in this programme will be assessed through a combination of continuous assessment (CA) and an examination at the end of the semester, while a few Modules are based on 100% formative assessment (see programme structure). A minimum Mark of 50% is required to pass a 100% CA module. 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 respective Modules. The CA will make up 50% while the Examination will make up 50% of the final mark of the Module. Duration of examinations will be for 3 hours for full Modules (20 credits) and 2 hours (10 credits) for half Modules. Students must attain a minimum CA mark of 40% to qualify to write the examination. A minimum final mark of 50% is required to pass each Module. Notwithstanding the above, a subminimum of at least 40% will apply to the Exam Mark, unless otherwise stated in the individual module descriptor.

F.6.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 78 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

F.6.6. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

F.6.7. DURATION OF STUDY

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

F.6.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

F.6.9. 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.6.10. 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 % attendance of practical classes is required.

F.6.11. BACHELOR OF SCIENCE IN ECOLOGY AND BIODIVERSITY CONSERVATION HONOURS (33HEBC)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880EP	Research Proposal	8	14	None	Compulsory
S4820VE	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4811EM	Molecular Systematics	8	20	None	Compulsory
S4831EA	Advanced Biostatistics	8	20	None	Compulsory
S4821VS	Strategic Land-use Planning	8	10	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Year 1 Semester 2					
S4842WL	Conservation Genetics	8	10	None	Compulsory
S4852EB	Behavioural Ecology	8	20	None	Compulsory
S4872ER	Restoration Ecology	8	20	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Total credits			**138**		

F.7. BACHELOR OF SCIENCE IN ENVIRONMENTAL MANAGEMENT HONOURS (33HENM)

F.7.1. ADMISSION REQUIREMENTS

A Bachelor of Science in Environmental and Geographical Science (NQF Level 7) from the University of Namibia, or equivalent qualification.

F.7.2. ADDITIONAL SELECTION CRITERIA

- ✓ The Department will ensure that gender considerations are taken into account in compliance with the Affirmative Action and Gender empowerment policies.
- ✓ Enrolment into this programme will also consider regional representation.
- ✓ Principles of equity will be applied to address the socially and economically disadvantaged as well as applicant with physical disability.
- ✓ In the event of there being too many students that qualify for admission and a limited number of applicants need to be selected, an entry test assessing both competencies and aptitudes will be administered. Students who score the highest in the entry test will be selected. If there are tiers in entry scores, and the number of students to be admitted still needs to be reduced, the students who have the highest average scores in their bachelor degree will be selected.

F.7.3. ARTICULATION OPTIONS

This qualification may articulate into **MSc Environmental Management** or a related field of study at **NQF level 9**.

F.7.4. ASSESSMENT CRITERIA

Most Modules in this programme will be assessed through a combination of continuous assessment (CA) and an examination at the end of the semester, while a few Modules are based on 100% formative assessment (see programme structure). A minimum Mark of 50% is required to pass a 100% CA module. 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 respective Modules. The CA will make up 50% while the Examination will make up 50% of the final mark of the Module. Duration of examinations will be for 3 hours for full Modules (20 credits) and 2 hours (10 credits) for half Modules. Students must attain a minimum CA mark of 40% to qualify to write the examination. A minimum final mark of 50% is required to pass each Module. Notwithstanding the above, a subminimum of at least 40% will apply to the Exam Mark, unless otherwise stated in the individual module descriptor.

F.7.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 78 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

F.7.6. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

F.7.7. DURATION OF STUDY

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

F.7.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

F.7.9. 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.7.10. 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 % attendance of practical classes is required.

F.7.11. BACHELOR OF SCIENCE IN ENVIRONMENTAL MANAGEMENT HONOURS (33HENM)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880EP	Research Proposal	8	14	None	Compulsory
S4820VE	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4831VE	Strategic Environmental Assessment	8	20	None	Compulsory
S4811VE	Waste Management	8	20	None	Compulsory
S4821VS	Strategic Land-use Planning	8	10	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Year 1 Semester 2					
S4822ER	Project Management	8	10	None	Compulsory
S4832VE	Environmental System Analysis & Monitoring	8	20	None	Compulsory
S4872ER	Restoration Ecology	8	20	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Total credits			**138**		

F.8. BACHELOR OF SCIENCE IN GEOSPATIAL SCIENCE HONOURS (33HGSS)

F.8.1. ADMISSION REQUIREMENTS

A Bachelor of Science in Environmental and Geographical Science (NQF Level 7) from the University of Namibia, or equivalent qualification.

F.8.2. ADDITIONAL SELECTION CRITERIA

In case of the demand for placement exceeding capacity in the programme, the following additional criteria shall apply: The Department will ensure that **gender considerations** are taken into account in compliance with the **Affirmative Action** and **Gender empowerment policies**. Enrolment into this programme will also consider **regional representation**. Principles of equity will be applied to address the socially and economically disadvantaged as well as applicant with physical disability. In the event of there being too many students who qualify for admission and a limited number of applicants need to be selected, **an entry test assessing both competencies and aptitudes will be administered**. Students who score the highest in the entry test will be selected. If there are tiers in entry scores, and the number of students to be admitted still needs to be reduced, the students who have the highest average scores in their bachelor's degree will be selected.

F.8.3. ARTICULATION OPTIONS

This qualification may articulate into **MPhil Geoinformatics** or related field of study at **NQF level 9**.

F.8.4. ASSESSMENT CRITERIA

Most Modules in this programme will be assessed through a combination of continuous assessment (CA) and an examination at the end of the semester, while a few Modules are based on 100% formative assessment (see programme structure). A minimum Mark of 50% is required to pass a 100% CA module. 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 respective Modules. The CA will make up 50% while the Examination will make up 50% of the final mark of the Module. Duration of examinations will be for 3 hours for full Modules (20 credits) and 2 hours (10 credits) for half Modules. Students must attain a minimum CA mark of 40% to qualify to write the examination. A minimum final mark of 50% is required to pass each Module. Notwithstanding the above, a subminimum of at least 40% will apply to the Exam Mark, unless otherwise stated in the individual module descriptor.

F.8.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 78 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

F.8.6. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

F.8.7. DURATION OF STUDY

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

F.8.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

F.8.9. 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.8.10. 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 % attendance of practical classes is required.

F.8.11. BACHELOR OF SCIENCE IN GEOSPATIAL SCIENCE HONOURS (33HGSS)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880EP	Research Proposal	8	14	None	Compulsory
S4820VE	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4831RE	Remote Sensing and Earth Observation	8	20	None	Compulsory
S4851VS	Machine Learning for Spatial Data	8	20	None	Compulsory
S4821VS	Strategic Land-Use Planning	8	10	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Year 1 Semester 2					
S4872VP	Spatial Statistics and Geostatistics	8	20	None	Compulsory
S4822ER	Project Management	8	10	None	Compulsory
S4832VP	Geoinformation in Practice	8	20	None	Compulsory
S4883ER	Research Project	8	8	None	Compulsory
Total credits			**138**		

F.8.12. TABLE OF EQUIVALENTS

CODE	OLD MODULE	CREDITS	LEVEL	CODE	NEW MODULE	CRDITS	CREDTS
BLG3810	Research Project	8	16	S4883ER	Research Project	8	30
EBL3871	Population Ecology	8	16	**No equivalent- module is to be offered again**			
EBL3851	Biogeography	8	16				
	None			S4842WL	Conservation Genetics	8	10
EBL3841	Integrated Natural Resources Management I	8	8				
EBL3852	Integrated Natural Resources Management II	8	16	**No equivalent- module is to be offered again**			
EBL3802	Disturbance and Restoration Ecology	8	8	S4872ER	Restoration Ecology	8	20
	None			S4821VS	Strategic Land-use Planning	8	10
EBL3812	Behavioural Ecology	8	16	S4852EB	Behavioural Ecology	8	20
	None			S4811EM	Molecular Systematics	8	20
EBL3800	Field Ecology	8	4	**No equivalent- module is to be offered again**			
	None			S4831EA	Advanced Biostatistics	8	20
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	S3531VA	Intro to Environ. Science	5	12
GHE3582	Fundamentals of Human Geography	5	12	S3512VH	Human Environment	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	S3661VS	Social & Cultural Geography	6	8
GHE3642	Biogeography	6	8	No equivalent- module is to be offered again			
GHE3662	Pedology	6	8	S3621VS	Soil Science	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	S3712VD	Spatial Database Managt	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	S3711ER	Research methods	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			

[2] ***To be offered two times only***

F.8.13. DEPARTMENT OF ENVIRONMENTAL SCIENCES HONOURS CURRICULUM COURSE DESCRIPTIONS

S4880EP	RESEARCH PROPOSAL
NQF Level:	8
NQF Credits:	14
Contact Hours:	3 hours practical per week for one semester
Course Assessment:	100% on CA, constituted by 90% written assignments, & 10% Oral presentations.
Examination:	No examination

COURSE DESCRIPTION: The purpose of this module is to: Provide students with knowledge of theoretical aspects of scientific principles that are followed to conduct research, analyze and interpret data, and communicate scientific results properly. **Ethics of Research and Plagiarism**. **The scientific method:** Logic and scientific, natural observations, asking questions and formulation of hypotheses, Predictions, Types of hypotheses (null, alternative, research); **Handling experimental data**; Processing and reporting; **Significance tests**; parametric and non-parametric tests. **Use of existing literature:** Using the internet and the university library; Finding and using literature references; Citation of references; **Writing a literature review:** Report Writing; Oral presentation using state-of-the-art equipment.

S4811EM	MOLECULAR SYSTEMATICS
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
Course Assessment:	**50% CA** of **8** practicals (40%], **3** tests [40%] & **2** assignments [10%]) & seminar presentation [10%]).
Examination:	1x 3 hours theory paper) contributing 50% of the final mark for the module.

COURSE DESCRIPTION: The purpose of this module is to train students to use molecular tools to study the evolution of relationships among individuals and species, with the aim of providing insight into the history of groups of organisms and the evolutionary processes that create diversity among species. This Module gives students the ability to generate DNA sequences, assess molecular systematic information and do molecular identification (DNA barcoding). Emphasis is put on phylogenetic thinking and species concepts. Students will gain the ability to visualize evolution in tree form, use tree diagrams to communicate, analyze evolutionary phenomena as well as develop an accurate understanding of evolution so as to organize knowledge of biological diversity. **Central concepts of general and molecular systematics** technologies for collection of molecular data and basic methods for phylogenetic analysis. **Systematic issues and methods** to address these; phylogenetic trees, the homology concept, classification. **Phylogenetics**: characters and character coding, sequence alignment, the parsimony criterion and other optimality criteria, tree search, sampling error and support, practical phylogenetic analysis. **Delimitation and identification of taxa (DNA Barcoding)**; species concepts, criteria and methods to delimit species in practice, identification of species with DNA sequences. **Molecular data**; types of molecular data for phylogenetic analysis and identification, extraction, amplification and sequencing of DNA.

S4821VS	STRATEGIC LAND-USE PLANNING
NQF Level:	8
NQF Credits	10
Contact Hours:	2 hours lectures per week per semester; 2 hours practicals per week per semester.
Course Assessment:	100% CA marks of 3 field-based practicals [50%], 2 tests [30%] and 2 seminar presentations [20%]).
Examination:	NONE

COURSE DESCRIPTION: The purpose of this module is to equip students with knowledge about the interface between rural and urban land use and how it affects the societies and the built environments. The course will also explore how to devise strategies which are geared towards striking the balance between urban/rural settlement patterns whilst considering social, economic and environmental objectives. **Introduction to land use planning**: Types of land uses in Namibia, land ownership structures in Namibia, Land governance and administration in Namibia, institutional mandates related to development and land use planning in Namibia. **Land use policy, legislative and institutional framework in Namibia:** (Communal Land Reform Act No. 5 of 2002, Agricultural Commercial Land Act, Resettlement Policy, Land Policy, Flexible Land Tenure Act, Regional and Local Authority Act of 1992, Urban and Regional Planning Act No. 5 of 2018, Traditional Authority Act of No. 25 2000, Land registration and ownership in Namibia, zoning of land). **Land use planning and sustainable urban development, land use planning policy and land management in Namibia. Integrated Land Use Planning and linkages at different levels** (National level, Regional level, Local Authority (towns/village) Level, Municipal Level), Participatory land use planning and linkages with development planning; Development of Integrated Regional Land Use Plans, spatial land use planning. **Social equity and land use planning**: (gender and land), impacts of urban expansion on people's livelihood, fair compensation for loss of land owing to urban expansion, rural development vs urbanization. **Challenges to land use planning in Namibia** (land grabbing, illegal settlement, illegal fencing, population growth, land use conflicts).

S4831EA	ADVANCED BIOSTATISTICS
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester
Course Assessment:	**50% CA** consist of Practicals 8 practicals (25%), Theory (3 tests (20%), Worksheet assignment (5%).
Examination:	1x 3 hours theory paper) contributing **50%** of the final mark for the module.

COURSE DESCRIPTION: The purpose of this module is to equip students with knowledge of the more advanced biostatistics, largely in the form of multivariate statistics and the applications of such statistical data in real life situations. Students will further acquire data analysis skills and the use of computers and various statistical packages as well as the interpretation of the results thereof. **Analysis of covariance (ANCOVA)** (Linear models for analysis of covariance, Null hypotheses in ANCOVA, Assumptions of ANCOVA). **Introduction to multivariate analyses** (Multivariate data, Distributions and associations, linear combinations of variables, eigenvectors and eigenvalues). **Multivariate distance and dissimilarity measures** (Dissimilarity measures for continuous and dichotomous (binary) variables, Comparison of dissimilarity measures). **Multivariate Analysis of Variance (MANOVA)** (single factor MANOVA, assumptions of MANOVA). **Canonical Correlation**; **Multiple linear regression (MLR) analysis** (the MLR analysis model, assumptions of the model). **Introduction to Classification and Gradient analysis Methods** (Cluster

analysis, Principal Components Analysis (linear gradient analysis), Canonical Correlation Analysis (unimodal gradient analysis). **Computers and statistical data analysis** (Use of various statistical packages to analyze data for the above statistics).

S4842WL	**CONSERVATION GENETICS**
NQF Level:	8
NQF Credits	10
Contact Hours:	2 lecture periods and one 2-hour practical session per week for one semester
.Course Assessment:	**50% CA 5** practicals (40%], 2 tests [40%] & 1 assignment [10%]) & seminar presentation [10%])
Examination:	1x 2 hours theory paper contributing 50% of the final mark for the module.

COURSE DESCRIPTION: The purpose of this module is to equip students with a basic understanding of population genetics and genetic diversity within an animal species, and the management implications for spatially restricted conservation areas. **Introduction to genetic conservation**; Genetics and extinction. Characterizing genetic diversity in single loci and by quantitative variation. **Evolution in large population**: natural selection and adaptation; mutation, migration and their interactions with selection. Evolution in small populations. Maintenance of genetic diversity. **Effect of population size reduction**: loss of genetic diversity in small populations, inbreeding depression, population fragmentation, genetically viable populations. Resolving taxonomic uncertainties and defining management units. Genetically modified food. Genetic management of wild and captive populations.

S4872ER	**RESTORATION ECOLOGY**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
.Course Assessment:	**50% CA 8** practicals (40%], 2 tests [50%] & 1 assignment [10%]) & seminar presentation [10%])
Examination:	1x 3 hours theory paper contributing 50% of the final mark for the module.

COURSE DESCRIPTION: The purpose of this module is to develop critical thinking skills in the application of ecological principles to restoration. Students will further be equipped with skills that enable them to assess ecosystem condition and suggest methods of restoration for various landscapes. **Introduction**: definitions, the need and importance of restoration. **Evaluation of ecological condition of systems**: emphasis on indicators of ecosystem degradation, e.g. contaminated water sources, overgrazed rangelands, mined areas and agro-ecosystems. **Principles of ecological restoration. Assessment and identification of the spatial scales and degrees at which various systems could be restored:** rehabilitation, reclamation, re-creation, reallocation and remediation. **Planning and evaluation of ecological restoration:** various ecosystems. **Ecological restoration in practice:** include relevant case examples on aquatic and terrestrial ecosystems; natural restoration (recap on the concept of succession); Microbial bioremediation. **Involvement of local communities in restoration work**: case examples. **Bio-monitoring and evaluation of the restoration process:** importance of adaptive management strategies for restoration ecology. **Challenges and opportunities for improving degraded landscapes**: including identification of possible restoration treatments and techniques in Namibia; critical analyses of some of the existing restoration plans/ measures in Namibia (assessing their practicality and providing recommendations for improvement).

S4852EB	**BEHAVIOURAL ECOLOGY**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods and one 3-hour practical session per week for one semester.
.Course Assessment:	**50% CA 8** practicals (40%], 3 tests [40%] & 2 assignment [10%]) & seminar presentation [10%])
Examination:	1x 3 hours theory paper contributing 50% of the final mark for the module.

COURSE DESCRIPTION: The purpose of this module is to facilitate learning on the role of behavior in understanding ecology of organisms in relation to survival and reproduction. Special emphasis will be given to the genetic basis of behavior, how behavior evolved (phylogeny) as well as how it develops in organisms (ontogeny). These will provide a foundation to understand learned and innate behavior and how behavioral ecology is instrumental in applied ecology disciplines such as conservation biology and management of natural resources, specifically animals. Students will acquire skills in analysis and evaluation of animal behavior. **Introduction:** Difference between animal behavior and behavioral ecology, nervous system and behavior, simple (reflexes) and complex behavior. **Development (ontogeny) of Behavior**: Genetic basis of behavior, development of behaviour: nature and nurture, instinct and learning in their biological setting, maturation-development involving growth, hormones and early development, play, imprinting and early experience.

Evolution (Phylogeny) of behaviour: Natural selection and behaviour, genetic basis of behaviour, the adaptiveness of behaviour, ritualization. **Diversity of behaviour**: Innate behaviour, innate releasing mechanisms, fixed action patterns. Learned behaviour: habituation, conditioned reflex Type 1, trial & error learning, latent learning, insight learning. **Communication in animals**: Definition, evolution and use of signals in communication, information content of signals e.g., honey bees, multimodal signalling and encoding of complex messages, manipulation in communication, cost, honesty/deceit & handicaps. **Sex and sexual selection**: Advantages of sex (why two sexes), selection on males and females, Mate choice (male/female competition and female/male choice), Intra-and inter-sexual selection, sperm competition and mate guarding. **Feeding and anti-predator behaviour**: Feeding behaviour, diversity of prey capture techniques (prey detection and capture), optimal foraging behaviour, costs & benefits, optimality models, constraints in foraging efficiency; Anti-predator behaviour: detection of predators, chemical defences, warning colouration, mimicry, alarm signals, improved vigilance, selfish herd effect. Dilution effect. **Social organisation:** Group living (advantages), types of mating systems (e.g., polyandry, polygyny, monogamy, lek), social dominance, cooperation; free riding and the problem of cooperation, kin selection, aggression, altruism, parental care; parental investments, sibling rivalry, territoriality, primate social organisation, insect social organisation. **Conservation and animal behaviour:** Influence of behavior of different organisms on the conservation and management of wildlife, with specific reference to Namibia.

S4811VE	WASTE MANAGEMENT
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week in a semester; 2 hours practical session per week in a semester.
Course Assessment:	**50% CA** of at least 2 written assignments, one written field-based practical report; 2 written tests.
Examination:	1 x 3 hour written examination paper

COURSE DESCRIPTION: **The purpose of this module is to:** familiarise students with the difficulties, challenges and opportunities inherent in managing of wastes, waste minimization techniques, methods of reducing wastes during product manufacturing, processing, the transportation, consumption and disposal. **Definition of and types of wastes:** solid waste, liquid waste, gaseous waste; waste generation: residential, commercial, industrial, institutional and organic agricultural waste; categories of waste: municipal solid waste (rubbish, garbage, trash, e-waste), industrial waste; characterisation and composition of waste; quantity and quality of waste. **Life Cycle Assessment/Analysis (LCA):** impact of product production on environmental media (land, water and air), impact of raw materials extraction, manufacturing of inputs, production, processing of products, distribution, transportation, consumption and disposal of related wastes; logistic of waste collection and transfer, transfer stations, route optimization. **Waste management**: prevalent strategies for collection, disposal and transportation; collection, processing, possible recycling; 'dilute and disperse' or 'concentrate and contain' principles. Hierarchy of preferred options: waste prevention, reuse, recycling, recovery, refurbishments (repair and restore) and disposal. **Circular waste economy**, waste auditing. **Treatment and management of waste**. Design and operation of waste systems: source separation, collection and conveyance systems, sanitary landfills, anaerobic digestion, biochemical conversion, composting, incineration. Waste disposal site/landfill closure and post-closure management. **Special waste management initiatives:** household hazardous, biomedical, radioactive waste; biochemical conversion of waste; application of technological in collection, processing and disposal of waste. **Threats and risks** to public health posed by wastes and waste management practices; leachate from waste dumps. National legal framework for waste collection, handling and disposal, cost of waste management, minimum standards for waste disposal.

S4831VE	STRATEGIC ENVIRONMENTAL ASSESSMENT
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week in a semester; 2 hours practical session per week in a semester.
Course Assessment:	**100% CA** (at least 3 field-based practicals [50%], 2 tests [30%] and 2 seminar presentations [20%]
Examination:	NONE

COURSE DESCRIPTION: **The purpose of this module is to:** equip students with knowledge on principles and SEA methodologies for assessing plans, policies and programs in order to ensure that it contributes to sustainable development. Introduction to SEA, Aims and objectives of SEA, Benefits of SEA, difference between EIA and SEA; Legal Framework for SEA (SEA EU Directive, Environmental Management Act provision on SEA, SEA in Namibia); Steps of the SEA process and methodologies, Principles for good practice SEA; Case studies on SEA globally; Limitation of SEA.

S4821VS	STRATEGIC LAND-USE PLANNING
NQF Level:	8
NQF Credits	10
Contact Hours:	4 lecture periods per week in a semester; 2 hours practical session per week in a semester.
Course Assessment:	**100% CA** (at least 3 field-based practicals [50%], 2 tests [30%] and 2 seminar presentations [20%]).
Examination:	NONE

COURSE DESCRIPTION: **The purpose of this module is to:** equip students with knowledge about the interface between rural and urban land use and how it affects the societies and the built environments. The course will also explore how to devise strategies which are geared towards striking the balance between urban/rural settlement patterns whilst considering social, economic and environmental objectives. **Introduction to land use planning**: Types of land uses in Namibia, land ownership structures in Namibia, Land governance and administration in Namibia, institutional mandates related to development and land use planning in Namibia. **Land use policy, legislative and institutional framework in Namibia:** (Communal Land Reform Act No. 5 of 2002, Agricultural Commercial Land Act, Resettlement Policy, Land Policy, Flexible Land Tenure Act, Regional and Local Authority Act of 1992, Urban and Regional Planning Act No. 5 of 2018, Traditional Authority Act of No. 25 2000, Land registration and ownership in Namibia, zoning of land). **Land use planning and sustainable urban development, land use planning policy and land management in Namibia. Integrated Land use Planning and linkages at different levels** (National level, Regional level, Local Authority (towns/village) Level, Municipal Level), Participatory land use planning and linkages with development planning; Development of Integrated Regional Land Use Plans, spatial land use planning. **Social equity and land use planning**: (gender and land), impacts of urban expansion on people's livelihood, fair compensation for loss of land owing to urban expansion, rural development vs urbanization. **Challenges to land use planning in Namibia** (land grapping, illegal settlement, illegal fencing, population growth, land use conflicts).

S4832VE	ENVIRONMENTAL SYSTEM ANALYSIS AND MONITORING
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week in a semester; 2 hours practical session per week in a semester.
Course Assessment:	**50% CA** of at least 2 written assignments, one written field-based practical report; 2 written tests.
Examination:	1 x 3 hour written examination paper

COURSE DESCRIPTION: **The purpose of this module is to:** acquaint students with a systems approach to decision-making and the theoretical context of the environmental system analysis tools and methods. The module aims to equip students with definite and meticulous problem-solving tools offering a mathematical foundation for decision-making. The module intents to impart knowledge, competency and practical skills to choose relevant tools or approaches, frame the purpose and extent of application and apply a number of environmental systems analysis tools in monitoring of the state of the environment. Definition of Environmental Systems Analysis: choosing necessary strategy for studying an environmental problem. Theory: context of the environmental system analysis tools and methods, general systems theory, decision-making theory;

environmental decision-making, systems thinking and systems analysis. Environmental systems analysis, environmental assessment, environmental evaluation. Tools for environmental systems analysis; strategic environmental assessment (EIA, LCA, MFA, cost-benefit analysis, technology assessment). Relevance and limitation of environmental systems analysis. Environmental monitoring methods. Assessment of prevailing environmental conditions and trends. Monitoring: urban air pollution, fugitive emission by industries, hazardous waste, solid waste, water quality, biodiversity, enterprise.

S4822ER	**PROJECT MANAGEMENT**
NQF Level:	8
NQF Credits	10
Contact Hours:	2 lecture periods and one 3-hour practical session per week for one semester
Course Assessment:	**100% CA**: 3 practical assignment reports – 40%, 2 tests – 30%, and 2 seminar presentations – 30%.

COURSE DESCRIPTION: **The purpose of this module is** to capacitate students with knowledge and skills for planning and managing a project from start to finish. It prepares students for project planning and management using modern project management approaches and tools that will enable students to work in project from different fields. **Project life cycle:** The nature of organizations, phases of project life cycle, project management process groups as well as the procurement process. **Strategic Planning, Scope, and Project Charter:** Strategic planning, scope of a project and project charter. **Human factor and Communication:** Efficient use of personnel in a project, the human factor, communication planning. **Budgeting and project costing:** Cost management, project resources and cost management, cost control and Earned Value management. **Time management:** The work breakdown structure (WBS), activity sequencing and network diagram, Gantt charts for time management. **Risk and Change management:** Understanding risk management, Quality risk analysis, strategies to respond to risk, change management.

S4831RE	**REMOTE SENSING AND EARTH OBSERVATION**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week for one semester; 2 hours practical session per week for one semester
Course Assessment:	**50% CA**: at least 2 practicals [20%], 2 tests [40%], 2 assignments [20%] & seminar presentation [20%])
Examination:	1x 3 hours theory paper) contributing 50% of the final mark for the module.

COURSE DESCRIPTION: **Introduction:** Application of remote sensing in land use/land cover mapping, Geologic and soil mapping, agriculture, forestry, rangeland, water resources and wetland mapping, wildlife ecology, and Natural disaster management. **Image classification**: Digital image interpretation and classification (supervised classification and unsupervised classification); Ground truthing techniques; Accuracy assessment and area estimation. **Landscape analysis and feature extraction**: Extraction of different environmental parameters from earth observation (EO) data using algorithms to extract vegetation indices, soil moisture indices, wetness indices, etc.; Hydrologic and Geomorphic feature extraction from DEM/ DTM data.

S4851VS	**MACHINE LEARNING FOR SPATIAL DATA**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week for one semester; 2 hours practical session per week for one semester
Course Assessment:	**100% CA**: of 3 practical tests (40%), 5 individual assignments (30%), & one group assignment (30%).

COURSE DESCRIPTION: **Introduction:** fundamental concepts and applications of machine learning, why machine learning, problems machine learning can solve or not solve. **Supervised learning:** classification and regression, generalization, overfitting and underfitting, supervised machine learning algorithms (k-Nearest Neighbours, Linear Models, Naive Bayes, Decision Trees, ensembles of Decision Trees, Kernelized Support Vector Machine, Neural Networks), Uncertainty estimations. **Unsupervised learning**: types of unsupervised learning, challenges in unsupervised learning, preprocessing and scaling, dimensionality reduction, feature extraction, and manifold learning, clustering. **Representing data and engineering features**: categorical variables, binning, discretization, automatic feature selection, expert knowledge. **Model evaluation and improvement**: Cross-validation, grid search, evaluation metrics and scoring.

S4832VP	**GEOINFORMATION IN PRACTICE**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods week for **10 weeks** a semester; **2 hours** practical week for 10 weeks, semester.
Course Assessment:	**100% CA**: at least 5 written assignments, one written field report; 2 written tests.

COURSE DESCRIPTION: The second goal is to provide hands-on training in essential field skills relating to research and equipment and field data collection for geoinformation research. **Spatial data infrastructure:** concepts and components, metadata and spatial data quality assessment. **WebGIS**: technology for spatial data publishing and sharing using the Internet **(spatial** databases, Geography Markup Language (GML), Web Map Server (WMS), Web Feature Server (WFS)). **Applied Photogrammetry**: concepts, data acquisition methods (aerial photography, unmanned aerial vehicles and satellites), image acquisition planning, mage-matching and processing techniques. **Designing appropriate data collection protocols**: census vs surveys; sampling techniques, technology for spatial data collection, planning logistics for fieldwork campaigns. **Fieldwork:** Data collection and management.

S4872VP	**SPATIAL STATISTICS AND GEOSTATISTICS**
NQF Level:	8
NQF Credits	20
Contact Hours:	4 lecture periods per week for one semester; 2 hours practical session per week for one semester
Course Assessment:	**CA 50%** of the final mark and will consist of at least **5** assessed practicals [60%], **2** theory tests [40%]
Examination:	1x 3-hour theory paper contributing 50% of the final mark for the module.

COURSE DESCRIPTION: This course introduces students to spatial point processes (homogeneous and inhomogeneous poisson processes), Spatial sampling, non-geostatistical interpolation and density estimation, background to geostatistics, applications of geostatistics, regionalised variable theory, variogram modelling, geostatistical prediction (simple kriging, ordinary kriging, universal kriging, indicator kriging)

F.9. MASTER OF SCIENCE IN BIODIVERSITY CONSERVATION & MANAGEMENT (33MSBD)

F.9.1. DEPARTMENTAL REGULATIONS

F.9.2. ADMISSION REQUIREMENTS

A Bachelor of Science (Hons) degree either in Environmental Biology, Ecology and Biodiversity Conservation, Biology, Ecology, Geography, Forestry, Wildlife Management, Fisheries, Integrated Environmental Science, or Aquatic Sciences, at NQF level 8 from the University of Namibia or equivalent, with an overall average mark of at least 60%.

F.9.3. ADDITIONAL SELECTION CRITERIA

Students with relevant work experience will have an added advantage. In the event of there being too many students that qualify for admission and a reduced number of applicants need to be selected, a programme-specific entrance test shall be administered, and successful applicants will be admitted based on their performance in the entry test, until the required number is fulfilled.

F.9.4. ARTICULATION OPTIONS

This qualification may articulate to a PhD in Environmental Biology or an equivalent degree at the University of Namibia and other Universities within the SADC region and beyond.

F.9.5. DURATION OF STUDY

The Master's in Biodiversity Conservation & Management is offered through coursework 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.

F.9.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the Master of Science in Biodiversity Conservation and Management, a student must have successfully completed the following minimum number of credits as indicated below:

- ✓ 72 credits by the end of the first year of registration
- ✓ 120 credits by the end of the second year of registration

The Programme must be completed after a maximum of 3 years.

F.9.7. ADVANCEMENT AND PROGRESSION RULES

Students must pass all modules (**120 credits**) of year 1 before they can proceed to year 2 (mini-thesis).

F.9.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a total of **240 credits**, who have passed all their modules, completed their mini-thesis (120 credits) satisfactorily and obtained at least a **50%** overall final mark.

F.9.9. 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.

F.9.10. PRACTICALS

Attendance of practical classes and field trips are compulsory.

F.9.11. CURRICULUM FRAMEWORK: MASTER OF SCIENCE BIODIVERSITY CONSERVATION & MANAGEMENT (33MSBD)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6983LA	Academic Writing for Postgraduate Students	9	16	
S6911ET	Functional Biodiversity of Terrestrial Ecosystems	9	24	Elective
S6931EA	Functional Biodiversity of Aquatic Ecosystems	9	24	Elective
S6951EG	Geoinformatics	9	24	Compulsory
S6903EB	Biostatistics and Research Methods	9	12	Compulsory
Year 1 Semester 2				
S6932EC	Conservation Governance and Management	9	24	Compulsory
S6952EB	Biodiversity Conservation and Climate Change	9	24	Compulsory
S6903EB	Biostatistics and Research Methods	9	12	Compulsory
Year 2				
S6953VT	Thesis **(Pass in all year 1 modules)**	9	120	Compulsory
Total credits for this programme			**240**	
Total credits for this programme			**240**	

F.10. MASTER OF SCIENCE IN CLIMATE CHANGE AND SUSTAINABILITY (33MSCC)

F.10.1. ADMISSION REQUIREMENTS

The Master of Science in Climate Change and Sustainability seeks to recruit suitably qualified students who can benefit from contributing to and completing the programme. To be considered for admission to this programme, a prospective student must: Prospective students must have a Bachelor's degree (Honours) at NQF Level 8 or any other equivalent qualification from a recognised higher education institution, in the relevant field of study. The prospective students would be accepted based on their undergraduate records with an overall average mark of at least **60%.** In addition, students with relevant work experience will have an added advantage. They are required to have a minimum of two years of experience in a climate change related position verifiable at enrolment application. Applicants are required to submit a reference letter from the employer that confirms their prior learning experience as part of the admission process.

F.10.2. ADDITIONAL SELECTION CRITERIA

The Department will ensure that gender considerations are considered in compliance with the University Affirmative Action and Gender empowerment policies. Principles of equity will be applied to address the socially and economically disadvantaged as well as physically handicapped applicants. Should there be too many students that qualify for admission, those with more years of experience in managerial positions will be given priority. The selection of candidates will be made on a high point on the University of Namibia evaluation scale guided by matters of equity as outlined in the national policy document.

F.10.3. ARTICULATION OPTIONS

Students who complete the **Master of Science in Climate Change and Sustainability** will be able to articulate in the Doctorate degree in Climate Change or a related cognate area of learning at **NQF Level 10**.

F.10.4. DURATION OF STUDY

This Master of Microbiology is offered through coursework, 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.

F.10.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the **Master of Science in Climate Change and Sustainability**, a student must obtain a minimum of **48 credits** at the end of the first year of registration. In the second year of registration, a student must obtain a minimum of **96 credits** at the end of the second year. In the third year of registration, students must have obtained a minimum of **120 credits**, and by the fourth year of registration, the student must have obtained all **240 credits**. The programme must be completed after a maximum of 4 years of registration.

F.10.6. ADVANCEMENT AND PROGRESSION RULES

To be registered for the thesis, the student must obtain a minimum of **120 credits** at the end of the first year of registration. In the second year of registration, a student must obtain a minimum of **240 credits**, including passing the Research Methodology Module at the end of the first semester in the second year.

F.10.7. REQUIREMENTS FOR QUALIFICATION AWARD

The Master of Science in Climate Change qualification will be awarded to candidates who have completed the 240 credits at Level 9 as prescribed in the curriculum and have obtained at least a **50%** overall final mark.

F.10.8. MASTER OF SCIENCE IN CLIMATE CHANGE & SUSTAINABILITY (33MSCC)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6983LA	Academic Writing for Postgraduate Students	9	16	
S6911EC	Research Methods and Statistics for Climate Science	9	24	Compulsory
S6901EF	Fundamentals of Climate Change	9	12	Compulsory
Select one elective module				
S6951EC	Climate Change and the Urban Environment	9	24	Elective
S6931VC	Climate Change Advocacy	9	24	Elective
S6971VC	Management of Climate Change Projects	9	24	Elective
Year 1 Semester 2				
S6912EC	Climate Change Adaptation and Mitigation	9	24	Compulsory
Select one elective module				
S6952EC	Climate Resilient Development	9	24	Compulsory
S6932VC	Climate Finance	9	24	Elective
S6972EC	Energy and Climate Change	9	24	Elective
S6952EB	Biodiversity Conservation and Climate Change	9	24	Elective
Select one elective module				
S6942VL	Climate Legal Framework and Governance	9	12	Elective
S6902VG	Climate Change, Gender and Social Inclusion	9	12	Elective
Year 2				
S6953BT	Thesis **(Pass in all year 1 modules)**	9	120	Compulsory
Total credits for this programme			**240**	

F.11. MASTER OF PHILOSOPHY IN FORESTRY (33MPFO)

For admission requirements, please see F.11.1.1/2

F.12. MASTER OF PHILOSOPHY IN ENVIRONMENTAL BIOLOGY (33MPEB)

F.12.1. ADMISSION REQUIREMENTS

To be eligible for this **MPhil programme**, the candidate must have completed an **Honours Degree at NQF level 8, or equivalent, in Forestry, Ecology and Biodiversity Conservation, Environmental Biology,** or a closely related discipline from the University of Namibia or from a recognised higher education institution, with an average of at least 60%. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA).

Along with the application, candidates **must submit a concept note** that highlights their proposed area of research, objectives, methodology, and a review of existing literature. The concept note will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

F.12.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's honours degree.

F.12.3. ARTICULATION OPTIONS

- This qualification may articulate to a **PhD in Philosophy in Forestry** and related fields.
- This qualification may articulate to a **PhD in Environmental Biology** or a related field of study.

F.12.4. DURATION OF STUDY

The **Master of Philosophy in Forestry** and the **Master of Philosophy in Environmental Biology** are offered through a **THESIS,** extending over two years of full-time study or three years of part-time study.

F.12.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. The Programme must be completed after a maximum of 4 years for full-time and 5 years for part-time. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

F.12.6. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

F.12.7. ASSESSMENT CRITERIA

Assessment will be done based on examination the thesis as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of **50% marks** in their thesis work. In addition to **the thesis**, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the MPhil programme.

F.12.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits** and who have met all other relevant UNAM requirements.

F.13. MASTER OF PHILOSOPHY IN FORESTRY (33MPFO)

F.14. MASTER OF PHILOSOPHY IN ENVIRONMENTAL BIOLOGY (33MPEB)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Modules				
U6983LA	Academic Writing for Postgraduate Students	9	16	
S6983ER/ S6983ET	Thesis	9	240	Compulsory
Total credits for this programme			**240**	

F.15. DEPARTMENT OF ENVIRONMENTAL SCIENCE'S DOCTOR OF PHILOSOPHY PROGRAMMES

For admission requirements, please see F.12.6.1/2

F.15.1. DOCTOR OF PHILOSOPHY IN CLIMATE SCIENCE (33DPCS)

For admission requirements, please see F.12.6.1/2

F.15.2. DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL BIOLOGY (33DPEB)

For admission requirements, please see F.12.6.1/2

F.15.3. DOCTOR OF PHILOSOPHY IN FORESTRY (S7083ET)

For admission requirements, please see F.12.6.1/2

F.15.4. DOCTOR OF PHILOSOPHY IN GEOINFORMATICS (33DPGI)

For admission requirements, please see F.12.6.1/2

F.15.5. DOCTOR OF PHILOSOPHY IN HUMAN GEOGRAPHY (33DPHG)

For admission requirements, please see F.12.6.1/2

F.15.6. DOCTOR OF PHILOSOPHY IN PHYSICAL GEOGRAPHY (33DPPG)

For admission requirements, please see F.12.6.1/2

F.15.6.1. ADMISSION REQUIREMENTS

To be eligible for this PhD programme, the candidate must have completed a master's degree at NQF level 9, or equivalent, in Climate Science, Environmental Science, Physical, Human Geography, Geoinformatics, Forestry or a closely related discipline from the University of Namibia or from a recognised higher education institution. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA). Along with the application, candidates need to submit a concept note highlighting their proposed area of research, objectives, methodology and a review of existing literature. The concept note will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space. In addition, applicants may be required to attend a pre-selection interview at the discretion of the Department.

F.15.6.2. ADDITIONAL SELECTION CRITERIA

Admission will depend on the availability of the necessary research facilities and infrastructure, and sufficiently qualified and experienced academics in the respective field of research specialisation that the student wants to engage.

F.15.6.3. DURATION OF STUDY

The Duration for PhD students is normally three (3) years for full-time students and five (5) years for part-time students.

F.15.6.4. ARTICULATION OPTIONS

The **PhDs in the Department** are the highest qualification at **NQF Level 10**; hence, articulation arrangements are not applicable.

F.15.6.5. ASSESSMENT CRITERIA

Assessment will be done based on examination of the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of **50% marks** in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

F.15.6.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of **the University's Higher Degrees Policy, Rules, and Regulations**, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission **(ANNEX 19B).**

F.15.6.7. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the **Annex 3A** (for students) and **Annex 3B** (for supervisors).

F.15.6.8. REQUIREMENTS FOR QUALIFICATION AWARD

The **PhD in Climate Science** will be awarded to candidates credited with a minimum of **360 credits** at NQF Level 10, and who have met all other relevant UNAM requirements.

F.15.6.9. CURRICULUM FRAMEWORK: DOCTOR OF PHILOSOPHY (ALL PROGRAMMES)

COURSE CODE	COURSE NAME	NQF	CREDIT	PRE-REQUISITE
Year 1 Semester 1				
U6989LA	Academic Literacy for Postgraduate Students	9	16 non-contributing credits	
S7093**CS**/S7093**EB**/S7093**GI**/S7093**HG**/S7093**PG**	Dissertation	10	360	Compulsory
Total credits for this programme			**360**	

F.15.7. DEPARTMENT OF ENVIRONMENTAL SCIENCES MASTERS & PHD CURRICULUM COURSE DESCRIPTIONS

S6911ET	FUNCTIONAL BIODIVERSITY OF TERRESTRIAL ECOSYSTEMS
NQF Level:	9
NQF Credits	24
Contact Hours:	4 lecture periods per week and 4 practical sessions for the semester.
Course Assessment:	**CA**: seminar presentations, practical assignments or field trip reports, quizzes, at least 2 tests.
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: **Functional biodiversity of savanna ecosystems**: Introduction to savanna ecosystems; southern Africa and elsewhere (Definition, extent and distribution, major types of savannas, etc.); Characteristics of savanna ecosystems of southern Africa (structure, tree-grass interactions, etc.); Determinants of tropical savannas; (primary, secondary, interactions among determinants); impacts of selected land-use practices and climate change on biodiversity and functioning of tropical savannas (specific Case studies); Causes and consequences of bush encroachment and its implications on biodiversity conservation and management; Introduction to modelling savanna dynamics for biodiversity conservation and management. **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/persistence; Adaptations of plants to the desert environment (physiological, anatomical, physical, etc.); Dispersal and invasion biology and its influence on the distribution of organisms. Adaptations of animals to the desert environment (physiological, anatomical, physical, behavioural, etc.); Desertification: causes, occurrence, criteria for indicators, possibilities of combating, Impacts of human activities on desert biodiversity (mining, off-road driving, harvesting, habitat fragmentation 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).
Assessing Biodiversity in terrestrial ecosystems: A general overview on the importance of biodiversity assessments; Levels at which biodiversity may be assessed (genetic, species, ecosystem, biome and global scale); 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. Use of various methodological approaches for assessment of selected components of biodiversity (terrestrial plants, invertebrates, reptiles, mammals, etc.) in various ecosystems; Use of Herbaria and Natural History Museums as repositories of biodiversity information and data.

S6931EA	FUNCTIONAL BIODIVERSITY OF AQUATIC ECOSYSTEMS
NQF Level:	9
NQF Credits	24
Contact Hours:	4 lecture periods per week and 4 practical sessions for the semester.
Course Assessment:	**CA**: seminar presentations, practical assignments or field trip reports, quizzes, at least 2 tests.
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: **Overview of physical and chemical properties in freshwater and marine ecosystems** (Light, Temperature, Pressure, Salinity, Nutrients, Dissolved gasses, Circulation – deep and shallow currents). **The Pelagic Environment** – Niches (distribution of species in multi-dimensional niche space), plankton in freshwater and marine (patchy distribution of plankton, role in upwelling, biological production, harmful algal blooms). Open ocean and pelagic food webs. **The Benthic Environment** – Organisms inhabiting soft and hard substrates, intertidal zone, benthic communities in a Namibian context. **Floodplain river systems:** Ecological processes; drivers of river productivity, flood pulse concept. **Conservation: -**Typical effects of fisheries, aquaculture, climate change and physical disturbances on marine and freshwater ecosystems, Principles and methods for conservation of marine and freshwater ecosystems. **Assessing Biodiversity in aquatic ecosystems:** A general overview about the history of biodiversity research (including important definitions); Introduction to the significance and vulnerability of biodiversity; Rational for aquatic biodiversity assessment; Global (Latitudinal diversity gradients) versus regional diversity; Ecological processes and habitat heterogeneity; Biodiversity indices; Introduction to rapid assessment of biodiversity for ecosystem services assessment and procedures for assessing phytoplankton, zooplankton, benthic macroinvertebrates and fish. Conducting (International Union for Conservation of Nature) IUCN Full Species Assessments; Concept of bio-indicators; and Spatial orientation and time (seasonality).

S6951EG	GEOINFORMATICS
NQF Level:	9
NQF Credits	24
Contact Hours:	4 lecture periods per week and 4 practical sessions for the semester.
Course Assessment:	**CA**: seminar presentations, practical assignments or field trip reports, quizzes, at least 2 tests.
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: **Introduction:** Benefits of GIS/Remote Sensing in Biodiversity Conservation and Management, 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:** Vector and Raster Data Models. **Data Acquisition and Sources:** Primary Data Sources (GPS, Digitizing, Scanning) and Secondary Data Sources (e.g geoportals, and data conversion (rasterisation and vectorisation)). **Remote Sensing as data source:** What is meant by remote sensing? Electromagnetic radiation; Platforms and sensors – Remote Sensed data sources, Display and manipulation of image files; image pre-processing: radiometric and spectral enhancement; geometric corrections; Image processing and analysis; remote sensing for land use/land cover identification; remote sensing for vegetation monitoring. Remote Sensing for hydrosphere. **Data Quality**: Data accuracy (thematic, spatial and temporal); metadata. **Vector Data Analysis:** Data re-classification, proximity analysis (buffering), Neighborhood Analysis, Overlay Analysis, Pattern Analysis, Spatial Interpolation. **Raster Data Analysis:** Local Operations, Neighbourhood Operations, Zonal Operations, Map Algebra. **Cartography and visualisation for impact**: The designing process, Map design controls, Non-cartographic output. Map composition and GIS integration (raster/vector).

S6903EB	BIOSTATISTICS AND RESEARCH METHODS
NQF Level:	9
NQF Credits	24
Contact Hours:	2 lecture periods and one 3-hour practical session every second week for both semesters.
Course Assessment:	**CA**: seminar presentations, practical assignments or field trip reports, quizzes, at least 2 tests.
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Univariate analysis. Revision of descriptive statistics (measures of location and spread as well as graphical presentation of data). Statistical Inference: Parametric and Nonparametric methods. **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), Clustering using selected 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. Qualitative methods of data analysis. **Scientific Communication and presentation.** 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: proposal writing; Generic components of scientific writing; Title, abstract, introduction, literature review, aims and objectives, hypotheses (null, alternative, research), formulation of key research 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.

S6911EC	RESEARCH METHODS AND STATISTICS FOR CLIMATE SCIENCE
NQF Level:	9
NQF Credits	24
Contact Hours:	4 lecture periods and one 3-hour tutorial seminar session per week for one semester.
Course Assessment:	**CA**: seminar presentations, practical assignments or field trip reports, quizzes, at least 2 tests.
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Research design. Research design; project planning; Principles of experimental design for climate science. **Research design for collecting qualitative data**: case studies, ethnography, grounded theory, etc. **Sampling methods in qualitative data collection**: purposive sampling, snowball sampling, voluntary response sampling, convenient sampling etc.. **Methods for collecting qualitative data**: interviews, surveys, focus group, observation and primary documents. **Methods for analyzing qualitative data**: For example, reflexive thematic analysis using computer software such as Atlas.ti, data analysis through lenses of a given theoretical framework, etc. **Strategies to ensure validity of qualitative data collection methods**. **Univariate analysis:** Revision of descriptive statistics (measures of location and spread as well as graphical presentation of data). Statistical Inference: Parametric and Nonparametric methods. **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); **Vulnerability and Risk analysis:** Understanding the level of vulnerability and risk of asset, environment and people, the likelihood and consequence of impact, and metrics of the consequence and likelihood of recurrence. **Time Series analysis and Forecasting:** objectives, assumptions, and components (stationary and non-stationary) of time series analysis and forecasting. **Qualitative data analysis:** Content analysis, thematic analysis, narrative analysis, grounded theory analysis, and discourse analysis.

S6932EC	CONSERVATION GOVERNANCE AND MANAGEMENT
NQF Level:	9
NQF Credits	24
Contact Hours:	2 lecture periods and one 3-hour practical session every second week for both semesters.
Course Assessment:	**CA** consist of at least 3 individual tutorial exercises, 1 field exercise and 1 test during the semester**.**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Introduction: Definitions, differences and links between governance and management; concepts of protected areas *vs* conserved areas. **Define the concept of governance:** Actors and their roles in decision making and implementation, levels for decision making, governance principles**.** Resource governance regimes/models and their implications for biodiversity conservation. **Communities and conservation governance:** Institutional arrangements for resource governance and environmental management; Environmental Law and Policy related to community conservation and governance. **International agreements for conservation governance:** The UNCBD, CITES and UNCCD focusing on their role in biodiversity conservation, management as well livelihood. **Socio-ecological systems:** Describe the principles/elements of an SES including dynamics/change; scale; adaptive capacity; resilience etc. and how these influence biodiversity conservation and sustainability and their implication on biodiversity conservation and sustainability. **Methods for valuating natural resource capital** including methods for valuation of ecosystem services. **Conservation planning**: Overview of threats to biodiversity; Introduction to conservation planning; Principles in Conservation Planning, Protected area design; Environmental Management Plans (EMPs), Environmental Audits; Conservation planning in practice – case studies., human wildlife conflicts analyses – case studies, adaptive management principles. Overview of Environmental Legislation and Policy related to conservation and environmental management. **Invasive species management**: Prevention; Eradication; Mitigation; Predictive models and Risk Assessment; institutional arrangements for management of invasive species in Namibia; Case studies of invasive species management. **Endangered and threatened species management**: Concepts of Minimum Viable Population

(MVP) and Population Viability Analysis (PVA); Environmental Law and Policy related to the management and conservation of endangered and threatened species; Case studies of endangered and threatened species management.

S6952EB	BIODIVERSITY CONSERVATION AND CLIMATE CHANGE
NQF Level:	9
NQF Credits	24
Contact Hours:	4 lecture periods per week and 4 practical sessions for the semester.
Course Assessment:	**CA 50%** at least two theoretical & or practical tests (40%), Practical (50%), seminar (10%).
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Biodiversity assessment and Monitoring in a changing climate: Biodiversity inventory and assessment and monitoring approaches; Methods and/or approaches used to determine/assess the impact of climate change on species and ecosystems. Species recovery; Theories, Methods and Techniques; Further topics will include Planetary boundaries, the Anthropocene, biodiversity loss and pandemics, African climate variability and change **Climate change introduction:** Climate change and Climate Science – the Context. **Climate change and ecosystem services**: Ecosystems & Ecosystem services under a changing climate; Role of ecosystems in climate change mitigation and adaptation. **Impact of climate change on selected ecosystems:** Case studies from Namibia and elsewhere.
Conservation genetics: Effect of climate change on genetic resources. **Extinction Risk from Climate Change:** Selected case studies **Natural History collections and climate change research:** long term data; species responsiveness to climate; disruption of species synchrony.

S6901EF	FUNDAMENTALS OF CLIMATE CHANGE
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours seminars per week, for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: The purpose of this module is to build the foundations and skills of climate change, focusing mainly on climate systems and drivers of change as well as climate science modelling and projections. If focuses both on the marine and terrestrial climates as well as rural and urban contexts. The module content covers topics related to climate systems, science, and modelling. Climate History of the Earth; Atmospheric Energy Transfer; Natural Greenhouse Effect; Climate Forcing Mechanism; Climate System Feedback; Ocean-atmosphere Coupling and Climate Variability; Global Climate Systems Modelling; Predictions of future climate change; Climate Anomalies and Teleconnections.

S6951EC	CLIMATE CHANGE AND THE URBAN ENVIRONMENT
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours seminars per week, for One semester*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Module will cover topics that evaluate and critically examine urbanization, urban development and the role of cities in fostering development and dealing with climate change. Other topics will be: Characterise and identify hazards, risks and impacts of climate change in the context of urban and built environments; Identify approaches aimed at reducing climate risks and vulnerabilities in cities, including urban climate adaptation, disaster risk reduction and urban resilience building; Identify urban resilience technologies in line with urban vulnerability; Evaluate and determine the level of resilience of cities through the application of the Environmental Resilience Index (ERI); Evaluate the possible contribution of smart buildings to community resilience as well as understanding the foundations of green certification concept.

S6931EP	CLIMATE CHANGE ADVOCACY
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours seminars 1 Tutorial per week, for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: *The purpose of this module is to*: Introduce students to the foundational concepts of effective communication; Enable students to formulate the climate change and sustainable social change message and building an online presence; and align communication approaches and audience. Module will cover topics that evaluate and critically examine urbanization, urban development and the role of cities in fostering development and dealing with climate change. Other topics will be: Introduction to the fundamentals of communication; Introduction to communicating science effectively; Foundational concepts of communication science and processes; Different types of communication (inter-personal, inter-cultural, mass communication, participatory science communication, etc.); Knowledge brokering and research for impact strategies; Effective communication within Namibian cultural contexts

S6971EP	MANAGEMENT OF CLIMATE CHANGE PROJECTS
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours seminars 1 Tutorial per week, for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Project Management: Introduction & Definitions of project, project management, environmental and social safeguards, stakeholder analysis, purpose of project management and how it works, broad types/categories of projects, **Project cycle management:** Programming; Identification; Formulation; Financing; Implementation; Monitoring & Evaluation; Organizational risk management; Developing project proposals for climate change financing; Requirements of selected global instruments for climate change financing. **Responsible Reporting;** Performance management, Key performance indicators, Performance reporting.

S6912EC	CLIMATE CHANGE ADAPTATION AND MITIGATION
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours, and two hours Tutorials once a week for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: *Introduction to climate change risks, impacts, vulnerability, adaptation, and mitigation concepts. Topics on Climate change adaptation and mitigation within the marine sector will also be covered in this module. Causes and factors (natural and human-induced) contributing to climate change. Impacts of human activities on climate and the impacts of climate change on ecosystem services and socio-economic systems; How to assess climate impacts, vulnerability assessment, Adaptation to climate change, challenges, approaches, limits to adaptation, monitoring, and evaluation of adaptation; Ecosystem services and Ecosystem-based adaptations (EbA); Climate Change Community engagement, Case studies of climate adaptation in Namibia; Evaluate potential adaptation strategies to reduce or avoid the impacts to people (men and women) and ecosystems; Identify mitigation strategies to achieve the Nationally Determined Contributions as per Paris Agreement for UNFCCC.*

S6952EC	CLIMATE RESILIENT DEVELOPMENT
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours, and two hours Tutorials once a week for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: ***Introduction to Climate Resilient Development (CRD):*** *background (climate change in countries with critical development challenges); definition of CRD, climate resilient development vs. "traditional development" etc.* ***CRD Pathways****: transformative action and system transitions (interconnected systems: land and ecosystems, energy, industry, urban & infrastructure and societal); meeting sustainable development goals.* ***Nature-based Solutions (NbS) for CRD****: climate change adaptation and mitigation (contributing to sustainable environmental management, improving livelihoods, and social and economic wellbeing), e.g. Ecosystem based Adaptations EbA; protecting existing forests; agroforestry; climate smart agriculture and afforestation.* ***Climate and risk planning****: at local/ regional and national level.* ***Enabling and Achieving Climate Resilient Development****: knowledge diversity; ecosystem stewardship; equity and justice; and inclusion (involvement of all relevant sectors, e.g. governments at all levels working with communities, civil society, educational bodies, scientific and other institutions, and international cooperation).* ***Climate Resilient Development in action:*** *case examples of CRD; students to suggest possible solutions to local situations.* ***Assessing Climate Resilient Development****.*

S6932VC	CLIMATE FINANCE
NQF Level:	9
NQF Credits	24
Contact Hours:	*4 Contact hours, and two hours Tutorials once a week for One semester.*
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: ***Climate change economy:*** Climate risks; Cost-benefit analysis; Social cost of carbon; Climate damage cost; Carbon pricing; Circular economy; Green economy; Economic instruments for climate policy; Economic approaches to international climate negotiation. **Climate Finance:** Climate-related financial risks; Hedging climate risks; Carbon pricing; Investment in climate innovation; Financing climate change with the national budget; Transnational funding negotiation.

S6972EC	ENERGY AND CLIMATE CHANGE
NQF Level:	9
NQF Credits	24
Contact Hours:	4 Contact hours, and two hours Tutorials once a week for One semester.
Course Assessment:	CA consists of 2 assignments **50%**, Projects **(30%)**: one individual project on a corporate or public institution, Seminar readings and presentations (**20%)**
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: The purpose of this module is to: introduce students to different energy systems, the interplay between energy generation and climate change, and energy for green economy. **Introduction to:** the planet's energy balance, energy and society, economic growth and energy demand, current and future frontiers of energy demand, energy generation and greenhouse gases emissions, the role of energy generation in climate change. **Energy systems and green energy**: Low carbon

energy technologies and innovation; energy policies and climate change; politics in energy generation and greenhouse gases emissions; energy and climate negotiations; sustainable energy technologies and use; climate change impacts on energy generation and supply, energy transition and low carbon future; green hydrogen as an emerging energy source.

S6952EB	BIODIVERSITY CONSERVATION AND CLIMATE CHANGE
NQF Level:	9
NQF Credits	24
Contact Hours:	4 Contact hours, and two hours Tutorials once a week for One semester.
Course Assessment:	**CA** consists of Theory two assignments or /practical tests (40%), Practical (50%), seminar (10%)).
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: The purpose of this module is to: introduce students to different energy systems, the interplay between energy generation and climate change, and energy for green economy. **Introduction to:** the planet's energy balance, energy. **Biodiversity assessment and Monitoring in a changing climate**: Biodiversity inventory and assessment and monitoring approaches; Methods and/or approaches used to determine/assess the impact of climate change on species and ecosystems. Species recovery; Theories, Methods and Techniques; Further topics will include Planetary boundaries, the Anthropocene, biodiversity loss and pandemics, African climate variability and change **Climate change introduction:** Climate change and Climate Science – the Context. **Climate change and ecosystem services**: Ecosystems & Ecosystem services under a changing climate; Role of ecosystems in climate change mitigation and adaptation. **Impact of climate change on selected ecosystems:** Case studies from Namibia and elsewhere. **Conservation genetics:** Effect of climate change on genetic resources. **Extinction Risk from Climate Change:** Selected case studies **Natural History collections and climate change research:** long term data; species responsiveness to climate; disruption of species synchrony.

S6942VL	CLIMATE LEGAL FRAMEWORK AND GOVERNANCE
NQF Level:	9
NQF Credits	24
Contact Hours:	2 Contact hours, and two hours Tutorials once a week for One semester.
Course Assessment:	**CA** consists two assignments (50%), Projects assessments (30%): one individual project involving community engagement. Seminar readings and presentations (20%)
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Multi-lateral Environmental Agreements (the three RIO Conventions: UNFCCC, UNCBD, UNCCD); Conceptualising Climate Governance and Institutional Frameworks within the context of sustainable development; History of climate change negotiations and power dynamics in climate negotiations and negotiation platforms; United Nations Framework Convention on Climate Change (UNFCCC) and associated protocols, accords and critical decisions such as: Kyoto Protocol, Bali Roadmap , Copenhagen Accord, Durban Platform, Warsaw International Mechanism on Loss and Damage, Paris Agreement and its provisions (e.g., Nationally Determined Contributions, National Adaptation Plans, Article 6 – Carbon Markets, etc.); The Glasgow Climate Pact, The 2030 Agenda for Sustainable Development (especially Climate Action SDG 13), Case studies on local government and corporate climate change policies; Understanding the NetZero emission by 2050 trajectory; Case studies on existing good practice climate change policies.

S6902VG	CLIMATE CHANGE, GENDER & SOCIAL INCLUSION
NQF Level:	9
NQF Credits	24
Contact Hours:	2 Contact hours, and two hours Tutorials once a week for One semester.
Course Assessment:	**CA** consists two assignments (50%), Projects assessments (30%): one individual project involving community engagement. Seminar readings and presentations (20%)
Examination:	1 x 3-hour theory paper **(Weighting: Continuous assessment 50%, Examination 50%).**

COURSE DESCRIPTION: Introduction to gender concepts and gender analytical frameworks, introduction to the gender and climate change nexus. The students will be critically reflecting on one's own conceptions of climate justice through a gendered and intersectionality lens using evidence from the literature review (e.g. recently published journal articles, published work of authoritative scholars, etc). Examine how gender relations, the division of labour, and access to and control of resources differentiate vulnerability to climate change and shape adaptation.

S6953VT/S6973EC	MINI-THESIS
NQF Level:	9
NQF Credits	120
Contact Hours:	4 lecture periods per week and 4 practical sessions for the semester.
Course Assessment:	The mini thesis will be assessed by an internal & external examiner recommended by the SHDB and approved by the HDegC.

COURSE DESCRIPTION: This module aims to teach students to do scientific research in a topic of their interest that would allow them to contribute to solving real-life problems in industry and the environment. The content and nature for the thesis will depend on the topic of research selected by the student. Students will engage in independent research that will be carried out either in the laboratory or field depending on the topic of research. **Literature survey:** Comprehensive literature survey of studies and recent development in climate change science, practice, and development (concentrating in the peer-reviewed publications from the last five years with a few longer where necessary). Here, chronological presentation of thoughts will be encouraged to develop competence in critical analysis and writing a good critique of reviewed literature. This is essential towards development and submission of logical research proposal. Students shall be encouraged to access both paper based and online databases, abstracts, and articles relevant to the proposed research title. **Development of research topic**: Come up with a research topic in a specific sub-field under the field of forestry. **Develop a research proposal**: delineating the research gap, aims and objectives, positioning the research in a particular theoretical background, indicating the appropriate method for collecting and analyzing data as well as the designing the research in terms of sampling, experiments etc. **Communicate scientific information**: including research proposal, progress report and results both orally and written. **Formal presentation of thesis:** Students are expected to successfully present their theses following the Rules for Postgraduate Studies.

DOCTOR OF PHILOSOPHY IN CLIMATE SCIENCE

S7093CS	DISSERTATION
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module: develop students into independent researchers in Climate Science by conducting empirical and simulation investigations of local, regional and global climate system. Candidates are also expected to have an extensive review of existing works of literature and practically demonstrate the viability of their research in solving climate problems while carrying out original independent research. Students will be able to design, develop, conduct and manage major research projects independently, as well as document and present the results. Students are expected to make a unique contribution to the existing body of knowledge in Climate Science.

Core elements of the course include the support of academic skills such as: **Literature review:** Conduct a comprehensive literature search of studies and recent developments in the study area (with a major focus on the more recent work undertaken in the last five to 10 years, and fewer resources from historical / longer studies where necessary). Candidates are encouraged to adopt a chronological presentation of thoughts during the literature review. This is essential for the development and submission of the research proposal. Candidates are further encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research study. **Development of the research proposal:** Based on the outcome of the literature review, candidates are expected to identify research gaps within the areas of interest and formulate a research proposal, by identifying the research approach / intended scope of work (research problem, justification, and objectives) and the relevance of the research to the society, environment, and scientific body, which will inform the research topic.

Implementation of the accepted and approved research proposal (methodology/experimental process): Once the research is accepted and approved, the candidate will implement the proposal through the stated methodology/experimental process under the guidance of the supervisor(s). **Ethical procedures**: Candidates will be required to adhere to all ethical requirements of research work and processes during the course of study. Before fieldwork is commissioned, candidates will need to apply for ethical clearance and will only proceed with fieldwork once they are cleared for research. The issue of plagiarism will be reiterated. **Data collection, interpretation and discussion:** Candidates will gather, assess and discuss data through means outlined in the approved research proposal. Where necessary, candidates are encouraged to enroll for specialized courses or training to enhance their skills set and data analysis. **Presentation of the research outcomes:** Candidates will present the research outcomes by submitting intermediate progress, written reports to their respective supervisors, drafting and submitting final theses, and publishing manuscripts in line with the researched topic following the Rules for Postgraduate Studies. They will also be expected to attend and present at conferences, workshops, and seminars. **Formal presentation:** Candidates are expected to successfully present their theses following the Rules for Postgraduate Studies.

DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL BIOLOGY

S7093EB	DISSERTATION
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module designed to develop students into independent researchers by deepening their scientific skills and knowledge in Environmental Biology by conducting empirical investigations related either to Terrestrial Ecology, Aquatic Ecology, Biodiversity Conservation & Management, Conservation Ecology & Management, Ecosystem Management, Evolution, or Behaviour & Biosystematics.

Core elements of the course include the support of academic skills such as: **Literature review:** Conduct a comprehensive literature search of studies and recent developments in the study area (with a major focus on the more recent work undertaken in the last five to 10 years, and fewer resources from historical / longer studies where necessary). Candidates are encouraged to adopt a chronological presentation of thoughts during the literature review. This is essential for the development and submission of the research proposal. Candidates are further encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research study. **Development of the research proposal:** Based on the outcome of the literature review, candidates are expected to identify research gaps within the areas of interest and formulate a research proposal, by identifying the research approach / intended scope of work (research problem, justification, and objectives) and the relevance of the research to the society, environment, and scientific body, which will inform the research topic.

Implementation of the accepted and approved research proposal (methodology/experimental process): Once the research is accepted and approved, the candidate will implement the proposal through the stated methodology/experimental process under the guidance of the supervisor(s). **Ethical procedures**: Candidates will be required to adhere to all ethical requirements of research work and processes during the course of study. Before fieldwork is commissioned, candidates will need to apply for ethical clearance and will only proceed with fieldwork once they are cleared for research. The issue of plagiarism will be reiterated. **Data collection, interpretation and discussion:** Candidates will gather, assess and discuss data through means outlined in the approved research proposal. Where necessary, candidates are encouraged to enroll for specialized courses or training to enhance their skills set and data analysis. **Presentation of the research outcomes:** Candidates will present the research outcomes by submitting intermediate progress, written reports to their respective supervisors, drafting and submitting final theses, and publishing manuscripts in line with the researched topic following the Rules for Postgraduate Studies. They will also be expected to attend and present at conferences, workshops, and seminars. **Formal presentation:** Candidates are expected to successfully present their theses following the Higher degree Policy rules and regulations.

DOCTOR OF PHILOSOPHY IN FORESTRY

S7083ET	DISSERTATION
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module: equip PhD candidates with the skills of setting up and carrying out scientific research in an independent manner to master the skills of quantitative/qualitative data collections and analysis; information retrieval and synthesis as well as communicating scientific work to a wide range of audience. The dissertation will focus on the area of specialization including agroforestry, silviculture, forest inventory and planning, forest governance, Forest Industry and Urban Forestry. **Development of research topic**: Come up with a research topic in a specific sub-field under the field of dryland forestry. **Develop a research proposal**: delineating the research gap, aims and objectives, positioning the research in a particular theoretical background, indicating the appropriate method for collecting and analyzing data as well as the designing the research in terms of sampling, experiments etc. **Conduct literature review**: Use library sources and web-based database for scholarly articles to retrieve and synthesize information relevant for research area of specialization. Collect and analyze data: Using appropriate methods. **Communicate scientific information**: in the form of research proposal, progress report, thesis report and publications in journals and book Chapters. Communicate both orally and in written form.

DOCTOR OF PHILOSOPHY IN GEOINFORMATICS

S7093GI	DISSERTATION
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module: designed to develop students into independent researchers of in the field of Geoinformatics by conducting empirical investigations while leveraging geospatial technologies. Candidates are also expected to have an extensive review of existing works of literature and practically demonstrate the viability of their research in solving geospatial problems while carrying out original independent research. Students will be able to design, develop, conduct and manage major research projects independently, as well as document and present the results. Students are expected to make a unique contribution to the existing body of knowledge in Geoinformatics. Core elements of the course include the support of academic skills such as: **Literature review:** Conduct a comprehensive literature search of studies and recent developments in the study area (with a major focus on the more recent work undertaken in the last five to 10 years, and fewer resources from historical / longer studies where necessary). Candidates are encouraged to adopt a chronological presentation of thoughts during the literature review. This is essential for the development and submission of the research proposal. Candidates are further encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research study. **Development of the research proposal:** Based on the outcome of the literature review, candidates are expected to identify research gaps within the areas of interest and formulate a research proposal, by identifying the research approach / intended scope of work (research problem, justification, and objectives) and the relevance of the research to the society, environment, and scientific body, which will inform the research topic. **Implementation of the accepted and approved research proposal (methodology/experimental process):** Once the research is accepted and approved, the candidate will implement the proposal through the stated methodology/experimental process under the guidance of the supervisor(s). **Ethical procedures**: Candidates will be required to adhere to all ethical requirements of research work and processes during the course of study. Before fieldwork is commissioned, candidates will need to apply for ethical clearance and will only proceed with fieldwork once they are cleared for research. The issue of plagiarism will be reiterated. **Data collection, interpretation and discussion:** Candidates will gather, assess and discuss data through means outlined in the approved research proposal. Where necessary, candidates are encouraged to enroll for specialized courses or training to enhance their skills set and data analysis. **Presentation of the research outcomes:** Candidates will present the research outcomes by submitting intermediate progress, written reports to their respective supervisors, drafting and submitting final theses, and publishing manuscripts in line with the researched topic following the Rules for Postgraduate Studies. They will also be expected to attend and present at conferences, workshops, and seminars. **Formal presentation:** Candidates are expected to successfully present their theses following the Rules for Postgraduate Studies.

DOCTOR OF PHILOSOPHY IN HUMAN GEOGRAPHY

S7093HG	DISSERTATION
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module develop students into independent researchers in Human Geography by conducting empirical investigations to human environment. Candidates are also expected to have an extensive review of existing works of literature and practically demonstrate the viability of their research in solving geographical problems while carrying out original independent research. Students will be able to design, develop, conduct and manage major research projects independently, as well as document and present the results. Students are expected to make a unique contribution to the existing body of knowledge in Human Geography. Core elements of the course include the support of academic skills such as: **Literature review:** Conduct a comprehensive literature search of studies and recent developments in the study area (with a major focus on the more recent work undertaken in the last five to 10 years, and fewer resources from historical / longer studies where necessary). Candidates are encouraged to adopt a chronological presentation of thoughts during the literature review. This is essential for the development and submission of the research proposal. Candidates are further encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research study. **Development of the research proposal:** Based on the outcome of the literature review, candidates are expected to identify research gaps within the areas of interest and formulate a research proposal, by identifying the research approach / intended scope of work (research problem, justification, and objectives) and the relevance of the research to the society, environment, and scientific body, which will inform the research topic. **Implementation of the accepted and approved research proposal (methodology/experimental process):** Once the research is accepted and approved, the candidate will implement the proposal through the stated methodology/experimental process under the guidance of the supervisor(s). **Ethical procedures**: Candidates will be required to adhere to all ethical requirements of research work and processes during the course of study.

Before fieldwork is commissioned, candidates will need to apply for ethical clearance and will only proceed with fieldwork once they are cleared for research. The issue of plagiarism will be reiterated. **Data collection, interpretation and discussion:** Candidates will gather, assess and discuss data through means outlined in the approved research proposal. Where necessary, candidates are encouraged to enroll for specialized courses or training to enhance their skills set and data analysis. **Presentation of the research outcomes:** Candidates will present the research outcomes by submitting intermediate progress, written reports to their respective supervisors, drafting and submitting final theses, and publishing manuscripts in line with the researched topic following the Rules for Postgraduate Studies. They will also be expected to attend and present at conferences, workshops, and seminars. **Formal presentation:** Candidates are expected to successfully present their theses following the Rules for Postgraduate Studies.

DOCTOR OF PHILOSOPHY IN PHYSICAL GEOGRAPHY

S7093PG	**DISSERTATION**
NQF Level	10
NQF Credits	360
Contact Hours	Face to face consultations with supervisor(s) on regular bases.

Course Descriptor: The purpose of this module designed to develop students into independent researchers by deepening their scientific skills and knowledge in Physical Geography by conducting empirical investigations of Geographical parameters related to the physical environment. Candidates are also expected to have an extensive review of existing works of literature and practically demonstrate the viability of their research in solving geographical problems while carrying out original independent research. Students will be able to design, develop, conduct and manage major research projects independently, as well as document and present the results. Students are expected to make a unique contribution to the existing body of knowledge in Physical Geography.

Core elements of the course include the support of academic skills such as: **Literature review:** Conduct a comprehensive literature search of studies and recent developments in the study area (with a major focus on the more recent work undertaken in the last five to 10 years, and fewer resources from historical / longer studies where necessary). Candidates are encouraged to adopt a chronological presentation of thoughts during the literature review. This is essential for the development and submission of the research proposal. Candidates are further encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research study. **Development of the research proposal:** Based on the outcome of the literature review, candidates are expected to identify research gaps within the areas of interest and formulate a research proposal, by identifying the research approach / intended scope of work (research problem, justification, and objectives) and the relevance of the research to the society, environment, and scientific body, which will inform the research topic. **Implementation of the accepted and approved research proposal (methodology/experimental process):** Once the research is accepted and approved, the candidate will implement the proposal through the stated methodology/experimental process under the guidance of the supervisor(s). **Ethical procedures**: Candidates will be required to adhere to all ethical requirements of research work and processes during the course of study. Before fieldwork is commissioned, candidates will need to apply for ethical clearance and will only proceed with fieldwork once they are cleared for research. The issue of plagiarism will be reiterated. **Data collection, interpretation and discussion:** Candidates will gather, assess and discuss data through means outlined in the approved research proposal. Where necessary, candidates are encouraged to enroll for specialized courses or training to enhance their skills set and data analysis. **Presentation of the research outcomes:** Candidates will present the research outcomes by submitting intermediate progress, written reports to their respective supervisors, drafting and submitting final theses, and publishing manuscripts in line with the researched topic following the Rules for Postgraduate Studies. They will also be expected to attend and present at conferences, workshops, and seminars. **Formal presentation:** Candidates are expected to successfully present their theses following the Rules for Postgraduate Studies.

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.1.1. ADMISSION REQUIREMENTS

G.1.1.1. 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 enrol for an Extended Programme that will take one year longer.

G.1.1.2. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES BEFORE 2021

Candidates in possession of a valid Namibian Senior Secondary Certificate (NSSC) issued before 2021 (only) and has a pass in 5 different subjects can enrol 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.1.1.3. 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.1.1.4. ALTERNATE PATHWAYS TO ADMISSION

G.1.1.4.1. 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 cover 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.1.1.4.2. RECOGNITION OF PRIOR LEARNING (RPL)

Another way of entering the programme is through the **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.1.2. 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.1.3. 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.

G.1.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

G.1.4.1. 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.

G.1.4.2. 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.1.5. ADVANCEMENT AND PROGRESSION RULES

G.1.5.1. 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.1.5.2. 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.1.6. 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.1.7. 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.1.8. 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 by information in Table 29.1 below.

G.1.9. 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		
U3420EM	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	Programming Fundamentals I	5	14		
Year 1 Semester 2					
S3502GY	Introduction to Physical Geology & Earth Systems Science	5	14		
S3512MC	Calculus II	5	12		
S3511PG	General Physics II	5	14		
S3532DP	Programming Fundamentals II	5	14		
Total Credits			**132**		

YEAR 2

Year 2 Core Semester 1					
U3420SE	Sustainability and Environmental 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 & Geophysics	6	16	**S3511PG,S3502GY,S3531CG**	
S3651GY	Introduction to Hydrology & 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 Geology I, Earth Science Field Skills)	6	8		
Total Credits			**136**		

YEAR 3

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 & 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.1.9.1. 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.1.9.2. COURSE DESCRIPTIONS FOR BSC GEOLOGY

S3502GY: INTRODUCTION TO PHYSICAL GEOLOGY, ENVIRONMENT & EARTH SYSTEMS SCIENCE

NQF level: 5
Credits: 8
Contact hours: 4 hours lectures per week and 3 hours practical per fortnight for one semester
Course assessment: **40% CA** of 1 assignment, two (2) tests, and five (5) graded Practicals.
Examination **60%:** 1x 3-hour exam paper.
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**
Credits: **4**
Contact hours: 1 hour lecturer per week for six weeks
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
Credits: **8**
Contact hours: 2-3 weeks field work
Course assessment: Continuous assessment 100%.
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
Credits:	**16**
Contact hours:	**4** hours lectures per week + 3 hours practical per week for one semester
Course assessment:	**40%** CA is based on 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
Credits:	16
Contact hours:	4 hours of lectures per week + 3 hours practical per week for one semester
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
Credits:	16
Contact hours:	4 hours lectures per week + 3 hours practical per week for one semester
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%.**

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
Credits:	8
Contact hours:	2 hours lectures per week + 3 hours practical per fortnight for one semester
Course assessment:	CA 100% with at least 2 assignment (with presentations), 2 tests, and 5 graded practicals.
Prerequisites:	S3502GY

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
Credits:	8
Contact hours:	2 hours lectures per week + 3 hours practical per fortnight for one semester
Course assessment:	100% with at least 2 assignment (with presentations), 2 tests, and 5 graded practicals.

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**
Credits:	8
Contact hours:	4 hours lectures per week + 3 hours practical per week
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

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
Credits:	16
Contact hours:	4 hours lectures per week + 3 hours practical per week
Course assessment:	CA is based **on 100%** with at least 1 assignment, 2 tests, and 10 graded practicals.

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
Credits:	16
Contact hours:	4 hours lectures per week + 3 hours practical per week
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
Credits:	7
Contact hours:	2-3 weeks of field work
Course assessment:	CA, 100% with at least 1 field quiz, field activities, field notebook evaluation & 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
Credits:	16
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester
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
Credits:	8
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester
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
Credits:	9
Contact hours:	4 hours lectures per week and 3 hours practical per fortnight for one semester
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
Credits:	9
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester
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 weathering.

S3732GY:	EXPLORATION GEOLOGY, GEOPHYSICS & GEOCHEMISTRY
NQF level:	7
Credits:	18
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester
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

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
Credits:	18
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester
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
Credits:	18
Contact hours:	Minimum of three weeks of work integrated learning.
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
Credits:	18
Contact hours:	4 hours lectures per week and 3 hours practical per week.
Course assessment:	100% CA at least 2 reports, 1 progress report &, 1 final report; & 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
Credits:	9
Contact hours:	2-3 weeks of field work
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.2. BACHELOR OF SCIENCE GEOLOGY (HONOURS) DEGREE 33HGLY

The purpose of this programme is to provide students with a holistic understanding of the Geoscience field & to develop critical skills which will enable graduates to contribute positively to the knowledge-based economy & understanding of our dynamic Earth. This programme will thus enhance the competency of geoscience graduates in line with UNAM, particularly the School of Science's mission and vision & scaffold their innovative potential, thus positioning them to be leading scientists with the capacity to conduct research in priority areas such as the blue economy, geodynamics, climate change, geohazards and environmental problems, etc. The knowledge and skills gained through the Bachelor of Science (Honours) programme will contribute towards the attainment of Namibia's NDP 6 and the United Nations Sustainable Development Goals 4, 12 and 13.

G.2.1. REGULATIONS

G.2.1.1. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science in Geology Honours, the applicant must be in possession of either:

- ✓ A BSc degree in **Geology (NQF level 7)** from the University of Namibia or an equivalent qualification from a recognised institution of higher education
- ✓ Students who have completed a double major BSc degree with **Geology** may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

G.2.1.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

G.2.2. ARTICULATION OPTIONS

This qualification serves as an entry point to the following related qualifications: MSc degrees in various fields of geology in national, regional, and international universities and colleges. This qualification provides credits for the following related qualifications: BSc in Geology and BSc in Geology Honours in national, regional, and international universities and colleges; Bachelor's degrees in other subjects, minoring in geology.

G.2.3. 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
- ✓ Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, field 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

G.2.1. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 80 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

G.2.2. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

G.2.3. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **128 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880GR	Research Methodology Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4883GR	Research Project	8	16	None	Compulsory
Semesters 1					
S4821GG	Field and Laboratory Techniques	8	10		
S4811GH	Historical Geology & Stratigraphy	8	20	None	Compulsory
S4811GT	Global Tectonics	8	20	None	Compulsory
Year 1 Semester 2					
S4822GM	Marine Geology	8	10	None	Compulsory
S4812GS	Applied Structural Geology	8	20		
S4812GP	Applied Mineralogy, Petrology & Geochemistry	8	20	None	Compulsory
Total credits			**128**		

G.3. BACHELOR OF SCIENCE ECONOMIC GEOLOGY HONOURS - 33HGEG

The program aims to provide students with comprehensive knowledge and understanding of various formation processes that are associated with ore mineralization, industrial minerals, and gemstone. It provides requisite skills for sustainable Exploration and Exploitation of mineral raw materials utilizing 4IR AI techniques. It responds to the African Mining Vision, Agenda 2063 and the strategies of the Harambe Prosperity Plan toward a just and sustainable exploitation of our natural resources to attain Vision 2030. As a country, we are guided by Countrywide, there are numerous indications of mineralization that warrant further systematic investigations to discover more possible ore deposits of economic importance particularly including critical minerals for Net Zero Emission strategy and thus responding to Various SDGs (1,2,6,7,8, 13..). Ultimately the program 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. The department seeks to facilitate students' progression towards fulfilling and exciting careers in academia, industry, and/or government as well as to undertake further studies in biochemistry. The programme is designed to contribute to national priorities and Namibia's Vision 2030 as articulated in the NDP5 and Sustainable Development Goals; No. 2 Zero Hunger, No. 3 Good Health and Wellbeing; No. 4 Quality Education; No. 9. Industry, Innovation, and Infrastructure; No. 12 Responsible Consumption and Production; No. 15 Life on Land. Additionally, the programme is in line with UNAM's mission and strategic direction to provide quality education through teaching and research activities for a progressive economy and improved quality of life.

G.3.1. REGULATIONS

G.3.1.1. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science in Economic Geology Honours, the applicant must be in possession of either:
A BSc degree in Geology (NQF level 7) from the University of Namibia or an equivalent qualification from a recognized institution of higher education. Students who have completed **a double major BSc degree with Geology** may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

G.3.1.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

G.3.1.3. ARTICULATION OPTIONS

This qualification may articulate into a master's degree in Geosciences or related field of study at NQF level 9.

G.3.1.4. 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 **CA (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. Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, field 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.

G.3.1.4.1. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 80 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

G.3.1.4.2. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

G.3.1.4.3. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880GR	Research Methodology Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4883GE	Research Project	8	16	None	Compulsory
Semesters 1					
S4821GG	Field and Laboratory Techniques	8	10		
S4811GN	Geological Resources of Namibia	8	20	None	Compulsory
S4811GO	Ore Deposit Geology	8	20	None	Compulsory
Year 1 Semester 2					
S4812GM	Mineral Exploration and Geometallurgy	8	20	None	Compulsory
S4812GS	Applied Structural Geology	8	20		
S4822GE	Exploration Geophysics	8	10	None	Compulsory
Total credits			**138**		

G.4. BACHELOR OF SCIENCE IN PETROLEUM GEOSCIENCES HONOURS - 33HGPG

The purpose of the BSc in Petroleum Geosciences is to provide students with a comprehensive foundation in the geological sciences, specifically tailored to the petroleum industry. This program aims to develop a deep understanding of the processes governing the formation, distribution, and extraction of hydrocarbon resources. Through rigorous coursework and hands-on field and laboratory training, students will gain expertise in subsurface mapping, reservoir characterization, and the application of geophysical and geochemical methods. The program prepares graduates to tackle real-world challenges in petroleum exploration and production, emphasizing practical skills and critical thinking necessary for success in a dynamic and evolving energy sector. By integrating fundamental geology with industry-specific applications, the BSc in Petroleum Geosciences equips students to contribute effectively to sustainable energy solutions and advancements in the field. As a country, we are guided by Vision 2030 toward a just and sustainable energy security as part of SDG7. Namibia is currently a hot spot for hydrocarbon exploration. The program contributes to the vision and mission of the School of Science and the University at large as it aims to develop productive and competitive human resources which can work in public and private institutions toward energy security, environmental protection and safe working environment.

G.4.1. REGULATIONS

G.4.1.1. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science in Geology Honours, the applicant must be in possession of either:

- ✓ A BSc degree in **Geology (NQF level 7)** from the University of Namibia or an equivalent qualification from a recognised institution of higher education
- ✓ Students who have completed a double major BSc degree with **Geology** may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

G.4.1.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

G.4.1.3. ARTICULATION OPTIONS

This qualification may articulate into a master's degree in Geosciences or a related field of study at NQF level 9.

G.4.1.4. 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
- ✓ Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, field 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

G.4.1.4.1. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 80 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

G.4.1.4.2. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

G.4.1.4.3. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880GR	Research Methodology Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4883GR	Research Project	8	16	None	Compulsory
Semesters 1					
S4811GN	Geological Resources of Namibia	8	20		
S4811GP	Petroleum Geology	8	20	None	Compulsory
S4821GP	Basin Excursion and Analytical Techniques	8	10	None	Compulsory
Year 1 Semester 2					
S4812GS	Applied Structural Geology	8	20	None	Compulsory
S4832GS	Sedimentary Geology	8	20		
S4822GE	Exploration Geophysics	8	10	None	Compulsory
Total credits			**138**		

G.5. BACHELOR OF SCIENCE IN HYDROGEOLOGY AND ENVIRONMENTAL GEOLOGY HONOURS

The program aims to provide students with comprehensive knowledge and understanding of hydrology and Environmental geology. It provides requisite skills for sustainable equitable, and optimal exploration and exploitation of (underground water contact) environmental impact assessments of mining and constructions. It responds to the African Mining Vision, Agenda 2063 and the strategies of the Harambe Prosperity Plan toward a just and sustainable exploitation of our natural resources to attain Vision 2030. These are also on par with the Maputo Declaration of 2006 for food security and many water related initiative in Africa (e.g. UN, FAO, Worldbank, World Economic Forum, Circle of Blue, The water project, water scarcity solutions) and thus to responding to various SDGs (1,2,8,13….). As a country, we are guided by the strategies of the Harambe Prosperity Plan toward a just and sustainable exploitation of our natural resources toward attaining Vision 2030. The program contributes to the vision and mission of the School of Science and the University at large as it aims to develop productive and competitive human resources which can work in public and private institutions toward water security, environmental protection and safe working environment.

G.5.1. REGULATIONS

G.5.1.1. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science in Geology Honours, the applicant must be in possession of either:

- ✓ A BSc degree in **Geology (NQF level 7)** from the University of Namibia or an equivalent qualification from a recognised institution of higher education
- ✓ Students who have completed a double major BSc degree with **Geology** may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

G.5.1.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the bachelor's degree for the BSc Honours qualification.

G.5.2. ARTICULATION OPTIONS

This qualification may articulate into a master's degree in Geosciences or a related field of study at NQF level 9.

G.5.3. 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
- ✓ Generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, field 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

G.5.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 80 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

G.5.5. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

G.5.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4880GR	Research Methodology Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4883GR	Research Project	8	16	None	Compulsory
Semesters 1					
S4811GN	Geological Resources of Namibia	8	20		
S4821GH	Field and Laboratory Techniques	8	10	None	Compulsory
S4811GH	Applied Hydrogeology	8	20	None	Compulsory
Year 1 Semester 2					
S4822GE	Exploration Geophysics	8	10	None	Compulsory
S4812GE	Environmental Geology	8	20		
S4832GE	Engineering Geology	8	20	None	Compulsory
Total credits			**138**		

G.5.7. TABLE OF EQUIVALENTS

OLD CURRICULUM				NEW CURRICULUM			
Module code	**Module name**	**NQF level**	**NQF credits**	**Module code**	**Module name**	**NQF level**	**NQF credits**
None					Design thinking	8	8
GLE3821	Environmental & Engineering Geology II	8	8			8	14
GLY3801	Industrial Mineral Gemstones	8	8		None (To be offered again)		
GLY3871	Igneous & Metamorphic Petrogenesis	8	16		None (To be offered again)		
GLY3811	Coal, Gas & Petroleum	8	8		None (To be offered again)		
GLY3812	Hydrogeology II	8	8		None (To be offered again)		
GLY3832	Exploration Geology & Geophysics	8	16		None (To be offered again)		
GLY3822	Remote Sensing	8	8		None (To be offered again)		
GLY3862	Structural Geology II	8	8		None (To be offered again)		
GLY3810	Research Project	8	32				
GLY3820	Field Geology for Research	8	8	S4823GR	Research Project	8	16
GLY3800	Field Geology III	8	8		None (To be offered again)		
GLE3821	Environmental & Engineering Geology II	8	8				8

G.5.1. COURSE DESCRIPTIONS FOR ALL BACHELOR OF SCIENCE IN GEOLOGY – HONORS

S4880GR: RESEARCH METHODOLOGY & PROPOSAL

NQF level: 8
Credits: 16
Contact hours: 1 hour per week for two semesters
Course Assessment: 100% of 30% Tests, research proposal (40%), practical reports (10%) & oral presentation (20%).
Examination 50%: No examination
Course description: The purpose of this module is to develop a research orientation among the students and to acquaint them with fundamentals of research methods. Furthermore, the course equips students with skills to do literature reviews, and to be able to assess and critique published journal articles. Introduction to research. Ethics of research. Problems and hypotheses. Experimental and field research design. Statistical methods. Methods of data collection, Processing and analysis of data. The scientific method. Sampling techniques. Presentation of data in scientific reports/theses/dissertation. Scientific writing, literature search. Citation. Writing a research proposal. Oral presentation.

S4883GH/S4883GR/S4883GP/S4883GE: RESEARCH PROJECT

NQF level: 8
Credits: 14/16
Contact hours: 4 hours lectures per week and 3 hours practical per fortnight for the core semester.
Course Assessment: 100% based on presentation (15 %), Oral test (15 %) and Mini Thesis report (70 %).
Examination 50%: No examination
Course description: The purpose of this module is to give the students an opportunity to learn how to design, manage, and complete a supervised research project (a research project under supervision) within the field of geology. to summarize the results in a research report and present the results of the project. Independent research study based on a topic of interest. The course is based on individual research work including literature studies according to the study plan. The student conducts research on a topic within the field of hydrogeology and environmental geology. Students have the opportunity to choose their own subject, as long as it fits in with the Department's capacity. The student asks one of the members of the Department to supervise him or her. The student's research can have multiple supervisors, but at least one of them must be a member of the Department.

S4880QD: DESIGN THINKING

NQF level: 8
Credits: 8
Contact hours: 2 lecture periods and 3 hours practical per week for the semester.
Course Assessment: 100% based on presentation (15 %), Oral test (15 %) and Mini Thesis report (70 %).
Examination 50%: No examination
Course description: **1**. Introduction to Design Thinking: - Understanding the principles and stages of the Design Thinking process. - Exploring the importance of empathy, ideation, prototyping, and testing in problem-solving. **2.** Geological exploration techniques: - Geological mapping and prospecting methods. - Exploration guides for various ore deposit types. - Exploration drilling methods and techniques. **3**. Application of Design Thinking in Geosciences: - Integrating Design Thinking methodologies into geological exploration practices. - Case studies and examples showcasing successful application of Design Thinking in geosciences. **4.** Hands-on Design Thinking Projects: - Collaborative projects applying Design Thinking principles to solve real-world geological challenges. - Group activities and exercises to practice empathy, ideation, and prototyping. **5**. Guest lectures and industry insights: - Inviting guest speakers from the geosciences industry to share their experiences applying Design Thinking. - Industry perspectives on the role of innovation and creativity in geological exploration. **6.** Field trips and workshops: - Field visits to geological sites to observe exploration techniques in action. - Workshops on prototyping and testing geological solutions using Design Thinking methods. **7**. Communication and Collaboration: -Effective communication of geological findings and proposals. -Collaborative teamwork in geological exploration projects.- Presentation skills and stakeholder engagement in the geosciences field.

S4821GG/S4812GE:	FIELD AND LABORATORY TECHNIQUES
NQF level:	8
Credits:	10
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester.
Course assessment:	100**%** CA of two tests (10%), Field ettiquett including teamwork (10%), Field Report (40%), Field Book (10%). A minimum of three practical reports (30%)
Examination 50%:	No examination

Course description: This course aims to: enable students to produce a geological map and cross-section in an area of complex geology and to write a geological field report. Introduction to exploration and sampling techniques; geological setting of mineral deposits; field geological and structural mapping of mineral deposits and associated host rocks; sampling and evaluation of a mineral property; environmental considerations; case studies of Namibian ore deposits; technical report writing. Sampling and sample preparation, geochemical data, X-ray diffraction (powder and single crystal), Determination of major and trace element bulk rock composition: AAS, XRF and ICP-MS. Scanning electron microscopy (SEM), SEM-CL, SEM-BSE, and Electron microprobe analysis. In-situ trace element composition of minerals: the laser-ablation ICP-MS technique. Analytical techniques in isotope geology: SIMS, TIMS, MC-ICPMS. Geochemical calculations and plots. Non-destructive testing and sampling techniques.

S4811GH:	HISTORICAL GEOLOGY & STRATIGRAPHY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester.
Course assessment:	CA of two tests (50%), five practical report (30%); Field report (10%); one assignment (10%)
Examination 50%:	1 x 3 hours theory paper 60% 1 x 3 hours practical paper 40%.

Course description: The purpose of this module is to provide a scientific basis for understanding the evolution of Earth over time, provide important information about ancient climate changes, volcanic eruptions, and earthquakes that can be used to anticipate the sizes and frequencies of future events. Historical Geology and Stratigraphy course is involved directly or indirectly in most aspects of geological studies. This course covers many subjects including the Evolution of stratigraphic classifications; present day classifications; types of lithostratigraphic units; combined successions of strata; sequences: surface outcrops, correlation of strata, unconformities; chronostratigraphic units; Eras and their characteristics: divisions, sediments, fossils; stratigraphy as a tool in mineral, water, and petroleum exploration. Elements of Stratigraphy, Principles of Paleography and Paleotectonics, Earth's Crustal Structure and Tectonic Divisions, Precambrian Basement, Proterozoic Formations, Paleozoic and Mesozoic History, Gondwana Sequence and Cenozoic History. Biostratigraphy, paleobotanical significance of the Nama group, microfossils in paleo-environment, paleo-climatic reconstruction, and isotope application. Cause and effects of mass distinction in the context of present global climate change. Adaptation and function morphology of Trilobites, Cephalopods, pelecypod, gastropods, Coelenterates and Graptolites with respect to the evolution of life and earth over Cambrian to recent.

S4811GT:	GLOBAL TECTONICS
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester.
Course assessment:	100% CA, constituted by 50% Tests, 20% assignment including a presentation, 30% practical reports
Examination 50%:	No Examination

Course description: This course aims to equip students with the knowledge of the Regional Geology of the Southern part of Africa including the history and geological evolution of the major geological events. Archean, Proterozoic and Phanerozoic earth's history and regional Geology of Southern Africa; cratonic evolution and mineral deposits of Southern Africa. The Paleoproterozoic evolution; The great oxidation event and appearance of BIFs as a geological process. The Mesoproterozoic evolution and the great sedimentation basins; granitoids; Assembly and dispersal of Supercontinents, The great Neoproterozoic rift basins and carbonate explosion; the assembly of Gondwana; The snowball earth events; the Pan African Events; The regional geology of Namibia from Archean to Phanerozoic. Overview of the mineral, water and energy resources of Namibia.

S4822GM:	MARINE GEOLOGY
NQF level:	8
Credits:	10
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester.
Course assessment:	100% CA, constituted by 50% Tests, 20% assignment including a presentation, 30% practical reports
Examination 50%:	1 x 3 hours theory paper 60% 1 x 3 hours practical paper 40%.

Course description: To equip students with knowledge about the origin, structure, processes, evolution and sustainable exploitation of resources of the ocean basins and their margins. Origin and evolution ocean basins, ocean floor topography: continental shelf and slope, submarine canyons, oceanic ridges, abyssal plains, seamounts and trenches, ocean circulation, sedimentary processes within ocean basins, impact of sea level changes, oceanic sediment archives, sea water chemistry, biochemical processes in sea water, carbon sequestration, marine resources: hydrocarbons, minerals, green hydrogen, sustainable marine resource exploitation, ocean basin exploration methods: echo-sounder, side-scan sonar, grab sampling and coring, dredging and seismic methods. Benguela Current Large Marine Ecosystem (BCLME).

S4822GM/ S4812GS:	APPLIED STRUCTURAL GEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 hours of lectures per week and 3 hours of practical per week for one semester.
Course assessment:	100% CA, constituted by 50% Tests, 10% assignment including a presentation, 30% practical reports, Field report (10%).
Examination 50%:	1 x 3 hours theory paper 60% 1 x 3 hours practical paper 40%.

Course description: Mechanics in geological applications, study of the motion of matter and factors that cause such motion; concepts of time-space-mantle dynamics. Application to point masses; Stress as a tensor; rheology, relationships between strain and stress; strain and rotation. Introduction to Structural algorithm in MATLAB functions. Displacement vectors and deformation mechanisms; relationships for shear stress versus normal stress. Fluid flow in the crust; flow in porous media; mantle flow models. Earthquake cyclicity; prediction of earthquakes; frequency factors in seismology. Stereographic projections in complex areas; unraveling of strata attitude for non-parallel boreholes. Geochronology and its application in the evolution of continental crust. Geodynamics and Plate Tectonics over time; tectonic stress and aseismic motion; time-dependent flow; sediment loading; post-glacial rebound; Rayleigh-Taylor Instability.

S4812GP:	APPLIED MINERALOGY, PETROLOGY AND GEOCHEMISTRY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester.
Course assessment:	100% CA, of 50% Tests, 10% assignment & presentation, 30% practical reports, Field report (10%).
Examination 50%:	1 x 3 hours theory paper 60% 1 x 3 hours practical paper 40%.

Course description: The aim of the subject is give understanding of mineral structure and morphology, furthemore to to get an overview of thermodynamical relations in mineralogy, petrology and geochemistry and rock-forming minerals. classification and characterization of minerals, crystallography that studies minerals from a physico-chemical and atomic structure point of view, the study of igneous and metamorphic processes and their impact on our territory, the characterization of natural and artificial (mortars, dimension stones, ancient and modern ceramics) belonging to the geoheritage and to the built environment, the classic biomineralogy and study of mineral surfaces, mineral based biomaterials and the study of the interactions between organic / biological matter and mineral surfaces. Themodaynamics, Specific Enthalpy (J/m3), Density (kg/m3), Specific heat capacity (J/K/m3), Expansivity (1/K, for volume), Compressibility (1/bar, for volume), Composition (Mol, Mass, or Wt%) of the system, Mode (Vol, Mol, or Wt proportion) of a phase, Composition (Mol, Mass, or Wt%) of a solution phase, Grueneisen thermal ratio, Adiabatic bulk modulus (bar), Adiabatic shear modulus (bar), Sound velocity (km/s), P-wave velocity (Vp, km/s), S-wave velocity (Vs, km/s), Vp/Vs, Specific entropy (J/K/m3).

S4811GN:	GEOLOGICAL RESOURCES OF NAMIBIA
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for 2 semester. one 3 hours practical session per week for 1 semester
Course assessment:	100% CA, constituted of 50% Tests, 30% practical reports, & 20% assignment, & presentations
Examination 50%:	No Examination

Course description: Archean, Proterozoic and Phanerozoic earth's history and regional Geology of Southern Africa. cratonic evolution and mineral deposits of Southern Africa. The Paleoproterozoic evolution. The great oxidation event and appearance of BIFs as a geological process. The Mesoproterozoic evolution and the great sedimentation basins. granitoids. Assembly and dispersal of Supercontinents, The great Neoproterozoic rift basins and carbonate explosion. the assembly of Gondwana. The snowball earth events. the Pan African Events. The regional geology of Namibia from Archean to Phanerozoic. Overview of the mineral, water and energy resources of Namibia. Legislation pertaining to geological projects: the land act and its implication on land tenure for geological projects. permit and license acquisition. The project life cycle: project initiation, project planning, project implementation, and project termination. Project management skills: planning and implementation, project resource allocation and budgeting, project monitoring, communication and conflict management. Health, safety and Environment best practice in the exploration, mining. Reporting according to approved reporting codes (for example: SAMVAL, JORCs, NI43-101). Basics of economic theory: supply and demand, commodity economics and the stock market.

S4822GE:	EXPLORATION GEOPHYSICS
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours per week and 3 hours practical per fortnight for the semester
Course assessment:	a minimum of 2 tests (50%); 5 practical reports (15%); Field report (30%); At least 1 assignment (5%)
Examination 50%:	1 x 3 hours theory paper 60% 1 x 3 hours practical paper 40%.

Course description: Physics of the main geophysical exploration 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.

S4821GP:	BASIN EXCURSION AND ANALYTICAL TECHNIQUES
NQF level:	8
Credits:	10
Contact hours:	2 hours of lectures per week and 3 hours of practical per fortnight for one semester
Course assessment:	100% CA based on presentation (15 %), Oral test (15 %) and Mini Thesis report (70 %).
Examination 50%:	No Examination

Course description: Guided field excursion to a major sedimentary basin in Namibia or overseas during which students gain experience in field-based data collection, analysis and interpretation of sedimentological, stratigraphic, structural and other relevant data. Activities undertaken during the field excursion provide a major opportunity to examine paleo-environments and use sequence-stratigraphic concepts to establish key aspects of basin margin history. The post-fieldwork report offers an opportunity to interpret student's own field data and synthesise both in graphical and written form. In addition, students would have the opportunity to evaluate petroleum system development with emphasis on reservoir geometry, architecture, heterogeneity and reservoir quality. Rock Eval pyrolysis, Course exercises include source rock analysis, construction of burial graphs, maturation calculations, construction/interpretation of structural maps and migration analysis, and thin section petrography of potential reservoir rocks, seismic and sequence stratigraphy. Environment of measurement (borehole, invasion profile) and related parameters. Fundamental equations (Archie formula) for log interpretation in clean formations. Mud logging, measurements during drilling, coring and wireline logging techniques. Introduction to modern well logging methods, engineering and core-log integration. techniques for subsurface evaluation of oil and gas reservoirs emphasizing quantitative interpretation of electric, sonic, and nuclear logs by overlay, cross-plot, and digital evaluation methods; multiple tool logging programs that provide comprehensive description of reservoir content and productivity. Log measurements and tools, interpretation of porosity, lithology and porosity in complex formations, saturation determination, interpretation charts. Basic principles of geochemical exploration and application of geochemical methods in oil and gas exploration.

S4811GP:	PETROLEUM GEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per fortnight for one semester.
Course assessment:	100% CA based on presentation (15 %), Oral test (15 %) and Mini Thesis report (70 %).
Examination 50%:	1 x 3 h combined theory and practical examination paper.

Course description: Sequence stratigraphy and basin analysis. Conditions responsible for primary production and accumulation of organic matter (OM). Source rock formation, properties and evaluation. Transformation of organic material to petroleum. Primary, secondary and tertiary migration of petroleum. Key reservoir properties including reservoir porosity and permeability. The role of depositional environment as a controlling factor for reservoir quality. Petroleum trapping mechanisms and classification. Types of basins and their petroleum potential. Diagenesis, catagenesis, and metamorphism, thermal markers. Case study of a selected petroleum province. construction and interpretation of isopach maps. The course also includes subsurface geology, energy economics, environmental science including carbon capture and sequestrations.

S4832GS:	SEDIMENTARY GEOLOGY
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours per week and 3 hours practical per fortnight for the semester.
Course assessment:	100% CA minimum of two tests (50%); a minimum of five practical report (30%), Field report (15%); one written or oral assignment (5%)
Examination 50%:	1 x 3 h combined theory and practical examination paper.

Course description: Petrographic analyses, mineralogy of clastic and biogenic components, mineralogy and texture of cements, sedimentary rock textures and fabrics; sediment provenance, environment and energy of deposition; diagenetic history, hydrocarbon reservoir quality. the content should include stratigraphy, micropaleontology sedimentary depositional and organic geochemistry. The evolution of ocean basins; ocean floor morphology & continental margins. Marine sedimentation. Evolutionary patterns in common microfossils; paleoecology and paleoenvironments; microfossils and paleogeography; taphonomy, biostratigraphy.

S4811GH:	APPLIED HYDROGEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for semester 1. one 3 hours practical session per week for semester 2.
Course assessment:	CA consist of a minimum of two tests (60%); 5 practical report (30%), 1 assignment (10%).
Examination 50%:	1 x 3 h combined theory and practical examination paper.

Course description: Groundwater residence and groundwater age dating, Water isotopes integration of isotope techniques into groundwater development, management and protection, Groundwater resources extraction and distribution methods. Application of groundwater flow modeling in groundwater resource evaluation, budgets, management, and protection of water resources.

S4810GO:	ORE DEPOSIT GEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures and 3 hours practicals per week.
Course assessment:	50% CA consist of two tests (50%); 5 practical report (30%), 1 Field report (15%); and 1 assignment or oral assignment (5%).
Examination 50%:	1 x 3 hours theory paper **(60%)** 1 x 3 hours practical paper **(40%).**

Course description: Ore-forming processes, geodynamic settings of various ore deposit types and with economic aspects of mineral resources globally, geochemistry, fluid inclusion and isotope of ore minerals. Mineral economics. Developmental Minerals: economic significance, classification, usage; aggregates and construction materials; dimension stones, and industrial minerals. Gemstones: host rocks and processes of formation; classifications, economics, and valuing; gem mining; gem cutting.

S4812GE:	ENVIRONMENTAL GEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester.
Course assessment:	CA consist of a minimum of two tests (60%); 5 practical report (20%), 1 assignment (20%).
Examination 50%:	1 x 3 h combined theory and practical examination paper.

Course description: Sustainability, Climate Change, Net zero emissions and Water Resources Sustainability. Role of geology in energy transition and sustainable energy solutions. Pollution and contamination of air, water, and soil. Types of contaminants in natural water resources, soils and atmosphere. Transport and fate of contaminants. health hazards., Geological hazards their origin characteristics, and geological / geographic distributions: control and predictions. Environmental impact of the exploration and exploitation of the earth's resources with emphasis on mineral and petroleum industry. Waste management with emphasis on Municipal Solid Wastes. landfills, waste associated with mining activities and e-wastes, characterization and remediation of contaminated sites (including the use of relevant geophysical methods with emphasis on Electrical Resistivity, and GPR), Environmental Impact Assessment.

S4832GE:	ENGINEERING GEOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 hours lectures per week and 3 hours practical per week for one semester**.**
Course assessment:	CA consist of two tests (50%); 5 practical report (30%), 1 Field report (15%); and 1 assignment or oral assignment (5%).
Examination 50%:	1 x 3 h combined theory and practical examination paper.

Course description: Basic soil mechanics. the engineering properties of soils. reservoirs & dams structures. Foundation principles and practices. Foundations of engineering structure: Bridges, dams and tunneling. Stability Problems and Support Measures: slope stability of classification and their mitigation. soil stabilization. Construction materials. Basic Rocks Mechanics: physical and mechanical properties of rocks, stress and strain in rocks, strength, and deformability of intact rock, in situ stress. Engineering classification of rocks. Weathering and rock strength. Engineering geology of Mine design and construction. Geological Hazards: seismic hazard and prevention of geological hazards. Influence of surface and groundwater on some engineering structures. Groundwater control: permanent and temporary water exclusion. subsurface exploration and geotechnical site investigations. Land surface evaluation and engineering geological maps. Development and application of engineering geological models (EGM) on projects.

S4812GM:	MINERAL EXPLORATION AND GEOMETALLURGY
NQF level:	8
Credits:	20
Contact hours:	2 hours lectures per week and 3 hours practical per fortnight for one semester.
Course assessment:	50% CA consist of **2** tests (**30%**); 5 practica (**30%),** group presentation **(20%), 2** assignments (20%)
Examination 50%:	1 x 3 hours theory paper **(60%)** 1 x 3 hours practical paper **(40%).**

Course description: Geological mapping in exploration; exploration and prospecting, sampling methods: pitting and trenching, drilling methods, ore reserve estimation using conventional methods. Remote Sensing including digital image processing and programing and GIS for mineral exploration. Geochemical exploration 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. Drilling: Diamond drilling, Rotary percussion and Auger drilling. Case studies of Junior and Startup Companies. Geostatistical methods in ore reserve estimation; statistics versus geostatistics, statistical significance and data handling; laws of distribution for ore deposits; Kriging and other estimation methods, error estimation; exploration and exploitation database. Ore characterization in terms of critical processing attributes: including blasting, crushing, grinding, liberation, recovery, and environmental management. Comminution, processing methods: Magnetic separation, classification, ore dressing, flotation. Flowsheet for Hydrometallurgy and pyrometallurgy processes.

G.6. MASTER OF SCIENCE IN APPLIED GEOLOGY - 33MSAG

G.6.1. ADMISSION REQUIREMENTS

To qualify for entry into the Master of Science Degree in Applied Geology, a candidate must hold a Bachelor of Science in Geology Honours Degree at NQF Level 8 from the University of Namibia or any related discipline or an equivalent qualification from any other recognised institution of higher education with an average of at least 60%.

G.6.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's honours degree, years of experience in the related field.

G.6.3. 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. 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. 2026, 2028].

G.6.4. 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.6.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A full-time student must pass at least **72 credits** of the courses registered for during the 1st-year to be re-admitted to the programme. The programme must be completed in a maximum of four (4) years. A part-time student must pass at least 24 credits of the courses registered for during the 1st-year to be re-admitted to the programme. By the end of the 2nd year the student will be expected to have passed 72 credits to be re-admitted to the programme. The programme must be completed in a maximum of five (5) years.

G.6.6. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework. A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining 120 credits of the coursework.

G.6.7. 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. 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.6.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits**, a pass in U6983LA Academic Literacy for Postgraduate Students, and have met all other relevant UNAM requirements. Master's by coursework students must present a paper on their own research work at a conference before graduation as outlined in the Higher Degrees Policy.

G.6.9. ARTICULATION OPTIONS

This qualification articulates into a PhD in geosciences or a related field of study.

G.6.10. CURRICULUM MASTER OF SCIENCE IN APPLIED GEOLOGY - 33MSAG

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	NCB		Compulsory
S6921GR	GIS and Remote Sensing	9	24		Compulsory
S6911GA	Analytical Techniques and Geophysics	9	24		Compulsory
S6921GP	Project Management and Economics	9	12		Compulsory
Total Credits Semester 1			**60**		
Year 1 Semester 2					
Choose one of the two electives below. *The elective is subject to two co-requisite modules that are compulsory					
S6922GO	Ore Deposits	9	12	(S6912GE), (S6912GM)	Elective
S6922GH	Hydro geochemistry	9	12	(S6912GG), (S6912GA)	Elective
Compulsory Modules					
S6912GE	Exploration Methods and Mining Geology	9	24		Compulsory
S6912GM	Geometallurgy and Modelling	9	24		Compulsory
S6912GG	Groundwater management & Protection	9	24		Compulsory
S6912GA	Site investigations and Environmental Assessment	9	24		Compulsory
Year 1 Semester 2			**60**		
Year 2 Semesters 0, 1 & 2			**120**		
S6993GR	Thesis	9	120	**All coursework modules**	Compulsory
TOTAL CREDITS FOR PROGRAM			**240**		

G.7. MASTER OF SCIENCE IN APPLIED PETROLEUM GEOSCIENCES - 33MSPG

G.7.1. ADMISSION REQUIREMENTS

To qualify for entry into the Master of Science Degree in Petroleum Geosciences, a candidate must hold a Bachelor of Science honours Degree at NQF Level 8 in Petroleum Geology or any related discipline from the University of Namibia or any other recognized institution of higher education with an average 60%.

G.7.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the **Bachelor of Science in Petroleum Geosciences (honours)** for the MSc qualification or appropriate professional experience in a geoscience related field.

G.7.3. 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. 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. 2026, 2028].

G.7.4. 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.7.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A full-time student must pass at least **72 credits** of the courses registered for during the 1st-year to be re-admitted to the programme. The programme must be completed in a maximum of four (4) years. A part-time student must pass at least 24 credits of the courses registered for during the 1st-year to be re-admitted to the programme. By the end of the 2nd year the student will be expected to have passed 72 credits to be re-admitted to the programme. The programme must be completed in a maximum of five (5) years.

G.7.6. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework. A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining 120 credits of the coursework.

G.7.7. ASSESSMENT CRITERIA

Unless otherwise indicated in the respective module descriptor, 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.7.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits**, a pass in U6983LA Academic Literacy for Postgraduate Students, and have met all other relevant UNAM requirements. Master's by coursework students must present a paper on their own research work at a conference before graduation as outlined in the Higher Degrees Policy.

G.7.9. ARTICULATION OPTIONS

This MSc qualification serves as an entry point to PhD degrees in various fields of geosciences, including Petroleum Geology, Paleontology, Sedimentology, and advanced research studies related to sedimentary terrains.

G.7.10. CURRICULUM MASTER OF SCIENCE IN APPLIED GEOLOGY - 33MSPG

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16		Compulsory
S6911GP	Petroleum Systems and Geochemistry	9	24		Compulsory
S6921GS	Seismic Techniques and Methods	9	12		Compulsory
S6911GS	Basin Analysis	9	24		Compulsory
Total Credits Semester 1			**60**		
Year 1 Semester 2					
S6912GS	Subsurface Geology and Prospect Analysis	9	24		Compulsory
S6922GE	Petroleum Economics and Management	9	12		Compulsory
S6912GP	Reservoir Petrophysics	9	24		Compulsory
Year 1 Semester 2			**60**		
Year 2 Semesters 0, 1 & 2			**120**		
S6993GP	Thesis	9	120	**All coursework modules**	Compulsory
TOTAL CREDITS FOR PROGRAM			**240**		

G.8. MASTER OF PHILOSOPHY IN GEOSCIENCES - 33MPGS

G.8.1. ADMISSION REQUIREMENTS

To be eligible for this MPhi programme, the candidate must have completed a bachelor honours degree in geosciences at NQF level 8 or equivalent degree in a relevant discipline from a recognised higher education institution, with an average of at least 60%. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA).

G.8.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelors honours or work experience.

G.8.3. 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. 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. 2026, 2028].

G.8.4. 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.8.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

G.8.6. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

G.8.7. ASSESSMENT CRITERIA

Assessment will be done based on examination the thesis/dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of 50% marks in their thesis/dissertation work. In addition to the thesis/dissertation, candidates must appear for a **Viva Voce (oral examination)** conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the MPhil programme.

G.8.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits** and who have met all other relevant UNAM requirements.

G.8.9. ARTICULATION OPTIONS

MPhil: This qualification may articulate to a PhD in the related field of study.

G.8.10. CURRICULUM MASTER OF PHILOSOPHY IN GEOSCIENCES - 33MPGS

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16		Compulsory
S6993GY	Dissertation	9	240	**All coursework modules**	Compulsory
TOTAL CREDITS FOR PROGRAM			**240**		

G.8.10.1. MASTER OF SCIENCE IN APPLIED GEOLOGY - 33MSAG

Table of equivalents during the phasing in/out period Old course	Lvl	Crd	New course	Lvl	Crd
Applied Geology equivalents					
UAE5819 Academic Writing for Postgraduate Studies	9	NCB	U6989LA Academic Literacy For Post Graduate Students	9	NCB
GLY5901 Applied GIS and Remote Sensing 12 None Yes	9	12	S6921GR GIS and Remote Sensing Applications in Geology	9	24
GLY5921 Mineral Processing and Metallurgy	9	12	To be re-offered		
GLY5902 Applied Geochemistry	9	12	To be re-offered		
GLY5922 Applied Geophysics	9	12	To be re-offered		
GLY5911 Project Management, Economics and Law	9	24	S6921GP Project Management, Economics & Law	9	24
GLY5941 Research methodology	9	12	To be re-offered		
GLY5912 Field Techniques and Technical Visits	9	24	To be re-offered		
GLA5901 Ore Forming Processes	9	12	To be re-offered		
GLA5911 Exploration Techniques, Methodology, & Economics	9	24	S6912GE Exploration Techniques and Mining Geology	9	24
GLA5931 Ore Body Modelling and Evaluation	9	12	S6912GM Ore body modelling & Geometallurgy	9	12
GLA5921 Underground and Open Pit Mining	9	12	To be re-offered		
GLE5911 Hydro-geochemistry	9	24	S6922GH Advanced Hydro geochemistry	9	24
GLE5931 Protection and Management of Water Resources	9	24	To be re-offered		
GLE5941 Environmental Impact Assessment and Sustainable Development	9	24	To be re-offered		
GLE5961 Impact of Mining Activities on Aquatic Systems	9	12	To be re-offered		
GLY5900 Master Thesis (Mini Thesis)	9	60	S6993GR Thesis	9	60

G.8.10.2. MASTER OF SCIENCE IN PETROLEUM GEOSCIENCES - 33MSPG

Table of equivalents during the phasing in/out period Old course	Lvl	Crd	New course	Lvl	Crd
Applied Geology equivalents					
UAE5819 Academic Writing for Postgraduate Studies	9	NCB	U6989LA Academic Literacy For Post Graduate Students	9	NCB
GLP5901 Sedimentology and Sedimentary Basins	9	12	S6911GS Basin Analysis	9	24
GLP5921 Petroleum Systems and GLP5942 Sedimentary Petrography and Organic Geochemistry	9	12	S6911GP Petroleum Systems and Geochemistry	9	24
GLP5941 Geophysics, Seismic Acquisition and Processing	9	12	S6921GS Seismic Techniques and Methods	9	12
GLP5902 Sequence Stratigraphy and Stratigraphic Forward Modelling	9	12	S6911GS Basin Analysis	9	24
GLP5912 Subsurface Geology & Seismic Interpretation	9	24	S6912GS Subsurface Geology and Prospect Analysis	9	24
			S6922GE Petroleum Economics and Management	9	12
GLY5941 Research methodology	9	12	To be re-offered		
GLP5962 Reservoir Geology and Prospect Analysis	9	12	S6912GP Reservoir Petrophysics	9	24
GLP5999 Industry Internship	9	12	There's no replacement		
GLP5990 Field Trip – Onshore Analogues	9	12	S6911GS Basin Analysis	9	24
GLP5900 Master Thesis	9	120	S6923GR MSc Thesis	9	120

G.9. DOCTOR OF PHILOSOPHY IN GEOSCIENCES - 33DPGS

G.9.1. ADMISSION REQUIREMENTS

To be eligible for this PhD programme, the candidate must have completed a master's degree in geosciences or related disciplines at NQF level 9 or equivalent in a relevant discipline from a recognised higher education institution.

G.9.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Master's for PhD qualification.

G.9.3. 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. 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. 2026, 2028].

G.9.4. 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.9.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

G.9.6. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

G.9.7. ASSESSMENT CRITERIA

Assessment will be done based on examination the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of a 50% marks in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

G.9.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **360 credits** and who have met all other relevant UNAM requirements.

G.9.9. ARTICULATION OPTIONS

PhD: N/A as this is the highest qualification in this field of study.

G.9.10. DOCTOR OF PHILOSOPHY IN GEOSCIENCES - 33DPGS

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16		Compulsory
S7093GY	Dissertation	10	360	**All coursework modules**	Compulsory
TOTAL CREDITS FOR PROGRAM			**360**		

G.9.10.1. DEPARTMENT'S COURSE DESCRIPTIONS FOR ALL POSTGRADUATE PROGRAMMES

S7093GY:	DISSERTATION (PHD IN GEOSCIENCES)
NQF level:	10
Credits:	360
Contact hours:	As necessary. A minimum of 2 weeks of fieldwork every year.
Course assessment:	The dissertation will be assessed in accordance with the University rules for studies at postgraduate level.
Examination 50%:	No Examination

Course description: This course is designed to broaden students' understanding of scientific principles in geosciences and its applications through extensive literature review and practical demonstration while carrying out original independent research. Students will be able to design, develop, conduct and manage major research projects independently, as well as document and present the results. **Students are expected to make a unique contribution to the existing body of knowledge in geosciences. Core elements of the course include the support of academic skills such as:**

- **Literature survey**: Comprehensive literature survey of studies and recent developments in the study (majorly in the last five years with a few longer where necessary). Here, chronological presentation of thoughts will be encouraged. This is essential for the development and submission of the logical research proposal. Students shall be encouraged to access both paper-based and online databases, abstracts, and articles relevant to the proposed research title.
- **Development of research title**: The outcome of the literature survey will inform the student under the guidance of the supervisor of the need to amend (if necessary) the title of the research based on findings, intended scope of work, and relevance of the research to the society, scientific, technological and industrial development. The ability to transform the conceptualized research idea into a research proposal through the proposal writing process coherently and chronologically forms the basis of this learning stage.
- **Implementation of the acceptable and approved research proposal (methodology/experimental process):** At this stage, the student will implement the proposal through the stated methodology/experimental process. Here, the student will demonstrate the ability to conduct independent research work under the guidance of a supervisor.
- **Data presentation, interpretation and discussion:** Skills and ability to apply relevant statistical analysis for data presentation and sound scientific and technical interpretation and discussion of the results will be displayed.
- **Presentation skills:** Students' written, and oral presentation skills will be revealed. Here, ability to summarise a report e.g. writing of abstract, conclusion etc. will be revealed. Knowledge of the student in preparing research outcomes for scientific communication (draft manuscript, PowerPoint presentation will be accessed.
- **Writing and submission of thesis for assessment**: The compilation of all the different sections of the research work into coherent chapters in the form of a thesis.
- **Ethical procedures**: Students will be required to adhere to all ethical requirements of research work and processes during study. The issue of plagiarism will be reiterated.
- **Formal presentation of thesis**: Students are expected to successfully present their theses following the Rules for Postgraduate Studies.
- **Learning and Teaching Strategies/Activities**
- **The PhD program applies the following methods of facilitated learning:**
  - ✓ Students will initiate and present a comprehensive research proposal and concomitant research plan, illustrating the concept and scope of the student's research project;
  - ✓ Students will attend regular research seminars until approval of the research proposal;
  - ✓ Students conduct independent research and are guided through regular contact sessions using all available means during which study planning, progress, and other relevant topics are discussed;
  - ✓ Students shall be required to present work-in-progress reports in scheduled departmental seminars will be done in line with the University's Higher Degrees Policy, Rules, and Regulations (ANNEX3A).
  - ✓ Students are encouraged to gain international experience by doing research in a foreign context;
  - ✓ Students are encouraged to participate in local, regional and international seminars, workshops and conferences;
  - ✓ Students are encouraged to present their final research at a local, regional or international conference, workshop, symposium, etc.

H. DEPARTMENT OF PHYSICS, CHEMISTRY & MATERIAL SCIENCE

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.

H.1. BACHELOR OF SCIENCE IN PHYSICS – 33BPHY

H.1.1. ADMISSION REQUIREMENTS

H.1.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

Candidates must have a valid Namibian Senior Secondary Certificate (NSSC) with EITHER

A pass in five (5) different subjects with:

- ✓ **Two** subjects on **NSSCAS** level with a **"d"** symbol or higher, & these **two subjects on NSSCAS** must be **Mathematics & Physics**
- ✓ **Three** subjects on **NSSCO** level a **"C"** symbol or higher. **Two 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 subjects on NSSCAS level with a **"d"** symbol or higher. Two 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.

H.1.1.2. 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 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.

H.1.2. ALTERNATE PATHWAYS TO ADMISSION

H.1.2.1. 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 cover 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%.**

H.1.2.2. 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.

H.1.2.3. 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.*

H.1.3. 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.

H.1.4. ARTICULATION OPTIONS

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

H.1.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

H.1.5.1. 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.

H.1.5.2. F.4.2. 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.

H.1.6. ADVANCEMENT AND PROGRESSION RULES

H.1.6.1. 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

H.1.6.2. 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%.

H.1.7. 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.

H.1.7.1. 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
S3532DP	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**		

H.2. BACHELOR OF SCIENCE IN CHEMISTRY - 33BCHM

H.2.1. ADMISSION REQUIREMENTS

H.2.1.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

H.2.1.1.1. NORMAL ENROLMENT

Candidates must have a valid Namibian Senior Secondary Certificate (NSSC). Additionally, the following requirements must be satisfied: **A pass in 5 different subjects as follows:**

- ✓ **Two subjects** on **NSSCAS** level with a **"d"** symbol or higher. These subjects must be **Chemistry and Mathematics**
- ✓ **Three** 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 subjects** on **NSSCAS** level with a **"d"** symbol or higher. Two of these three subjects must be **Chemistry & Mathematics,** and the third should be Physics or Biology or Computer Science.
- ✓ **Two 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 who 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.

H.2.1.2. 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.

H.2.2. ALTERNATE PATHWAYS TO ADMISSION

H.2.2.1. 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%.

H.2.2.2. 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.

H.2.3. 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.

H.2.4. ARTICULATION OPTIONS

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

H.2.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

H.2.5.1. 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.

H.2.5.2. 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.

H.2.6. ADVANCEMENT AND PROGRESSION RULES

H.2.6.1. NORMAL ENROLMENT

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

- ✓ Year 1 to Year 2: 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.

H.2.6.2. 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 **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%.**

H.2.6.3. 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.

H.2.7. BACHELOR OF SCIENCE IN CHEMISTRY - 33BCHM

YEAR 1

CODE	COURSE	NQF	CREDIT	CO/PRE-REQUISITE	Compulsory/Elective
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
S3532DP	Programming Fundamentals II				E
Total Credits			**132**		

YEAR 2

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
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	CompulsoryElective
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**		

H.2.7.1. 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:

H.2.7.1.1. 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		

H.2.7.1.2. 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

H.2.7.2. PHYSICS & CHEMISTRY CURRICULUM COURSE DESCRIPTIONS

S3411PS:	PHYSICS SUPPORT I
NQF Level:	4
Credits:	**NCB (13)**
Contact Hours:	4 lectures & a 3-hour practical session every 2nd week, 1-hour tutorial session per week a semester.
Course assessment:	50% CA of tests & quizzes, assignments, & practical reports (at least 5 gradable items).
Examination:	3 hours (50% of the final mark).

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
Credits:	**NCB (13)**
Contact Hours:	4 lectures & a 3-hour practical session every 2nd week, 1-hour tutorial session per week a semester.
Course assessment:	**50%** CA of tests & quizzes, assignments, & practical reports (at least 5 gradable items).
Examination:	1X3hr Examination paper (**50%)**.

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**
Credits:	**14**
Contact Hours:	4 lecture periods and 1 practical session per week.
Course assessment:	**CA 50%** of 3 tests, which counts **70%. Laboratory Mark:** Laboratory work **20%**, **Tutorials (10%)**.
Examination:	1X3hr Examination paper (**50%)**.

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**
Credits:	**14**
Contact Hours:	4 lecture periods and 1 practical session per week.
Course assessment:	**CA 50%** of three tests which counts **70%. Laboratory Mark:** Laboratory work **20%**, **Tutorials (10%)**.
Examination:	1X3 hr Examination paper (**50%)**.

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
Credits:	2
Contact Hours:	One 3-hour practical session every week for the duration of CS1
Course assessment:	100% CA of mark generated by a participation rubric and programming assignment.

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
Credits:	14
Contact Hours:	4 lectures, a 3-hour practical session every week, with a bi-weekly 1-hour semester tutorial session.
Course assessment:	CA of **50%** of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1X3 hr Examination paper (**50%)**.

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
Credits:	14
Contact Hours:	4 lectures, a 3-hour practical session every week, with a bi-weekly 1-hour semester tutorial session.
Course assessment:	CA of **50%** of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1X3 hr Examination paper (**50%)**.

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**
Credits:	**14**
Contact Hours:	Four (4) lectures and a 3-hour practical session every week for one semester.
Course assessment:	CA of **50%** of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1X3 hr Examination paper (**50%)**.

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**
Credits:	**14**
Contact Hours:	4 lecture periods and 1 practical session per week.
Course assessment:	**CA 50%** of three tests which counts **70%. Laboratory Mark:** Laboratory work **20%**, **Tutorials (10%)**.
Examination:	1X3 hr Examination paper (**50%)**.

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**
Credits:	**14**
Contact Hours:	4 lecture periods and 1 practical session per week.
Course assessment:	**CA 50%** of three tests which counts **70%. Laboratory Mark:** Laboratory work **20%**, **Tutorials (10%)**.
Examination:	1X3 hr Examination paper (**50%)**.

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**
Credits:	**2**
Contact Hours:	2 hours of lectures per week and one 3-hour practical session every 2nd week 2
Course assessment:	**100% mark** CA of **case study-based assignments** to solve during the online-based lab sessions

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:** fertilisers, pesticides, food additives.

S3532CP:	LABORATORY TECHNIQUES AND SKILLS
NQF Level:	**5**
Credits:	**14**
Contact Hours:	4 Online lecture periods and 1 practical session per week
Course assessment:	**CA 50%** of three tests which counts **70%. Laboratory Mark:** Laboratory work **20%**, **Tutorials (10%)**.
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 tests and quizzes, assignments, and practical reports (at least 6 gradable items.
Examination:	1X3 hr Examination paper (**50%)**.
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 tests and quizzes, assignments, and practical reports (at least 6 gradable items.
Examination:	1X3 hr Examination paper (**50%)**.
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** of tests/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** of tests/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (at least 4 gradable items).
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** of tests/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:	**100% CA** of tests/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (at least 4 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 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% CA** of tests/or quizzes, data analysis reports, numerical coding assignments and/or presentations, as part of an assessment portfolio (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%** consisting 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%** consisting of tests and quizzes, assignments, and practical reports (at least 6 gradable items).
Examination:	1 x 2-hour examination paper, **50%.**

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.

H.3. BACHELOR OF SCIENCE IN PHYSICS HONOURS (33HPHY)

H.3.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

To provide a graduate of an NQF level 7 Bachelors of Science in Physics an appropriate NQF level 8 qualification that exposes the candidate to more advanced theory, and practical/applied skills, and most importantly, an introduction to basic research methodology as well as a functional experience in guided research. During this process, the student will be expected to expand skills relevant for the 4th Industrial Revolution through the use of modern computerised tools including (but not limited to) data analysis software, CAS systems and, where appropriate, utilising HPC and AI tools. In line with the *Namibian Space Science and Technology Policy* [1] of 2021, the *Memorandum of Understanding for Institutionalising Cooperation in Radio Astronomy, signed on* 24/08/2017 [2], and the 4th Pillar of the *National Development Plan (NDP5)* is "Environmental Sustainability" that directs the development of renewable energy resources, specifically in the solar and wind regimes [4], this programme allows for specialisation into Astrophysics, Sustainable Energy and the Nuclear Sciences. This is in preparation for the successful graduate to either enter an NQF level 9 master's degree or equivalent or take employment at a higher level than before by bringing more knowledge and skills to the workplace.

H.3.2. ADMISSION REQUIREMENTS

To qualify for entry into the Bachelor of Science in Physics Honours, the applicant must be in possession of either:

- ✓ A Bachelor of Science degree in **Physics (NQF level 7)** from the University of Namibia, or an equivalent qualification from a recognized institution of higher education.

OR A Pre-NQF Bachelor of Science degree in Physics or an equivalent degree from a recognised institution.

- ✓ Students who have completed a double major Bachelor of Science degree with Physics as a major may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

H.3.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or a high score/percentage obtained in the bachelor's degree.

H.3.4. ARTICULATION OPTIONS

This qualification may articulate into a master's degree in physics, astrophysics, nuclear science, renewable energy, or related field of study at NQF level 9.

H.3.5. 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 the 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%).

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

To be re-admitted to the programme for a second year of registration, a student must have passed a minimum of 80 credits by the end of the first year. **The programme must be completed after a maximum of 2 years of registration**.

H.3.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 138 credits, and who have met the requirements

H.3.8. BACHELOR OF SCIENCE IN PHYSICS HONOURS (33HPHY) - ARTICULATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4890AR	Research Methodology Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4893AR	Research Project	8	8	None	Compulsory
Semesters 1					
S4811PQ	Quantum Mechanics	8	20		
S4811PS	Statistical Mechanics	8	20	None	Compulsory
S4801PA	Stellar Astrophysics	8	10	None	Compulsory
Year 1 Semester 2					
S4812PN	Nuclear Physics & Elementary Particles	8	20	None	Compulsory
S4812PS	Solid State Physics	8	20	None	Compulsory
Choose one (1) of the electives below					
S4802PE	Sustainable Energies	8	10	None	Elective
S4802PP	Plasma Physics	8	10	None	Elective
Total credits			**138**		

H.4. BACHELOR OF SCIENCE IN CHEMISTRY HONOURS (33HBSC)

H.4.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of this program is to provide students with advanced chemistry theory, and practical/applied skills, and most importantly, an introduction to research methodology as well as a functional experience in guided research. The chemistry field forms an indispensable part of the scientific community and it is responsible for producing graduates that are employable in a considerable number of fields, central to the national industrialization, as well as producing research outcomes vital for solving various humankind problems, either via the creation of important chemical compounds or designing systems aimed at mitigating diverse environmental pollutions, just to mention a few. Such advancements can only be achieved via high-level research activities. Thus, the need of an advanced programme to produce qualified graduates in the field of chemistry. The proposed programme is therefore, a pathway for the successful graduate to either enter an NQF level 9 master's degree or equivalent or take employment at a higher level than before by bringing more knowledge and skills to the workplace.

H.4.2. ADMISSION REQUIREMENTS

This program is open to all BSc graduates with NQF level 7 or equivalent qualification and with Chemistry as one of their majors. The applicants will be accepted on the basis of their BSc record. An average mark of **60%** is required.

H.4.3. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference will be given to students with the highest marks, guided by matters of equity as outlined by the national policies.

H.4.4. ARTICULATION OPTIONS

This qualification provides entry into relevant master's programmes in Chemistry and related fields.

H.4.5. 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 shall be calculated using a ratio of $CA\ mark: Exam\ Mark$ of $1:1$, 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. For 100% Continuous Assessment modules, a final aggregate mark of 50% shall be required to pass. All practical sessions are compulsory. Tutorial sessions are compulsory in the courses where they are offered

H.4.6. 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: 58 credits (of which 36 is non-core) by the end of the first year of registration. **The programme must be completed after a maximum of 2 years of registration (138 credits)**.

H.4.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year programme.

H.4.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 138 credits, and who have met the requirements of the prescribed curriculum and all other UNAM requirements.

H.4.9. BACHELOR OF SCIENCE IN CHEMISTRY HONOURS (33HBSC) – ARTICULATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4890AR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4893AR	Research Project	8	16	None	Compulsory
S4809CN	Nuclear Chemistry	8	20	None	Elective
Year 1 Semester 1					
S4811CP	Physical Chemistry	8	20	None	Compulsory
S4811CO	Organic Chemistry	8	20	None	Compulsory
Electives (Choose any one of the following modules)					
S4801CW	Water Analysis & Wastewater Treatment I	8	10	None	Elective
S4801CP	Petroleum Chemistry I	8	10	None	Elective
S4801CC	Computational Chemistry	8	10	None	Elective
Year 1 Semester 2					
S4812CI	Inorganic Chemistry	8	20	None	Compulsory
S4812CA	Analytical Chemistry	8	20	None	Compulsory
Electives (Choose any one of the following modules)					
S4802CD	Fundamentals of Drug Discovery & Medicinal Chemistry	8	10	CORE: S4811CO & CORE: S4801CC	Elective
S4802CW	Water Analysis and Wastewater Treatment II	8	10	CORE: S4801CW	Elective
S4802CP	Petroleum Chemistry II	8	10	CORE: S4801CP	Elective
Total credits			**138**		

H.5. BACHELOR OF SCIENCE IN MATERIAL CHEMISTRY HONOURS (33HBSM)

H.5.1. PURPOSE AND RATIONALE OF THE QUALIFICATIONS

The purpose of this program is to provide students with advanced material chemistry theory, and practical/applied skills, and most importantly, an introduction to research methodology as well as a functional experience in guided research. In Namibia, like elsewhere around the world, the field of Material Chemistry is well suited for the development of high-performance materials needed for the future generations. It must be however noted that the advancements in the material sciences can only be achieved via high-level research activities at honours, masters, and PhD levels.

Therefore, this programme is designed to contribute to national priorities and Namibia's Vision 2030, as articulated in the NDP5 and Sustainable Development Goals; specifically, SDG2 (Zero Hunger), SDG3 (Good Health and Wellbeing), SDG4 (Quality Education), SDG6 (Clean Water and Sanitation), SDG7 (Affordable and Clean Energy), SDG9 (Industry, Innovation, and Infrastructure), SDG11 (Sustainable Cities and Communities), and SDG12 (Responsible Consumption and Production). Furthermore, the proposed programme is a pathway for the successful graduate to either enter an NQF level 9 master's degree or equivalent or take employment at a higher level than before by bringing more knowledge and skills to the workplace.

H.5.2. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science in Material Science Honours**, the applicant must be in possession of either:

- ✓ a Bachelor of Science degree in Chemistry (NQF level 7) from the University of Namibia or an equivalent qualification from a recognized institution of higher education,

OR **Pre-NQF Bachelor of Science degree in Chemistry** or any equivalent qualification from a recognized institution.

- ✓ Students who have completed a double major Bachelor of Science degree with Chemistry as a major may be required to register for a number of undergraduate modules for non-degree purposes in order to gain admission into this programme.

H.6. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's degree for the BSc Honours qualification.

H.6.1. ARTICULATION OPTIONS

This qualification may articulate into a **Master's degree in Material Chemistry** or a related field of study at NQF level 9.

H.6.2. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules with Continuous Assessment (CA) and Examination, **(a)** 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; **(b)** 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; **(c)** notwithstanding the result of the mark above, a subminimum of at least 40% in the exam is required; **(d)** generally, assessment criteria are based on written examinations, written tests, assignments, laboratory practicals, mini-projects, portfolios, research reports, oral examinations, and seminar presentations; **(1)** In cases where modules are assessed by continuous assessment only; **(1.1)** The final mark will be constituted of 100% CA mark; **(1.2)** A final aggregate mark of 50% shall be required to pass the module.

H.6.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted to the programme for a second year of registration, a student must have passed a minimum of 76 credits by the end of the first year. **The programme must be completed after a maximum of 2 years of registration.**

H.6.4. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year programme.

H.6.5. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other UNAM requirements.

H.6.6. BACHELOR OF SCIENCE IN MATERIAL CHEMISTRY HONOURS (33HBSM) - ARTICULATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4890AR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design thinking	8	8	None	Compulsory
Semesters 1 & 2					
S4893AR	Research Project	8	16	None	Compulsory
Year 1 Semester 1					
S4811AE	Molecular Electronics	8	20	None	Compulsory
S4811AM	Material Chemistry	8	20	None	Compulsory
S4801CC	Computational Chemistry	8	10	None	Compulsory
Year 1 Semester 2					
S4812AS	Supramolecular Chemistry	8	20	None	Compulsory
S4812CI	Inorganic Chemistry	8	20	None	Compulsory
S4802AE	Functional Materials & Environment	8	10	None	Compulsory
Total credits			**138**		

H.6.7. TABLE OF EQUIVALENTS DURING THE PHASING-IN/OUT PERIOD

Old course	Cred	New course	Cred
PHY3811: Quantum Mechanics	16	**S4811PQ:** Quantum Mechanics	18
PHY3831: Statistical Mechanics	16	**S4811PS:** Statistical Mechanics	18
PHY3809: Advanced Electrodynamics	8	*To be offered again*	
PHY3821: Plasma Physics	8	**S4802PP:** Plasma Physics	9
PHY3812: Solid State Physics	16	**S4812PS:** Solid State Physics	18
PHY3802 Nuclear Physics	8	**S4812PN:** Nuclear Physics & Elementary Particles	18
PHY3822: Optics & Laser Physics	8	*To be offered again*	
PHY3842: Astrophysics	8	**S4801PA:** Stellar Astrophysics	9
REP3802: Aspects of Renewable Energy Physics	8	**S4802PE:** Sustainable Energies	9

H.6.8. PHYSICS & CHEMISTRY CURRICULUM COURSE DESCRIPTIONS

S4890AR RESEARCH METHODOLOGY AND PROJECT PROPOSAL

NQF Level: 8
Credits: **14**
Contact Hours: 4 lectures per week of the core semester
Course assessment: 100% CA, 2 assignments (50%); Research proposal (30%); and Presentation of the proposal (20%)
Course description: **The purpose of this module is to** *enable students to carry out literature study and prepare a research proposal for the research to be carried out for the rest of the year.* This core semester course constitutes a review of aspects of research methodology concurrently with a literature study, the planning of a research activity and the preparation of a research proposal for an available project within the various fields of physics. The actual content will depend on the topic of research selected by the student, from the available specialized fields within the department. Methodology: The Scientific Method; Identifying and avoiding pseudoscience; Research Ethics; Review of research methods.

S4880QD DESIGN THINKING

NQF Level: 8
Credits: 8
Contact Hours: 2 lectures and 1 3-hour practical session per week of the core semester
Course assessment: 100% CA, Mini project (50%); and Presentation of the proposal (50%)
Course description: **The purpose of this module is to** *develop problem-solving skills, interdisciplinary thought, problem structuring, and design thinking skills, inculcating innovation, concept development, applied creativity, prototyping and experimentation.* Problem structuring methods: creative reasoning, innovative offering (i.e. a new product) based on creative reasoning, various problem structuring methods from different disciplines; Design thinking dimensions: cognitive (reference to creativity & exploratory issues), social (reference to stakeholder & process issues), strategic (reference to creating value & organisational strategy). Prototyping: Discussion on the impact that biological sciences could have on people's everyday lives. Students will choose any product that they thought biochemical applications could influence in the next 10-20 years. Empathy and Human-Centred Design: encourage students to consider the implications of their actions on the environment, biodiversity, and human health.

S4893AR RESEARCH PROJECT

NQF Level: 8
Credits: 16
Contact Hours: 2 lectures and 1 3-hour practical session per week of the core semester
Course assessment: 100% CA, Research Report (70%); and Presentation (30%)
Course description: **The purpose of this module is to** *enable students to carry out research work and write a comprehensive research report in physics.* This one-year course constitutes research and report writing for an available project within the various fields of physics. The actual content of the course will depend on the topic of research selected by the student from the available specialised fields within the department. The student will submit a written research report of the project upon completion of the research activities.

S4811PQ QUANTUM MECHANICS

NQF Level: 8
Credits: 20
Contact Hours: 4 lectures and 1 practical per week for one semester.
Course assessment: 50% of the final mark) consisting of three (3) tests (75%); quizzes (15%), and an assignment (10%).
Examination: 1 x 3-hour Exam Paper (50%).
Course description: **The purpose of this module is to** *Provide a rigorous introduction to quantum mechanics. Quantum mechanics is the foundation of all quantum physics including quantum field theory, quantum chemistry, quantum technology & quantum information science.* Historical review; The postulates of quantum mechanics; The Schrodinger Equation; The Statistical Interpretation; Probability; Normalization; Momentum; The Uncertainty Principle; Stationary States; The Infinite Square Well; The Harmonic Oscillator; The Free Particle; The Delta-Function Potential; The Finite Square Well; Hilbert Space; Observables; Eigenfunctions of a Hermitian Operator; Commutator relations and compatible observables; Time development of expectation values, Ehrenfest's principle and applications, constants of motion; conservation of energy; Generalized Statistical Interpretation; Vectors and Operators; The Schrödinger Equation in Spherical Coordinates; The Hydrogen Atom; creation and annihilation operators; Angular Momentum; commutation properties of the components of angular momentum; Spin; Nondegenerate Perturbation theory; Degenerate Perturbation theory; the Stark effect; Variational method; Scattering.

S4811PS	STATISTICAL MECHANICS
NQF Level:	8
Credits:	20
Contact Hours:	4 lectures and 1 practical per week for one semester.
Course assessment:	50% of three (3) tests (75%); quizzes (15%), and an assignment (10%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *make students use microscopic viewpoint and Statistical Probability to discuss different thermodynamic properties for different systems.* Macroscopic and microscopic view point of systems, classical and statistical probability; statistics and distribution function, significance of Lagrangian multipliers; the Bose-Einstein statistics, the Fermi-Dirac statistics, the Maxwell-Boltzmann statistics; the Bose-Einstein distribution function, the Fermi-Dirac distribution function, the Maxwell-Boltzmann distribution function; thermodynamic properties of a system; applications of statistics to gases, monatomic ideal gas; the distribution of molecular velocities, Maxwell-Boltzmann speed distribution, ideal gas in gravitational fields; the principle of equipartition of energy, specific heat capacity of a diatomic gas; applications of quantum statistics to other systems; the Einstein theory of the specific heat capacity of a solid; the Debye theory of the specific heat capacity of a solid; Blackbody radiation, paramagnetism, negative temperatures; the electron gas.

S4801PA	STELLAR ASTROPHYSICS
NQF Level:	8
Credits:	10
Contact Hours:	2 lectures and 1 bi-weekly practical per week for one semester
Course assessment:	50% of three (2) tests (70%); quizzes (20%), and an assignment (10%).
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to *Provide students with a working background in the foundations of Astrophysics, specifically Stellar Physics and Stellar Evolution. Extensive coverage will be given to the properties of matter at extreme densities and temperatures inside main sequence stars and matter at quantum densities inside compact objects like white dwarfs and neutron stars. A selection of exotic objects will be covered to provide easy transition to related advanced Astrophysical topics at the forefront of current research for purposes of further study and/or research. A characteristic of Astrophysics is its extreme interdisciplinary nature where Modern Physics, Quantum Mechanics, Quantum Statistics, Statistical Mechanics, Thermodynamics, and much more is drawn together in a cogent unit.* The Origins of Astronomy; Observational Techniques; Introduction to the c-g-s system of Units; Basic Observations: Review of Blackbody Radiation; Measurement of Stellar Parameters; The Hertzsprung-Russel Diagram; Hydrostatic Equilibrium; The Virial Theorem; Mass Continuity; Radiative Energy Transport; Energy Conservation; The Equations of Stellar Structure; The Equation of State; Opacity; Scaling Relations on the Main Sequence; Nuclear Energy Production; Nuclear Reaction Rates; Solution of the Equations of Stellar Structure; Convection; Stellar Evolution; White Dwarfs; Supernovae & Neutron Stars; Pulsars & Supernova Remnants; Black Holes; Interacting Binaries; Star Formation & the Interstellar Medium: Cloud Collapse & Star Formation; H II Regions; Components of the Interstellar Medium; Dynamics of Star-Forming Regions;

S4811CP	PHYSICAL CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 lecture periods per week and 1 practical session per week, for the semester
Course assessment:	50% of three (3) tests (80%); *Graded laboratory reports will count 20% towards the CA.*
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *provide a rigorous theoretical treatment of topics in Statistical Thermodynamics, Mixtures and Solutions, Partial Molar Quantities and Excess Molar Functions and Catalysis.* **Statistical Thermodynamics:** Statistical thermodynamics: The Boltzmann Distribution functions; Molecular partition functions; Molecular energies; The canonical ensemble; The internal energy and the entropy. The Debye-Hückel theory for electrolytes; Lattice models for liquids; The Bragg-Williams approximation; The Thermodynamic descriptions of **Mixtures :** Ideal solutions, Raoult's law and Deviations from Raoult's law, Henry's law and Deviations from Henry's law; **Partial Molar Quantities and Excess Molar Functions:** Expressions for partial molar quantities, Determining partial molar quantities using slope method, Excess functions, Excess molar functions, Determining excess molar functions using slope method, method of intercepts and method based on Gibbs-Duhem equation; **Catalysis:** Characterization of heterogeneous catalysts, Surface characterization of heterogeneous catalysts, Structure and synthesis of catalysts, Catalytic process.

S4811CO	ORGANIC CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 lecture periods per week and 1 practical session per week, for the semester
Course assessment:	50% of three (3) tests (80%); *assignment will count 20% & laboratory will count 20% towards the CA.*
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *build on the organic chemistry knowledge and concepts offered in undergraduate (Organic chemistry I and II) modules. Provide students with theoretical and practical laboratory knowledge on advanced techniques and skills used in the preparation and structural characterization of organic compounds.* Stereochemistry and fundamentals of stereoselective synthesis. Retrosynthetic analysis: disconnections, protecting groups, umpolung. Organometallics: organo-sulphur chemistry, organolithium reagents, direct ortho-metallation; coupling reactions: Heck, Suzuki, Sonogashira, Stille, Negishi reactions; Bioorganic chemistry: carbohydrates, amino acids, lipids, nucleotides, nucleic acids, and proteins. Advanced enolate chemistry: generation of zinc, selenium- and silyl enolates; regioselectivity and stereoselectivity in enolate formation.

S4801CW	WATER ANALYSIS AND WASTE WATER TREATMENT I
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	laboratory reports will count 20% towards the CA.
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to is that student get knowledge on waste water analysis and industrial aspects, and applications of Waste water treatment. 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. Analysis of water quality. Types of industries and their wastewater, Sampling of wastewater Analysis of industrial wastewater. Examples of wastewater from different industries, Toxicity, Dissolved, suspended solids. Uses of water in industry. Cooling, conveying, process, boilers, water heaters, etc.

S4801CC	COMPUTATIONAL CHEMISTRY
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	100% CA of **2** tests which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to *introduce students to the theoretical background of computational chemistry and the practical skills needed to perform computations to solve chemical problems.* ***(1)*** Theoretical treatments of rotational, vibrational and electronic spectroscopy of polyatomic molecules. **(2)** Computation of the structure and properties of isolated molecules and clusters. **(3)** Computation of spectroscopic properties of molecules and clusters. **(4)** Computation of reaction paths including transition states.

S4801CW	PETROLEUM CHEMISTRY I
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	laboratory reports will count 20% towards the CA.
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to *is that student get knowledge on industrial aspects, and applications of Petroleum Chemistry.* Heterogeneous catalysts and its application in petrochemical industry, Hydraulic fracturing, Crude oil, Coal, Bitumen, Asphaltenes, Kerogen introduction, origin, composition, extraction, separation, refining process detailed studies. Petroleum reserves, exploration and exploitation of petroleum. Geological conditions for accumulation of petroleum. Types of wells and recovery process. Hydrotreating processes, desulphurization, hydrogenation, deoxygentation.dewaxing, deasphalting.

S4812PS	SOLID STATE PHYSICS
NQF Level:	8
Credits:	20
Contact Hours:	4 lectures and 1 practical per week for one semester.
Course assessment:	50% of three (3) tests (75%); quizzes (15%), and an assignment (10%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *Provide a comprehensive introduction on the physics of solid materials. Solid State Physics is a study of the physical (e.g., the electrical, dielectric, magnetic, elastic, and thermal) properties of solids in terms of basic physical laws. Students will learn about the structure and properties of solids such as simple crystals, metals, semiconductors, and superconductors.* **Crystal structure**; Fundamental types of lattices, crystal planes Building blocks of crystals: Bravais lattices, reciprocal lattice, Brillouin zones; **Diffraction**: Theory and experimental methods. Diffraction of waves by crystals, Bragg law, reciprocal lattice vectors, diffraction conditions, Laue equations, structure factor; **Lattice dynamics**: Phonons, density of states, specific heat, thermal conductivity. **Electron theory**: Free electron model, elementary band theory, metals, semiconductors, electrical conductivity. **Forces between atoms and molecules**, forces due to the ionic and covalent bonds, van der Waals forces, dipole-dipole forces; Elastic properties of solids, Young's modulus in terms of inter-atomic force constant, Bulk modulus of an ionic solid, generalized relation between bulk modulus and lattice energy; **Lattice dynamics**, vibrations of crystals with monatomic basis and with two atoms per primitive basis; **Thermal properties**, phonon heat capacity, density of states, Einstein model, Debye model, Umklapp processes; Electrons in metals, the free electron Fermi gas, electrical conductivity, Ohm's law, Hall effect; Nearly free electron model, energy bands.

S4809CN	NUCLEAR CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	100% CA of **2** tests which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to *familiarise students with the principles and practice of the chemistry of radioactive elements. Develop measuring, data manipulation and reporting skills in nuclear chemistry.* Chemistry of radioisotopes, Separation techniques of Nuclear material, Nuclear material, Radioactive dose, risk and regulations, Nuclear Measurement techniques, Nuclear chemistry and its role in Namibia. Introduction to the current issues on new separation methods of nuclear materials and nuclear techniques.

S4812PN	NUCLEAR PHYSICS & ELEMENTARY PARTICLES
NQF Level:	8
Credits:	20
Contact Hours:	4 lectures and 1 practical per week for one semester.
Course assessment:	50% of three (3) tests (75%); quizzes (15%), and an assignment (10%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description: **The purpose of this module is to** *This course aims to make students learn about the structure and properties of the nucleus and elementary particles.* Nuclear Structure, nuclear radius, nomenclature; Decay of the nucleus, alpha decay, beta decay, gamma decay, spontaneous fission; Radioactivity, radioactive growth and decay, transient equilibrium, secular equilibrium, radioactive decay series, carbon dating; Chart of Nuclides; Nuclear reactions, elastic scattering, inelastic scattering, reaction of transmutation, radiative capture, photodisintegration, induced fission; Interaction of radiation with matter, photoelectric effect, pair production, Compton scattering, calculation of energy transferred in Compton scattering using relativistic equations; The liquid drop model, variation of binding energy per nucleon with mass number; Weizsacher's semi-empirical mass formula; The shell model; Nuclear energy, nuclear reactors, introductory reactor physics, nuclear power plants; Nuclear instrumentation, radiation detectors, accelerators; Two body systems and nuclear force: properties of nuclear forces, the deuteron, qualitative treatment of n-p and p-p scattering at low energies; Elementary particle. Introduction to accelerators, beams and detectors; Pions and Muons. An introduction to the Standard Model and its components; Antiparticles, Symmetries and conservation laws and their significance in particle physics. Hadron-hadron interaction. The quark model including spectroscopy.

S4812PN	SUSTAINABLE ENERGIES
NQF Level:	8
Credits:	10
Contact Hours:	2 lectures and 1 bi-weekly practical per week for one semester
Course assessment:	50% of three (2) tests (70%); quizzes (20%), and an assignment (10%).
Examination:	1 x 2-hour Exam Paper (50%).

Course description: **The purpose of this module is to** *Provide a comprehensive introduction on the sustainability of energy generation and supply systems, as employed by mankind to satisfy their needs, and how man's energy needs have changed over time.* Energy needs; Energy - energy changes in a system involving heating, work done using forces, or work done using an electric current: calculating the stored energies and energy changes involved. Power as the rate of transfer of energy; conservation of energy in a closed system, dissipation. Calculating energy efficiency for any energy transfers; Renewable (biomass, wind, hydro, tidal, geothermal, wave and solar) and non-renewable (fossil fuels and nuclear power) sources of energy; Energy conversion Technologies, (Overview of Nuclear; Fossil fuels; Photovoltaic; Solar thermal; Geothermal; Biomass and Biogas; Wind Energy systems); Calculation of extractable power; Design of Solar Photovoltaic Systems; Design of Solar Thermal Systems; Design of Wind energy systems.

Features of sustainable urban living; Energy: the changing energy mix; growing significance of renewables; economic and environmental issues associated with exploitation of energy sources. Areas of surplus (security) and deficit (insecurity): global distribution of energy consumption and supply. Reasons for increasing energy consumption; Factors affecting energy supply; Impacts of energy insecurity; Overview of strategies to increase energy supply; Moving towards a sustainable resource future: individual energy use and carbon footprints. Energy conservation: designing homes, workplaces and transport for sustainability, demand reduction, use of technology to increase efficiency in the use of fossil fuels. Tar sands; Coal gasification; Methane hydrates; Fracking; Hydrogen.

S4802PP	PLASMA PHYSICS
NQF Level:	8
Credits:	10
Contact Hours:	2 lectures and 1 bi-weekly practical per week for one semester
Course assessment:	50% of three (2) tests (70%); quizzes (20%), and an assignment (10%).
Examination:	1 x 2-hour Exam Paper (50%).

Course description: **The purpose of this module is to** *Familiarise the student with the Physics of the fourth state of matter, Plasma. This course is first and foremost an introductory course of an advanced topic in Physics with intricate and involved mathematical derivations bringing together subjects like Electrodynamics, Statistical Mechanics, and Optics. Plasma Physics forms an essential skill for research in fields like Controlled Fusion, Magnetospheric Physics, Solar-Terrestrial Physics, Space Physics and Astrophysics.* Introduction: definition, temperature, Debye shielding, plasma parameter, criteria for plasmas, applications; Single-Particle Motion: uniform **E-** and **B**-fields, non-uniform **B**-field, non-uniform **E**-field, time-varying **E**-field, time-varying **B**-field, guiding-centre drifts, adiabatic invariants; Plasmas as Fluids: relation to electrodynamics, fluid equation, fluid drifts perpendicular and parallel to **B**, plasma approximation; Waves in Plasmas: waves, group velocity, plasma oscillations, electron plasma waves, ion acoustic waves, electrostatic electron oscillations perpendicular to **B**, electrostatic ion waves perpendicular to **B**, electromagnetic waves perpendicular and parallel to **B**, cut-offs and resonances, whistlers, Faraday rotation, hydromagnetic an magnetosonic waves, CMA Diagram; Diffusion and Resistivity: diffusion in weakly ionised gasses, plasma decay by diffusion, steady state solutions, diffusion across **B**-field, collisions and diffusion in fully ionised plasmas, MHD equations, diffusion equation, Bohm diffusion; Equilibrium and Stability: hydromagnetic equilibrium, diffusion of **B**-field into a plasma, instabilities and classification thereof.

S4802CD	FUNDAMENTALS OF DRUG DISCOVERY AND MEDICINAL CHEMISTRY
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	50% of three (3) tests (80%); *laboratory will count 20% towards the CA.*
Examination:	1 x 3-hour Exam Paper (50%).

Course description: **The purpose of this module is to** to provide an overview of the drug discovery and development pipeline; to introduce students to key concepts in medicinal chemistry and how it relates to drug discovery; to create awareness of the multidisciplinary approach to drug discovery; to provide an overview of the technologies and strategies used in the drug discovery and development process to outline current and future trends in drug discovery. Classification of drugs, orphan drugs, blockbuster drugs; drug discovery and development pipeline: druggable and validated drug targets, pre-clinical trials, clinical trials, pharmacovigilance, pharmacological assays, drug attrition; pharmacodynamics: drug-target interaction; pharmacokinetics: absorption, distribution, metabolism and excretion; pharmacophore, hit compound, lead compound sources and optimization: isosterism and bioisosterism, structure-activity-relationships(SAR), chirality, lead-likeness versus drug-likeness, Lipinski's rule-of-five; prodrugs, computation in drug discovery, combinatorial chemistry and parallel synthesis; high throughput screening, quantitative structure–activity relationships (QSAR)

S4812CA	ANALYTICAL CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 lecture periods per week and 1 practical session per week, for the semester
Course assessment:	100% CA of **3** tests which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: **The purpose of this module is to** ***(a)*** *provide information about advanced topics in the field of chromatography, including column technology, multidimensional chromatography and hyphenated techniques.* ***(b)*** *Provide theoretical background information on advanced mass spectrometry techniques and their applications.* ***(c)*** *Provide knowledge of advanced topics in sample preparation techniques.* ***(d)*** *Provide knowledge of advanced topics in 1D and 2D-NMR techniques and their application to the structure elucidation of complex molecules,* ***(e)*** *Provide knowledge on advanced X-ray analysis techniques.* ***(f)*** *Introduce students to Raman spectroscopy and electron microscopy, including SEM, TEM, EDS/EDX.* Advanced chromatography: Column technology; 2D-HPLC, 2D-GC, etc; Hyphenated techniques: GC-MS, LC-MS and LC-NMR; Advanced mass spectrometry: Other ionisation sources, mass analysers, tandem mass spectrometry; Advanced Sample Preparation: Other sorptive extraction techniques, online SPE, etc; Correlation (2D) NMR spectroscopy, including interpretation of COSY, HETCOR, HMQC, HMBC and NOESY spectra. Other topics in 1-dimensional NMR, including NOE-difference spectra. Structure elucidation of complex organic molecules and metal complexes using 1D and 2D NMR spectroscopy. Advanced X-ray analysis techniques. Introduction to Raman spectroscopy and electron microscopy, including SEM, AFM and XPS.

S4812CI	INORGANIC CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 lecture periods per week and 1 practical session per week, for the semester
Course assessment:	100% CA of **3** tests which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: **The purpose of this module is to** ***(a)*** *Integrate organometallic chemistry with inorganic and organic chemistry, the roles and applications in applied chemistry process.* ***(b)*** *Understand the concepts and principles of solid-state chemistry, and its applications and roles in applied chemistry.* ***(c)*** *Understand how metal ions interact with biological environments and how these interaction influences the properties of metal centers.* Introduction to organometallic chemistry; organometallic chemistry of d-block elements (18-electron rule); bonding, ligands, metallocenes, compounds and reactions, catalysis involving organometallic compounds; applications of organometallic compound and catalysis in chemistry. Chemistry of solids; the fundamental relationship between electronic structure, chemical bonding and atomic order, chemical properties of "aggregates of molecules," including crystals, metals, glasses, semiconductors, solutions (rheology and its properties) and acid-base equilibria. Polymers: Introduction, Classification, Applications in Inorganic Chemistry and Biomaterials. The roles of defects in chemistry and vacancies in crystal structures. Applications of solid-state chemistry, in industrial practice (e.g. semiconductor manufacturing), energy generation and storage (e.g. automobile engines, lithium batteries), emerging technologies (e.g. photonic and biomedical devices), and the environmental impact of chemical processing (e.g. recycling glass, metal, and plastic). Bioinorganic chemistry; metal ions present in biological systems, cofactors and metal clusters, metal ion transport and storage, Heme Fe – O_2 carriers (Myoglobin, Hemoglobin); trace metals of life, geochemical effect on the distribution of metals. Excess and deficiency of some trace metals (and their toxicity levels), in different systems. Toxicity of metal ions (Hg, Ag, Cu, Pb, Cd, Zn and As), use of chelating agents in medicine, analysis of cations and anions in varying systems. Inorganic chemistry research frontiers.

S4802CP	PETROLEUM CHEMISTRY II
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Co-requisites:	***Petroleum Chemistry I***
Examination:	1 x 3-hour Exam Paper (50%).

Course description: **The purpose of this module is** *that student get knowledge on industrial aspects of Petroleum Chemistry, and get employed in Research institute, University, and Chemical Industry (Petroleum).* Hydrocarbon and non-hydrocarbon constituents. Composition of petroleum, Physical properties of petroleum fractions. Refining of oil. Separation processes. Conversions, cracking. Various. Treating processes. Sweetening, clay, nano catalysts and solvent treatment Petroleum at refining. Blending and separation. Structure of the refinery. Hydrocarbon distillates. Nano technology in Petrochemcial Industry.

Types of Cracking: Catalytic cracking, thermal cracking, Fluid catalytic cracking. Volatility, vapour pressure, density, Average boiling point, boiling range, specific gravity. Problems to overcome scarcity of oil globally. Africa's perspective on natural gas.

S4802CW	WATER ANALYSIS AND WASTE WATER TREATMENT II
NQF Level:	8
Credits:	10
Contact Hours:	2 hours of lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Co-requisites:	***WATER ANALYSIS AND WASTE WATER TREATMENT I***
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *train students on water analysis and develop process for waste water treatment, water quality regulations of WHO and Namibia. Industrial aspects of Water analysis and waste water treatment and students get employed in Research institute, University, and Water Treatment Plants.* 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. Wells, reservoirs, aquifiers. Hydraulic fracturing, Water quality regulations (WHO and Namibia). Nanotechnology for waste water treatment. Biosynthesis of nano particles from plant extract, synthesis of activated carbon from plant source, synthesis of nano carbon polymer composites for waste water treatment.

S4811AE	MOLECULAR ELECTRONICS
NQF Level:	8
Credits:	20
Contact Hours:	4 hours lecture periods and 1 practical session per week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *Introduce students to the emerging field of molecular electronics with single molecules. Expose students to experimental techniques and theoretical concepts for electron transport through single molecule devices, and familiarize the students with the basic concepts for describing and simulating the physical properties of such systems. Use organic and inorganic materials in designing appropriate materials for different functionalities.* Organic semiconductors and conductors for molecular electronics; Charge injection and transport in mesoscopic systems; Dynamic redox systems: Towards realisation of unimolecular memory; Photochromic Materials, designs and applications; Molecular logic: Logic gates and application in molecular devices; Device fabrication methods including Langmuir-Blodget Films; Semiconductor and molecular assembly nanowires; Making contacts to single molecules; Biology inspired concepts + Biochemical and quantum computing; Charge transport in DNA based devices; Sensing and manipulating molecules – SPM technologies for characterisation and manipulation; Hybrid semiconductor/nanowire/molecular wire) devices, circuits and architecture; Lab-on-chip concepts; Photonics; organic bioelectronics; printed electronics (methods, inks, applications); organic electronics photovoltaics (measurement techniques, solar cells); Dye-sensitized solar cells based photo-electrochemical cells (Graetzel). Solar light harvesting optimization: "upconversion" and "downconversion" processes. Excited states in molecular aggregates: excitons classification (Frenkel, charge-transfer, Wannier). An overview of current applications and commercialization (cost, implementation, environmental consideration).

S4811AM	MATERIAL CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 hours lecture periods and 1 practical session per week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *Introduce students to concepts relevant to understanding and performing research in the chemistry of defects. Prepare students to be able to manipulate the states of materials by manipulating the band gaps.* Defects – Crystal Defects: Types of defects, thermodynamics of Schottky and Frenkel defect formation, Kroger-Vink notation for crystal defects, Atomic theory of diffusion—self diffusion mechanism; ionic transport, Mixed valency, disproportionation, charge-ordering; Electrical properties - insulators, metals, semiconductors, semiconductor junctions, superconductors, thermopower, Dielectric Properties – Polarization mechanisms, Shannon's dielectric polarizability; Thermal properties - conductivity, expansion; Thermoelectrics. Electronic and optoelectronic Devices: Metals, semiconductors and insulators; Doping, contacts and junctions; Field-effect transistors and light emitting diodes.

S4811AM	COMPUTATIONAL CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	2 lecture periods per week and 1 practical session every 2nd week for the semester.
Course assessment:	100% CA of **2** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 2-hour Exam Paper (50%).

Course description: The purpose of this module is to *introduce students to the theoretical background of computational chemistry and the practical skills needed to perform computations to solve chemical problems. (1)* Theoretical treatments of rotational, vibrational and electronic spectroscopy of polyatomic molecules. (2) Computation of the structure and properties of isolated molecules and clusters. (3) Computation of spectroscopic properties of molecules and clusters. (4) Computation of reaction paths including transition states.

S4812AS	SUPRAMOLECULAR CHEMISTRY
NQF Level:	8
Credits:	20
Contact Hours:	4 hours lecture periods and 1 practical session per week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *introduce students to concepts and techniques in supramolecular chemistry, demonstrating how molecular assembly and supramolecular structures leads to functions and properties, and their relevance to material and biological science.* **Supramolecular Chemistry: Basic concept and principles**; History, Molecular recognition, Hydrogen Bonds. **Non-covalent interactions**: **Aromatic-Aromatic Interactions**: **Biological supramolecular systems**: Ionophores, Porphyrin and other Tetrapyrrolic Macrocycles, Coenzymes, Neurotransmitters, DNA and Biochemical Self-assembly. **Biomimetic systems and Artificial receptors**: (a) Cation Binding hosts. (b) Anion binding hosts (c) Ion Pair Receptors, (d) Hosts for Neutral Receptors. **Transport processes**; Dynamic Combinatorial chemistry. **Supramolecular chirality and chirality imprinting**. Organic Crystal Structures, Metal Organic Frameworks (MOFs), Covalent Organic Frameworks, Polymorphism, Amarphous Materials Crystal Engineering: **Supramolecular Synthons**, Structure-Property Correlation, Design of Solids, Design of Properties, phase transformations, stimuli responsive solids Topochemical and photopolymerization in crystals. Design strategy. **Supramolecular devices**: Chemosensors, Molecular logic (Boolean Logics) gates, molecular switches and machines, photoswitching materials, Semiochemistry, Photonic devices. Electronic devices – switches, wires, rectifiers. Non-Linear Optical materials**. Liquid crystals**: Structure and properties of LC. **Selected applications**; Self-processes - Self-assembly, dynamic combinatorial chemistry, foldamers. Nanochemistry in supramolecular chemistry - Top-down and bottom up approaches, carbon nanotubes and graphene.

S4802AE	FUNCTIONAL MATERIALS & ENVIRONMENT
NQF Level:	8
Credits:	10
Contact Hours:	2 hours lectures per week and 1 practical session every 2nd week, for the semester
Course assessment:	100% CA of **3** tests, which count **80%** & graded laboratory reports will count **20%** towards the CA.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: The purpose of this module is to *Develop fundamental understanding of materials and nature. Recognize the significance of natural materials and other materials in daily life. Recognize sustainability aspects of natural materials and consequences of their uses. Understand how manage and control environmental hazards from pollutants Provide students with a broad overview of how recent advances in materials chemistry are opening up new possibilities in the application areas of energy, environment, health and process manufacturing.* **Functional Materials: Intermetallic materials, including;** memory metals/alloys, superalloys, surface coating materials; **Biomaterials; Advanced ceramic materials, including;** ferroelectric and piezoelectric materials, electric insulators, thermal barrier coatings; **Magnetic materials; Electronic materials, including;** conductors, elementary and composite semiconductors, conductive polymers, ionic conductors; **Catalytic materials. Materials & Environment**: Introduction to material dependence, natural materials, natural material management (reduce, reuse, recycle), resource consumption, material life cycle, end of first life, material selection strategies, chemical make-up of selected materials, eco-informed material selections, materials and environment, materials for low-carbon use, material efficiency. Introduction to GRATA DESIGN EDU-PACK software for material selection.

H.7. MASTER OF SCIENCE IN PHYSICS (33MPHY)

For admission requirements, please see H.7.1/2

H.8. MASTER OF PHILOSOPHY IN PHYSICS (33MPPH)

H.8.1. ADMISSION REQUIREMENTS

To qualify for entry into the **Master of Science in Physics (33MPHY)/ Master of Philosophy in Physics (33MPPH)**, a candidate must hold a Bachelor of Science Honours Degree at NQF Level 8 in Physics from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a **60% average**.

H.8.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelors honours for the MSc qualification.

H.8.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD in Physics, Astrophysics, Space Physics, Radiation Physics**, or a related field of study.

H.8.4. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules with Continuous Assessment (CA) and Examination. **(a)** The final mark for each module shall be calculated using a ratio of continuous assessment **(50%)** and a written examination (50%). **(b)** 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. **(c)** Notwithstanding the result of the mark above, a subminimum of at least 40% in the exam is required. **(d)** Assessment criteria are based on written examinations, written tests, assignments, laboratory practical, mini-projects, portfolios, research reports, oral examinations, and seminar presentations. **(e)** The thesis shall be assessed and candidates are expected to secure a minimum of **50%** mark in their thesis as per the current Higher Degree Policy guidelines. **In cases where modules are assessed by continuous assessment only:** ***(1)*** *The final mark will be constituted of 100% CA mark.* ***(2)*** *A final aggregate mark of* ***50%*** *shall be required to pass the module.*

H.8.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A full-time student must pass at least 72 credits of the courses registered for during the 1st-year to be re-admitted to the programme. The programme must be completed in a maximum of four (4) years. A part-time student must pass at least 24 credits of the courses registered for during the 1st-year to be re-admitted to the programme. By the end of the 2nd year the student will be expected to have passed 72 credits to be re-admitted to the programme.

H.8.6. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study upon obtaining 120 credits of the coursework. A part-time student advances to the 2nd year of study upon obtaining 48 credits, and advances to the 3rd year only upon obtaining 120 credits of the coursework.

H.8.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 240 credits, a pass in U6983LA: *Academic Literacy for Postgraduate Students,* and who have met all other relevant UNAM requirements. Master's by coursework students must present a paper on their own research work at a conference before graduation as outlined in the Higher Degrees Policy.

H.8.8. 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.

H.8.9. MASTER OF SCIENCE IN PHYSICS (33MPHY) & (33MPPH) CURRICULUM COMPILATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Semesters 1 & 2					
S6923PR	Research Methodology and Project Proposal	9	24	None	Compulsory
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16 (non-contributing)		Compulsory
S6911PM	Mathematical Methods of Physics	9	24	None	Compulsory
S6911PC	Computational Physics	9	24	None	Compulsory
Year 1 Semester 2					
Choose <u>two</u> (2) of the electives below					
S6912PA	Astro- and Space Physics	9	24		Elective
S6912PQ	Advanced Quantum Mechanics	9	24		Elective
S6912PR	Radiation Physics	9	24		Elective
S6912PM	Advanced Classical Mechanics	9	24		Elective
S6912PS	Capita Selecta in Physics	9	24		Elective
Year 2 Semesters 0, 1 & 2					
S6983PT	Thesis in Physics	9	120	**All coursework modules**	Compulsory
Total credits			**240**		

H.9. MASTER OF SCIENCE IN CHEMISTRY (33MCHM)

For admission requirements, please see H.9.1.1/2

H.10. MASTER OF PHILOSOPHY IN CHEMISTRY (33MPCH)

H.10.1. PURPOSE OF THIS PROGRAMME

The purpose of this qualification is to provide students with an opportunity to independently carry out research and specialize in relevant areas of chemical sciences. It aims to equip students with high level theoretical and practical knowledge in chemical sciences. Furthermore, the programme aims to provide students with an opportunity to acquire an internationally recognized postgraduate qualification in chemistry. The qualification further seeks to provide the industrial and academic markets with qualified and specifically well-trained professional chemists. As is captured in the objectives and aspirations of Namibia's long-term vision (Vision 2030), Namibia needs a skilled labour that will assist in the national developmental process towards economic transformation and industrialisation. A postgraduate programme in Chemistry is essential in any developed or developing economy, and well-trained chemists with strong academic background and research skills play vital roles in many areas of economic importance and contribute to the advancement of humankind. Some of the chemists' achievements worth highlighting include life-saving pharmaceuticals, advanced energy solutions, improved agricultural productivity, and novel materials used in products from clothing to electronic devices, to mention a few. The intended programme consists of six possible areas of specialisation including Physical Chemistry, Inorganic Chemistry, Analytical Chemistry, Organic Chemistry/Natural Products, Environmental Chemistry (Water Treatment and Analysis), and Chemical Technology. This diversified programme offers a variety of options to students to choose their areas of interest. The graduates of our programme are expected to play an important role in the implementation of the national development plans in the priority areas highlighted in the National Development Plans (NDPs) and Namibia's Vision 2030. Implementation of the country's national development agenda will in turn contribute to the realisation of the Global Sustainable Development Goals (SDGs), Africa Union Agenda 2063 and SADC's Regional Integrated Strategic Development Plan (RISDP).

H.10.2. ADMISSION REQUIREMENTS

This programme is open to all BSc (Hons) graduates with NQF level 8 or equivalent qualification and with Chemistry as one of their majors. The applicants will be accepted on the basis of their BSc (Hons) record. An average mark of 60% is required.

H.10.3. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, preference will be given to students with the highest marks.

H.10.4. ARTICULATION OPTIONS

This qualification provides entry into relevant doctoral programmes in Chemistry and related fields.

H.10.5. 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.

H.10.6. ASSESSMENT CRITERIA

Students shall be assessed through written tests, mini-projects, and seminar presentations as well as written examinations. In all cases, except where specified otherwise in a specific course descriptor, students shall be assessed through Continuous Assessment (CA) and a written examination paper (Examination). The final mark shall be a combination of CA and Examination on a 50%/50% basis and a final mark of 50% shall be required to pass each course. The thesis shall be assessed and the final mark for the Thesis shall be computed as per the current Post-Graduate Studies guidelines.

H.10.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A Student must pass at least 72 credits of the courses registered for during the 1st year to be re-admitted into the programme. Additionally, Academic Literacy for Postgraduate Students (U6983LA) must also have been passed.

H.10.8. ADVANCEMENT AND PROGRESSION RULES

A student advances to the 2nd year of studies upon passing 96 credits of the 1st-year curriculum. Additionally, Academic Literacy for Postgraduate Students (U6983LA) must also have been passed.

H.10.9. 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. In addition, the successful candidate should have completed the course, Academic Literacy for Postgraduate Students (U6983LA).

H.10.10. MASTER OF SCIENCE IN CHEMISTRY (33MCHM) & (33MPCH) 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.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16 (non-contributing)		Compulsory
S6921CM	Research Methodology and Project Proposal	9	12	None	Compulsory
S6911CA	Advanced Analytical Chemistry	9	24	None	Compulsory
S6931CI	Advanced Inorganic Chemistry	9	24	None	Compulsory
Year 1 Semester 2					
S6912CP	Advanced Physical Chemistry	9	24	None	Compulsory
S6932CO	Advanced Organic Chemistry	9	24	None	Compulsory
S6902CH	Current Topics in Chemistry	9	12	None	Compulsory
Year 2 Semesters 0, 1 & 2					
S6983CT	Thesis in Chemistry	9	120	**Pass in all Year 1 modules**	Compulsory
Total credits			**240**		

H.11. MASTER OF SCIENCE IN RENEWABLE ENERGY (PHOTOVOLTAICS) 33MREP

H.11.1. PURPOSE OF THIS PROGRAMME

The purpose of this postgraduate programme is to provide candidates with specialized knowledge in Photovoltaics and to empower them to create a more sustainable future. Photovoltaics is the technology of direct conversion of sunlight into electricity. Namibia imports over 60% of its electricity, despite being endowed with one of the best solar resources in the world. The implementation of photovoltaic systems ensures not only cheap generation of electricity locally but also provides a sound basis for the development of the export oriented green economy, which the Government of Namibia initiated with the Green Hydrogen Initiative. The need for human resources with expertise in renewable energy science and technology in a green economy is ever growing. To that effect, the National Renewable Energy Policy (July 2017) highlighted the need for continued education and training in the renewable energy fields through degree programmes at universities, vocational colleges, or other technical institutions across the country, in order to create capacity and generate jobs, and also increase the operational lifetimes of renewable energy applications. This postgraduate programme will build human capacity for innovative solutions in one of Namibia's most urgent challenges for sustainable development – the increased local electricity generation from own resources, 21st century electrification levels and growth of the green economy.The programme is, therefore, developed in response to the current needs of our stakeholders in line with the vision and mission of the university, as well as in alignment with the objectives of the Vision 2030 through the National Development Goals (NDPs), National Renewable Energy Policy, and the Namibia Green Hydrogen Strategy. The programme also contributes to the achievement of the Sustainable Development Goals (SDGs) of the United Nations.

H.11.2. ADMISSION REQUIREMENTS

To qualify for entry into the **Master of Science in Renewable Energy (Photovoltaics),** a candidate must hold a Bachelor of Science Honours Degree at NQF Level 8 in Physics or Engineering (electrical or mechanical) or a closely related field from a recognised institution of higher education, with a minimum of 60% average.

H.11.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelors honours for this MSc qualification.

H.11.4. ARTICULATION OPTIONS

This qualification may articulate into a PhD in Physics, Engineering, or any other related fields of study.

H.11.5. DURATION OF STUDY

The duration of the **MSc in Renewable Energy (Photovoltaics) is two (2) years for full-time** only. Relevant committees may grant an extension of registration up to six (6) months beyond the stipulated period if valid reasons are advanced.

H.11.6. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules with Continuous Assessment (CA) and Examination. **1)** The final mark for each module shall be calculated using a ratio of continuous assessment (50%) and a written examination (50%). **2)** 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. **3)** Notwithstanding the result of the mark above, a subminimum of at least 40% in the exam is required. **4)** Assessment criteria are based on written examinations, written tests, assignments, laboratory practical, mini-projects, portfolios, research reports, oral examinations, and seminar presentations. **5)** The thesis shall be assessed and candidates are expected to secure a minimum of 50% mark in their thesis as per the current Higher Degree Policy guidelines. **In cases where modules are assessed by continuous assessment only**: **a)** The final mark will be constituted of 100% CA mark. **b)** A final aggregate mark of 50% shall be required to pass the module.

H.11.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE PROGRAMME

A student must pass the following minimum credits to be re-admitted into the programme: **1**) 72 credits at the end of the 1st year of registration. **2)** 120 credits at the end of the 2nd year of registration. **3)** 240 credits at the end of the 3rd year of registration The programme must be completed in a maximum of three (3) years.

H.11.8. ADVANCEMENT AND PROGRESSION RULES

A student advances to the 2nd year of studies upon passing all 120 credits of the 1st-year curriculum.

H.11.8.1. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with 240 NQF level 9 credits as prescribed in the curriculum. In addition, the successful candidate should have completed the module, *Academic Literacy for Post-Graduate Students* (U6989LA).

H.11.8.2. 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.

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Year 1 Semester 1 & 2					
S6923PV	Research Methodology and Project Proposal	9	24		Compulsory
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16 (non-contributing		Compulsory
S6911PV	Advanced Theory of Solar Cells I	9	24	None	Compulsory
S6931PV	Solar Energy and Solar Technologies	9	24	None	Compulsory
Year 1 Semester 2					
S6912PV	Advanced Theory of Solar Cells II	9	24	None	Compulsory
S6952PV	Photovoltaic Devices and Systems	9	24	None	Compulsory
Year 2 Semesters 0, 1 & 2					
S6983PV	Thesis in Photovoltaics	9	120	**Pass in all Year 1 modules**	Compulsory
Total credits			**240**		

H.12. MASTER OF SCIENCE IN RENEWABLE ENERGY (GREEN HYDROGEN & SYNTHETIC FUELS) 33MREH

H.12.1. PURPOSE OF THIS PROGRAMME

The purpose of this qualification is to provide students with specialized knowledge and skills in the field of Renewable Energy focusing specifically in Hydrogen and Synthetic Fuels. The programme focuses on training graduate students in areas of production and utilization of hydrogen as an energy carrier and other related products. To date, Namibia imports more than 50% of its electricity needs, despite being endowed with one of the best solar regimes in the world. The local generation capacity can be enhanced by the development and deployment of renewable energy technologies which include green hydrogen. dditionally, in an effort to contribute to global decarbonization, the Government of the Republic of Namibia has implemented a national Green Hydrogen Initiative with a mission to sustainably produce hydrogen both as a source of energy and a precursor for the production of other hydrogen-based synthetic derivatives, by using the abundant solar and wind resources. All these activities should be accompanied by requisite human resources with expertise in renewable energy science and technology. To that effect, the National Renewable Energy Policy (July 2017) highlighted the need for continued education and training in the renewable energy fields through degree programmes at universities, vocational colleges, or other technical institutions across the country, in order to create capacity and generate jobs, and also increase the operational lifetimes of renewable energy applications. Similarly, the Namibia Green Hydrogen Strategy emphasized the importance of training and up-skilling in the STEM fields to fill the skills gap that would emerge from the implementation of hydrogen development projects. The programme is, therefore, developed in response to the current needs of our stakeholders in line with the vision and mission of the university, as well as in alignment with the objectives of the Vision 2030 through the National Development Goals (NDPs), National Renewable Energy Policy, and the Namibia Green Hydrogen Strategy. The programme also contributes to the achievement of the Sustainable Development Goals (SDGs) of the United Nations.

H.12.2. ADMISSION REQUIREMENTS

To qualify for entry into the **Master of Science in Renewable Energy (Green Hydrogen and Synthetic Fuels),** a candidate must hold a Bachelor of Science Honours Degree at NQF Level 8 in Chemistry, Physics, or Engineering (Chemical, Metallurgical, or Process Engineering) from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

H.12.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or a high score/percentage obtained in the bachelor honours.

H.12.4. ARTICULATION OPTIONS

This qualification may articulate into a PhD in Chemistry, Material Science, Physics, or any other related fields of study.

H.12.5. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules with Continuous Assessment (CA) and Examination. **1)** The final mark for each module shall be calculated using a ratio of continuous assessment (50%) and a written examination (50%). **2)** 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. **3)** Notwithstanding the result of the mark above, a subminimum of at least 40% in the exam is required. **4)** Assessment criteria are based on written examinations, written tests, assignments, laboratory practical, mini-projects, portfolios, research reports, oral examinations, and seminar presentations. **5)** The thesis shall be assessed and candidates are expected to secure a minimum of 50% mark in their thesis as per the current Higher Degree Policy guidelines. **In cases where modules are assessed by continuous assessment only**: **a)** The final mark will be constituted of 100% CA mark. **b)** A final aggregate mark of 50% shall be required to pass the module.

H.12.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE PROGRAMME

A student must pass the following minimum credits to be re-admitted into the programme: **1**) 72 credits at the end of the 1st year of registration. **2)** 120 credits at the end of the 2nd year of registration. **3)** 240 credits at the end of the 3rd year of registration
The programme must be completed in a maximum of three (3) years.

H.12.7. ADVANCEMENT AND PROGRESSION RULES

A student advances to the 2nd year of studies upon passing all 120 credits of the 1st-year curriculum.

H.12.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with 240 NQF level 9 credits as prescribed in the curriculum. In addition, the successful candidate should have completed the module, *Academic Literacy for Post-Graduate Students* (U6989LA).

H.12.9. CURRICULUM COMPILATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Year 1 Semester 1 & 2					
S6923HS	Research Methodology and Project Proposal	9	24		Compulsory
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16 (non-contributing		Compulsory
S6931HS	Renewable Energy Systems	9	24	None	Compulsory
S6911HS	Principles of Hydrogen Production	9	24	None	Compulsory
Year 1 Semester 2					
S6912HS	Hydrogen Materials and Conversion Technologies	9	24	None	Compulsory
S6932HS	Hydrogen Safety, Transportation and Storage	9	24	None	Compulsory
Year 2 Semesters 0, 1 & 2					
S6983HS	Thesis in Green Hydrogen and Synthetic Fuels	9	120	**Pass in all Year 1 modules**	Compulsory
Total credits			**240**		

H.12.10. MASTER OF SCIENCE IN RENEWABLE ENERGY (PHOTOVOLTAICS) 33MREP TABLE OF EQUIVALENTS

OLD MODULE	LVL	CRDT	NEW MODULE	LVL	CRDT
REP5920 Research Methodology and Project Proposal	9	24	S6920PV Research Methodology and Project Proposal	9	24
REP5911 Advanced Theory of Solar Cells I	9	24	S6911PV Advanced Theory of Solar Cells I	9	24
REP5931 Renewable Energy Frontiers	9	24	None – To be offered again until phased out		
REP5952 Photovoltaic Systems	9	24	S6952PV Photovoltaic Devices and Systems	9	24
REP5932 Characterization of Photovoltaic Devices	9	24	None – To be offered again until phased out		
REP5912 Advanced Theory of Solar Cells II	9	24	S6912PV Advanced Theory of Solar Cells II	9	24

H.12.11. MASTER OF SCIENCE IN PHYSICS (33MPHY) TABLE OF EQUIVALENTS DURING THE PHASING IN/OUT PERIOD

Old course	Lvl	Crd	New course	Lvl	Crd
Physics equivalents					
PHY5920: Research Methodology & Project Proposal	**9**	**24**	**S6923PR:** Research Methodology & Project Proposal	**9**	**24**
PHY5911: Advanced Quantum Mechanics	**9**	**24**	**S6912PQ:** Advanced Quantum Mechanics	**9**	**24**
PHY5951: Mathematical Methods of Physics	**9**	**24**	**S6911PM:** Mathematical Methods of Physics	**9**	**24**
PHY5912: Lasers and Applications	**9**	**24**	*Discontinued*	**9**	**24**
PHY5932: Radiation Physics	**9**	**24**	**S6912PR:** Radiation Physics	**9**	**24**
PHY5952: Computational Physics	**9**	**24**	**S6911PC:** Computational Physics	**9**	**24**
PHY5972: Advanced Classical Mechanics	**9**	**24**	**S6912PM:** Advanced Classical Mechanics	**9**	**24**
PHY5992: Astro- and Space Physics	**9**	**24**	**S6912PA:** Astro- and Space Physics	**9**	**24**
PHY5980: Thesis	**9**	**120**	**S6983PT:** Thesis	**9**	**120**

H.12.12. MODULE DESCRIPTOR FOR ALL DISCIPLINE MASTER OF SCIENCES

S6923PR RESEARCH METHODOLOGY AND PROJECT PROPOSAL - PHYSICS

NQF Level: 9
NQF Credits: 24
Contact Hours: 2h of integrated theory & tutorial work per week for 2 semesters.
Course assessment: 100% consisting of three assignments (45%), a Research Proposal (30%), and a presentation (25%).
Examination: No Examination

Course description: Data Analysis and Statistical Methods; 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; Hypothesis verification/refutation; Revision of the Scientific Method and the Epistemology of Science; Logic and the taxonomy of Fallacies of Reason & Rhetoric; Research Ethics, Intellectual Property and Citation; IOP (Institute of Physics) referencing style; UNAM Policy documents (Plagiarism, PG School Regulations & Procedures); Identification of preferred research area and prospective thesis supervisor(s); Comprehensive literature review under guidance of chosen supervisor(s), writing and presentation of a Research Proposal as per UNAM regulations and submission to relevant committees;

S6923PR: RESEARCH METHODOLOGY AND PROJECT PROPOSAL - CHEMISTRY

NQF Level: 9
NQF Credits: 24
Contact Hours: 2h of integrated theory & tutorial work per week for 2 semesters.
Course assessment: **100%** consisting of Presentations, Research proposal & Written and Peer-reviewed Assignments.

Course description: Review of the scientific method. Research planning and design. Literature review and proper citation. Components of a research proposal. Scientific writing – report, review, article. Chemostatistics: handling experimental data, processing and reporting, e.g. significance tests. Analysis of variance (ANOVA), regression analysis methods, validation of experimental data and experimental design. Research integrity and ethics. Intellectual property and patent filing. Occupational Health and Safety in the laboratory. Preparing and conducting oral and poster presentations.

S6923PV: RESEARCH METHODOLOGY AND PROJECT PROPOSAL - PHOTOVOLTAIC

NQF Level: 9
NQF Credits: 24
Contact Hours: 2 lectures per week.
Course assessment: **100% CA: 3** assignments (**30%**), **2** mini-literature review reports **(20%),** Research Proposal **(40%)** & **2** presentations **(10%)**

Course description: The Philosophical underpinnings of the Scientific Method, The Fallacies of Reason and Rhetoric, avoiding "bad science" and pseudoscience, ethical and legal issues, statistical and mathematical principles, error analysis and propagation, hypothesis verification/refutation, the IOP (Institute of Physics) referencing style and citation; Logic and the taxonomy of Fallacies of Reason & Rhetoric, philosophical streams in the Philosophy of Science (empiricism, positivism, logical positivism, analytic philosophy) and overview of modern philosophers of science like Bertrand Russell, Carl Popper and Thomas Kuhn; Library resource utilisation, e.g. finding specific papers on systems like JSTOR, mini literature review projects in prospective

fields of research, identification of thesis supervisor(s) and project, extensive literature review under guidance of chosen supervisor(s), writing and presentation of a Research Proposal as per UNAM regulations;

S6923HS:	RESEARCH METHODOLOGY AND PROJECT PROPOSAL -GREEN HYDROGEN
NQF Level:	9
NQF Credits:	24
Contact Hours:	2 lectures per week
Course assessment:	**100% CA: 3** assignments (**30%**), **2** mini-literature review reports **(20%),** Research Proposal **(40%)** & **2** presentations **(10%)**

Course description: The Philosophical underpinnings of the Scientific Method, The Fallacies of Reason and Rhetoric, avoiding "bad science" and pseudoscience, ethical and legal issues, statistical and mathematical principles, error analysis and propagation, hypothesis verification/refutation, the IOP (Institute of Physics) referencing style and citation; Logic and the taxonomy of Fallacies of Reason & Rhetoric, philosophical streams in the Philosophy of Science (empiricism, positivism, logical positivism, analytic philosophy) and overview of modern philosophers of science like Bertrand Russell, Carl Popper and Thomas Kuhn; Library resource utilisation, e.g. finding specific papers on systems like JSTOR, mini literature review projects in prospective fields of research, identification of thesis supervisor(s) and project, extensive literature review under guidance of chosen supervisor(s), writing and presentation of a Research Proposal as per UNAM regulations;

S6911PC	COMPUTATIONAL PHYSICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	50% of the final mark) consisting of two (2) tests (60%), 2 assignments (20%) & *a mini project (20%).*
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Control flow; Loops; Reading in and writing to files; Functions; Lists; Arrays; Matrices; Statistical distributions: Binomial, Poisson, Gaussian; Error propagation; Least-squares fitting; Chi-squared fitting; Multivariate least-squares; Polynomial fitting; Fourier fitting; Numerical solutions of ODEs: Euler method; Runge-Kutta method; Frequentist statistics: Maximum Likelihood Estimator; Bayesian Statistics: Posterior probability, Likelihood function, Prior probability, Bayesian evidence, Model selection, Parameter estimation; Machine learning: Supervised learning, Unsupervised learning, Example algorithms: K-Nearest Neighbour, Naïve Bayes, Decision Trees, Random Forest, Neural Networks.

S6911PM	MATHEMATICAL METHODS OF PHYSICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & tutorial work per week for 1 semester**.**
Course assessment:	50% of the final mark) consisting of two (2) tests (40%), and three (3) assignments (60%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Computer Algebra Systems (CAS), Revision of ODEs, Systems of ODEs, Power series solutions of ODEs & Special functions, Fourier Analysis, DFTs and FFTs, Applications of Convolution and FFT in Physics, Analytical solution of important PDEs in Physics, Numerical methods for ODEs and systems of ODEs, multi-step methods, Numerical methods for PDEs (Elliptic, Parabolic & Hyperbolic). Tensors and tensor analysis, dyad & triad notation, pseudo-tensors.

6912PQ	ADVANCED QUANTUM MECHANICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	50% of two (2) tests (60%), an assignment (10%) & *a* quiz (20%), & a presentation (10%).
Examination:	1 x 3-hour Exam Paper (50%).

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.

S6932CO:	ADVANCED ORGANIC CHEMISTRY
NQF Level:	9
NQF Credits:	24
Contact Hours:	7 hours of Integrated Theory & Practical/week for one semester.
Course assessment:	comprising tests, mini-project and workshop, unannounced quizzes, presentations
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Advanced organic synthesis and reaction mechanisms: reactive intermediates, neighbouring group participation, radical initiators. **Aromatic heterocycles**: reactions and synthesis, application of multicomponent reactions. **Polymer chemistry**: the polymerization process, condensation polymers, addition polymers, block, graft and ladder polymers, selected applications, recycling. **Natural product chemistry:** sources and classification of natural products, phytochemicals

biosynthesis and the application of isotopic labelling studies, case studies on partial/ total synthesis and structure elucidation of natural products.

S6912PR	RADIATION PHYSICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	50% of two (2) tests (60%), an assignment (10%) & *a* quiz (20%), & a presentation (10%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Review of atomic and nuclear structures, atomic and nuclear radiation, classification of radiation, natural and man-made sources of radiation; 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, capture process, fission; **Methods of radiation detection:** Ionization in gases, gas-filled detectors, Scintillation and semiconductor detectors, neutron detectors; Radiation dosimetry: exposure, absorbed dose, dose equivalent, measurement of exposure –free air ionization chamber, air-wall chamber – measurements of absorbed dose, X-ray and gamma ray dose, neutron dosimetry, dose calculations; **Radiation hazards and effects:** direct and indirect radiation, chemical and biological effects, the acute radiation syndrome, somatic effects –stochastic and nonstochastic; External radiation protection: Distance, time and shielding, gamma-ray shielding, protection from beta radiation, neutron shielding; Applications of different types of radiation: Industrial, medical, scientific, environmental pollution, geological.

S6912PM	ADVANCED CLASSICAL MECHANICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	50% of two (2) tests (40%), and two (2) assignments (60%).
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: Hamilton's principle; Calculus of variations; Derivation of Lagrange's equations from Hamilton's principle; Extension to nonholonomic systems; Conservation theorems; CENTRAL FORCE PROBLEM: Equations of motion and first integrals, Virial Theorem, Integrable Power-Law Potentials, Bertrand's Theorem, Time dependent motion in the Kepler Problem, Laplace-Runge-Lenz Vector, Scattering and transformation to laboratory coordinates, the 3-body problem; RIGID BODY MOTION: Euler angles; Caley-Klein parameters; Euler theorem on the motion of a rigid body; Finite and infinitesimal rotations; Coriolis force; 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; Introduction to General Relativity; 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;

S6912PA	ASTRO- & SPACE PHYSICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	50% of two (2) tests (60%), an assignment (10%) & *a* quiz (20%), & a presentation (10%).
Examination:	1 x 3-hour Exam Paper (50%).

Course description:. Properties of Cosmic Rays; Distribution functions, intensities, energy and mass spectra; Second order Fermi-acceleration; Astrophysical magnetohydrodynamic shocks; Rankine-Hugoneot relations; Compression ratios and derived properties of astrophysical shocks; First order Fermi-acceleration; Diffusive shock acceleration; 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; 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 Stellar Physics & Stellar Evolution; ISM & 21 cm observations of HI regions; Star Formation; Free-free radio emission from HII regions; Stellar Remnants & Degenerate objects: white dwarfs & neutron stars; Pulsars, multi-wavelength e-m emission from pulsars, Plerions and Supernova Remnants; Black Holes; Structure of the Milky Way; Galaxy Demographics; Active Galactic Nuclei and Quasars; Groups & Clusters of Galaxies. The Universe Observed: Olbers' Paradox; Extragalactic Distances; Hubble's Law; Cosmic Clocks; Isotropy; The composition of the Universe, The expanding Universe, Mapping the Universe; Cosmological Models: Homogeneous, Isotropic Spacetimes, The Cosmological redshift, Matter, Radiation, and vacuum, Evolution of the flat FRW Models, The Future of the Universe; Light Element Nucleosynthesis; The Big Bang and Age of the and Size of the Universe, Spatially Curved Robertson-Walker Metrics, Dynamics of the Universe; Which Universe and Why: Surveying the Universe, Explaining the Universe.

S6911CA:	ADVANCED ANALYTICAL CHEMISTRY
NQF Level:	9
NQF Credits:	24
Contact Hours:	10 hours of Integrated Theory & Practical/week for one semester
Course assessment:	50% of 2 tests (60%), Mini project (30% of the CA mark)& at least 2 presentations (10%)
Examination:	1 x 3-hour Exam Paper (50%).

Course description: (Selected topics of the following will be covered)**:** Chromatography - Theory of chromatography, High Performance Liquid Chromatography (HPLC), ion chromatography, supercritical fluid chromatography. Mass Spectrometry: Gas 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. FAB–MS and electrospray MS, to the structure elucidation of both small and large organic molecules. 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 (^{1}J)-HECTOR, HMQC, HSQC; hetero-nuclear long range HMBC, LR HECTOR and COLOC.; selective 1D experiments: SEL TOCSY and SEL NOESY. Radiochemistry and radioanalytical techniques. 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. Electro-analytical chemistry: Ion selective electrodes, potentiometry, polarography, coulometry and electro-gravimetry. Advanced techniques in electro-analytical chemistry; solution electrode interface, Buttler-Volmer relationships. Application of Analytical techniques to food science, pesticide analysis, forensic analysis, bio-analytical chemistry as well as other topics that are of interest.

S6912CP:	ADVANCED PHYSICAL CHEMISTRY
NQF Level:	9
NQF Credits:	24
Contact Hours:	10 hours of Integrated Theory & Practical/week for one semester.
Course assessment:	CA of 2 tests (40%), a mini project (50%) & at least 2 presentations (10%)
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Selected topics of the following will be covered: **Quantum Chemistry. Computational Chemistry**: practical applications of electronic structure methods [Hartree-Fock Method. Density Functional Theory (DFT), Moller Plesset Pertubation Theory; Coupled Cluster Approach]; Molecular dynamics. Biophysical Chemistry. Statistical Mechanics. **Advanced kinetics:** rates of chemical reactions; reactions in the gas and solution phases; complex reactions. Advanced Molecular Spectroscopy.

S6931CI:	ADVANCED INORGANIC CHEMISTRY
NQF Level:	9
NQF Credits:	24
Contact Hours:	10 hours of Integrated Theory & Practical/week for one semester.
Course assessment:	CA of 2 tests (50%), a mini project (40%) & at least 2 presentations (10%)
Examination:	1 x 3-hour Exam Paper (50%).

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. **Cluster compounds** (constitution and structures). **Organometallic chemistry and Catalysis** (designs, potency and applications). **Bioinorganic Chemistry** (roles and applications). **Transformation of Inorganic Chemistry and its role in Material Chemistry**.

S6902CH:	CURRENT TOPICS IN CHEMISTRY
NQF Level:	9
NQF Credits:	12
Contact Hours:	2 hours consultation per week for one semester.
Course assessment:	100 CA of independent study reports (80%), & at least 1 presentation (20%)

Course description: Students will be asked to perform literature review, write reports, present and conduct seminars on selected topics on the current advances in different areas of chemistry (Analytical Chemistry, Organic Chemistry, Physical Chemistry, and Inorganic Chemistry). Experts in the department will provide a list of contemporary topics that are at the forefront of their respective fields of Chemistry.

S6911PV:	ADVANCED THEORY OF SOLAR CELLS I
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester.
Course assessment:	50% CA, a minimum of **2 tests (60%),** laboratory practical (or the mini project) counts **30%;** at least 2 presentations **(10%)** graded by staff members.
Examination:	1 x 3-hour Exam Paper (50%).

Course description: 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.

S6931PV:	SOLAR ENERGY AND SOLAR TECHNOLOGIES
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project) **30%;** 2 presentations **(10).**
Examination:	1 x 3-hour Exam Paper (50%).

Course description: Solar resource: light, the solar spectrum, irradiance; extra-terrestrial and terrestrial solar radiation - atmospheric effects, orbital and rotation effects; motion of the sun – declination, elevation, azimuth; sun path diagrams; solar radiation on tilted surfaces; measurement of solar radiation; instrumentation; solar radiation databases. Solar energy technologies: photovoltaic and solar thermal. Concentrating solar power plants (CSP) – parabolic trough and central receiver systems; components, energy conversion and efficiencies; performance assessment. Solar Water Heaters (SWHs) – flat plate collector (FPC) and evacuated tube collector (ETC) - components, energy conversion and efficiencies; performance assessment. Solar cookers – concentrating and non-concentrating – design principles (with and without thermal energy storage), energy conversion, efficiencies, performance assessment.

S6912PV:	ADVANCED THEORY OF SOLAR CELLS II
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project) **30%;** 2 presentations **(10).**
Examination:	1 x 3-hour Exam Paper (50%).

Course description: 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.

S6912PS	CAPITA SELECTA IN PHYSICS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4h of integrated theory & practical/tutorial work per week for 1 semester
Course assessment:	100% of the final mark tests/quizzes/assignment (50%), a mini project (40%), & a presentation (10%).
Examination:	No Examination.

Course description: The course content shall be conducted along the lines of a course (or an interleaving of partial courses) being lectured at another prestigious university in the world and adapted for UNAM graduate students by a renowned subject expert.

S6952PV:	PHOTOVOLTAIC DEVICES AND SYSTEMS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project) **30%;** 2 presentations **(10).**
Examination:	1 x 3-hour Exam Paper (50%).

Course description: 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. Agrivoltaic (AgriPV) systems – design principles, system characteristics and assessment criteria. Solar module efficiency measurements, I-V testing, optical characterization, electroluminescence, thermography.

S6931HS:	RENEWABLE ENERGY SYSTEMS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester
Course assessment:	Assessment shall be done according to the current post-graduate studies regulations.

Course description: 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 proposal writing, information gathering, analysis and interpretation. An industrial attachment of up to 6 months will also be incorporated in the appropriate cases, depending on the nature of the research project.

S6911HS:	PRINCIPLES OF GREEN HYDROGEN PRODUCTION
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester**.**
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project **30%; 2** presentations **(10%)**

Course description: The principles of hydrogen gas; Fundamental knowledge of Green hydrogen; Need for Green Hydrogen Energy: Global energy picture, present and projected uses for hydrogen, prospects, prognosis and future for hydrogen energy, challenges; Introducing hydrogen as a part of energy security; Hydrogen and Hydrogen economy; International strategies and road maps; Primary sources of green hydrogen; "Colours" of hydrogen: Green, Blue, Grey, Turquoise and Pink Hydrogen. Hydrogen production: electrolysis, thermolysis, photovoltaic electrolysis, plasma arc decomposition, thermochemical process, photocatalysis, biomass conversion, gasification, high-temperature electrolysis.

S6912HS:	HYDROGEN MATERIALS AND CONVERSION TECHNOLOGIES
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester.
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project) **30%;** 2 presentations **(10).**

Course description: Hydrogen in the Chemical Industry and in Refineries: uses, hydrogen gas compression, liquified hydrogen, liquid organic carriers, Simple hydrogen-bearing chemicals, ammonia, Haber-Bosch process, synthetic(syn) fuels; syn-methanol, Fischer Tropsch process, syn-kerosene, syn-diesel, alkenes, amines; Hydrogen for energy generation and mobility application: Fuel cell essentials: definition of fuel, what is a fuel value? why do we want to use hydrogen as fuel? classification of fuel cells, application of fuel cells; Overview of hydrogen utilization: I.C. Engines, gas turbines, hydrogen burners, power plant.

S6932HS:	HYDROGEN SAFETY, TRANSPORTATION AND STORAGE
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester.
Course assessment:	50% CA, of **2 tests (60%),** laboratory practical/mini project) **30%;** 2 presentations **(10).**

Course description: Hydrogen infrastructure and technology: hydrogen transportation, storage, and distribution; hydrogen storage materials and technologies: chemical and electrochemical hydrogen storage, compressed hydrogen storage, hydrogen storage in liquid form, solid-state hydrogen storage, nanostructured materials; hydrogen transportation, distribution-strategic considerations; dewars for hydrogen transport applications, gas cylinders, pipelines, storage in road vehicles, industrial-scale pressurized hydrogen storage. **GH_2T – Materials Compatibility**: Introduction – GH_2T value chains, definition of materials compatibility, processes for proper selection of materials; Overview of metallic materials for GH_2T (steels, nickel alloys, aluminium alloys, copper alloys, titanium alloys); Mechanisms of hydrogen-metal interactions I: Gaseous and aqueous H-absorption, permeability, diffusion, trapping, enhancing, desorption, hydrogen degradation phenomena, hydrogen cracking mechanisms, hydrogen assisted corrosion cracking, effects of mechanical loading; Phenomenology of hydrogen and evaluation procedures to select appropriate materials for GH_2T, threshold values to evaluate materials compatibility and criteria to prevent hydrogen degradation and cracking; Analysis of hydrogen concentrations and diffusion coefficients; Conclusive test sequences for materials compatibility and life time evaluation of components used for GH_2T, slow strain rate testing, small scale testing and laboratory applicability of test procedures; Modelling and simulation of materials compatibility and life time evaluation of components for GH_2T; Materials compatibility for LH_2 applications and for hydrogen derivate production (ammonia); Hydrogen compatibility of polymer and composite materials, sealing materials, cryo-tribology in the context of GH_2T. **GH_2T – Safety**: Introduction – GH_2T value chains, safety assessment procedures, types and avoidance of hazards associated with the production, transportation, storage and usage of GH_2; Fundamentals on explosion protection: GH_2 and ammonia; Ways to identify service conditions to avoid accidental hazards in GH_2T; Potential hazards caused by release of pressurized hydrogen and LH_2; Large and full scale safety testing of hydrogen technologies; Modelling and simulation of hydrogen releases, ignitions and explosions; Safety assessment of hydrogen gas storage systems; Sensors for GH_2T applications; Overview of standards and regulations for H_2Safety, status of national and international GH_2T strategies.

S6983PT	PHYSICS THESIS
NQF Level:	9
NQF Credits:	120
Contact Hours:	As needed.
Course assessment:	The Mini Thesis assessed as per the current Higher Degrees Studies Regulations and Guidelines by at least two (2) examiners.

Course description: The student will be expected to choose a topic under the guidance and direction of a supervisor (or supervisors) and undertake directed research in Physics or a related field. The research results shall be presented in a scholarly manner in a Mini Thesis of 18,000—22,000 words, not exceeding 120 pages. Producing and presenting a contribution at a conference. All conference contributions and publications (if any) must be listed after the Abstract of the Mini Thesis.

S6983CT:	CHEMISTRY THESIS
NQF Level:	9
NQF Credits:	120
Contact Hours:	Face to face consultations with supervisor(s) on regular basis.
Course assessment:	Assessment shall be done according to the current Post-Graduate Studies regulations.

Course description: 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.

S6983PV:	PHOTOVOLTAIC THESIS
NQF Level:	9
NQF Credits:	24
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester
Course assessment:	Assessment shall be done according to the current Post-Graduate Studies regulations.

Course description: 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 proposal writing, information gathering, analysis and interpretation. An industrial attachment of up to 6 months will also be incorporated in the appropriate cases, depending on the nature of the research project.

S6983HS:	GREEN HYDROGEN THESIS
NQF Level:	9
NQF Credits:	120
Contact Hours:	4 lectures per week and one practical every week or a mini project for the semester.
Course assessment:	Assessment shall be done according to the current Post-Graduate Studies regulations.

Course description: 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 proposal writing, information gathering, analysis and interpretation. An industrial attachment of up to 6 months will also be incorporated in the appropriate cases, depending on the nature of the research project.

H.13. DOCTOR OF PHILOSOPHY IN PHYSICS (33DPHY)

For admission requirements, please see F.12.6.1/2

H.14. DOCTOR OF PHILOSOPHY IN CHEMISTRY (33DCHM)

H.14.1. PURPOSE OF THIS PROGRAMME

The purpose of this qualification is to provide students with the highest academic qualification in a field related, directly, or indirectly, to Physics. A **Doctorate in Physics/ Chemistry** will provide the opportunity to specialise in and develop deep knowledge and understanding of a sub-field of Physics, or an inter/intra-disciplinary field thereof. This qualification equips a candidate with the skills to design and conduct rigorous experiments, manage, mine, and analyse large and complex sets of data, and, from these, draw meaningful conclusions. Alternatively, candidates can engage in the development of theoretical and computational models for a great variety of purposes. It opens opportunities for careers in academia, research institutions, and industries such as data science, pharmaceuticals, energy, and technology, to name but a few. A doctoral qualification enables and qualifies a candidate to significantly contribute to the scientific community by publishing original research, presenting at conferences, and collaborating with other scientists. There shall be two modes of this qualification:

- ✓ a Doctorate by Dissertation and publishing from the dissertation, and
- ✓ a Doctorate by Dissertation Incorporating Publications (DIP)

H.14.2. ADMISSION REQUIREMENTS

To be eligible for the **Doctor of Philosophy in Physics/ Chemistry** programme, the candidate must have completed a **Master of Science degree in Physics/ Chemistry at NQF level 9** or equivalent in a relevant discipline from the University of Namibia or any other recognised institution of higher education.

H.14.3. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the MPhil or Master's for PhD qualification.

H.14.4. ASSESSMENT CRITERIA

Assessment will be done based on examination the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of 50% marks in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

H.14.5. DURATION OF STUDY

The duration of the programme is normally three (3) years for full-time students and five (5) years for part-time students.

H.14.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

H.14.7. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

H.14.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 360 credits, and who have met all other relevant UNAM requirements.

H.14.9. ADDITIONAL INFORMATION

Additional information can be found in the General Rules and Regulations prospectus.

H.14.10. FULL-TIME ENROLMENT: DOCTORATE BY DISSERTATION AND PUBLICATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Year 1—3 (Max: 5)					
S7083PD/ S7083CD	Dissertation	10	360		
Total credits			**240**		

H.14.11. PART-TIME ENROLMENT: DOCTORATE BY DISSERTATION AND PUBLICATION

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Year 1—5 (Max: 6)					
S7083PD/ S7083CD	Dissertation	10	360		
Total credits			**240**		

H.14.12. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

S7083PD/ S7083CD:	DISSERTATION
NQF level:	9
NQF Credits:	24
Contact hours:	As needed
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%**) &

Course description: The candidate will be expected to choose a topic under the guidance of a supervisor (or supervisors) and undertake independent research in Physics, or a related field:

- ✓ Experimental Physics/Data Analysis/Data Mining
- ✓ Experimental and applied Chemistry
- ✓ Applied Physics
- ✓ Instrumentation
- ✓ Computational Chemistry
- ✓ Computational Physics/HPC/Simulation/etc
- ✓ Theoretical Physics
- ✓ Mathematical Physics
- ✓ Etc.

The research results shall be presented in a professional and scholarly manner in one of the following modes:

- ✓ A classical Dissertation of 46,000—75,000 words, not exceeding 300 pages, from which at least two (2) peer-reviewed research papers must be published at indexed publishing outlets as author or co-author.
- ✓ A Dissertation Incorporating Publications (DIP) of 46,000—75,000 words, not exceeding 300 pages, inclusive of at least four (4) peer-reviewed incorporated publications/book chapters at indexed publishing outlets. In this case, all publication incorporations must be with the full permission of and in full compliance with the requirements of the relevant publishing outlet(s).

If the abovementioned papers are not yet published at the time of the examination of the dissertation, then letters of acceptance must be submitted with the dissertation. In case of collaboration publications, the candidate must be listed as a *corresponding author*. All publications and conference contributions must be listed with their Digital Object Identifiers (DOIs) after the Abstract of the Dissertation, whether incorporated or not.

I. DEPARTMENT OF WILDLIFE MANAGEMENT AND TOURISM STUDIES

I.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.

I.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.

I.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 **"Mathamatics", "Biology", "Geography", "Agriculture","Chemistry and Physics", or "History".** Where an applicant has an **"e"** in one of the two required subjects at NSSAS level, an extended study mode will apply provided such 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" "Development Studies" 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 **"Mathematics", "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 with a minimum of C symbol.**

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.

I.1.2.1. 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, 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.

I.1.2.2. ALTERNATE PATHWAYS TO ADMISSION

I.1.2.2.1. MATURE AGE ENTRY SCHEME (MAE)

Candidates can register on 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 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%.

I.1.2.2.2. 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.

I.1.2.2.2.1. CANDIDATES WITH A THREE-YEAR DIPLOMA

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.

I.1.3. 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.

I.1.4. 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.

I.1.5. 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.

I.1.5.1. 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

I.1.5.2. 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.

I.1.6. ADVANCEMENT AND PROGRESSION RULES

I.1.6.1. 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 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%.

I.1.6.2. 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

I.1.7. 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.

I.1.8. B.SC. WILDLIFE & TOURISM MANAGEMENT [33BSWM] NQF 7 (3 YEARS) 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.***

I.1.9. BACHELOR OF SCIENCE IN SUSTAINABLE TOURISM MANAGEMENT (NQF 8) - 33HSTM TABLE OF EQUIVALENTS

Old course	Level	Credits	New course	Level	Credits
GHT 3581 Fundamentals of Tourism Management	5	12	S3551WC Fundamentals of Tourism Management	5	14
GHT 3582 Customer Relations in Tourism	5	12	S3632WG Customer Experience Management	6	14
GHT 3601 Physical Geography of Namibia	6	8	S3511WA Physical Geography and Climate	5	14
GHT 3631 Tourism Accounting	6	14	S3771WN Financial Management in Tourism	7	18
GHT3652 Operations Management in Tourism	6	14	**None (To be offered again)**	6	8
GTI 3699 Tourism Business Internship	6	8	S3662WI CWIE prep	6	8
GHT 3711 Tourism Management	7	16	S3712WD Tourism and Local Economic Development	7	18
GHT 3732 Tourism Entrepreneurship	7	16	S3772WC Tourism Entrepreneurship	7	18
GTI 3799 Tourism Business Internship	7	16	S3721J CWIE	7	24
GHT 3810 Research Project in Tourism Management Studies	8	32	None (To be offered again)	8	16
GHT 3800 Tourism Studies	8	16	**None (To be offered again)**	8	20
GHT 3820 Tourism Planning and Development	8	16	**None (To be offered again)**	8	10
GHT 3840 Tourism Marketing	8	16	S4832DM Innovation & Digital Marketing in Tourism	8	20

I.1.10. TABLE OF EQUIVALENTS FOR THE BSc IN WILDLIFE MANAGEMENT AND CONSERVATION (NQF 7) – 33BSWM

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			

I.1.11. MODULE DESCRIPTORS FOR BACHELOR OF WILDLIFE MANAGEMENT AND CONSERVATION (NQF 7) – 33BSWM

S3540WT	WILDLIFE TRACKING
NQF level:	5
NQF Credits:	4
Contact hours:	1 lecture period + 1 practical per week for one semester.
Module assessment:	CA **100%**: Theoretical practical & sign identification (40%), field practical on track and sign identification and interpretation (60%)

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
NQF Credits:	4
Contact hours:	1 lecture hours + two practical per week for 1 semester.
Module assessment:	Continuous assessment (100%).

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**
NQF Credits:	14
Contact hours:	4 lecture hours + 1 practical per week for one semester.
Module assessment:	Continuous assessment (100%)

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
NQF Credits:	14
Contact hours:	4 lecture hours + 1 practical per week for one semester.
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.

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
NQF Credits:	14
Contact hours:	4 lecture hours + 1 practical per week for one semester.
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.

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
NQF Credits:	14
Contact hours:	2 lecture hours + 1 practical per week for 1 semester.
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
NQF Credits:	12
Contact hours:	4 lecture hours + 1 practical per week for 1 semester.
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
NQF Credits:	12
Contact hours:	4 lectures and 1 practical session per week for one semester.
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**
NQF Credits:	14
Contact hours:	4 lecture hours + 1 practical per week for 1 semester.
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**
NQF Credits:	**4**
Contact hours:	**1** lecture hours + 1 practical per week for 1 semester.
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**
NQF Credits:	**4**
Contact hours:	**1** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**CA 100%** 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**
NQF Credits:	**2**
Contact hours:	**1** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**100%** 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**
NQF Credits:	**16**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**50%** consisting of tests and 4 quizzes, assignments, practical reports and/or presentations
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**
NQF Credits:	**16**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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**
NQF Credits:	**7**
Contact hours:	**2** lecture hours + 1 practical/tutorial session per week.
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**
NQF Credits:	**16**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**9**
Contact hours:	**3** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**14**
Contact hours:	4 lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**8**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**100%** (at least five (5) practical assessments based on field excursions and three (3) assignments).

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**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

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.

S3772WC	TOURISM ENTREPRENEURSHIP
NQF level:	**7**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**100%** CA of written and/or online assessments: Test(s) and/or quiz(es.

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.

S3752WB	ANIMAL BEHAVIOR
NQF level:	**7**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
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.

S3712WD	TOURISM & LOCAL ECONOMIC DEVELOPMENT
NQF level:	**7**
NQF Credits:	**18**
Contact hours:	**4** lecture hours + 1 practical per week for 1 semester.
Module assessment:	**100%** CA of written and/or online assessments: Test(s) and/or quiz(es
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.2. BACHELOR OF SCIENCE IN WILDLIFE MANAGEMENT AND CONSERVATION HONOURS - 33HWLM

I.2.1. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science in Wildlife Management and Conservation (NQF level 8)**, the applicant must be in possession of a Bachelor of Science in Wildlife and Tourism Management (NQF level 7) from the University of Namibia or an equivalent qualification from a recognised institution of higher education.

I.2.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's Degree qualification.

I.2.3. ARTICULATION OPTIONS

This qualification may articulate into an **MSc in Wildlife Management or Sustainable Tourism Management at NQF level 9.**

I.2.4. 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 unless otherwise stated in the individual module descriptor 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. 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*

I.2.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of 68 credits by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

I.2.6. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

I.2.7. DURATION OF STUDY

The minimum duration of the study is one (1) year, and the maximum duration is two years.

I.2.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

I.2.9. 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.

I.2.10. 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 % attendance of practical classes is required.

I.2.11. BACHELOR OF SCIENCE IN WILDLIFE MANAGEMENT AND CONSERVATION (HONOURS) - 33HWLM

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
F3880AP	Research Proposal	8	14	None	Compulsory
F3880AD	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4811WP	Protected Areas Management	8	20	None	Compulsory
S4811WS	Socio-ecological systems	8	20	None	Compulsory
S4821WI	Applied Geo informatics	8	10	None	Compulsory
S4833WE	Research Project	8	8	F3880AP	Compulsory
Year 1 Semester 2					
S4812WP	Policy & Legal Framework in Wildlife Management	8	20	None	Compulsory
S4822WE	Environmental and Social Impact Assessment	8	10	None	Compulsory
S4812WE	Conservation Genetics	8	20	None	Compulsory
S4833WE	Research Project	8	8	F3880AP	Compulsory
Total credits			**138**		

I.3. BACHELOR OF SCIENCE IN SUSTAINABLE TOURISM MANAGEMENT HONOURS - 33HSTM

I.3.1. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science in Sustainable Tourism Management (NQF level 8)**, the applicant must be in a possession of a Bachelor of Science in Wildlife and Tourism Management (NQF level 7) from the University of Namibia or an equivalent qualification from a recognized institution of higher education.

I.3.1.1. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's Degree qualification.

I.3.1.2. ARTICULATION OPTIONS

This qualification may articulate into an **MSc in Wildlife Management or Sustainable Tourism Management at NQF level 9.**

I.3.1.3. 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 unless otherwise stated in the individual module descriptor 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. 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*

I.3.1.4. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

To be re-admitted into the programme for a second year of registration, a student must have passed a minimum of **83 credits** by the end of the first year. The programme must be completed after a maximum of **2 years** of registration.

I.3.1.5. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this is a one-year program.

I.3.1.6. DURATION OF STUDY

The minimum duration of the study is **one (1) year**, and the maximum duration is two years.

I.3.1.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **138 credits** and who have met the requirements of the prescribed curriculum and all other relevant UNAM requirements.

I.3.1.8. 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.

I.3.1.9. 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 % attendance of practical classes is required.

I.3.1.10. BACHELOR OF SCIENCE IN SUSTAINABLE TOURISM MANAGEMENT HONOURS - 33HSTM

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
F3880AP	Research Proposal	8	14	None	Compulsory
F3880AD	Design thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4811WH	Heritage tourism	8	20	None	Compulsory
S4811TM	Traditional Marketing in Tourism	8	20	None	Compulsory
S4851TP	Tourism Planning	8	10	None	Compulsory
Year 1 Semester 2					
S4832DM	Innovation and Digital Marketing in Tourism	8	20	None	Compulsory
S4822ER	Project Management	8	10	None	Compulsory
S4872TP	Tourism Policy and Governance	8	20	None	Compulsory
S4853WR	Research project	8	16	**To be offered in both semester 1 and 2**	
Total credits			**138**		

I.3.1.11. TABLE OF EQUIVALENTS FOR THE BSc IN WILDLIFE MANAGEMENT AND CONSERVATION (NQF 8) - 33HWLM

Old Curriculum				New Curriculum			
Module	**Module name**	**level**	**credits**	**Module**	**Module name**	**NQF**	**credits**
None				F3880AD	Design thinking	8	8
WLM3810	Research Projects	8	32	F3880AP	Research proposal	8	14
				S4841WR	Research project	8	16
WLM3802	Ecotourism Marketing and Travel Pan Development	8	8		None (To be offered again)		
WLM3821	Economics of Wildlife Resources	8	8		None (To be offered again)		
WLM3801	Freshwater ichthyology	8	8		None (To be offered again)		
WLM3811	Entomology	8	16		None (To be offered again)		
WLM3881	Environmental impacts analysis	8	12		None (To be offered again)		
WLM3841	Digital Wildlife Photography	8	8		None (To be offered again)		
WLM3822	Wildlife in Agriculture Ecosystems	8	8		None (To be offered again)		
				S4811WP	Protected Areas Management	8	20
				S4811WS	Socio-ecological systems	8	20
				S4821WI	Applied Geo informatics	8	10
				S4812WP	Policy & Legal Framework in Wildlife management	8	18
				S4822WE	Environmental and Social Impact Assessment	8	10
				S4842WG	Conservation Genetics	8	20

I.3.1.12. MODULE DESCRIPTORS FOR BACHELOR OF WILDLIFE MANAGEMENT AND CONSERVATION (HONOURS) - 33HWLM

S4810BR: RESEARCH METHODOLOGY AND PROPOSAL

NQF level: 8
NQF Credits: 14
Contact hours: 4 hours of lectures per week for the semester
Module assessment: CA of **2 tests (65%)**, assignments, Oral & Poster presentation literature review **(15%),** two statistics exercises **(10%),** Oral presentation using PowerPoint **(5%)** & a poster presentation **(5%).**

Module Content: *The purpose of this module is to provide students with knowledge of theoretical aspects of scientific principles that are followed to conduct research, analyze and interpret data, and communicate scientific results properly.* **Ethics of Research and Plagiarism**. **The scientific method:** Logic and scientific, natural observations, asking questions and formulation of hypotheses, Predictions, Types of hypotheses (null, alternative, research); **Chemostatics Topics:** Handling experimental data; Processing and reporting; Significant tests; Regression analysis; Validation of experimental data (quality control); Optimization of parameters; **Use of existing literature:** Using the internet and the university library; Finding and using literature references; Citation of references; **Writing a literature review:** Report Writing; Oral presentation using state-of-the-art equipment; Presenting results as posters.

S4811WS: SOCIO-ECOLOGICAL SYSTEMS

NQF level: 8
NQF Credits: 20
Contact hours: 4 lecture periods and one 3 hours practical every week for the semester.
Module assessment: 50% CA consisting of at least three assessments, and practical assessments.
Examination: **1 x 2-hour examination** (50% of final mark).

Module Content: *This course focuses on the human dimension of environmental change, analyzing how social and ecological processes are intertwined; ecosystem services, political ecology and complex adaptive systems.* **Introduction to Socio:Ecological Systems:** Defining socio:ecological systems (SES) Historical context and emergence of SES as a field of study key concepts, principles, and terminology; **Interdisciplinary Approaches:** Understanding the need for interdisciplinary research Integrating social and ecological sciences Role of anthropology, ecology, economics, and other disciplines in SES research; **Fundamentals of Ecosystems:** Ecosystem structure and function Biodiversity and ecosystem services Ecological resilience and stability; **Human:Environment Interactions:** Human impact on natural systems Feedback loops and feedback mechanisms Coupled human:nature dynamics; **Drivers of Change in SES:** Demographic trends and population growth Land use and land cover change Climate change and its impacts; **Resource Management and Governance:** Natural resource management theories Common:pool resource dilemmas The tragedy of the commons; **Case Studies in SES:** Analysis of real:world socio:ecological systems Examples from various regions and ecosystems Lessons learned and best practices; **Resilience and Adaptation** Resilience theory in SES Adaptive management strategies Building resilience in communities and ecosystems; **Sustainability and Conservation:** Sustainable development goals (SDGs) Conservation biology and SES Balancing economic development and environmental preservation; **Community Engagement and Participation:** Community:based natural resource management Indigenous knowledge and traditional ecological practices The role of local communities in SES governance.

S4811WP:	PROTECTED AREAS MANAGEMENT
NQF level:	8
NQF Credits:	20
Contact hours:	4 lecture periods and one 3 hours practical every week for the semester.
Module assessment:	40% CA consisting of at least three assessments, and practical assessments.
Examination:	1 x 3-hour examination (50% of final mark).

Module Content: *The course aims to provide an overall view on the classification, development, planning and management of protected areas, including national parks, game reserves and community conservation areas, particularly in Namibia, other SADC countries and other parts of Africa.* **Introduction to Namibia's Protected Areas:** Overview of Namibia's diverse protected areas and their significance in conservation; **Namibia's Unique Biodiversity:** Exploration of the country's rich ecological diversity and iconic wildlife species; **Legal and Policy Framework for Protected Areas:** Examination of the legal and policy instruments governing protected areas management in Namibia; **Stakeholders and Partnerships:** Analysis of the roles and collaborations among government agencies, NGOs, local communities, and the tourism industry; **Challenges and Threats to Conservation:** Identification and mitigation of key challenges such as human:wildlife conflict, poaching, and habitat degradation; **Sustainable Management Practices:** Introduction to sustainable conservation practices, including adaptive management and restoration ecology; **Community:Based Conservation and Conservancies:** Exploration of the benefits and success stories of community involvement in conservation efforts; **Ecotourism and Revenue Generation:** Discussions of the role of ecotourism in funding and supporting protected areas management in Namibia.

S4821WI:	APPLIED GEO INFORMATICS
NQF level:	8
NQF Credits:	10
Contact hours:	2 lecture periods and one 2 hours practical every week for the semester.
Module assessment:	50% CA consisting of at least three assessments, and practical assessments.
Examination:	1 x 3-hour examination (50% of final mark).

Module Content: **Introduction to Geo-Informatics**: An overview of geospatial technologies, including GIS, remote sensing, and Global Positioning Systems (GPS), and their relevance to wildlife conservation; **Spatial Data Acquisition**: Techniques for collecting spatial data, including satellite imagery, aerial photography, and ground-based surveys, with a focus on wildlife-specific applications; **Geospatial Data Management**: Strategies for organizing, storing, and managing geospatial data, ensuring data quality and integrity; **Geospatial Analysis**: Methods for spatial data analysis, including spatial interpolation, spatial modeling, and habitat suitability modeling for wildlife species; **Remote Sensing for Wildlife Monitoring**: Utilizing remote sensing data to monitor wildlife populations, track migration patterns, and assess habitat changes; **GIS in Wildlife Habitat Mapping**: Applying GIS tools to create habitat maps, identify critical habitats, and analyze landscape connectivity for wildlife conservation; **Wildlife Tracking and Telemetry**: Use of GPS tracking and telemetry devices to study animal movements, behavior, and migration patterns; **Conservation Planning and Decision Support**: Integrating geospatial information into wildlife conservation planning and decision-making processes, considering ecological corridors and protected areas; **Spatial Data Visualization**: Techniques for creating informative and visually compelling maps and spatial data visualizations for effective communication; **Case Studies and Practical Applications**: Exploration of real-world examples and case studies where geo-informatics played a crucial role in wildlife conservation and management; **Ethical and Legal Considerations**: Discussion of ethical and legal issues related to geospatial data collection, privacy concerns, and data sharing in wildlife research; **Field Work and Data Collection**: Practical field exercises and data collection techniques using geospatial tools and technology.

S4812WP:	POLICY AND LEGAL FRAMEWORK IN WILDLIFE AND TOURISM
NQF level:	8
NQF Credits:	20
Contact hours:	4 lecture periods and one 2-hour practical every week for the semester.
Module assessment:	50% CA consisting of at least three assessments and practical assessments.
Examination:	1 x 2-hour examination (50% of final mark).

Module Content: *This course aims to introduce students to the process of formulating national and international environmental policy, laws and conventions on wildlife management and wildlife conservation. Also covers the existing legal/legislative/policy framework for the management of wildlife resources in Namibia.* **Namibian Wildlife Conservation History**: An overview of the historical context and milestones in wildlife conservation and tourism development in Namibia; **National Conservation Policies**: Examination of Namibia's national policies aimed at preserving biodiversity, including the National Policy on Wildlife Conservation and Utilization; **Wildlife Legislation**: In;depth analysis of relevant wildlife laws, acts, and regulations, such as the Wildlife Conservation and National Parks Act, and their implications for wildlife management; **Community;Based Natural Resource Management**: Exploration of community involvement in wildlife and tourism management, focusing on communal conservancies and their legal framework; **Tourism Regulations**: Understanding the legal requirements and guidelines governing the tourism industry, including permits, licenses, and standards; **Conservation Financing**: Discussion of financial mechanisms and funding sources for wildlife conservation and tourism development in Namibia; **International Agreements and Conventions**: Overview of Namibia's commitments to international agreements and conventions related to wildlife conservation and their legal implications; **Challenges and Emerging Issues**: Analysis of contemporary challenges and emerging legal issues in wildlife and tourism management, such as poaching, climate change, and ecotourism trends; **Policy Evaluation**: Methods for evaluating the effectiveness of policies and legal instruments in achieving conservation and tourism goals.

S4832WG:	CONSERVATION GENETICS
NQF level:	8
NQF Credits:	20
Contact hours:	2 lecture periods and one 2-hour practical every week for the semester.
Module assessment:	50% CA consisting of at least three assessments and practical assessments.
Examination:	1 x 2-hour examination (50% of final mark).

Module Content: *Equip students with a basic understanding of population genetics and genetic diversity within an animal species, and the management implications for spatially restricted conservation areas.* **Introduction to Conservation Genetics:**

Genetic diversity and its role in conservation, Historical and current perspectives on conservation genetics; **Population Genetics:** Principles of population genetics, Genetic drift, gene flow, effective population size, metapopulation dynamics; **Molecular Techniques in Conservation:** DNA extraction and amplification methods, Genetic markers for population analysis, Environmental DNA; **Genetic Diversity Assessment:** Estimating genetic diversity indices, Identifying genetic bottlenecks; **Conservation Genomics:** Next:generation sequencing technologies, Genomic approaches to conservation; **Inbreeding and Genetic Rescue:** Causes and consequences of inbreeding depression, Genetic rescue strategies; **Hybridization and Introgression:** Hybridization in conservation, Managing hybrid populations; **Case Studies in Conservation Genetics:** Analyzing real:world examples of conservation genetics projects, Lessons learned and best practices; **Ethical Considerations:** Ethical issues in conservation genetics research and management, Balancing genetic intervention and natural processes; **Conservation Planning and Decision:Making:** Integrating genetic data into conservation action plans, Designing effective strategies for species preservation;

S4822WE:	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
NQF level:	8
NQF Credits:	10
Contact hours:	2 lecture periods and one 2-hour practical every week for the semester.
Module assessment:	50% CA consisting of at least three assessments and practical assessments.
Examination:	1 x 3-hour examination (50% of final mark).

Module Content: *This course aims to familiarize students with the process and techniques of environmental impact assessments required for fulfilment of sustainable environmental development.* **Environmental Impact Assessment (EIA):** Environmental Impact Assessment (EIA) is a systematic process used to evaluate the potential environmental, social, and economic consequences of proposed projects, policies, or activities before they are implemented; It aims to inform decision;makers and stakeholders about the potential impacts and to identify measures for mitigating adverse effects; **Strategic Environmental Assessments (SEAs):** Strategic Environmental Assessments (SEAs) are a broader form of assessment that goes beyond individual projects and extends to policies, plans, and programs; SEAs evaluate the environmental implications of proposed policies and planning processes, ensuring that sustainability considerations are integrated into decision;making at a strategic level; **Environmental Studies:** Environmental studies encompass a wide range of disciplines, including ecology, geology, hydrology, sociology, and economics; These studies provide the foundation for understanding ecosystems, natural resource dynamics, and the social and economic factors that influence environmental impact; **Environmental Impact on Natural Resources:** Human activities can have profound effects on natural resources, including land, water, air, and biodiversity; These impacts may include habitat destruction, pollution of water bodies, deforestation, and emissions of greenhouse gases, all of which can disrupt ecosystems and harm human well;being; **Impact on Atmosphere:** Activities such as industrial emissions, transportation, and energy production can contribute to air pollution, leading to health issues and environmental damage, including climate change; **Impact on Water Bodies:** Contamination of water bodies through pollutants like chemicals, heavy metals, and excess nutrients can result in reduced water quality, harming aquatic life and posing risks to human health; **Impact on Vegetation and Wildlife:** Development and land;use changes can lead to habitat loss and fragmentation, affecting both plant and animal species; Species may face threats such as reduced food availability, increased competition, and higher risk of extinction; **Environmental Considerations in Physical Planning:** Integrating environmental considerations into physical planning involves identifying areas of ecological significance, setting aside protected areas, and zoning land for compatible land uses to minimize adverse environmental impacts; **Impact Identification, Monitoring, and Mitigation:** Identification of potential impacts, continuous monitoring during and after project implementation, and the application of mitigation measures are essential components of EIA; Mitigation actions aim to reduce or offset adverse impacts and may include habitat restoration, pollution control, and community engagement; **Methods of Identifying Impacts:** Various methods can be employed to identify impacts, including baseline studies, ecological surveys, modeling, and stakeholder consultations; These methods help assess potential effects on ecosystems and human communities; **Monitoring Environmental Impacts:** Monitoring programs involve collecting data on environmental conditions before, during, and after a project; Remote sensing, water quality sampling, and ecological monitoring are common techniques to track changes over time; **Types of Mitigation Actions:** Mitigation measures can be categorized as avoidance (e;g;, selecting alternative project locations), minimization (e;g;, using eco;friendly technologies), and compensation (e;g;, habitat restoration) strategies; The choice of mitigation action depends on the specific project and its impacts; **Formal Environmental Impact Assessment:** A formal EIA process typically involves scoping, impact assessment, public consultation, documentation, decision;making, and post;approval monitoring; It ensures transparency and public participation in decision;making; **Policy and Framework in Namibia:** Namibia has established a comprehensive policy and legal framework to govern environmental impact assessments; Key documents include the Environmental Management Act, the National Policy on Environment and Sustainable Development, and guidelines issued by the Ministry of Environment, Forestry, and Tourism; **Social Aspects of Policy:** Namibia's environmental policies also consider the social aspects, including community engagement, stakeholder consultations, and the equitable distribution of benefits and burdens associated with development projects; Social impact assessments may be conducted to assess the effects on local communities and ensure social sustainability.

S4833WE:	RESEARCH PROJECT
NQF level:	8
NQF Credits:	16
Contact hours:	Individual student consultation equivalent to 1 hour per week
Module assessment:	100% (research proposal, proposal presentation, seminar, presentation of empirical findings).
Examination:	No Examination.

Module Content: *The purpose of this module is to prepare students for carrying out research under direct supervision.* **Choosing a research topic of interest**: in fields such as wildlife management, ecosystem ecology, terrestrial ecology, conservation genetics and related fields. **Formulating a problem statement**: Identify a gap in knowledge and articulate the consequences of general area of interest, learn more about the problem, Review the context of the information, determine relationships between variables, Select and include important variables, Receive feedback and revise. **Conducting a comprehensive literature review**: Citations for the referenced materials. A discussion of the materials' research purpose, methods, and findings. A discussion of how those findings relate to your research. A discussion of the similarities and differences between cited materials and identifying research gap in literature. **Formulating a theoretical/conceptual framework in the chosen field:**

Examine your dissertation title and research problem, Brainstorm on what you consider to be the key variables in your research, Review related literature to find answers to your research question, List the constructs and variables that might be relevant to your study. **Cite sources in a scholarly manner using the approved referencing system:** Explore common methods of referring to a source document in the text of an essay, dissertation or assignment. These methods are direct quotation from another source, paraphrasing or summarising material, and citing the whole of a source document. Use of various referencing tools such as Mendeley, Endnote, RefWorks, and Zotero help to organize, manage and format citations. **Design research instruments and collect field data for qualitative and quantitative research**. **Data analysis using the appropriate packages and presentation** of findings. Academic writing skills. Effective communication skills including seminar presentation.

I.4. MASTER OF PHILOSOPHY IN WILDLIFE MANAGEMENT AND CONSERVATION - 33MWMC

For admission requirements, please see I.5.1/2

I.5. MASTER OF PHILOSOPHY IN SUSTAINABLE TOURISM MANAGEMENT - 33MSTM

I.5.1. ADMISSION REQUIREMENTS

To be eligible for this MPhil, the candidate must have completed a **Bachelor's honours degree at NQF level 8 in Wildlife Management and Conservation** or equivalent qualification from a recognised institution of higher education, with an average of at least 60%. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA). Along with the application, candidates need to submit a detailed research proposal highlighting their proposed area of research, objectives, methodology and a review of existing literature. The research proposal will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

I.5.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or high score/percentage obtained in the Bachelor's Honours for the MPhil.

I.5.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

I.5.4. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

I.5.5. ASSESSMENT CRITERIA

Assessment will be done based on examination the thesis/dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of 50% marks in their thesis/dissertation work. In addition to the thesis/dissertation, candidates must appear for a **Viva Voce (oral examination)** conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the MPhil programme.

I.5.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240 credits** and who have met all other relevant UNAM requirements.

I.5.7. ARTICULATION OPTIONS

MPhil: This qualification may articulate to a PhD in the related field of study.

I.5.8. QUALITY ASSURANCE ARRANGEMENTS

This programme shall be reviewed after every 5 years or earlier as may be required. The programme shall be submitted to NQA for the NQF registration. The programme shall be submitted to NCHE for accreditation. The quality assurance of student supervision and examination of theses/dissertations will be done in line with the University's Higher Degrees Policy, Rules, and Regulations.

I.5.9. MASTER OF PHILOSOPHY IN WILDLIFE MANAGEMENT AND CONSERVATION - 33MWMC CURRICULUM

I.5.10. MASTER OF PHILOSOPHY IN SUSTAINABLE TOURISM MANAGEMENT - 33MSTM CURRICULUM

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16		Compulsory
S6933WM/ S6933WT	Thesis	9	240		Compulsory
TOTAL CREDITS FOR PROGRAM			**240**		

I.6. DOCTOR OF PHILOSOPHY IN WILDLIFE MANAGEMENT AND CONSERVATION (33DWMC)

For admission requirements, please see I.7.1/2

I.7. DOCTOR OF PHILOSOPHY IN SUSTAINABLE TOURISM MANAGEMENT (33DSTM)

I.7.1. ADMISSION REQUIREMENTS

To be eligible for this PhD programme, the candidate must have completed a **Master's degree at NQF level 9 in Wildlife Management and Conservation** or equivalent in a relevant discipline from a recognised higher education institution, with an average of at least 60%. Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA). Along with the application, candidates need to submit a detailed research proposal highlighting their proposed area of research, objectives, methodology and a review of existing literature. The research proposal will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per Section B. 3.3. of the Higher Degrees Policy Procedures, Rules and Regulations, the Department reviews the submitted concept note and identifies potential supervisor(s) and recommends the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

I.7.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates will be based on additional criteria such as equity considerations or high score/percentage obtained in the **MPhil or MSc for PhD** qualification.

I.7.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B).

I.7.4. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

I.7.5. ASSESSMENT CRITERIA

Assessment will be done based on examination the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of a 50% marks in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

I.7.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **360 credits** and who have met all other relevant UNAM requirements.

I.7.7. ARTICULATION OPTIONS

PhD: N/A as this is the highest qualification in this field of study.

I.7.8. QUALITY ASSURANCE ARRANGEMENTS

This programme shall be reviewed after every 5 years or earlier as may be required. The programme shall be submitted to NQA for the NQF registration. The programme shall be submitted to NCHE for accreditation. The quality assurance of student supervision and examination of theses/dissertations will be done in line with the University's Higher Degrees Policy, Rules, and Regulations.

I.7.9. DOCTOR OF PHILOSOPHY IN WILDLIFE MANAGEMENT AND CONSERVATION (33DWMC)

I.7.10. DOCTOR OF PHILOSOPHY IN SUSTAINABLE TOURISM MANAGEMENT (33DSTM)

CODE	COURSE	NQF	CREDITS	(Co-requisites)/Pre-requisites	COMPULSORY
Year 1 Semester 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	16		Compulsory
S7033WM/ S7033WT	Dissertation	10	360	**All coursework modules**	Compulsory
TOTAL CREDITS FOR PROGRAM			**360**		

I.7.11. MODULE DESCRIPTORS FOR THE MASTER'S & DOCTOR OF PHILOSOPHY OF WILDLIFE MANAGEMENT & CONSERVATION

S6933WM/ S6933WT/ S7033WM/ S7033WT:	THESIS/ DISSERTATION
NQF level:	9
NQF Credits:	240
Contact hours:	2 contact hours per fortnightly for two semesters with supervisor.
Module assessment:	The thesis will be examined as per University Postgraduate guidelines.
Examination:	No Examination.

Module Content: Choosing a research topic of interest: in fields such as biodiversity conservation, wildlife management, ecosystem ecology, terrestrial ecology, conservation genetics, ecotourism, environmental science and related fields. **Formulating a problem statement**: Identify a general area of interest, learn more about the problem, Review the context of the information, determine relationships between variables, Select and include important variables, Receive feedback and revise. **Conducting a comprehensive literature review**: Citations for the referenced materials. A discussion of the materials' research purpose, methods, and findings. A discussion of how those findings relate to your research. A discussion of the similarities and differences between cited materials and identifying research gap in literature. **Formulating a theoretical/conceptual framework in the chosen field:** Examine your dissertation title and research problem, Brainstorm on what you consider to be the key variables in your research, review related literature to find answers to your research question, List the constructs and variables that might be relevant to your study. **Cite sources in a scholarly manner using the approved referencing system:** Explore common methods of referring to a source document in the text of an essay, dissertation or assignment. These methods are direct quotation from another source, paraphrasing or summarising material, and citing the whole of a source document. Use of various referencing tools such as Mendeley, Endnote, RefWorks, and Zotero help to organize, manage and format citations. **Design research instruments and collect field data for qualitative and quantitative research**. **Data analysis using the appropriate packages and presentation** of findings. Academic writing skills. Effective communication skills including seminar presentation.

J. DEPARTMENT OF COMPUTING, MATHEMATICAL & STATISTICAL SCIENCES

J.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.

J.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):

- ✓ **1 subject on NSSCAS** level with a minimum **e** or higher.
- ✓ **4 subjects on NSSCO** level with a **D** or higher.
- ✓ **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.

J.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):

- ✓ 5 subjects on ordinary level (NSSCO) **OR** a combination of ordinary level (NSSCO) and higher level (NSSCH).
- ✓ 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.

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 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%.**

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. **Candidates may also be admitted into the programme through the national indigenous or marginalized scheme, regional representation, as well as quota and equity systems.**

J.1.4. CONDITIONAL ADMISSION PATHWAYS TO DIPLOMA PROGRAMMES

The following conditional admission pathways are also available for entrance into Diplomas:

- ✓ 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;
- ✓ 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;
- ✓ 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;
- ✓ 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.

J.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.

J.1.6. 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.

J.1.7. 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.

J.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 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.**

J.1.9. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.1.9.1. 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.

J.1.9.2. EXTENDED ENROLLMENT

Extended enrolment **does not apply** to the Diploma in Applied Statistics.

J.1.10. ADVANCEMENT AND PROGRESSION RULES

J.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 **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.**

J.1.11. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification shall be awarded to candidates credited with a minimum of **370** credits, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

J.1.12. 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.

J.1.13. 33DSST - DIPLOMA IN APPLIED STATISTICS (LEVEL 6) FULL-TIME: 3 YEARS - MAIN CAMPUS

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		C
S2411SS	The Statistical System	4	12		C
S2431SB	Basics of Statistics	4	12		C
S2411DB	Business of Information Systems	4	12		C
Year 1 Semester 2					
S2412SI	Index Numbers and Time series	4	12		C
S2432SD	Basic Demography and Epidemiology	4	12		C
S2472SB	Basic Data Processing	4	14		C
S3412MS	Mathematics Support II	4	12		C
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
G3511EA	Basic Microeconomics	5	12		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
G3512EB	Basic Macroeconomics	5	12		C
Total credits			**122**		

YEAR 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
Core Semester					
W3700IC	CWIE	6	24		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	G3511EA	C
S3601SN	Non-parametric Statistics	6	8	S2511SP; S2502SS	C
Year 3 Semester 2					
G3612EA	Intermediate Microeconomics II	6	14	G3511EA;G3512EB	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**		

J.2. DIPLOMA IN COMPUTING 33DCMP (OSHAKATI CAMPUS)

J.2.1. 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.

J.2.2. ADMISSION REQUIREMENTS

J.2.2.1. ADMISSION BASED ON NAMIBIAN SCHOOL LEAVING CERTIFICATES 2021 ONWARDS

To qualify for admission to the Diploma in Computing based on the 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):

- ✓ 1 subject on NSSCAS level with a minimum **e** or higher.
- ✓ 4 subjects on NSSCO level with a **D** or higher.
- ✓ English and Mathematics must be at a minimum of **D** at the NSSCO level.

Other subjects can either be Computer Science, Physics, Chemistry, Geography, Accounting, Economics, Development Studies, etc.

J.2.2.2. 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):

- ✓ 5 subjects on ordinary level (NSSCO) **OR** a combination of ordinary level (NSSCO) and higher level (NSSCH).
- ✓ 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.

J.2.2.3. ALTERNATE PATHWAYS TO ADMISSION

J.2.2.3.1. 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%.**

J.2.2.3.2. 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.**

J.2.2.4. CONDITIONAL ADMISSION PATHWAYS TO DIPLOMA PROGRAMMES

The following conditional admission pathways are also available for entrance into Diplomas:

- ✓ 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;
- ✓ 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;
- ✓ 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;
- ✓ 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.

J.2.3. 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 equity matters as outlined by National Policies.

J.2.4. 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.

J.2.5. 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.

J.2.6. 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.

J.2.7. 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.

J.2.7.2. EXENTENDED ENROLMENT

Extended enrolment does not apply to the Diploma in Computing.

J.2.8. 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.

J.2.9. 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.2.10. ARTICULATION ROUTE

The qualification may serve as an entry point to a BSc. Degree in Computing undergraduate degrees.

J.2.11. 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.

J.2.12. 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.

J.2.13. 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**		

J.2.13.1. MODULE EQUIVALENTS FOR THE DIPLOMA IN APPLIED STATISTICS

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 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

J.2.13.2. MODULE EQUIVALENTS FOR THE DIPLOMA IN COMPUTING

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*		

J.2.13.3. 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

J.2.13.4. MODULE DESCRIPTORS FOR THE DIPLOMA IN APPLIED STATISTICS & DIPLOMA IN COMPUTING

S2411SS:	THE STATISTICAL SYSTEM
NQF Level	5
NQF Credits	12
Contact Hours	4 contact lecture periods per week for one semester
Course Assessment:	50% of the final mark.
Examination:	**50%** (1 x 3-hour examination paper)

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
NQF Credits	12
Contact Hours	4 lecture periods and 1 tutorial session (2 hours) per week for one semester
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
NQF Credits	NCB
Contact Hours	4 lecture periods and 1 tutorial session (2 hours) per week for one semester
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
NQF Credits	12
Contact Hours	4 contact lecture periods per week for one semester
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
NQF Credits	12
Contact Hours	4 contact lecture periods per week for one semester
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
NQF Credits	12
Contact Hours	4 contact lecture per week for one semester; one practical session per week for one semester
Course Assessment:	**CA** consist of 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
NQF Credits	6
Contact Hours	2 contact lecture per week for one semester: one tutorial session per week for one semester
Course Assessment:	**50%** consisting of written and/or online assessments: Test(s) and quiz(es)
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
NQF Credits	6
Contact Hours	2 contact lecture periods per week for one semester; 1 hour tutorial
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 p**roportions (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
NQF Credits	8
Contact Hours	Up to 2 contact lecture periods per week for one semester
Course Assessment:	**100 CA** will be individual and group practical activities, quizzes, tests, assignments.
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
NQF Credits:	12
Contact Hours:	Up to 4 contact lecture periods per week for one semester.
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
NQF Credits:	14
Contact Hours:	Up to 4 contact lecture periods per week and one practical session per week for one semester
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
NQF Credits:	8
Contact Hours:	4 contact lecture periods per week for six weeks.
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
NQF Credits:	12
Contact Hours:	4 contact lecture periods per week for one semester.
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
NQF Credits:	12
Contact Hours:	4 contact lecture periods per week for one semester.
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
NQF Credits:	12
Contact Hours:	4 contact lecture periods per week for one semester.
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
NQF Credits:	14
Contact Hours:	4 contact lecture per week for one semester; one practical session per week for one semester.
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
NQF Credits:	14
Contact Hours:	Up to 4 contact lecture periods per week and one practical session per week for one semester
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
NQF Credits:	14
Contact Hours:	4 contact lecture per week for one semester; one practical session per week for one semester
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
NQF Credits:	14
Contact Hours:	4 contact lecture per week for one semester; one practical session per week for one semester.
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**
NQF Credits:	**7**
Contact Hours:	Up to 2 contact lecture periods and 1 Practical session per week for one semester
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
NQF Credits:	14
Contact Hours:	4 contact lecture per week for one semester; one practical session per week for one semester
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: 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**
NQF Credits:	**7**
Contact Hours:	2 contact lecture periods and 1 Practical session per week for one semester
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**
NQF Credits:	**16**
Contact Hours:	4 contact lecture periods and 3 hour practical session per week for one semester
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**
NQF Credits:	**16**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
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**
NQF Credits:	**16**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
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**
NQF Credits:	**16**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
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**
NQF Credits:	**16**
Contact Hours:	4 contact lecture periods and 3-hour practical session per week for one semester
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.3. QUALIFICATION: BACHELOR OF SCIENCE IN STATISTICS – 33BSST -3 YEARS FULL-TIME

J.3.1. Purpose

The purpose of this programme is to provide the successful candidates with both theoretical & practical foundation and 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, the 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 into honours degrees and thereafter into master's and doctoral qualifications in Statistics. With an introduction of more computing modules than in the previous 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.3.2. ADMISSION REQUIREMENTS

J.3.2.1. ADMISSION 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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 who 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.3.2.2. 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):

- ✓ 2 subjects on NSSCH with **4** or higher,
- ✓ 3 subjects on NSSCO with **C** or higher, and additionally,
- ✓ English and Mathematics must be at minimum **C** on NSSCO level.

OR

- ✓ 3 subjects on higher level (NSSCH) with **4** or higher,
- ✓ 2 subjects on ordinary level (NSSCO) with **C** or higher,
- ✓ 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 who 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.3.2.3. ALTERNATE PATHWAYS TO ADMISSION

J.3.2.3.1. 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.3.2.3.2. 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.3.2.3.3. 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.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.

J.3.4. 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.3.5. 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.3.6. 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 **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 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.
- ✓ 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.3.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.3.7.1. 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.3.7.2. 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:

- ✓ 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 fifth year of registration

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

J.3.8. ADVANCEMENT AND PROGRESSION RULES

J.3.8.1. 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.3.8.2. 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%. Further to the above **all First-Year modules** must be passed before a student can register for any Third-Year module.

J.3.9. 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 all other relevant UNAM requirements.

J.3.10. ARTICULATION ROUTES

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

J.3.11. 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**
S3531DP	Programming Fundamentals I	5	14		**C**
Year 1 Semester 2					
S3512ST	Statistical Methods	5	12		**C**
S3512SC	Fundamentals of Statistical Computing	5	14	(S3511SF)	**C**
S3512MC	Calculus II	5	12		**C**
S3532DP	Programming Fundamentals II	5	14		**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 Skills	5	2		**C**
U3420PJ	Project Management Skills	4	2		**C**
U3420RT	Entrepreneurship Skills	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 Statistics	6	8	S3511SF, S3512ST	**C**
S3631DI	Introduction to Database Systems	6	16		**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.4. BACHELOR OF SCIENCE IN POPULATION STUDIES – 33BSPO (3 YEAR FULL-TIME)

The 21st Century is faced with challenges of a 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.4.1. ADMISSIONS REQUIREMENTS

J.4.1.1. 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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 enrol for an EXTENDED PROGRAMME that will take one year longer. i.e., students who 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.4.1.2. 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 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.

J.4.1.3. 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.4.2. ALTERNATE PATHWAYS TO ADMISSION

J.4.2.1. 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.4.2.2. 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.4.2.3. 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.

J.4.3. 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.

J.4.4. 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.

J.4.5. 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 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.4.5.1. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.4.5.1.1. 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.4.5.1.2. 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.4.6. ADVANCEMENT AND PROGRESSION RULES

J.4.6.1. 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.4.6.2. 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.4.7. 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.4.8. 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.4.9. QUALIFICATION: BACHELOR OF SCIENCE IN POPULATION STUDIES – (33BSPO) - 3 YEARS

YEAR 1

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP/ELECT
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	(S3511SF)	
S3512UF	Fundamentals of Population Theory	5	12		
Total credits			**122**		

YEAR 2

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMPULSORY/ELECTIVE
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	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	Linear 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.5. BACHELOR OF SCIENCE IN MATHEMATICS 33BSMM - 3 - YEAR FULL-TIME

J.5.1. ADMISSION REQUIREMENTS

J.5.1.1. ADMISSION 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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.5.1.2. 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):

- ✓ 2 subjects on NSSCH with **4** or higher,
- ✓ 3 subjects on NSSCO with a **C** or higher, and additionally,
- ✓ English and Mathematics must be at a minimum **C** on the NSSCO level.

OR

- ✓ 3 subjects on higher level (NSSCH) with 4 or higher,
- ✓ 2 subjects on ordinary level (NSSCO) with **C** or higher,
- ✓ 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.5.1.3. ALTERNATE PATHWAYS TO ADMISSION

J.5.1.3.1. 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%**.

J.5.1.3.2. 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.

J.5.2. 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.

J.5.3. 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.

J.5.4. 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.

J.5.5. 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.**

J.5.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/PROGRAMME

J.5.6.1. 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

J.5.6.2. 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.

J.5.7. ADVANCEMENT AND PROGRESSION RULES

J.5.7.1. 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

J.5.7.2. 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%.

J.5.8. 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.

J.5.9. 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.

J.5.10. QUALIFICATION: BACHELOR OF SCIENCE IN MATHEMATICS - 33BSMM - 3 YEARS

YEAR 1

CODE	COURSE NAME	NQF	CREDITS	CO/PREREQUISITES	COMP/ELECT
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**
S3532DP	Programming Fundamentals II	5	14		**C**
Total Credits			**124**		

Year 2

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	S3532DP	**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) /S3532DP	**E**
S3602ZM	CWIE: Prep	6	8		**C**
Total Credits			**136**		

Year 3

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**		

J.6. BACHELOR OF SCIENCE IN QUANTITATIVE FINANCE – 33BSQF (3 YEAR FULL-TIME)

J.6.1. ADMISSION REQUIREMENTS

J.6.1.1. ADMISSION 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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**.

J.6.1.2. 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):

- ✓ 2 subjects on NSSCH with **4** or higher,
- ✓ 3 subjects on NSSCO with **C** or higher, and additionally,
- ✓ English and Mathematics must be at minimum **C** on NSSCO level.

OR

- ✓ 3 subjects on higher level (NSSCH) with **4** or higher,
- ✓ 2 subjects on ordinary level (NSSCO) with **C** or higher,
- ✓ 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**.

J.6.2. ALTERNATE PATHWAYS TO ADMISSION

J.6.2.1. 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.6.2.2. 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.6.3. 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.

J.6.4. 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.

J.6.5. 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.

J.6.6. 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.**

J.6.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.6.7.1. 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

J.6.7.2. 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.

J.6.8. ADVANCEMENT AND PROGRESSION RULES

J.6.8.1. 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 in addition to at least **84** second-year credits

J.6.8.2. 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%.

J.6.9. 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.

J.6.10. 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.

J.6.11. QUALIFICATION: BACHELOR OF SCIENCE IN QUANTITATIVE FINANCE – (33BSQF) - 3 YEARS FULL-TIME

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**
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**		

Year 2

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 & Integral Transforms	6	14	S3511MC **OR** S3512MC	**C**
S3611SP	Probability Theory	6	14	S3511SF, S3512MC	**C**
S3611MF	Financial Derivatives analysis	6	14	S3512MQ	**C**
S3601MN	Numerical Mathematics	6	8	S3511MC	**C**

Year 2 Semester 2					
S3612SD	Distribution Theory	6	14	(S3611SP), S3512MC	**C**
S3602MN	Numerical Analysis	6	8	(S3601MN) / S3512MC	**C**
S3612ML	Linear Algebra II	6	14	S3511ML	**C**
S3602ZM	CWIE prep	6	8		**C**
Total credits			**118**		

Year 3

CODES	COURSE NAMES	NQF	CREDITS	CO/PRE-REQUISITES	COMP-C/ELECT-E
3rd Year's Core Semester Modules					
W3700IC	CWIE	7	24	S3602ZP or S3602ZQ	**E**
Year 3 Semester 1					
S3711MP	Investment Analysis & Portfolio Management	7	16	S3611MF	**C**
S3711SV	Survival Analysis	7	16		**C**
S3711SR	Linear Models	7	18		**C**
S3731MA	Analysis of Equities and Valuation	7	16	S3611MF	**C**
Year 3 Semester 2					
S3732MF	Fixed Income analysis	7	16	S3611MF	**C**
S3712MR	Risk Analysis and Modelling	7	16	S3612SD	**C**
S3712SO	Stochastic Processes	7	16	S3612SD	**C**
Total credits			**138**		

J.7. BACHELOR OF SCIENCE IN DATA SCIENCE – 33BSDS (3 YEAR FULL-TIME)

J.7.1. PURPOSE

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.

J.7.2. ADMISSION REQUIREMENTS

J.7.2.1. ADMISSION 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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.

J.7.2.2. 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):

- ✓ 2 subjects on NSSCH with **4** or higher,
- ✓ 3 subjects on NSSCO with **C** or higher, and additionally,
- ✓ English and Mathematics must be at minimum **C** on NSSCO level.

OR

- ✓ 3 subjects on higher level (NSSCH) with **4** or higher,
- ✓ 2 subjects on ordinary level (NSSCO) with **C** or higher,
- ✓ 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.

J.7.2.3. ALTERNATE PATHWAYS TO ADMISSION

J.7.2.3.1. 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.7.2.3.2. 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.7.3. 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.

J.7.4. 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.

J.7.5. 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.

J.7.6. 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.

J.7.7. 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

J.7.8. 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%.**

J.7.9. 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.

J.7.10. 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.

J.7.11. 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 1 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 1 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, S3512MC	**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	Linear 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	(S3711SR)	**C**
S3722DS	Data Security and Data Privacy	7	16		**C**
S3732DL	Artificial Intelligence and Machine Learning	7	18		**C**
Total credits			**130**		

J.8. BACHELOR OF SCIENCE IN COMPUTING

J.8.1. ADMISSION REQUIREMENTS

J.8.1.1. ADMISSION 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):

- ✓ 2 subjects on NSSCAS level with **d** average or higher, of which one should be Mathematics.
- ✓ 3 subjects on NSSCO level with **C** average or higher, and
- ✓ 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.

J.8.1.2. 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):

- ✓ 2 subjects on NSSCH with **4** or higher,
- ✓ 3 subjects on NSSCO with **C** or higher, and additionally,
- ✓ English and Mathematics must be at minimum **C** on NSSCO level.
- ✓ 3 subjects on higher level (NSSCH) with **4** or higher,
- ✓ 2 subjects on ordinary level (NSSCO) with **C** or higher,
- ✓ 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.

J.8.2. ALTERNATE PATHWAYS TO ADMISSION

J.8.2.1. 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.

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%**.

J.8.2.2. 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.8.3. 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.

J.8.4. 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.

J.8.5. 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.**

J.8.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL

J.8.7. 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.

J.8.7.1. 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.

J.8.8. ADVANCEMENT AND PROGRESSION RULES

J.8.8.1. 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%**.

J.8.9. 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.

J.8.10. 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.

J.8.11. 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**		

J.8.11.1. 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.

J.8.11.2. 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

J.8.11.3. 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	S3601SN	Nonparametric Statistics	6
STS3771	Statistical Inference	7	S3711SI	Statistical Inference	7
STS3732	Data Processing	7	S3712SA	Data Processing	7
STS3772	Linear Models	7	S3711SR	Linear 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*		

J.8.11.4. 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: Linear 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.*

J.8.11.5. MODULE DESCRIPTOR FOR STATISTICS AND POPULATION STUDIES

S3512UF:	FUNDAMENTALS OF POPULATION THEORY
NQF Level	5
NQF Credits	12
Contact Hours	4 lecture periods per week for one semester; 1 tutorial session per week for one semester 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
NQF Credits	12
Contact Hours	4 lecture periods per week for one semester; 1 tutorial session per week for one semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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
NQF Credits	12
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	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
NQF Credits	12
Contact Hours	4 lectures plus 3 practical's hours per week/ semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (project using real data assessed through presentation and written report).
Pre(Co)-requisites:	(S3511SF)

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.**

S3512ST:	STATISTICAL METHODS
NQF Level	5
NQF Credits	**12**
Contact Hours	4 lectures periods per week for one semester; 1tutorial sessions per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	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).

S3601UD:	DEMOGRAPHIC DATA
NQF Level	6
NQF Credits	8
Contact Hours	2 lecture periods per week for one semester. 2 tutorial sessions per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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*).

S3611UD:	INTRODUCTION TO DEMOGRAPHIC ANALYSIS
NQF Level	**6**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial per 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 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**
NQF Credits	**14**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial per week for one semester
Course Assessment:	**50%** of a combination of tests, quizzes, assignments, & 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.

S3611SS:	SURVEY SAMPLING
NQF Level	**6**
NQF Credits	**14**
Contact Hours	4 lectures periods per week for one semester. 1 tutorial session per week for one semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisites:	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**.

S3601SN:	NONPARAMETRIC STATISTICS
NQF Level	**6**
NQF Credits	**8**
Contact Hours	2 lecture hours + 2 practical hours per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	S3511SF and S3512ST

Course description: Goodness of fit tests: Chi- square test, Kolmogorov – Smirnov test; Nonparametric Statistics, nonparametric tests: Median tests, Sign test, Wilcoxon Signed Rank test, Mann – Whitney U test, Kruskal – Wallis H test, Friedman's test, Spearman Rank Correlation test; Contingency tables: inferences for two way contingency tables: chi-square tests of independence, comparing proportions: difference in proportions, odds ratio and risk ratio; Trend test, Test for correlated contingency table; Summary measures of association: binary variables: phi and Cramer's V; ordinal measure of association: Kendall's tau, Goodman and Kruskal's gamma, Somer's d; nominal measures of association; Summary measures of agreement: kappa.

S3611SP:	PROBABILITY THEORY
NQF Level	**6**
NQF Credits	**14**
Contact Hours	4 lecture hours + 1 tutorial hour per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Prerequisites:	S3511SF and S3512MC

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.

S3612SD:	DISTRIBUTION THEORY
NQF Level	**6**
NQF Credits	**14**
Contact Hours	4 lecture hours + 1 tutorial hour per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)

Pre(Co)-requisites: S3512MC and (S3611SP)

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**.

S3612SE:	EXPERIMENTAL DESIGN & ANALYSIS OF VARIANCE
NQF Level	**6**
NQF Credits	**14**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	S3511SF and 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**
NQF Credits	**24**
Contact Hours	As determined by the specific activity.
Course Assessment:	CWIE portfolio 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.

S3711UD:	DEMOGRAPHIC METHODS & ANALYSIS I
NQF Level	**7**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for one semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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.

S3712UM:	POPULATION MIGRATION & URBANIZATION
NQF Level	**7**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper).

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**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for one semester.
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)

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.

S3711SI:	STATISTICAL INFERENCE
NQF Level	**7**
NQF Credits	**18**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	S3611SP and S3612SD

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**.

S3711SR:	LINEAR MODELS
NQF Level	**7**
NQF Credits	**18**
Contact Hours	4 lectures plus 3-hours practical per week/ semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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**.

S3711SV:	SURVIVAL ANALYSIS
NQF Level	**7**
NQF Credits	**16**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)

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.**

S3712SO:	STOCHASTIC PROCESSES
NQF Level	**7**
NQF Credits	**16**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	**CA** 50% of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	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**
NQF Credits	**16**
Contact Hours	4 lecture periods per week for one semester. 1 tutorial session per week for 1 semester.
Course Assessment:	**CA** 50% of written and/or online assessments: Test(s) and Quiz(es).
Examination:	**50%** (1 x 3-hour examination paper)
Pre-requisites:	S3611SP

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.

S3712SA:	DATA PROCESSING
NQF Level	**7**
NQF Credits	**18**
Contact Hours	4 lectures plus 3-hour practical per week/ semester
Course Assessment:	**CA** 50% of two tests and two assignments.
Examination:	**50%** (project using real data assessed through presentation and written report).
Pre(Co)-requisites:	(S3711SR)

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.**

J.8.11.6. MODULE DESCRIPTOR FOR QUANTITATIVE FINANCE, DATA SCIENCE AND COMPUTING

G3511EA:	BASIC MICROECONOMICS
NQF Level	5
NQF Credits	12
Contact Hours	4 hours per week for semester
Course Assessment:	50% of the final mark consists of two tests and one assignment.
Examination:	**50%** (1 x 3-hour examination paper)

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
NQF Credits	12
Contact Hours	4 hours per week for semester
Course Assessment:	Consists of two tests and one assignment
Examination:	**50%** (1 x 3-hour examination paper)

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
NQF Credits	12
Contact Hours	4 hours lecture & 2 tutorials per week for semester
Course Assessment:	50% of the final mark consists of two tests and one assignment.
Examination:	**50%** (1 x 3-hour examination paper)

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
NQF Credits	12
Contact Hours	4 hours lecture & 2 tutorials per week for semester
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
NQF Credits	12
Contact Hours	4 hours lectures per week for semester +1 tutorials per week
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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
NQF Credits	14
Contact Hours	4 lecture periods + 1 practical session per week for one semester
Course Assessment:	**CA** 50% consisting of a combination of written and/or online assessments: Test(s) and Quiz(es).
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
NQF Credits	14
Contact Hours	4 hours lectures per week for semester
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.

S3611MD:	DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS
NQF Level	6
NQF Credits	14
Contact Hours	4 hours lectures per week for semester
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.

S3601MN:	NUMERICAL MATHEMATICS
NQF Level	**6**
NQF Credits	**8**
Contact Hours	2 lecture hours + 2 practical hours per week for one semester
Course Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments); Examination 50% (1 × 3-hour paper).

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.

S3620DM:	DIGITAL MARKETING, SOCIAL MEDIA & WEB ANALYTICS
NQF Level	**6**
NQF Credits	**8**
Contact Hours	1 lecture hour + 1 practical session per week for one semester
Course Assessment:	**CA 100% based:** Tests, Quizzes, presentations,Assignment portfolios, Basic Machine Learning group project

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**
NQF Credits	**8**
Contact Hours	2 lecture hours + 2 practical hours per week for one semester
Course Assessment:	CA **50%** of 1 (one) test and one programming assignment in the form of a mini-project.
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**
NQF Credits	**8**
Contact Hours	2L per week
Course Assessment:	The CA **50%** will be compiled from three written class tests.
Examination:	**50%** (1 x 3-hour examination paper)

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**
NQF Credits	**16**
Contact Hours	4 hours lectures per week for 16 weeks and one practical session per week for one semester.
Course Assessment:	**CA 50%** of the final mark consisting of a minimum of 3 (three) tests.
Examination:	**50%** (1 x 3-hour examination paper)

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**
NQF Credits	**8**
Contact Hours	4 lecture hours + 1 practical session per week for one semester.
Course Assessment:	**CA 50%:** Tests, Quizzes, presentations, Assignment portfolios & Industrial group project
Examination:	**50%** (1 x 3-hour examination paper)

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**
NQF Credits	**16**
Contact Hours	4 hours lectures per week for semester
Course Assessment:	CA **50%** 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**
NQF Credits	**16**
Contact Hours	4 hours lectures per week for semester
Course Assessment:	CA **50%** 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.

S3712MF:	FIXED INCOME ANALYSIS
NQF Level	**7**
NQF Credits	**16**
Contact Hours	4 hours lectures per week for semester
Course Assessment:	CA **50%** will be written and/or online assessments: Test(s) and quiz(es).
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**
NQF Credits	**16**
Contact Hours	4hours lectures per week for semester
Course Assessment:	CA **50%** will be written and/or online assessments: Test(s) and quiz(es).
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**
NQF Credits	**24**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	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**
NQF Credits	**9**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
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**
NQF Credits	**18**
Contact Hours	**4** lecture hours + 1 practical session per week for one semester
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, understanding 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**
NQF Credits	**18**
Contact Hours	**4** lecture hours + practical session per week for one semester
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; Regularization; Model interpretation; GPU optimization 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**
NQF Credits	**2**
Contact Hours	**1** lecture hour + 1 practical session per week for one semester
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
NQF Credits	12
Contact Hours	4 hours lectures per week for semester +1 tutorials per week
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
NQF Credits	4
Contact Hours	One contact hour lecture period and one-hour practical session per week for one semester
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
NQF Credits	14
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
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. **Basic Data Types**: lists, dictionaries, and tuples; **Functions and Methods:** Create Parameterless and Parameterised Methods, Return Results.

S3532DP:	PROGRAMMING FUNDAMENTALS II
NQF Level	5
NQF Credits	14
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
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
NQF Credits	14
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments)
Examination:	**50%** (1 x 3-hour examination paper)

Course description: Introduction to Computing: Computing Concepts, History of Computing, Computing Discipline; **Internet and World Wide Web:** History of the Internet and World Wide Web, Internet, Intranets, & extranets, World Wide Web (Web pages, web server, browsers, Internet Service Providers, MAC addresses vs Internet Protocol addresses, Uniform Resource Locator, hyperlinks, search engine architecture, web crawling and indexing); **Data Communications:** 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); **Practical Computing (**Web Design using HTML and CSS): *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
NQF Credits	14
Contact Hours	Four contact hours lecture periods and three hours practical session per week for one semester
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, Throughput, Analog and Digital Signals, Noise; **Modulation:** Analog and Digital Modulation; **Multiplexing & Duplexing:** Techniques i.e. Frequency Division Multiplexing and Time Division Multiplexing; **Routing and Switching:** routing algorithms, optimal path, challenges in routing, Switching Systems in Telecommunication Networks (Circuit Switched Networks, Packet switching, Message Switching). **Protocols**: TCP, IP, HTTP/HTTPS, UDP, FTP, SMTP, POP3, IMAP, DHCP; Standards and International Bodies; **Error Detection and Correction:** Error classification, Redundance, Methods of Error detection and Error correction; **Security and Privacy:** confidentiality, integrity, and availability (CIA) Triad; Malware: Viruses, Worms, Trojans, Spyware, Adware; Threats, Vulnerability and Attacks : Ransomware, DoS, Social engineering, Phishing, Session 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:** Ethical, Legal and Ethical Dilemmas, Copyright, and Intellectual Property Rights.

S3532DI:	INTRODUCTION TO DIGITAL ELECTRONICS
NQF Level	5
NQF Credits	14
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
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
NQF Credits	14
Contact Hours	4 hours lectures per week for semester
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
NQF Credits	14
Contact Hours	4 hours lectures per week for semester
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.

S3620CT:	COMPUTATIONAL THINKING
NQF Level	**6**
NQF Credits	**8**
Contact Hours	**2** hours lecture periods and one and a half hours practical session per week for one semester
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

Course description: Introduction toCcomputational Thinking: Useful concepts and techniques; **Pillars of computational thinking:** decomposition, pattern recognition, data representation and abstraction, and algorithms. **Expressing and analyzing 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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.

Course description: Introduction to Databases: Databases and database users, Database systems concepts and architectur; **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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.

Course description: Basic structures: sets, functions, sequences; **Logic and Proofs; Set Theory, Number Theory, Probability Theory, and Graph Theory**; **Induction. Counting. Relations. Graphs. Trees.**

S3420CE:	COMPUTER ETHICS
NQF Level	4
NQF Credits	**2**
Contact Hours	**1** contact hour lecture period and a half hour practical session per week for one semester
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
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**
NQF Credits	**16**
Contact Hours	2 hours lecture periods and one and a half hours practical session per week for one semester
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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
Course Assessment:	**50%**, minimum of 2 tests and 2 assignments.
Examination:	**50%** - 1 x 3-hour examination paper.

Course description: 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, ACID Transactions, Concurrency Control Techniques, Database Recovery Techniques, Database Security. **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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

Course description: Network architecture: Packetization, 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**
NQF Credits	**16**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester
Course Assessment:	CA 50% (Minimum of 2 tests and 2 assignments); Examination 50% (1 × 3-hour paper).
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**
NQF Credits	**24**
Contact Hours	4 lectures plus 1 hour tutorial per week/ semester
Course Assessment:	The CWIE portfolio shall be evaluated according to a rubric & 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 organization/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**
NQF Credits	**18**
Contact Hours	**4** lecture hours + 1 practical session per week for one semester
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, understanding 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**
NQF Credits	**18**
Contact Hours	**4** lecture hours + practical session per week for one semester
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**
NQF Credits	**2**
Contact Hours	**1** lecture hour + 1 practical session per week for one semester
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.

S3731DS:	SOFTWARE ENGINEERING
NQF Level	**7**
NQF Credits	**18**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
Course Assessment:	CA 50% (Minimum of 2 tests and 2 assignments); Examination 50% (1 × 3-hour paper).

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**
NQF Credits	**18**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester**.**
Course Assessment:	CA 50% (Minimum of 2 tests and 2 assignments); Examination 50% (1 × 3-hour paper).

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**
NQF Credits	**18**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
Course Assessment:	**100%** Continuous assessment (Tests, Assignments and Practical Projects).

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**
NQF Credits	**18**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** (1 x 3-hour examination paper)

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**
NQF Credits	**18**
Contact Hours	**2** contact hours lecture periods and a half hours practical session per week for one semester.
Course Assessment:	CA 50% (Minimum of 2 tests and 2 assignments); Examination 50% (1 × 3-hour paper).

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 Lifecycle; **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**
NQF Credits	**9**
Contact Hours	**4** contact hours lecture periods and three hours practical session per week for one semester.
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** (1 x 3-hour examination paper)

Course description: History of operating systems; **Types of Operating Systems**; Computer System Structures; Operating System Structures; process management (Process Concept, Concurrent Processes, Process Scheduling, Threads, **CPU Scheduling**, Virtualisation, Concurrent processes, 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 studyies**(Linux, windows, Symbian).

S3722DH:	HUMAN COMPUTER INTERACTION
NQF Level	**7**
NQF Credits	**9**
Contact Hours	**4** contact hours lecture periods and a half hours practical session per week for one semester.
Course Assessment:	**50%** (Minimum of 2 tests and 2 assignments.
Examination:	**50%** (1 x 3-hour examination paper)

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; interface design and user centred design process in software development: tangible interfaces; haptic interaction; and mobile interfaces. Interface usability evaluation methodologies and practice.

J.9. BACHELOR OF SCIENCE IN DATA SCIENCE HONOURS (33BHSD)

J.9.1. ADMISSION REQUIREMENTS

To qualify for the **Bachelor of Science in Data Science Honours**, a candidate must hold a Bachelor of Science degree at NQF Level 7 in Data Science from the University of Namibia or an equivalent qualification from a recognised institution of higher education.

J.9.2. ASSESSMENT CRITERIA

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.

J.9.3. ARTICULATION OPTIONS

After the successful completion of all the requirements, the qualification serves as an entry point to any of the following related qualifications:

- ✓ NQF level 9 MSc in IT, MSc in Data Science-or other related areas (coursework & thesis) at UNAM and other regional universities
- ✓ NQF level 9 MPhil at UNAM and other regional universities.

J.9.4. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.9.5. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.9.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted to the School of Science for a second year of registration, a student must have passed a minimum of **64 credits** by the end of 1st year.

J.9.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.9.8. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **136 credits** and who have passed all the modules prescribed for this degree programme.

J.9.9. CURRICULUM FRAMEWORK FOR THE BACHELOR OF SCIENCE IN DATA SCIENCE HONOURS (33BHDS)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
S4880DR	Data Science Foundations	8	8	None	Compulsory
Year 1 Semester 1 & 2					
S4883DP	Data Science Research Project	8	16	None	Compulsory
Year 1 Semester 1					
S4851DE	Data Engineering	8	18	None	Compulsory
S4831DV	Data Visualisation and Presentation	8	18	None	Compulsory
S4821DM	Applied Machine Learning & Deep Learning	8	9	None	Compulsory
S4831DP	Programming for Data Scientists	8	9	None	Compulsory
Year 1 Semester 2					
S4822DB	Big Data Analytics and Data Mining	8	9	None	Compulsory
S4842DE	Data Ethics, Governance and Privacy	8	9		Compulsory
S4812DH	Higher Performance Computing	8	9	None	Compulsory
Select ONE from these modules					
S4832DL	Large Language Models for Data Science	8	9	None	Elective
S4802MD	Dynamical Systems and Applications	8	9	None	Elective
Total credits			**138**		

J.9.1. MODULE DESCRIPTOR FOR THE BACHELOR OF SCIENCE IN DATA SCIENCE HONOURS

S4883DP:	DATA SCIENCE RESEARCH PROJECT
NQF level:	8
Credits:	16
Contact hours:	2-hour consultation every other week for two semesters.
Module assessment:	100% of oral presentation (25%), written report (Mini-Theis) (35%) & a project demonstration (40%).

Module Content: Engage students in an independent and/or supervised capstone research project with real-life scenario focused on data science, culminating in the development of a demonstrable product that demonstrates their research findings. A written report is required. Therefore, research results shall be presented in a form of a short project report (Mini-Thesis) of about 35 pages in length, excluding the references/bibliography. A final data-driven project must be demonstrated and examined by at least two (2) independent internal or external examiners and be defended by the student in an oral examination (i.e., presentation based on the project).

S4880DR:	DATA SCIENCE FOUNDATIONS
NQF level:	8
Credits:	8
Contact hours:	2 hours contact lecture periods per week & a 2-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper (50%)

Module Content: **Introduction to Data Science:** core concepts, different types of data; **Data science process:** process Overview, different steps, data collection, data preprocessing, data analysis; **Data science projects identification:** potential impact, data availability, and feasibility, project evaluation and success metrics. **Data Science Methods:** Machine Learning, Artificial Intelligence; **Applications of Data Science:** Explore various industry domains (Modelling, Smart Manufacturing, and Industrial Automation), Understand specific use cases and challenges; **Project Management for Data Science:** project scoping, planning, objectives, scheduling and tracking progress. Ethical issues in data science: Informed Consent, Data Storage, Security and Privacy, Ethical Principles.

S4832DL:	LARGE LANGUAGE MODELS FOR DATA SCIENCE
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Introduction to LLMS**: What are LLMs; Open AI Movement, **Transformers in NLP:** Transformers in Production; History of Transformers; **Training Transformers:** Transfer Learning; Transformer Architecture overview; Self-attention; multi-head attention and Feed Forward Network; **Large Language Models:** GPT-3; GPT-3 use cases; Challenges of GPT-3; GLaM; Megatron-Turing NLG Model; Gopher; Scaling laws; Chinchilla; BIG-bench; PaLM; OPT and BLOOM; **How to Use and Adapt LLMs:** Prompt Engineering; **Dissecting LLMs:** Data, Model Scaling and Risks; **Beyond Current LLMs:** Models and Applications

S4812DH:	HIGHER PERFORMANCE COMPUTING (HPC)
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Introduction to Higher Performance Computing (HPC):** Fundamental concepts, Application of high-performance computing, HPC Cluster Overview, Cluster and cloud computing, HPC Networking, Installation of an HPC cluster using ROCKS; **Design of HPC Cluster – Ecosystem:** Requirement Analysis, Building blocks of HPC, Hardware and software selection process, Design of HPC Cluster, Architecture and Cluster software, Cluster building tools, Multicore-architecture. **HPC System Management and Monitoring:** Processor usage, Memory usage, Network usage; **Storage and Backup Management:** Redundant Array of Independent Disks (RAID), Direct-attached Storage (DAS), Network-attached Storage (NAS), Storage Area Networks (SAN), Backup management; **Resource Management:** Job scheduling, Job submitting, managing jobs and Managing nodes; **Security and Privacy:** HPC Roll, Backup, etc. **High-Performance Data Analysis:** Introduction to the basics of Parallel Programming/Shared Memory Programming (OpenMP)/Message Passing Programming (MPI)/GPU programming.

S4851DE:	DATA ENGINEERING
NQF level:	8
Credits:	18
Contact hours:	4 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Introduction:** What is Data Engineering? Data Engineering Life Cycle; Python Fundamentals; Analyzing & Exploring Data; Intro to the Cloud; linux; Data Gathering - working with APIs + Scraping; Serving data with APIs; **Software Engineering:** Write and Deploy a Web Service; Continuous Integration and Deployment; Testing methodologies; Networking; Jenkins & Docker; Microservices & Kubernetes; Software Engineering Best Practices; **SQL:** Data Modelling & ERD; SQL Operations & Functions; Stored Procedures; Query Optimization and profiling; Extract, Transform and load; Transactions & ACID; **Big Data:** Columnar, Key Value; Object store and Graph Databases;Hadoop (Yarn, HDFS); Spark; Stream processing; SQL like big data; Kafka & Data Lakes.

S4822DB:	BIG DATA ANALYTICS AND DATA MINING
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Overview of Big Data Analysis: What is big data; Why is big data important; Types of data sources and data gathering. **Big Data Architecture & Hadoop:** Evolution of Big data Architecture; BigData Architecture Use cases; History and Milestones of Hadoop; Hadoop Architecture and Cluster. **Big Data tools:** Apache Hadoop; Apache Spark; Hive. **Reporting, Graphing and Plotting:** Frequency Curves, Histograms, 2d and 3d Scatter Diagrams, graphical representation information, contour plots, 3d plots, tools such as R, iPython and Tableau. **Overview of Data Mining:** What is data mining? Diverse types of data mining tasks; Data mining tools. **Data Mining Algorithms:** Decision trees; Support vector machines; Naive Bayes; K-means clustering; Principal component analysis.

S4831DV:	DATA VISUALIZATION AND PRESENTATION
NQF level:	8
Credits:	18
Contact hours:	4 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Data Visualization and Presentation: What is data visualization; Different types of data visualizations; Principles of good visualization; Tools and techniques for creating visualizations. **Data Exploration and Visualization:** Exploring data with visualizations; Choosing the right visualization for the data. **Communicating with Data Visualizations:** The elements of good data communication and presentation; Designing effective data visualizations and presentation; Data Visualization and Presentation Tools. **Advanced Data Visualization Techniques:** Interactivity; Animation; Storytelling.

S4831DP:	PROGRAMMING FOR DATA SCIENTISTS
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Programming for Data Science: Overview of data science and the role of programming; Introduction to programming languages (Python, R, MATLAB); **Basic programming concepts** (variables, data types, loops, conditionals); Data structures (lists, tuples, dictionaries); Functions and libraries in data science; **Data Manipulation with Programming**: Data import and export; Data cleaning and preprocessing; Exploratory data analysis (EDA); Data visualization with libraries like Matplotlib and Seaborn; **Advanced Data Manipulation:** Working with databases (SQL and NoSQL) Handling missing data; Combining and reshaping datasets; Time series data manipulation **Data Analysis and Statistics:** Introduction to statistical analysis with programming; Hypothesis testing and confidence intervals; Descriptive and inferential statistics; Regression analysis with programming languages; **Version Control and Collaboration: Introduction** to version control systems (e.g., Git); Collaborative coding and project management tools; Code documentation and best practices for collaboration; **Scripting and Automation:** Writing scripts for automating data-related tasks; Scheduled tasks and batch processing **Developing data pipelines with programming languages**: Code Optimization and Performance; Identifying and resolving performance bottlenecks; **Efficient data processing techniques**: Parallel and distributed computing.

S4821DM:	APPLIED MACHINE LEARNING AND DEEP LEARNING
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests, five practicals and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Learning: Linear regression; Logistic regression; Decision trees; Support vector machines. **Unsupervised Learning:** K-means clustering; Principal component analysis; Expectation-maximization. **Reinforcement Learning:** Markov decision processes; Q-learning; Policy gradients. **Introduction to Deep Learning:** Deep Learning History; Applications of Deep learning. **Neural networks:** Pattern Recognition; Decision Trees; Bayes Learning; Layer Perceptrons; Support Vector Machines; Optimization of Deep Neural; Data Wrangling. **Convolutional Neural Networks:** Convolution and Pooling Layers; Convolutional Neural Network Architectures; Deep Visualization. **Structured Neural Representations:** Graph Neural Networks; Tree Neural Networks; Sequence Neural Networks; Neural Attention Models.

S4842DE:	DATA ETHICS, GOVERNANCE AND PRIVACY
NQF level:	8
Credits:	9
Contact hours:	2 hours contact lecture periods per week & a 3-hour practical session per week for one semester.
Module assessment:	50% consisting of at least two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction: What are ethics? Why data science needs ethics; **Basic codes of ethics:** History; Standards currently used in the IT industry; **Consent:** Principle of informed consents; Responsible data collection **Ownership: Data** Ownership; Data Privacy; **Data Anonymization Techniques:** K-anonymity; L-diversity; T-closeness; **Data Validity:** Basic concepts of data validity: Examples of data validity; **Fairness in Data Analytics:** Analytical Fairness; Preventing Algorithms with discrimination; Preventing biased judgeme.

J.10. BACHELOR OF SCIENCE IN MATHEMATICS HONOURS (33HMAT)

J.10.1. ADMISSION REQUIREMENTS

To qualify for the **Bachelor of Science in Mathematics Honours (NQF Level 8)**, a candidate must hold a Bachelor of Science degree in Mathematics (NQF Level 7) from the University of Namibia or an equivalent qualification from a recognized institution of higher learning.

J.10.2. ASSESSMENT CRITERIA

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.

J.10.3. ARTICULATION OPTIONS

This qualification may articulate into a **Master's Degree in Mathematics** or related field of study at NQF level 9.

J.10.4. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.10.5. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.10.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted into the programme, a student must have successfully completed a minimum of **68 credits** by the end of the first year of registration. The programme must be completed after a maximum of 2 years of registration.

J.10.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.10.8. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **138 credits** and who have passed all the modules prescribed for this degree programme.

J.10.9. CURRICULUM FRAMEWORK FOR THE BACHELOR OF SCIENCE IN MATHEMATICS HONOURS (33HMAT)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
CORE SEMESTER 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
YEAR 1 SEMESTER 1 & 2					
S4883MR	Research Project	8	16	None	Compulsory
YEAR 1 SEMESTER 1					
S4811MT	General Topology	8	20	None	Compulsory
S4831MM	Measure and Integration	8	20	None	Compulsory
S4801ME	Elements of Category Theory	8	10	None	Compulsory
S4801MF	Fluid Mechanics	8	10	None	Compulsory
YEAR 1 SEMESTER 2					
OPTION A: PURE MATHEMATICS (50 CREDITS)					
S4812MF	Introduction to Functional Analysis	8	20	None	Compulsory
S4812MA	Commutative Algebra & Algebraic Geometry	8	20	None	Compulsory
S4802MT	Differential Topology	8	10	None	Compulsory
OPTION B: APPLIED MATHEMATICS (50 CREDITS)					
S4812MF	Introduction to Functional Analysis	8	20	None	Compulsory
S4812MC	Calculus of Variations	8	20	None	Compulsory
S4802MN	Advanced Numerical Analysis	8	10	None	Compulsory
Total credits			**138**		

J.10.9.1. TABLE OF EQUIVALENTS: BACHELOR OF SCIENCE IN MATHEMATICS HONOURS

Table of equivalents during the phasing-in/out period					
Old Module(s)	NQF Level	NQF Credits	New Module(s)	NQF Level	NQF Credits
MAT3810: Research Project	8	32	To be offered again to the repeating students as per the table above.	8	32
MAT3811: General Topology	8	16	To be offered again to the repeating students as per the table above.	8	16
MAT3871: Numerical Analysis II	8	16	To be offered again to the repeating students as per the table above.	8	16
MAT3851: Complex Analysis I	8	16	To be offered again to the repeating students as per the table above.	8	16
MAT3802: Category Theory	8	16	To be offered again to the repeating students as per the table above.	8	16
MAT3822: Normed Vector Spaces	8	8	To be offered again to the repeating students as per the table above.	8	8
MAT3852: Complex Analysis II	8	16	To be offered again to the repeating students as per the table above.	8	16
MAT3872: Algebra	8	16	To be offered again to the repeating students as per the table above.	8	16

J.10.9.2. MODULE DESCRIPTOR FOR THE BACHELOR OF SCIENCE IN MATHEMATICS HONOURS

S4883MR:	RESEARCH PROJECT
NQF level:	8
Credits:	16
Contact hours:	3 practical hours per week for 2 semesters
Module assessment:	100% of presentations of research plan/ proposal & results **(50%),** research report **(50%).**
Examination:	No Examination

Module Content: This one-year course constitutes the research and report writing for an available project within the various fields of Mathematics. The actual content of the course will depend on the topic of research selected by the student, from the available specialized fields within the department. Guided by an academic supervisor (or supervisors), whose highest qualification is at least an MSc in the relevant field, the student will submit a written research report of the project upon completion of the research activities.

S4811MT:	GENERAL TOPOLOGY
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Topological spaces: Topologies on a set, topological spaces, open and closed sets, continuous functions, interiors amd closures, boundary, base of a topology, neighbourhoods, accumulation point, derived set, dense and nowhere dense sets, subspace and product topologies. **Convergence and Filters:** Sequences and filters, neighbourhood filters, base of a filter, ultrafilters, refinements, cluster points and limits of a sequence and of a filter. **Countability and Separability:** Separable topological spaces, countability axioms, meagre sets, set of second category, Separation axioms: *T*0-, *T*1-, and *T*2-spaces. **Connectedness**: Connected subset, connected subsets of the real line, connected components, totally disconnected topological spaces, locally connected topological spaces. **Compactness**: Quasicompact spaces, compact space, locally quasicompact spaces, countably quasicompact space, Heine-Borel theorem.

S4831MM:	MEASURE AND INTEGRATION
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Measure and integration: Measure spaces, σ-algebras, measures, finite and σ-finite measures, and measurable functions, integration, the case of the Lebesgue measure, Vitali set, The Fatou lemma, dominated convergence theorem, monotone convergence theorem, the Radon-Nykodim theorem, L^p-spaces; **Abstract measure theory:** Outer measures, measure on an algebra, measurability, the Carathéodory theorem, product of measures, the Fubini-Tonelli theorem.

S4802MN:	ADVANCED NUMERICAL ANALYSIS
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Approximation:** Least – square approximations, fitting non-linear curves by least squares, Legendre and Cebyshev polynomials, approximation of functions with the use of economized power series, approximations with rational functions, norms and analysis of error. **Optimisation:** First and second order Taylor approximations, the steepest descent method, zeroing the gradient and conjugate gradient methods. **Convergence of numerical integration methods:** Newton-Coates integration formulas, trapezoidal rule, Romberg integration, Simpson's rules, Gaussian quadrature, adaptive integration. **Numerical solution to ordinary differential equations:** convergence criteria, Taylor series method, Euler and modified Euler methods, Runge-Kutta methods, Milne's method, the shooting method for boundary value problems, finite difference methods.

S4812MF:	INTRODUCTION TO FUNCTIONAL ANALYSIS
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Topological Vector Spaces**: Normed vector spaces, Banach spaces, weak topology, dual space, the Hahn-Banach theorem, Hilbert spaces, weak convergence. **Distribution theory:** test functions, distributions, tempered distributions, operations on distributions, convolution, Fourier transform, Sobolev spaces, applications to PDE. **Operators on Hilbert spaces:** bounded, unbounded, normal, compact, self-adjoint operators, spectral theory for self-adjoint operators, applications to the Schrödinger equation.

S4812MA:	COMMUTATIVE ALGEBRA AND ALGEBRAIC GEOMETRY
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Commutative Algebra: Rings, ideals, prime and maximal ideals, unique factorization, localization of a ring, local rings, Noetherian rings, integral dependence, Noether normalization, modules over a ring, tensor product of modules, flatness, Nakayama's lemma, Hilbert's Nullstellensatz; Algebraic Geometry: spectrum of a ring, Zariski topology, introduction to sheaves, the functor of points, (quasi)-coherent sheaves, the relative point of view, properties of morphism of schemes, the Proj construction, regularity and smoothness, divisors, Čech cohomology, curves, elliptic curves, the Riemann-Roch theorem, application to robotics, optimization theory and cryptography.

S4801ME:	ELEMENTS OF CATEGORY THEORY
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Categories, functors, natural transformations, the Yoneda lemma, monomorphisms, epimorphisms, isomorphisms, product, coproducts, equalizers, coequalizers, pullbacks, pushouts, limits, colimits, (co)complete categories, limits preserving functors, filtered colimits, interchange of (co)limits, limits in categories of functors, adjoint functors, equivalences, reflective subcategories, Kan extensions, categories of fractions, orthogonal subcategories, 2-categories.

S4812MC:	CALCULUS OF VARIATIONS
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Extrema of several-variable functions, the geodesic. Fundamental Lemma of calculus of variations: Euler-Lagrange equation, Hamilton's principle of least action; minimal surface of revolution, the brachistochrome, geodesics on the sphere.Second variation: Hessian and Jacobi operators. **Noether's** theorem and conservation laws: Noether's theorem, isoperimetric problems, Lagrange multipliers; variational partial differential equations:, examples, Noether's theorem for multidimensional Lagrangians. Problems and applications: probability and maximum entropy, geodesics, harmonic maps and Killing vectors, geodesics on a surface of revolution.

S4802MT:	DIFFERENTIAL TOPOLOGY
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Topological manifold, differentiable manifolds, smooth maps, diffeomorphism, the tangent and the cotangent space, vector bundles, operations on bundles, the tangent and cotangent bundle, submanifolds, immersions and embeddings, partition of unity, Riemannian structures, transversality, orientability, differential equations and flows on manifolds, cobordism.

S4801MF:	FLUID MECHANICS
NQF level:	8
Credits:	10
Contact hours:	2 lecture hours and 2 practical hours per week for one semester.
Module assessment:	50% consisting of at least tests (80%) and assignments (20%).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: properties: Fluid motion and coordinate systems, forces in a fluid, integral and differential forms of the fluid dynamic equations, the material derivative. Fluid statics: pressure due to gravity, hydrostatic pressure in a compressed fluid, buoyancy and stability of floating objects; One-dimensional flow, the Bernoulli equation; Viscous incompressible flow; Dimensional analysis and high-Reynolds-number flows; Laminar boundary-layer flow.

J.11. BACHELOR OF SCIENCE IN QUANTITATIVE RISK MANAGEMENT HONOURS (33BSQH)

J.11.1. ADMISSION REQUIREMENTS

To qualify for the **Bachelor of Science in Quantitative Risk Management Honours**, a candidate must hold a Bachelor of Science degree at NQF Level 7 in Quantitative Finance from the University of Namibia or an equivalent qualification from a 247ecognized institution of higher education.

J.11.2. ASSESSMENT CRITERIA

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.

J.11.3. ARTICULATION OPTIONS

After successful completion of this degree, a candidate can articulate into the **MSc in Financial Mathematics** or any relevant Masters programme.

J.11.4. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.11.5. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.11.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted to the School of Science for this programme, a student must have a minimum of **50% of the credits for** the entire programme, including credits of core modules and is required to finish the programme within 3 years of first registration.

J.11.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.11.8. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **138 credits** and who have passed all the modules prescribed for this degree programme.

J.11.9. CURRICULUM FRAMEWORK: BSC IN QUANTITATIVE RISK MANAGEMENT HONOURS (33BSQH)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
CORE SEMESTER 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
YEAR 1 SEMESTER 1 & 2					
S4883MR	Research Project	8	16	None	Compulsory
YEAR 1 SEMESTER 1					
S4811MQ	Quantitative Risk Analysis	8	18	None	Compulsory
S4811SM	Multivariate Distribution theory	8	18	None	Compulsory
S4821DM	Applied Machine Learning and Deep Learning	8	10	None	Compulsory
YEAR 1 SEMESTER 2					
S4862MF	Principles of Corporate Finance	8	9	None	Compulsory
S4812ST	Time series and Forecasting	8	20	None	Compulsory
S4852MA	Actuarial Mathematics	8	9	None	Compulsory
S4812MS	Stochastic Calculus for finance	8	18	None	Compulsory
Total credits			**138**		

J.11.9.1. TABLE OF EQUIVALENTS: BACHELOR OF SCIENCE IN QUANTITATIVE FINANCE HONOURS

New Curriculum Modules		Old Curriculum Modules	
Module Code	Module Name	Module Code	Module Name
S4811SM	Multivariate Distribution theory	STS3812	Multivariate Distribution theory
S4812ST	Time Series and Forecasting	STS3872	Time Series and Forecasting
S4812MS	Stochastic Calculus for Finance	MAF3812	Stochastic Calculus for Finance

J.11.9.2. MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN QUANTITATIVE RISK MANAGEMENT HONOURS (33BSQH)

S4811MQ: QUANTITATIVE RISK ANALYSIS

NQF level: 8
Credits: 18
Contact hours: 4 lectures plus 1 hour tutorial per week/ semester.
Module assessment: **40%** two tests, two tutorial tests and two assignments.
Examination: 1x3-hour Examination paper **(60%)**

Module Content: Risk concepts: Risk definition; fundamental elements of any given risk - the event, the probability, and the severity (or impact); Risk Attitudes and Appetites; Classifying Risk; Risk Breakdown Structure; Risk Taxonomy; Risk Facets and other Risk Categories. The Risk Management Structure: Risk Management Planning; Risk Governance; Identifying Risks - Documentation Reviews, Information-Gathering Techniques, Checklists, Assumptions Analysis and Diagramming Techniques; Risk Avoidance; Risk Transference; Risk Mitigation; Risk Acceptance; Risk analysis methods- qualitative risk analysis and quantitative risk analysis; Risk Management Techniques within the field of Quantitative Risk Analysis (Technique Description, When Applicable, Inputs and Outputs, Major Steps in Applying the Technique, Use of Results, Resource Requirements, Reliability and Selection Criteria): Expert Interviews; Expected Monetary Value; Decision Tree/network Analysis; Sensitivity Analysis; Monte Carlo Simulations; and Risk Reviews and Audits.

S4811SM: MULTIVARIATE DISTRIBUTION THEORY

NQF level: 8
Credits: 18
Contact hours: 4 lectures plus 1 hour tutorial per week/ semester.
Module assessment: **50%** two tests, two tutorial tests and two assignments.
Examination: 1x3-hour Examination paper **(50%)**

Module Content: 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 T^2 - Statistics 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 Statistics) and it is unknown (i.e. F -Statistics); Correlation: Estimation of population mean vector and correlation matrix, Distribution and tests associated with the Pearson correlation coefficient.

S4821DM:	APPLIED MACHINE LEARNING AND DEEP LEARNING
NQF level:	8
Credits:	9
Contact hours:	4 lectures plus 1 hour tutorial per week/ semester.
Module assessment:	**50%** two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Supervised Learning: Linear regression; Logistic regression; Decision trees; Support vector machines. **Unsupervised Learning:** K-means clustering; Principal component analysis; Expectation-maximisation. **Reinforcement Learning:** Markov decision processes; Q-learning; Policy gradients. **Introduction to Deep Learning:** Deep Learning History; Applications of Deep learning. **Neural networks:** Pattern Recognition; Decision Trees; Bayes Learning; Layer Perceptrons; Support Vector Machines; Optimisation of Deep Neural; Data Wrangling. **Convolutional Neural Networks:** Convolution and Pooling Layers; Convolutional Neural Network Architectures; Deep Visualisation. **Structured Neural Representations:** Graph Neural Networks; Tree Neural Networks; Sequence Neural Networks; Neural Attention Models.

S4822MP:	PRINCIPLES OF CORPORATE FINANCE
NQF level:	8
Credits:	18
Contact hours:	2 lecture periods per week for one semester.
Module assessment:	**40%** two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(60%)**

Module Content: Goals and Governance of the Firm - How to Calculate Present Values - Valuing Bonds -The Value of Common Stocks - Net Present Value and Other Investment Criteria- Making Investment Decisions with the Net Present Value Rule. Introduction to Risk and Return - Portfolio Theory and the Capital Asset Pricing Model - Risk and the Cost of Capital - Efficient Markets and Behavioral Finance - overview of Corporate Financing - How Corporations Issue Securities - Credit Risk and the Value of Corporate Debt - The Many Different Kinds of Debt – Leasing - Managing Risk - Managing International Risks - Financial Analysis - Financial Planning - Working Capital Management.

S4812MS:	STOCHASTIC CALCULUS FOR FINANCE *(also 33BSFH)*
NQF level:	8
Credits:	18
Contact hours:	4 hours of lectures per week for 14 weeks.
Module assessment:	**40%** CA from three tests.
Examination:	1x3-hour Examination paper **(60%)**

Module Content: Introduction to measure theory and integration – definitions and properties, General probability theory: brief introduction, expectations, measures, Jensen's inequality, Radon-Nikodym Theorem (without proof).Discrete time models: discrete time formalism, martingales and arbitrage opportunities, complete markets and option pricing.Brownian motion: Random walk, symmetric random walks, Martingale property, limiting distribution, definition of Brownian motion, distribution, filtration and Martingale property for Brownian motion, reflection principle. Ito's integral: simple integrand, general integrands, Ito-Doeblin formula, Black-Scholes-Merton equation-Risk neutral pricing- stochastic interest rate modeling.

S4812ST:	TIME SERIES ANALYSIS AND FORECASTING
NQF level:	8
Credits:	**20**
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests and two assignments (5**0%)**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: 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.

S4812MA:	ACTUARIAL MATHEMATICS *(also 33BSFH)*
NQF level:	8
Credits:	18
Contact hours:	4 lectures plus 1 hour tutorial per week/ semester.
Module assessment:	**40%** two tests, two tutorial tests and two assignments.
Examination:	1x3-hour Examination paper **(60%)**

Module Content: The deterministic life contingencies model – deterministic vs stochastic models – basic deterministic model – life expectancy- life annuities – life insurance – insurance and annuity reserves – fractional durations – continuous payments – multiple life contracts – multiple decrement theory – stochastic life contingencies model – survival distribution and failure times: discrete and continuous cases – stochastic approach to insurance and annuities – minimum failure time – hazard functions – the common shock model – copulas.

J.12. BACHELOR OF SCIENCE IN FINANCIAL MATHEMATICS HONOURS (33BSFH)

J.12.1. ADMISSION REQUIREMENTS

To qualify for the **Bachelor of Science Honours (NQF Level 8) in Financial Mathematics**, a candidate must hold a Bachelor of Science degree at NQF Level 7 in Quantitative Finance from the University of Namibia or equivalent qualification from a recognized institution of higher learning.

J.12.2. ADDITIONAL SELECTION CRITERIA

Depending on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or highest scores obtained in the bachelor's degree (NQF Level 7).

J.12.3. ASSESSMENT CRITERIA

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.

J.12.4. ARTICULATION OPTIONS

This qualification articulates into a **Master's Degree in Financial Mathematics** or any relevant field of study at NQF Level 9.

J.12.5. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.12.6. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.12.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted into the programme, a student must have successfully completed a minimum of **68 credits** by the end of the first year of registration. The programme must be completed after a maximum of 2 years of registration.

J.12.8. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.12.9. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **136 credits** and who have passed all the modules prescribed for this degree programme.

J.12.10. CURRICULUM FRAMEWORK FOR BACHELOR OF SCIENCE IN FINANCIAL MATHEMATICS HONOURS (33BSFH)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
CORE SEMESTER 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
YEAR 1 SEMESTER 1 & 2					
S4883MR	Research Project	8	16	None	Compulsory
YEAR 1 SEMESTER 1					
S4811SM	Multivariate Distribution theory	8	18	None	Compulsory
S4831MM	Measure and Integration	8	20	None	Compulsory
S4821MD	Dynamical Systems for Finance	8	10	None	Compulsory
YEAR 1 SEMESTER 2					
S4822MF	Financial Engineering and Loss Reserving	8	10	None	Compulsory
S4812MA	Actuarial Mathematics	8	20	None	Compulsory
S4812MS	Stochastic Calculus for finance	8	20	None	Compulsory
Total credits			**136**		

S4880MR:	RESEARCH PROPOSAL
NQF level:	8
Credits:	14
Contact hours:	3 practical hours per week for 2 semesters
Module assessment:	**100%** CA of presentations of research proposal.
Examination:	No Examination

Module Content: *The purpose of this module is to expose the learner to survey appropriate literature relevant to the chosen topic of research and present the research proposal.* The students will choose the topic of research in conjunction with supervisor and carry our literature survey to prepare and present a research proposal.

S4883MR:	RESEARCH PROJECT
NQF level:	8
Credits:	16
Contact hours:	3 practical hours per week for 2 semesters
Module assessment:	**100%** CA of presentations **(50%)** (research plan, proposal &results) and research report **(50%).**
Examination:	No Examination

Module Content: This one-year course consists of research and report writing for an available project within the various fields of Mathematics. The course's content will depend on the topic of research selected by the student, from the available specialized fields within the department. Guided by an academic supervisor (or supervisors), whose highest qualification is at least an MSc in the relevant field, the student will submit a written research report of the project upon completion of the research activities.

S4811SM:	MULTIVARIATE DISTRIBUTION THEORY
NQF level:	8
Credits:	18
Contact hours:	4 lectures per week/ semester.
Module assessment:	**CA (50%):** consisting of a minimum of three tests **(80%)** and assignments **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: 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 T2- Statistics 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 Statistics) and it is unknown (i.e. F-Statistics); Correlation: Estimation of population mean vector and correlation matrix, Distribution and tests associated with the Pearson correlation coefficient.

S4831MM:	MEASURE AND INTEGRATION
NQF level:	8
Credits:	20
Contact hours:	4 lecture hours + 2 practical hours per week for one semester.
Module assessment:	**CA (50%):** consisting of a minimum of three tests **(80%)** and assignments **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: **Measure and integration**: Measure spaces, σ-algebras, measures, finite and σ-finite measures, and measurable functions, integration, the case of the Lebesgue measure, Vitali set, The Fatou lemma, dominated convergence theorem, monotone convergence theorem, the Radon-Nykodim theorem, L^p-spaces; **Abstract measure theory:** Outer measures, measure on an algebra, measurability, the Carathéodory theorem, product of measures, the Fubini-Tonelli theorem.

S4821MD:	DYNAMICAL SYSTEMS FOR FINANCE
NQF level:	8
Credits:	9
Contact hours:	2 lecture hours + 1 tutorial hour per week for one semester.
Module assessment:	**CA (50%):** consisting of a minimum of three tests **(80%)** and assignments **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to matrix diagonalization – eigen values, eigen vectors and Diagonalization, Jordan canonical form. Definition of dynamical systems - one dimensional linear system - discrete time and continuous time linear system - applications in banking and finance - two or more dimensional linear systems - iagonalizable and non-diagonalizable linear systems - nonlinear systems - fixed points - stability - linearization in one dimension and multidimension - Lyapunov's method – gradient systems - one dimensional non-linear systems with no periodicity - Poincare Bendixon method – Hopf bifurcation - Discrete time -stability of periodic points bifurcation - Chaotic systems- Lorenz system and chaos- Rossler system.

S4822MF:	FINANCIAL ENGINEERING AND LOSS RESERVING
NQF level:	8
Credits:	9
Contact hours:	2 lecture hours + 1 tutorial hour per week for one semester.
Module assessment:	**CA (50%):** consisting of a minimum of three tests **(80%)** and assignments **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Theories of financial market behaviour: rational expectations theory – rational choice theory – stochastic interest rate of return models, Asset valuations: Mean-variance portfolio theory – Asset pricing models – single and multifactor models for investment returns – simple models for credit risk, Liability valuations: - ruin theory – run-off triangles.

J.13. BACHELOR OF SCIENCE IN POPULATION STUDIES HONOURS (33HPOS)

J.13.1. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science Honours in Population Studies (NQF Level 8)**, the applicant must be in possession of a Bachelor of Science degree in Population Studies (NQF Level 7) from the University of Namibia or (an equivalent qualification from a recognized institution of higher education).

J.13.2. ADDITIONAL SELECTION CRITERIA

In the case of demand for applications exceeding capacity, **the department may run a placement test** for all the potentially eligible candidates, whereby preference shall be given progressively to candidates with higher scores.

J.13.3. ASSESSMENT CRITERIA

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.

J.13.4. ARTICULATION OPTIONS

This qualification may articulate into a **MASTER'S DEGREE IN APPLIED STATISTICS AND DEMOGRAPHY** or any other relevant qualification at NQF level 9.

J.13.5. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.13.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted to the programme for a second year of registrations, a student must have successfully completed **68 credits** by the end of the first year. The programme must be completed after a maximum of 2 years of registration.

J.13.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.13.8. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **130 credits** and who have passed all the modules prescribed for this degree programme.

J.13.9. CURRICULUM FRAMEWORK FOR THE BACHELOR OF SCIENCE IN POPULATION STUDIES HONOURS (33HPOS)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
CORE SEMESTER 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
YEAR 1 SEMESTER 1 & 2					
S4883SR	Research Project	8	16	None	Compulsory
YEAR 1 SEMESTER 1					
S4883RP	Research Project	8	16	None	Compulsory
S4811ME	Monitoring & Evaluation Techniques	8	18		
S4801DD	Digital Demography	8	10	None	Compulsory
S4831GH	Gender Issues and Health	8	18	None	Compulsory
YEAR 1 SEMESTER 2					
S4822PP	Population Projections	8	10	None	Compulsory
S4812CP	Contemporary Population Issues	8	18	None	Compulsory
S4812IE	Indirect Estimation	8	18	None	Compulsory
Total credits			**140**		

J.13.9.1. TABLE OF EQUIVALENTS: BACHELOR OF SCIENCE IN POPULATION STUDIES HONOURS

OLD CURRICULUM							
Code	Module name	NQF	Credits	Module	Module name	Level	NQF
None				S4880QD	Design thinking	8	8
POP3810	Research Projects	8	32	S4880RP S4883RP	Research Proposal Research Project & Report	8 8	14 16
POP3831	Monitoring and Evaluation Techniques	8	16	S4811ME	Monitoring & Evaluation Techniques	8	18
POP3852	Population Projections	8	16	S4802PP	Population projections	8	10
POP3812	Indirect Estimation	8	16	S4812IE	Indirect Estimation	8	18

SOS3860	Sociology of Gender and Sexuality	8	8	-	None (To be offered again)	-	-
STS3871	Survival Analysis	8	16	-	None (To be offered again)	-	-
POP3872	Population Migration and Urbanization	8	16	-	None (To be offered again)	-	-
-	-	-	-	S4811DD	Digital Demography	8	10
-	-	-	-	S4811GH	Gender Issues and Health	8	18
-	-	-	-	S4812CP	Contemporary Population Issues	8	18

J.13.9.2. MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN POPULATION STUDIES HONOURS (33HPOS)

S4880RP: RESEARCH PROPOSAL

NQF level: 8
Credits: 14
Contact hours: 4 contact lecture periods per week for the semester.
Module assessment: 100% continuous assessment (at least four assignments and presentations).
Examination: No Examination.
Module Content: Philosophy and Paradigm of Scientific Research; Scientific Research Synopsis: basic versus applied versus translational research, hypothesis-generating versus hypothesis-testing research, retrospective versus prospective research, longitudinal versus cross-sectional research, descriptive versus analytic research, observational versus experimental research, quantitative versus qualitative research; Conceptualization of a Scientific Research Problem: origins of research problems, characteristics of well-conceived research problems, types of research questions, role of the literature search, crafting the problem & purpose statements; Conducting a Literature Review: reviewing relevant literatures and theoretical framework development, deductive & inductive reasoning techniques, developing arguments, compilation of a literature review & applicable reference system; Data Collection & Management in Applied Research: principles of data identification & collection, data sources, data capture, error identification & resolution, document retention, security & storage, role of institutional review boards, confidentiality & privacy of research data, monitoring & observation, continuing review, ethical issues; Selecting & Evaluating Secondary Data: narrative reviews, systematic review, scoping review, meta-analysis, sensitivity analysis, heterogeneity test, publication bias; Sampling Methodology & its Implications for Drawing Conclusions from Applied Research Findings: populations vs. samples, sample size, probability sampling, non-probability sampling; Preparing a Publishable Proposal & Article: title, authorship, abstract, the IMRAD structure, conclusion.

S4883RP: RESEARCH PROJECT

NQF level: 8
Credits: 18
Contact hours: 2 contact lecture periods per week for one semester.
Module assessment: 100% (Oral presentation **20%** and Project report **80%** *(Internal and External assessment 80% each)*.
Examination: 1x3-hour Examination paper **(50%)**
Module Content: *The purpose of this course is to demonstrate and practically implement scientific or empirical research investigations. It provides the opportunity to students to conduct their own research projects independently with the guidance of supervisors. Through the course, students will develop vital research skills such as literature review, methodology, analysis and interpretations and presentation of scientific idea in writing.* 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. Where possible students may be attached to relevant industries/institutions and so on where the research project problem is associated.

S4801DD: DIGITAL DEMOGRAPHY

NQF level: 8
Credits: 18
Contact hours: 4 contact lecture periods per week for the semester.
Module assessment: **CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination: 1x3-hour Examination paper **(50%)**
Module Content: Introduction to Digital and Computational Demography; Statistical approaches for combining representative data and non-probabilistic samples; identifying sources of bias in digital trace data and adjusting for them. Online surveys and experiments. Harnessing microsimulations to study demographic processes and kinship dynamics; Potential and drawbacks of crowd-sourced Big Data: the case of online genealogies. Big data, computational social science, and using bibliometric data to understand the migration of scholars. Agent-Based Modelling of Demographic Processes. **50% CA mark and 50% Examination mark.**

S4811ME: MONITORING AND EVALUATION

NQF level: 8
Credits: 18
Contact hours: 4 contact lecture periods per week for the semester.
Module assessment: **CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination: 1x3-hour Examination paper **(50%)**
Module Content: This course offers an introduction and a critical explanation to definitions and concepts of monitoring and evaluation such as: 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. **50% CA mark and 50% Examination mark.**

S4831GH:	GENDER ISSUES AND HEALTH
NQF level:	8
Credits:	18
Contact hours:	4 contact lecture periods per week for the semester.
Module assessment:	**CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: This course offers an introduction and a critical explanation to definitions and concepts of monitoring and evaluation such as: 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. **50% CA mark and 50% Examination mark.**

S4822PP:	POPULATION PROJECTIONS
NQF level:	8
Credits:	10
Contact hours:	2 contact lecture periods and 2 practical per week for one semester.
Module assessment:	**CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: *The purpose of this module is to introduce the students to the concept of population projection and forecasting and provide them with broad knowledge on various population projection techniques and their advantages and disadvantages.* This course offers an introduction to 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. **50% CA mark and 50% Examination mark.**

S4812CP:	CONTEMPORARY POPULATION ISSUES
NQF level:	8
Credits:	18
Contact hours:	4 contact lecture periods per week for one semester.
Module assessment:	**CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: This course offers broad issues of the major socio-demographic challenges that the various regions of the world face in the 21st century. The topics addressed cover both socio-demographic and health trends, as well as their economic, social, political and environmental causes and consequences. The course intends to give students a certain critical distance from public debates on socio-demographic phenomena. The course is structured around themes relating to major contemporary socio-demographic issues. Among the themes covered are:

- ✓ Food security, Neighborhood Food Environment and Self-Rated Health; Agriculture and Changing Livelihood Options: measurements, indicators and impact, and policy implications,
- ✓ Environmental change and sustainable science: Theoretical and methodological developments in the analysis of interrelationships of population, resources and environment. Challenges to Achieving the Sustainable Development Goals
- ✓ Globalisation and Population Economics: Analysis of factors involved in the economic development of nations with particular reference to population change, poverty, and welfare; Macroeconomics of Family, Population Transition, Demographic Dividend, Low Fertility: Population Policies and Their Effectiveness.
- ✓ Demographic Aspects of the Work Force: Analysis of the work force: the different approaches used in studying it. Trends and patterns of work force composition in developing and developed economies. Relation of the work force to other socio-economic variables like education, urbanization and fertility.
- ✓ Population and Development Planning & Policies: Review of policies and programmes directly or indirectly affecting population. Linkage of empirical findings with activities aimed at formulating specific policies, plans and programmes.
- ✓ Population and Health: Theoretical and methodological developments in the understanding of interrelationships of population, reproductive health, sexuality, epidemiologic transition, aging and other population related issues and concerns (Water, Energy, Health and Sanitation Challenges)

50% CA mark and 50% Examination mark.

S4812IE:	INDIRECT ESTIMATION
NQF level:	8
Credits:	18
Contact hours:	4 contact lecture periods per week for one semester.
Module assessment:	**CA (50%):** consisting of three tests **(60%)** and an assignment graded at **(40%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: *The purpose of this module is to teach the students the reasons or the need for indirect estimation of demographic estimates and how to execute estimation methods.* 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. **50% CA mark and 50% Examination mark.**

J.14. BACHELOR OF SCIENCE IN STATISTICS HONOURS (33BSSH)

J.14.1. ADMISSION REQUIREMENTS

To qualify for the **Bachelor of Science in Statistics Honours** programme, a candidate must hold a Bachelor of Science degree at NQF Level 7 in Statistics from the University of Namibia or equivalent qualification from a recognised institution of higher education.

J.14.2. ADDITIONAL SELECTION CRITERIA

In the case of demand for applications exceeding capacity, **the department may run a placement test** for all the potentially eligible candidates, whereby preference shall be given progressively to candidates with higher scores.

J.14.3. ASSESSMENT CRITERIA

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.

J.14.4. ARTICULATION OPTIONS

This qualification serves as an entry point to the **Master of Science in Statistics** or any other statistically related programme at a Master's degree of NQF Level 9.

J.14.5. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.14.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted to the School of Science for a second year of registration, a student must have obtained a minimum of **60% of the total programme credits**, excluding the UNAM core modules, by the end of the year; in other words, **(136-23) X 60% =68 credits.** The programme must be completed within a maximum period of two years of registration.

J.14.7. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.14.8. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **136 credits** and who have passed all the modules prescribed for this degree programme.

J.14.9. CURRICULUM FRAMEWORK FOR THE BACHELOR OF SCIENCE IN STATISTICS HONOURS (33BSSH)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
CORE SEMESTER 1					
S4810SR	Research Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
YEAR 1 SEMESTER 1 & 2					
S4803SR	Research Project	8	16	None	Compulsory
YEAR 1 SEMESTER 1					
S4821SO	Operations Research	8	10	None	Compulsory
S4811SM	Multivariate Distribution Theory	8	18	None	Compulsory
Choose one of the following two electives:					
S4851SL	Longitudinal Data Analysis	8	20	None	Elective
S4871SE	Extreme Value Theory	8	20	None	Elective
YEAR 1 SEMESTER 2					
S4822DB	Big Data Analytics and Data Mining	8	10	None	Compulsory
S4812ST	Time Series & Forecasting	8	20	None	Compulsory
Choose one of the following two electives:					
S4832SB	Biostatistics	8	20	None	Elective
S4852SY	Bayesian Statistics	8	20	None	Elective
Total credits			**136**		

J.14.9.1. TABLE OF EQUIVALENTS: BACHELOR OF SCIENCE IN STATISTICS HONOURS

Old Module			New/Revised Module		
Old Code	**Name**	**Year & Semester**	**New**	**Name**	**Year & Semester**
STS3871	Survival Analysis	Y4S1	-	*Phased out, now in BSc in Statistics programme*	BSc: Y3S1
STS3831	Stochastic Processes	Y4S1	-	*Phased out, now in BSc in Statistics programme*	BSc: Y3S2
STS3832	Statistical Quality Control	Y4S2	-	*Phased out, now in BSc in Statistics programme*	BSc: Y3S2
STS3851	Operational Research	Y4S1	S4811SO	Operational Research *(changed from full module to half modile, and now with programming practicals)*	Y1S1
STS3812	Multivariate Distribution Theory	Y4S2	S4811SM	*No change, to be offered again*	Y1S1
STS3872	Times Series & Forecasting	Y4S2	S4812ST	Times Series & Forecasting *(now with programming practicals)*	Y1S2
-	-	-	**S4851SL or S4871SE**	Longitudinal Data Analysis or Extreme Value Theory	New: Y1S1
-	-	-	**S4832SB or S4852SY**	Biostatistics or Bayesian Statistics	New: Y1S2
-	-	-	**S4822DB**	Big Data Analytics and Data Mining	New: Y1S2
STS3810	Research Project	Y4S1&2	**S4803SR**	Research Project	Y1S1&2

J.14.9.2. MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN STATISTICS HONOURS

S4810SR: RESEARCH PROPOSAL

NQF level: 8
Credits: 14
Contact hours: As determined by the specific activity.
Module assessment: 100% continuous assessment (at least four assignments and presentations).
Module Content: The purpose of this module is to expose the learner to survey appropriate literature relevant to the chosen topic of research and present the research proposal. The students will choose the topic of research in conjunction with supervisor and carry our literature survey to prepare and present a research proposal.
Learning and Teaching Strategies/Activities
- ✓ Candidate shall engage in a specific activity under the tutelage of a mentor.
- ✓ Candidate will submit a research proposal on a chosen topic of research.

Student Assessment Strategies
- ✓ Research proposal.
- ✓ Presentation of proposal

Learning and Teaching Enhancement Strategies
- ✓ Student progress shall be monitored by timely assessment and feedback.

Prescribed Learning Resources
- ✓ Research Journals.

S4803SR: RESEARCH PROJECT

NQF level: 8
Credits: 16
Contact hours: 1 contact hour per week / 2 semesters.
Module assessment: 100% (Oral presentation **20%** and Project report **80%** *(Internal and External assessment 80% each)*.
Module Content: The aim of this module is to provide a platform for students to demonstrate and practically implement methods that they have learn in modules throughout their study in the course to real life practical situations and problem-solving environments in both quantitative and qualitative field and the demonstrate knowledge to conduct general research. *Honours project on a selected topic demonstrating the applications of relevant 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 and so on.*

S4821SO: OPERATIONAL RESEARCH

NQF level: 8
NQF Credits: 10
Contact hours: 2 lectures plus 2-hours practical session per week / semester.
Module assessment: CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination: 1x3-hour Examination paper **(50%)**
Module Content: 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.

S4811SM:	MULTIVARIATE DISTRIBUTIONS THEORY
NQF level:	8
NQF Credits:	18
Contact hours:	4 lectures plus 1-hour tutorial per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: 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 T^2- Statistics 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 Statistics) and it is unknown (i.e. *F*-Statistics); **Correlation:** Estimation of population mean vector and correlation matrix, Distribution and tests associated with the Pearson correlation coefficient.

S4851SL:	LONGITUDINAL DATA ANALYSIS
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Nature of longitudinal data, 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.

S4871SE:	EXTREME VALUE THEORY
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to and examples of extreme value data; review of asymptotic likelihood theory required for the analysis of extreme values and of the relevant model diagnostic plots; the Extremal Types Theorem and distributions of extreme values: Gumbel, Fréchet and Weibull; the Generalised Extreme Value distribution; inference for the GEV distribution; threshold data and the Generalised Pareto (GP) distribution for the modelling threshold excesses; inference for the GP distribution; modelling and analysis of extremes of stationary (dependent) series; extremes of non-stationary series.

S4812ST:	TIME SERIES ANALYSIS AND FORECASTING
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: 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.

S4832SB:	BIOSTATISTICS
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Biostatistics : Fundamental concepts of Biostatistics, Data Type, Research Design used in Biostatistics, **Relative risk, Odds Ratio and Attributable Risk**, **Hypothesis testing:** Formulating Hypotheses in public health, biological research, Parametric Hypothesis Tests, Non-parametric Hypothesis Tests, **Experimental Design and Analysis of Variance:** Two way ANOVA, Repeated Measures ANOVA, Multivariate ANOVA ,**Regression analysis:** Linear Model, **Generalized Linear Model:** Logistic regression, Poisson regression, Negative Binomial Regression , Mixed Effect Model and Non-Linear Regression, **Meta-Analysis.**

S4852SY:	BAYESIAN STATISTICS
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures plus 3-hours practical session per week/ semester.
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Bayes' Inverse Probability Formula and Bayes' Theorem. The concepts of prior and posterior distributions. Posterior predictive distribution. Various types of prior distributions. Bayesian model comparison and Bayesian model averaging. Numerical tools for Bayesian estimation: Markov Chain Monte Carlo (MCMC) methods, Gibbs sampler and Metropolis-Hasting sampler. Bayesian inference on linear regression models, generalised linear models, and mixed-effects models. Normal-Gamma Conjugate Family. Non-conjugate priors, credible intervals and predictive inference models. Treatment of missing data and latent parameters. Bayesian computations using R and WinBUGS.

S4822DB:	BIG DATA ANALYTICS AND DATA MINING
NQF level:	8
NQF Credits:	10
Contact hours:	2 lectures plus 2-hour practical per week/semester
Module assessment:	CA of at least two tests, two tutorial tests and two assignments **(50%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Overview of Big Data Analysis: What is big data; Why is big data important; Types of data sources and data gathering. **Big Data Architecture & Hadoop:** Evolution of Big data Architecture; Big Data Architecture Use cases; History and Milestones of Hadoop; Hadoop Architecture and Cluster. **Big Data tools:** Apache Hadoop; Apache Spark; Hive. **Reporting, Graphing and Plotting:** Frequency Curves, Histograms, 2d and 3d Scatter Diagrams, graphical representation information, contour plots, 3d plots, tools such as R, iPython and Tableau. **Overview of Data Mining:** What is data mining? Diverse types of data mining tasks; Data mining tools. **Data Mining Algorithms:** Decision trees; Support vector machines; Naive Bayes; K-means clustering; Principal component analysis.

J.15. POSTGRADUATE DIPLOMA IN APPLIED STATISTICS AND REPORT WRITING (33PARM)

J.15.1. ADMISSION REQUIREMENTS

To register for this programme, **a candidate must hold at least an NQF level 7 diploma or an undergraduate degree** or any equivalent qualification from a recognized institution. In addition, candidate must have already done the research methods module & research project/mini-thesis or their equivalents in their NQF level 7 qualification.

J.15.2. ADDITIONAL SELECTION CRITERIA

In a case of the demand exceeding capacity, preference will be given to the candidate with the higher aggregate mark calculated from **Research Methods & Research Project/Mini-Thesis** from their NQF level 7 qualification. Consideration will also be given to matters of equity as outlined by National Policies.

J.15.3. ASSESSMENT CRITERIA

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.

J.15.4. ARTICULATION OPTIONS

Although the programme is designed to equip NQF level 7 diploma & undergraduate degree holders, irrespective of their areas of specialization, with advanced knowledge of research methods & data analysis skills at an NQF level 8, it can be used as a horizontal/cross articulation bridge into an NQF level 9 specialized degree or any equivalent qualification.

J.15.5. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.15.6. ASSESSMENT CRITERIA

For modules assessed with Continuous Assessment (CA) and Examination: **a)** a minimum CA mark of 40% is required to gain entrance into the relevant module examination, **b)** the final mark for each module shall be calculated using a ratio of $CA\ mark{:}Exam\ Mark$ of $50\%{:}50\%$, and **c)** to pass such a module, a minimum final mark of 50% shall be required, while a subminimum of at least 40% shall apply to the Exam Mark. **d)** 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% CA modules, a final aggregate mark of 50% shall be required to pass.

J.15.7. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

J.15.7.1. NORMAL& 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: 45 credits (of which 29 must be non-core) by the end of the first year of registration. 90 credits (of which 57 must be non-core) by the end of the second year of registration (extended). **The programme must be completed after a maximum of 2 years of registration (3 years-Extended).**

J.15.8. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.15.9. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with **a minimum of 136 credits**, and who have met the requirements of the prescribed curriculum and have met all other relevant UNAM requirements.

J.15.10. POSTGRADUATE DIPLOMA IN APPLIED STATISTICS AND REPORT WRITING (33PARM)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
U5880SP	Research Proposal	8	14	None	Compulsory
U5880QD	Design Thinking	8	8	None	Compulsory
Semester 1					
S5861SE	Experimental Design	8	9	None	Compulsory
S5861SQ	Quantitative Methods	8	20	None	Compulsory
S5871SD	Data Management	8	20		
Semester 2					
S5872SA	Statistical Modelling	8	20	None	Compulsory
S5872SU	Qualitative Methods	8	20		
S5862SS	Sampling Survey	8	9	None	Compulsory
Semester 1 & 2					
S5863SP	Research Project	8	8	None	Compulsory
Total credits			**136**		

U5880SP:	RESEARCH PROPOSAL
NQF level:	8
Credits:	14
Contact hours:	4 lecture periods per week for one semester
Module assessment:	100% continuous assessment (at least four assignments and presentations).

Module Content: Philosophy and Paradigm of Scientific Research; **Scientific Research Synopsis**: basic versus applied versus translational research, hypothesis-generating versus hypothesis-testing research, retrospective versus prospective research, longitudinal versus cross-sectional research, descriptive versus analytic research, observational versus experimental research, quantitative versus qualitative research; **Conceptualization of a Scientific Research Problem**: origins of research problems, characteristics of well-conceived research problems, types of research questions, role of the literature search, crafting the problem & purpose statements; **Conducting a Literature Review:** reviewing relevant literatures and theoretical framework development, deductive & inductive reasoning techniques, developing arguments, compilation of a literature review & applicable reference system; **Data Collection & Management in Applied Research**: principles of data identification & collection, data sources, data capture, error identification & resolution, document retention, security & storage, role of institutional review boards, confidentiality & privacy of research data, monitoring & observation, continuing review, ethical issues; **Selecting & Evaluating Secondary Data**: narrative reviews, systematic review, scoping review, meta-analysis, sensitivity analysis, heterogeneity test, publication bias; **Sampling Methodology & its Implications for Drawing Conclusions from Applied Research Findings**: populations vs. samples, sample size, probability sampling, non-probability sampling; **Preparing a Publishable Proposal & Article**: title, authorship, abstract, the IMRAD structure, conclusion.

S5861SE:	EXPERIMENTAL DESIGN
NQF level:	8
Credits:	9
Contact hours:	2 lecture periods per week for one semester.
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 2-hours Examination Paper

Module Content: Design of Experiments: observations vs. experiment, factors, factor levels, treatments, placebo effect, control group, bias, principles of experimental design, analysis of variance (1-way & 2-way), completely randomized design, randomized block design, matched pairs design, Latin squares design, Graeco-Latin squares design; **Incomplete designs and missing values**: analysis involving incomplete tables missing observations.

S5861SQ:	QUANTITATIVE METHODS
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for one semester. One practical session per week for one semester.
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 2-hour Examination Paper

Module Content: Descriptive Statistics: frequency & cross-tabulation, measures of central tendencies, measures of variability; **Probability**: basics of probability, conditional probability, expectation, random variables & common probability distributions; **Statistical Inference**: estimation & hypothesis testing, parametric versus non-parametric tests, chi-square test & goodness-of-fit tests (tests of independence and homogeneity of proportions); **Correlation**: examining scatterplots, bivariate, multiple & partial correlation; **Resampling Methods & Assessments of Inferential Methods (optional)**: jack-knife, bootstrap, permutation tests, Monte-Carlo methods, assessing inferential methods via simulation.

S5871SD:	DATA MANAGEMENT
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for one semester. One practical session per week for one semester.
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 3-hour Examination Paper

Module Content: Collecting & Managing Research Data: data management quality system, minimum standards, determinates of data management rigor, ethics, regulations, institutional policies, funder requirements, plans for data use or reuse, frameworks for thinking about managing research data; **Defining Data & Information**: definition (the three fundamental kinds), data elements, Stevens's scales of measurement, categories of data; **Deciding & Documenting Data to be Collected**: constructs & concepts, operational & conceptual definitions, reliability & validity, special considerations for continuous data elements, specifics for discrete data elements, deciding what data to collect, choosing the right data element when options exist, documenting data element definitions; **Data Management Planning**: definition, data sharing & documentation requirements, extent of data management planning, data flow & workflow; **Quality Management Systems**: defining quality, frameworks for managing quality & quality management of research data; **Selecting Software for Collecting & Managing Data**: automation, data collection, processing tasks & storage, software selection.

S5872SA:	STATISTICAL MODELLING
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for one semester. One practical session per week for one semester.
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 3-hour Examination Paper

Module Content: Review of Linear Models: simple linear regression, multiple linear regression, residuals & other diagnostic checks; **Generalized Linear Models (Logistic & Poisson Regression)**; **Semiparametric Regression**; **Survival Analysis**; **Time Series Analysis**: fundamental concepts, stationary & nonstationary time series models, forecasting, model identification & parameter estimation, seasonal time series models, time series regression & GARCH models; **Introduction to Multivariate Data**

Analysis: overview of multivariate analysis, multivariate data visualization & dimension reduction, principal component analysis, factor analysis, multivariate regression analysis, cluster analysis; **Multilevel & Panel data analysis (optional)**: nature of data, strategies for modelling.

S5872SU:	QUALITATIVE METHODS
NQF level:	8
Credits:	20
Contact hours:	4 lecture periods per week for one semester. One practical session per week for one semester**.**
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 3-hour Examination Paper

Module Content: Introduction to Qualitative Research: qualitative vs. quantitative, qualitative paradigms, questions & approaches; **Sampling in Qualitative Research**; **Consolidated Criteria for Reporting Qualitative Research**: interviewing and generating verbal data, entering the field (rapport & participant/observation, textual and visual data), in-depth & open-ended exploratory interviewing, semi-structured interviews & observations, participant observation & informal interviewing, reflexivity & participant engagement, designing and conducting focus groups, designing and conducting an observation study, action research; **Data Analysis Strategies**: quality & rigour in qualitative research, using computers to code, manage, and analyze qualitative text data, phenomenology & grounded theories; **Structured Approaches to Data Collection in Ethnographic Research**: surveys & sampling approaches, quality definition & evaluation; **Writing a Qualitative Result**: interpretation & discussion; **Ethical Guidelines in Qualitative Research**.

S5862SS:	SAMPLING SURVEY
NQF level:	8
Credits:	9
Contact hours:	2 lecture periods per week for one semester.
Module assessment:	CA (50%) of written and/or online assessments, Test(s) and quiz(es), assignments & presentations.
Examination:	1X 2-hour Examination Paper

Module Content: Types of Survey Errors: response & non-response errors; **Point Estimation**: population mean, total, proportion & variance in simple random sampling, stratified random sampling, systematic sampling & one- and two-stage cluster sampling; **Interval Estimation**: population mean, total, proportion & variance in simple random sampling, stratified random sampling, systematic sampling & one-and two-stage cluster sampling; **Sample Size Allocation**: simple random sampling (with & without replacement), stratified random sampling, systematic sampling & one- and two-stage cluster sampling; **Estimation of Errors**: sampling & non-sampling errors; **Use of Weighting in Survey Sampling**.

S5863SP:	RESEARCH PROJECT
NQF level:	8
Credits:	16
Contact hours:	One practical session per week for semesters 1 & 2.
Module assessment:	100% CA based on oral presentations of proposal, data analysis & final results **20%**, internal examination of proposal & final report **40%**, & external examination of final report **40%**.

Module Content: There are no specific topics & sub-topics to be covered in this research project module as it is designed to develop the research & data analysis skills of students through the completion of a research project on an approved topic in their field of interest. Students will be expected to develop & submit a written research proposal (with the guidance of an assigned supervisor), collect & analyze data using appropriate statistical methods, present the findings both orally & in written format in the form of a journal article and submit a written research report.

J.16. BACHELOR OF SCIENCE IN COMPUTER SCIENCE HONOURS (33HCOS)

J.16.1. ADMISSION REQUIREMENTS

To register for this honours program, a candidate must hold a valid bachelor's degree in computer science (or related) or a recognised equivalent qualification. 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. Should the need arise to limit intake numbers, the Department may run a selection test, offering admission into the programme to candidates who score a mark of at least 50% on the test.

J.16.2. ADDITIONAL SELECTION CRITERIA

In addition to the admission entry requirements in Section 23, and should the need arise to limit intake numbers, the Department of Computing may run a Departmental Entry Selection test, offering admission into the programme to candidates who score a mark of at least 50% in the test. This test is an aptitude test that is normally given before registration, to enable students who do not qualify to select other programmes.

J.16.3. ASSESSMENT CRITERIA

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.

J.16.4. ARTICULATION OPTIONS

This qualification may serve as an entry point to an MSc degree in Information Technology.

J.16.5. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.16.6. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.16.7. 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:

- ✓ 61 credits (of which 0 must be non-core) by the end of the first year of registration.
- ✓ 90 credits by the end of the second year of registration
- ✓ 132 credits by the end of the third year of registration

The programme must be completed after a maximum of 3 years of registration.

J.16.8. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.16.9. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **138 credits** and who have passed all the modules prescribed for this degree programme.

J.16.10. CURRICULUM FRAMEWORK: BACHELOR OF SCIENCE IN COMPUTER SCIENCE HONOURS (33HCOS)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
Year 1 Semester 1					
S4831DR	Research Project	8	16	None	Compulsory
S4831DD	Distributed Systems	8	20	None	Compulsory
S4831DA	Artificial Intelligence	8	20	None	Compulsory
Select ONE from these two modules					
S4821DN	Network System Security	8	10		Elective
S4821DR	Numerical Methods & Operations Research	8	10	None	Elective
Year 1 Semester 2					
S4832DR	Machine Learning	8	20	None	Compulsory
S4832DP	Parallel Programming	8	20	None	Compulsory
Select ONE from these modules					
S4822DE	Entrepreneurship Management of IT Systems	8	10		Elective
S4822DD	Data Warehousing and Data Mining	8	10	None	Elective
Total credits			**138**		

J.16.10.1.MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN COMPUTER SCIENCE HONOURS

S4831DR:	RESEARCH PROJECT
NQF level:	8
NQF Credits:	18
Contact hours:	4 hours of contact lecture periods per week and 3 hours practical per week for one semester.
Module assessment:	Every stage of the research project and field attachment is assessed continuously. Final presentation (50%) & Solution (software) presentation (50%)
Examination:	No Examination

Module Content: *The purpose of this module is to: provide the necessary research skills through the completion of a supervised research project; expose the students to Industrial environment provide the framework for the development of the necessary interpersonal skills through completion of a supervised field attachment; present the research project and field attachment report orally and in written form.* Literature review, requirement elicitation and specification, requirement analysis, proposal development and presentation, software design and implementation, testing, deployment and evaluation, report writing, and field attachment.

S4831DD:	DISTRIBUTED SYSTEMS
NQF level:	8
NQF Credits:	16
Contact hours:	4 hours of contact lecture periods per week and 3-hour practical per week for one semester
Module assessment:	**CA of 50%** (Minimum of 2 tests and 2 assignments).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Distributed systems architectures; Inter-process communications; RPC; multithreaded processes; client-server communication; server structures; concurrent and distributed programming; caching; coherence; protocols; name service; reliability and availability; recovery techniques, distribution, and duplication; fault management; distributed algorithms; synchronization; distributed coordination; Peer-to-peer; clusters and grid; security; research issues with key application areas will be selected from enterprise computing systems; GRIDS; Clouds; B2B integration; Infrastructure.
50% CA mark and 50% Examination mark.

S4831DA:	ARTIFICIAL INTELLIGENCE
NQF level:	8
NQF Credits:	20
Contact hours:	2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	**CA of 50%** (Minimum of 2 tests and 2 assignments).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: The module will cover the following topics: -Introduction to AI; Major components in a typical intelligent system, Flavors of AI; Church-Turing thesis, The Turing test, Searle's Chinese room argument; Introduction to PROLOG, The PROLOG Language, PROLOG in AI; Search: Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill-climbing search. Optimisation and search such as stochastic annealing and genetic algorithm; dynamic programming, A*; Representing Knowledge: Production rules, monotonic and non-monotonic logics, description logics; Reasoning and Control: Data-driven and goal-driven reasoning, AND/OR graphs; Reasoning under Uncertainty: Probabilities, conditional independence, causality, Bayesian networks; Machine Learning: Inductive and deductive learning, unsupervised and supervised learning, reinforcement learning, concept learning from examples, Quinlan's ID3, classification and regression trees, Bayesian methods. **50% CA mark and 50% Examination mark.**

S4821DN:	NETWORK SYSTEM SECURITY *(also for 33BSHI)*
NQF level:	8
NQF Credits:	18
Contact hours:	2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	**CA of 50%** (Minimum of 2 tests and 2 assignments).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Security services, digital signature, key management, network security: IPsec, SSL/TLS, PGP, VPN, firewalls, and intrusion detection systems. Cryptography: symmetric, asymmetric, and digital signature. email security: SMIME. Malware: viruses, worms, Trojan horses, spyware, rootkit, and dishonest adware. security in wireless and Ad-hoc networks, Secure remote access, electronic payment, and web security. **50% CA mark and 50% Examination mark.**

S4832DR:	MACHINE LEARNING *(also for 33BSHI)*
NQF level:	8
NQF Credits:	20
Contact hours:	4 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	**CA of 40%** (Minimum of 2 tests and 2 assignments).
Examination:	1x3-hour Examination paper **(60%)**

Module Content: Introduction to Data Science; Machine Learning Business and Technology Drivers; Machine Learning Benefits and Challenges ; Machine Learning Usage Scenarios; Datasets, Structured, Unstructured and Semi-Structured Data; Models, Algorithms, Model Training and Learning; How Machine Learning Works; Collecting and Pre-Processing Training Data; Algorithm and Model Selection; Training Models and Deploy Trained Models; Machine Learning Algorithms and Practices; Basics of Supervised Learning and Unsupervised Learning and Clustering; Semi-Supervised and Reinforcement Learning; Machine Learning Best Practices; How Machine Learning Systems Work; Common Machine Learning Mechanisms; How Mechanisms Are Used in Model Training; Machine Learning and Deep Learning, Artificial Intelligence (AI).
40% CA mark and 60% Examination mark.

S4832DP:	PARALLEL PROGRAMMING *(also for 33BSHI)*
NQF level:	8
NQF Credits:	20
Contact hours:	4 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	**CA of 50%** (Minimum of 2 tests and 2 assignments). Practical project 60% (A project where the student must apply the knowledge acquired during the semester and make a presentation).

Module Content: *The purpose of this module is to: provide students with the tools needed to solve problems that require high computational resources and can be solved by applying parallel programming techniques.* Parallel Computer rchitectures. Supercomputers, Clusters, Multicores, and Many Cores. Design and analysis of parallel algorithms in shared and distributed memory. Shared memory tools: OpenMP, threading building blocks. Distributed memory tools: MPI. Massively Parallel Processors: CUDA.

S4822DE:	ENTREPRENEURSHIP MANAGEMENT OF IT SYSTEMS
NQF level:	8
NQF Credits:	10
Contact hours:	2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	Continuous Assessment **50%**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Definitions of Entrepreneurship; entrepreneurial mind; starting a new business; home-based businesses; overview of challenges of SMEs; Namibian context and entrepreneurial action; legal and accounting concerns; Business plans; economic characteristics; Critical success factors; evaluation processes and feasibility study; entrepreneurial team; Social entrepreneurship, ethics and strategic planning and franchising; management of IT Systems(Making a strategic case for IT systems, historical Development of IT systems, Information Management, Managers views); strategic management of IT systems (sector management of IT systems A Framework for Management of IT Systems); Information technology and Strategic advantage(formulating Information Systems Strategy, formulating IT strategy. Formulation Information Management Strategy); Organizing IT activities:(controlling IT activities, Financing IT, appraising IT and Responsibility Accounting for IT); evaluation IT; Integrating IT and Organization. **50% CA mark and 50% Examination mark.**

S4821DR:	NUMERICAL METHODS AND OPERATIONS RESEARCH
NQF level:	8
NQF Credits:	18
Contact hours:	2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	**CA of 50%** (Minimum of 2 tests and 2 assignments).
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Model Building; Graphical Solution of Linear Programming Problems; Simplex Algorithm; Goal Programming; Nonlinear Programming; NLPs; Decision Making; Theory and Framing; Game Theory; Probabilistic Inventory Models; Stochastic Processes; Markov Chains; Deterministic Dynamic Programming; Queuing Theory; Discrete-Event Simulation; Random Numbers and Monte Carlo Simulation; Simulation with Continuous Random Variables; Statistical Analysis in Simulations; Simulation; Time Series Models; exponential Smoothing with Season; Ad Hoc Forecasting; Regression; Operations Research Packages; Simulation with SIMULA; operations research with packages. **50% CA mark and 50% Examination mark.**

S4822DD:	DATA WAREHOUSING AND DATA MINING
NQF level:	8
NQF Credits:	10
Contact hours:	2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment:	Every stage of the research project and field attachment is assessed continuously. Final presentation (50%) & Solution (software) presentation (50%)

Module Content: Data warehouse; Data models; architecture; relational and multidimensional OLAP; implementing data Warehouses(data extraction, cleansing, transformation, and loading, data cube computation, materialized view selection); OLAP query processing; data Mining Fundamentals (data mining process and system architecture, relationship with data warehouse and OLAP systems); mining Techniques and Application(association rules, mining spatial databases, mining multimedia databases, web mining, mining sequence and time-series data and text mining and data pre-processing).

J.17. BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS (33BSHI)

J.17.1. ADMISSION REQUIREMENTS

To qualify for entry into the **Bachelor of Science Honours in Information Technology**, the applicant must be in possession of a **Bachelor of Science degree in Information Technology (NQF Level 7)** from the University of Namibia (or an equivalent qualification from a recognised institution of higher education).

J.17.2. SELECTION CRITERIA

Further to the admission requirements in above Section 26, and should the need arise to limit intake numbers, the Department may run a selection test, offering admission into the programme to candidates who score a mark of at least 50% on the test.

J.17.3. ADDITIONAL SELECTION CRITERIA

In addition to the admission entry requirements in Section 23, and should the need arise to limit intake numbers, the Department of Computing may run a Departmental Entry Selection test, offering admission into the programme to candidates who score a mark of at least 50% in the test. This test is an aptitude test that is normally given before registration, to enable students who do not qualify to select other programmes.

J.17.4. ASSESSMENT CRITERIA

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.

J.17.5. ARTICULATION OPTIONS

This qualification may articulate into a **Master of Science in Information Technology** or related fields of study at NQF level 9.

J.17.6. MODE OF DELIVERY AND DURATION OF STUDY

The programme is offered on a full-time basis only on the Main Campus of UNAM. The minimum duration of the study is one year, and the maximum duration is two years.

J.17.7. ASSESSMENT CRITERIA

All taught modules will be assessed using a combination of **CA (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 CA mark of **40%** will be eligible to write the examinations.

J.17.8. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL/ PROGRAMME

To be re-admitted to the programme for a 2nd year of registration, a student must have completed a minimum of **54 credits** by the end of the first year of registration. The programme must be completed after a maximum of 2 years of registration.

J.17.9. ADVANCEMENT AND PROGRESSION RULES

Not applicable as this programme is offered over one year. Students can re-register for all failed modules the following year.

J.17.10. REQUIREMENTS FOR QUALIFICATION AWARD

The Bachelor of Science in Computer Science Honours (Level 8) will be awarded to candidates credited with a minimum of **138 credits** and who have passed all the modules prescribed for this degree programme.

J.17.11. CURRICULUM FRAMEWORK: BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS (33BSHI)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
Core Semester 1					
S4810MR	Research Methodology and Proposal	8	14	None	Compulsory
S4880QD	Design Thinking	8	8	None	Compulsory
Year 1 Semester 1 & 2					
S4831DR	Research Project	8	16	None	Compulsory
Year 1 Semester 1					
S4811II	IT Project Management	8	20	None	Compulsory
S4851IS	System Administration	8	20	None	Compulsory
Select ONE from these two modules					
S4832DR	Network System Security	8	10	None	Elective
S4841IN	Network Administration	8	10	None	Elective
Year 1 Semester 2					
S4802IC	Cloud Computing	8	20	None	Compulsory
S4822IT	Technopreneurship	8	20	None	Compulsory
Select ONE from these modules					
S4842IM	Management of IT Systems	8	10	None	Elective
S4842ID	Database Administration	8	10	None	Elective
Total credits			**138**		

J.17.11.1.TABLE OF EQUIVALENTS: BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS (33BSHI)

Old Curriculum				New Curriculum			
Module code	**Module name**	**NQF level**	**NQF credits**	**Module code**	**Module name**	**NQF level**	**NQF credits**
None				S4880QD	Design thinking	8	8
CIT3810	Research Project	8	32	S4880MR S4883IR	Research Proposal Research Project	8 8	14 16
CMP3821	Network System Security	8	8	S4821DN	Network System Security	8	10
CMP3841	Wireless & Mobile Computing	8	8		None (To be offered again)		
CIT3811	IT Project Management	8	16	S4811II	IT Project Management	8	20
CMP3851	Distributed Systems	8	16		None (To be offered again)		
CMP3871	Artificial Intelligence	8	16		None (To be offered again)		
CMP3832	Entrepreneurship and Management of IT Systems	8	16	S4842IM	Management of IT Systems	8	10
CMP3631	Expert Systems	8	16		None (To be offered again)		
CMP3812	Real Time Multimedia	8	16		None (To be offered again)		
CIT3812	Cloud Computing	8	16	S4802IC	Cloud Computing	8	20

J.17.11.2.MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS

S4880MR: RESEARCH PROPOSAL

NQF level: 7
NQF Credits: 14
Contact hours: CA 100% of a A minimum of two tests **(65%).** Assignments, Oral & Poster presentation **(35%).**
Module assessment: Every stage of the research project and field attachment is assessed continuously.
Examination: No Examination

Module Content: Introduction to Research Proposal: Understanding the Purpose and Importance of Research Proposals, **Problem Identification and Justification:** Formulating Research Problems, Questions, or Hypotheses, Significance of the Research Problem and Research Gap, Building a Strong Rationale for the Chosen Research Topic. **Literature Review and Theoretical Framework:** Conducting a Comprehensive Literature Review, Identifying Key Concepts, Theories, and Models, constructing a Theoretical Framework to Guide the Study. **Research Objectives and Research Questions:** Crafting Clear and Specific Research Objectives, Formulating Research Questions Aligned with Objectives, Ensuring Objectives are Specific, Measurable, Achievable, Relevant, and Time-Bound. **Research Methodology:** Overview of Research Methodologies (Qualitative, Quantitative, Mixed Methods), Selecting the Appropriate Methodology for the Research Objectives, Defining Research Design, Sampling Techniques, and Data Collection Methods. **Ethical Considerations in Research:** Understanding Research Ethics and Responsible Conduct, Addressing Ethical Considerations in Data Collection and Analysis, Ensuring Informed Consent, Participant Confidentiality, and Data Integrity. **Proposal Structure and Components:** Components of a Research Proposal: Introduction, Problem Statement, Literature Review, Methodology, etc. **Proposal Writing Skills:** Effective Scientific Writing: Clarity, Conciseness, and Coherence, Adhering to Formatting Guidelines, Citation Styles, and Scholarly Standards.

S4883IR: RESEARCH PROJECT

NQF level: 8
NQF Credits: 16
Contact hours: 2 hours consultation session per week for 2 semesters.
Module assessment: Every stage of the research project and field attachment is assessed continuously.
Examination: No Examination

Module Content: *The purpose of this module is to provide the necessary research skills through the completion of a supervised research project; expose the students to an Industrial environment to provide the framework for the development of the necessary interpersonal skills through the completion of a supervised field attachment; present the research project and field attachment report orally and in written form.* Identification of research topic; literature review; requirement elicitation and specification; requirement analysis; proposal development and presentation; software design and implementation; testing; deployment and evaluation; report writing; field attachment.

S4841IN: NETWORK ADMINISTRATION

NQF level: 8
NQF Credits: 10
Contact hours: 2 hours of contact lecture periods per week and 3-hour practical per week for one semester.
Module assessment: **CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination: 1x3-hour Examination paper **(50%)**

Module Content: Networking Fundamentals. Network Devices and Topologies. Network Protocols. Wireless Networks. Network Design and Planning. Installation and Configuration of Network Devices. Network Services Management. Network Monitoring. Network Troubleshooting. Network Redundancy and High Availability. Network Security and Best Practices.

S4811II:	IT PROJECT MANAGEMENT
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Project Management Function; project management process; project integration; scope and time frames; quality; human resources; communication; procurement; network scheduling; cost and risk management. Students will learn how to identify and schedule project resources, carry out resource allocation, create project flow charts, produce critical path planning, and evaluate reports. Emphasis will also be on tools such as Programme Evaluation and Review Technique (PERT) charts and Critical Path Method (CPM) charts. Critical issues of staff selection and team management will also be covered. These learning objectives will be reinforced by a team project that allows students to apply the principles and use the tools they learned.

S4851IS:	SYSTEM ADMINISTRATION
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Systems Administration Concepts. Linux vs Windows Server Operating Systems. Server Operating System Installation, Configuration. Server Administration Tools. Group and User Management. File Management and Permissions. Scheduling, Scripts and Task Automation. Service Management: File Sharing, Web Services, Remote Access Protocols, Domain Controllers, Active Directory, Print Services. **Virtualization. System Backup and Recovery. System Security**

S4842ID:	DATABASE ADMINISTRATION
NQF level:	8
NQF Credits:	20
Contact hours:	2 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Databases and Programming: Database Systems, Data Model, View of Data, Database Model, Data Abstraction, Database Design, Database Programming Languages;
Database System Architectures: Types of DBMS Architecture (1-Tier Architecture, 2-Tier Architecture, 3-Tier Architecture, n-Tier Architecture), MVC Architecture. **Database Transactions Models:** Transactions, Advanced Transaction Models (Flat or simple transactions, MultiTransactions, Nested transaction, Dynamically Restructured Transactions Models, Distributed Transactions, Workflow models), Transaction State, ACID Properties, issues. **Advanced Transaction Management**: Workflow Management Systems (Scheduler, Transaction Manager, Recovery Manager) Transaction Execution, Serializability, serial and nonseries schedules; locking methods; times-tamping methods; Thomas write rule; Concurrency Control, Locking Methods, Deadlock, Database Recovery Techniques. **Relational Algebra:** Object data standard; object-store; common gateway interface (CGI); **Web Technology and DBMS:** web-database platform; web-DBMS integration; web-DBMS approach; scripting languages; hypertext transfer protocol; web server; components; containers; container-Managed persistence; persistent classes; remote data services; common language runtime; open database connectivity; object-relational DBMS; privileges; query processing; relational algebra tree..

S4802IC:	CLOUD COMPUTING
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to Cloud Computing: Cloud Computing concepts, issues and technologies, Cloud introduction and standardization overview, cloud computing is effective for future computing trend shifts, different Clouds; **Cloud Computing architecture**: Introduction to standardized Cloud computing architecture and Requirements; Cloud taxonomy; **Cloud technologies**: software as a service, platform as a service, infrastructure as a service, Service-Oriented Architecture; **Virtualization**: on-demand computing, discussion on Hypervisors, Storage Virtualization, CPU Virtualization, Virtualization at the infrastructure level and operating system; **Virtualization Security**: vulnerabilities and threats. **Intelligent web applications**: advanced information retrieval, analysis and visualization and handling data in the Cloud environment; **Cloud security**: risks, threats, and potential vulnerabilities; client-server architectures; **Data centres**: Cloud storage, vendors, challenges, ownership, Cloud management, Policy, organizational Risks and technical Risks.

S4822IT:	TECHNOPRENEURSHIP
NQF level:	8
NQF Credits:	20
Contact hours:	4 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to entrepreneurship: Concepts in Technology Entrepreneurship; the importance of techno-entrepreneurship; Attributes of Technology Entrepreneurs; Skills and mindset of Entrepreneurial Leaders. **Innovation and Idea creation:** What is innovation; Research vs development – translational research; Types of innovation: product, process, and business model; Innovation-driven vs small-medium enterprise; Organization-driven vs market-driven idea. **Entrepreneurial**

Value Proposition: Benefits vs features, relation to needs, and high value-adding; Solution is driven or efficiency improvement; Value = benefits/cost; Value proposition statement including Needs, Approach, Benefits per cost, Competition. **Customers**: Customer needs, pain points and demographics; Market research and validation; the decision-making process, Target customer profile, persona. **Competitive Advantage**: Competitive Analysis (Porter's five forces of competitive position analysis); **Markets Identification and Analysis:** Feasibility study; SWOT analysis; Classes of competitors; Product differentiation, positioning; Market structures; Market segments, size; Beachhead market and creating your market; Barriers to Market; Execution and Business Plan: Roadmap for research, development, and production; Budget and timeline; Marketing, Sales and Distribution Strategies/plans; cost of customer acquisition, customer lifetime value; Plans for R&D, operations, Business & Venture planning, human resources; Lean concepts and organization. **Financial Analysis and Accounting Basics:** Cash flow statements and projections; Income (P&L) statements; accrual accounting, depreciation, operating expenses; Balance sheets; equity, liability; Break-even time. **Raising Capital:** Sources: debt and venture capital; Incubators, accelerators; Grants application, Proposals (R&D) Presentation and Business pitch competitions. **The Product or Service:** What is the core that makes it special; Minimum viable product and iterative design; Cost of goods sold; Product development plan, Gantt chart. **Business Models:** Time value of money; Revenue generation; Price structure; price elasticity; Channels of distribution; Strategic partners. **Ethics and social responsibility:** Ethics. Codes of ethics; theoretical frameworks; broader ethical considerations; Social businesses; **Globalization:** Cultural differences in communication; Ethical issues. **Introduction to Intellectual Property (IP):** What is IP? Why do I have IP protection? Cost of protection, Copyright, Trademarks, Patents, trade secrets, contracts, and non-disclosure and non-compete agreements.

S4842IM:	Management of IT systems
NQF level:	8
NQF Credits:	10
Contact hours:	2 lectures per week and 3 hours practical session per week for one semester.
Module assessment:	**CA of 50%** of a minimum of **3** tests **(80%)** and assignment **(20%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to IT System Management: Concepts, Importance of IT Management, Responsibilities of IT Managers. **Information Technology and Strategy:** Strategic Frameworks of IT; IT Strategic Planning; Organization Strategies for Technology Acquisition: e.g. In House System Development. Alternatives for Acquiring New Technologies e.g., outsourcing. **Management of IT Systems Development:** SDLC. Strategic **Management of IT Systems: Framework** for Management of IT Systems; Operations and Maintenance Management; Application Implementation Strategies, User Support Services Management, Security Management & Disaster Recovery Planning. Human Resource and Change Management. Technological Innovation Management. Managing IT Research & Development (R & D). Intellectual Property Management. **Information Technology and Strategic Advantage:** IT and Competitive Advantage, Porter's Five Forces and Value Chain, IT Industry Evaluation, Internet and E-commerce for a Competitive Advantage, Formulating IT strategies. Organizational Structure and Technology: integration in Organization. Organizing and controlling IT activities e.g. Financing IT, IT Audit, etc.). **Social, Ethical, and Legal Issues in Technology Management:** Impact of Technological Change, Intellectual Property; Privacy, Copyright and Creative Commons. **Impacts of IT on Globalization:** Role of IT in Globalization.

J.18. MASTER OF SCIENCE IN INFORMATION TECHNOLOGY (33MSIT)

J.18.1. ADMISSION REQUIREMENTS

To qualify for the **Master of Science in Information Technology (NQF Level 9)**, a candidate must hold a Bachelor of Science degree at NQF Level 8 in Information Technology, Computer Science, Data Science, or Information Systems from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

J.18.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or highest scores obtained in the Honours (Level 8) programme.

J.18.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD in IT, Computer Science, Information Systems**, or any Computing-related PhD programme at NQF Level 10.

J.18.4. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules assessed with Continuous Assessment (CA) and Examination. The final mark for each module shall be calculated using a ratio of continuous assessment(50%) and an examination(50%). A minimum CA mark of 40% is required to gain entrance into the relevant module examination. 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. **For 100% Continuous Assessment modules:** the final mark will be constituted of 100% CA mark. a final aggregate mark of 50% shall be required to pass the module.

J.18.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A full-time student must pass at least 72 credits of the courses registered for, during the 1st year, to be re-admitted to the programme. The student must pass 120 credits at the end of 2nd year of registration. The programme must be completed in a maximum of three(3) years. A part-time student must pass at least 24 credits of the courses registered for, during the 1st year, to be re-admitted to the programme. By the end of the 2nd year, the student will be expected to have passed 72 credits to be re-admitted to the programme. The programme must be completed in a maximum of four (4) years.

J.18.6. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study (thesis) upon obtaining 120 credits of the coursework. A part-time student advances to the 2nd year of study upon obtaining 48 credits, and advances to the 3rd year upon obtaining 120 credits of the coursework.

J.18.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with **240** credits, a pass in U6983LA Academic Literacy for Postgraduate Students, and have met all other relevant UNAM requirements. Masters by coursework students must present a conference paper on their research work before graduation as outlined in the Higher Degrees Policy.

J.18.8. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN INFORMATION TECHNOLOGY (33MSIT)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
YEAR 1 SEMESTERS 1 AND 2					
U6989LA	Academic Literacy for Post-Graduate Students	9	NCB	None	Compulsory
YEAR 1 SEMESTER 1					
S6921DI	Data Analytics and Visualizations	9	12	None	Compulsory
S6911DI	Artificial Intelligence	9	24	None	Compulsory
S6941DC	Cloud Computing and Virtualization	9	12	None	Compulsory
S6961DI	Advanced Operating Systems	9	12	None	Compulsory
YEAR 1 SEMESTER 2					
S6912DI	Cryptography and Network Security	9	24	None	Compulsory
S6922DR	Research Methodology and Research Proposal	9	12	None	Compulsory
S6922DI	Advanced Software Engineering	9	12	None	Compulsory
S6902DC	Digital Forensics	9	12	None	Compulsory
YEAR 2 SEMESTERS 1 AND 2					
S6993DI	Thesis	9	120	S6922DR	Compulsory
Total credits			**240**		

J.18.8.1. MODULE DESCRIPTOR: MASTER OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS

Old curriculum				New curriculum			
Code	**Module Names**	**NQF**	**Credits**	**Codes**	**Module Names**	**NQF**	**Credits**
CMP5971	Advanced Operating Systems	9	12	S6961DI	Advanced Operating Systems	9	12
CMP5912	Cryptography and Network Security	9	24	S6912DI	Cryptography & Network Security	9	24
CMP5932	Research Methodology & Research Proposal	9	12	S6922DR	Research Methodology & Research Proposal	9	12
CMP5952	Advanced Software Engineering	9	12	S6922DI	Advanced Software Engineering	9	12
CMP5900	Thesis	9	120	S6993DI	Thesis	9	120

J.18.8.2. MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY HONOURS

S6921DI:	DATA ANALYTICS AND VISUALIZATIONS
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 50%** of a minimum of 2 tests, 2 assignments and a group project.
Examination:	1x2-hour Examination paper **(50%)**

Module Content: Introduction, Data Cleansing, Data Interpretation; Data Modeling; Data Visualization; Data ethics; Methods, platforms, and tools used in data analytics. Linear and Nonlinear Regression; Model Selection; Classification, Logistic Regression; Clustering; Decision Trees.

S6911DI:	ARTIFICIAL INTELLIGENCE
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 50%** of a minimum of 2 tests **(60%)**, and 2 assignments **(40%)**.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Foundations of AI: Comprehensive overview of AI, its history, & evolution. **Understanding of key AI subfields,** such as machine learning, natural language processing, computer vision, robotics, and knowledge representation. Artificial intelligence ecosystem; Different types of technologies, trajectory and impact of AI in the digital ecosystem, current AI landscape; **Types of machine learning:** supervised, reinforcement, and unsupervised learning. **Machine learning approaches**; Impact of human decisions in the workflow of supervised, reinforcement, and unsupervised learning, Benefits and limitations of machine learning approaches within different contexts; **deep learning & neural networks:** functionality of errors and weights, mechanics of machine learning algorithms, use cases of deep neural networks, impact of backpropagation on neural networks; **Exploration of ethical & societal considerations** in AI development & deployment: pitfalls of AI, regulatory considerations of using AI, sources of algorithmic bias, ethical principles of AI applications.

S6941DI:	CLOUD COMPUTING AND VIRTUALIZATION
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 50%** of a minimum of 2 tests **(60%)**, 2 assignments **(20%)** and and a group project**(20%).**
Examination:	1x2-hour Examination paper **(50%)**

Module Content: Introduction Cloud Computing, Introduction to Virtualization, Principles of parallel and distributed computing, Cloud Computing Architecture, Cloud Privacy and Security, Emerging technologies and innovations, Architecting Cloud solutions, Containers and Virtualization, Virtualized Infrastructure and Server, Cloud Delivery Model Considerations, Cost Metrics and Pricing Models, and Service Quality Metrics.

S6961DI:	ADVANCED OPERATING SYSTEMS
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 50%** of a minimum of 2 tests **(60%)**, 2 assignments **(20%)** and 1 group project **(20%).**
Examination:	1x2-hour Examination paper **(50%)**

Module 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, Concurrency and Parallelism, Distributed Systems, Security and Protection, Real Time Systems, Operating Systems Design and Performance.

S6912DI:	CRYPTOGRAPHY AND NETWORK SECURITY *(also for 33MSCY)*
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 50%** of a minimum of 2 tests and 2 practical assignments.
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Introduction to cryptography, classical cryptosystem, cryptanalysis on substitution cipher (frequency analysis), play fair cipher, block cipher, Data Encryption Standard (DES), Triple DES, modes of operation, stream cipher, pseudorandom sequence, LFSR based stream cipher, mathematical background, abstract algebra, number theory, modular inverse, extended Euclid algorithm, Fermat's Little Theorem, Euler's phi-Function, Euler's Theorem, quadratic residue, polynomial arithmetic. Advanced Encryption Standard (AES), introduction to public key cryptosystem, Diffie-Hellman key exchange, Knapsack cryptosystem, RSA cryptosystem. Cryptosystem, elliptic curve over the reals, elliptic curve modulo a prime, generalised El Gamal public key cryptosystem, Chinese remainder theorem, Rabin cryptosystem, Legendre and Jacobi symbol, message authentication, digital signature, key management, key exchange, hash function, universal hashing, cryptographic hash function, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS), more on key exchange protocol, cryptanalysis, time-memory trade-off attack, differential cryptanalysis, more on differential cryptanalysis, linear cryptanalysis, cryptanalysis on stream cipher, algebraic attack, implementation attacks, side channel attack, internetwork security, SSL, PGP, cloud security, introduction to Blockchain and bitcoin.

S6922DR:	RESEARCH METHODOLOGY AND RESEARCH PROPOSAL
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 100%** of a minimum of 4 assignments.
Examination:	No Examination

Module Content: Overview of the research process; research questions of objectives; reviewing the literature; research participants and ethics; research strategies: surveys, design and creation, case studies, experiments, action research, ethnography; data collection strategies: interviews, observations, questionnaires, documents; quantitative data analysis; qualitative data analysis; presentation of research.

S6922DC:	ADVANCED SOFTWARE ENGINEERING
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**100%** CA (Practical Projects **(40%),** Assignments **(20%)** and Tests **(40%).**
Examination:	No Examination

Module Content: Software engineering process (review); Project planning(review); Software requirements specification; Software design; Software implementation/development; Software testing: test cases, unit testing, system testing, testing automation; Software reuse: open source, design patterns; Software Maintenance; Software Metrics; Quality Management; Software configuration management; Emerging trends in software engineering.

S6902DC:	DIGITAL FORENSICS *(also for 33MSCY)*
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	CA of **60%** (minimum of 2 tests and 2 practicums)
Examination:	1x2-hour Examination paper **(40%)**

Module Content: **Introduction:** Definition, limits and types of tools (open source versus closed source). **Legal Issues:** right to privacy, protection of encryption keys, types of legal authority, protection from legal processes, legal request for preservation of digital evidence. Affidavits, testimony and testifying. **Digital forensic tools:** types, artifact-focused versus all-in-one tools, requirements, and limitations. **Investigatory process:** alerts, identification of evidence, collection and preservation of evidence, timelines, reporting, chain of custody, and authentication of evidence. Acquisition and preservation of evidence: pull-the-plug versus triage, write-blocking, forensically prepared destination media, imaging procedures, acquisition of volatile evidence, live forensics analysis, and chain of custody. **Analysis of evidence**: sources of digital evidence, deleted and undeleted files, temporary files, metadata, print spool files, slack space, hibernation files, windows registry, browser history, log files, file systems, file recovery, and file carving. **Presentation of results:** Timeline analysis, attribution, lay versus technical explanations, executive summaries, detailed reports, and limitations. **Authentication of evidence:** hashing algorithms (MD5, SHA-1, and so on), hashing entire media vs individual files, and pre-exam and post-exam verification hashing. **Reporting, incident response and handling:** report structures, incident detection and analysis, containment, eradication and recovery, post-incident activities, and information sharing. **Mobile forensics**: wireless technologies, mobile device technology, collection/isolation of mobile device, mobile operating systems (OS) and apps, and mobile artifacts.

S6993DI:	THESIS
NQF level:	9
NQF Credits:	120
Contact hours:	2 hours of consultation per week for one semester.
Module assessment:	**100% CA**. The thesis will be examined by one Internal Examiner and one External Examiner.
Examination:	No Examination

Module Content: A student will be expected to choose a topic and undertake a research project under the guidance of an approved supervisor(s). Focus is on research projects that combine aspects associated with Information Technology within specific industries (such as government, health, education, banking, finance, and manufacturing). Topics include Software Engineering, Data Analysis and Visualization, Digital Forensics, Cryptography, Network Security, Operating Systems, and Artificial Intelligence. The project must reflect the integration and application of different areas of Information Technology. Students will be expected to demonstrate master of key research steps including choosing an appropriate topic, conducting a literature review, selecting appropriate methods, frameworks, and tools, collecting data, analysis and interpretation of data, drawing conclusions and recommendations from data. Students will also be expected to present the findings and conclusions of their research in a thesis.

J.19. MASTER OF SCIENCE IN CYBERSECURITY (33MSCY) NQF LEVEL 9

J.19.1. ADMISSION REQUIREMENTS

To qualify for the **Master of Science in Cybersecurity**, a candidate must hold a Bachelor of Science degree at NQF Level 8 in Information Technology, Computer Science, Data Science, or Information Systems from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

J.19.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or the highest scores obtained in the related Bachelor Honours (Level 8) programme.

J.19.3. ARTICULATION OPTIONS

This qualification may articulate into a PhD degree at NQF Level 10, in Cybersecurity, Information Technology, Computer Science, Information Systems, or any Computing-related PhD programme at NQF Level 10.

J.19.4. 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.

J.19.5. ASSESSMENT CRITERIA

The Final Mark shall normally be made up of **60% Continuous Assessment and 40%** Final Examination, except for those Modules which are assessed based on 100% CA. The minimum Pass Mark in any Module is 50%. **Unless stated otherwise in the respective module descriptor, the following shall apply:** For modules assessed with Continuous Assessment (CA) and Examination. The final mark for each module shall be calculated using a ratio of continuous assessment (60%) and an examination (40%) 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. **For 100% Continuous Assessment modules:** the final mark will be constituted of 100% CA mark. a final aggregate mark of 50% shall be required to pass the module.

J.19.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

A full-time student must pass at least **72 credits** of the courses registered for, during the 1st-year, to be re-admitted to the programme. The programme must be completed in a maximum of three (3) years. A part-time student must pass at least 24 credits of the courses registered for, during the 1st year to be re-admitted to the programme. By the end of the 2nd-year, the student will be expected to have passed **72 credits** to be re-admitted to the programme. The programme must be completed in a maximum of four (4) years.

J.19.7. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework. A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining **120 credits** of the coursework.

J.19.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240** credits including a pass in **U6989LA** Academic Literacy for Postgraduate Students, and who have met all other relevant UNAM requirements. Masters by coursework students must present a conference paper on their own research work before graduation as outlined in the Higher Degrees Policy.

J.19.9. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN CYBERSECURITY (33MSCY) NQF LEVEL 9

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
YEAR 1 SEMESTER 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	NCB	None	Compulsory
S6901DC	Cyber Space and Cyber Security	9	12	None	Compulsory
S6911DC	Malware Analysis and Defense	9	24	None	Compulsory
S6931DC	Penetration Testing and Ethical Hacking	9	24	None	Compulsory
YEAR 1 SEMESTER 2					
S6902DC	Digital Forensics	9	12	None	Compulsory
S6922DC	Prevention and Protection Strategies	9	12	None	Compulsory
S6912DC	Cryptography and Network Security	9	24	None	Compulsory
S6922DR	Research Methodology and Proposal	9	12	None	Compulsory
Total credits			**140**		

J.19.9.1. MODULE DESCRIPTOR: BACHELOR OF SCIENCE IN CYBERSECURITY

S6901DC:	CYBER SPACE AND CYBER SECURITY
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 60%** of a minimum of 2 tests, and 2 assignments.
Examination:	1x2-hour Examination paper **(40%)**

Module Content: Domains of Cybersecurity; Fundamentals of Security and CIANA model: (authentication, authorization, nonrepudiation, confidentiality, integrity and availability) cybersecurity objectives; threats and vulnerabilities: devices at risk, information threat, physical threats, vulnerabilities in software and programming languages; attacker motivations the corruption factor; cyber espionage, threats to physical infrastructure; attacker techniques: proxies and attacking tools, tunneling techniques, phishing, malicious code, click fraud and botnets; social engineering and hacker culture. Assessing the problem: the human element, cybercrime; cyber threats in the 20th and 21st Century, future threats; assessing risks and rosts of a cyber-attack; cyber warfare: case studies of previous cyber-attacks; cases of state hackers, the rise of non-state hackers; discussions on selected cases of cyber-attacks highlighting impact of attacks, perpetrators overview, hackers profiles, methods of attacks; legal status of cyber warfare: relevant laws and regulations, applicability of law to cyber incidents, challenges of defending against cyber-attacks. **60% CA mark and 40% Examination mark.**

S6911DC:	MALWARE ANALYSIS AND DEFENCE
NQF level:	9
NQF Credits:	24
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 60%** of a minimum of 2 tests, and 2 assignments.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Topics include Malware analysis fundamentals; malware behavior and hiding places; static analysis, dynamic analysis, malicious code analysis; in-depth malware analysis; self-defending malware; malicious document memory forensics; malware analysis tournament; identifying and protecting against malware, malware challenges in the real-world. **60% CA mark and 40% Examination mark.**

S6931DC:	PENETRATION TESTING AND ETHICAL HACKING
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 60%** of a minimum of 2 tests, and 2 assignments.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Topics include: identifying vulnerabilities, network security assessment plans and tools, social engineering, denial of service attacks, hacking systems; hacking web servers, hacking web applications, mobile hacking, information gathering, network traffic analysis, attack and penetration tools, preventing intrusion and attacks; securing systems. **60% CA mark and 40% Examination mark.**

S6922DC:	PREVENTION AND PROTECTION STRATEGIES
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of integrated theory and practical per week for 1 semester.
Module assessment:	**CA of 60%** of a minimum of 2 tests, and 2 assignments.
Examination:	1x2-hour Examination paper **(40%)**

Module Content: Training, encryption, virtual private networks, policies, practices, access controls, secure systems development, software assurance arguments, verification, and validation; firewall architectures, anti-virus, patching practices, personnel security practices, and physical security practices. Business continuity plans and disaster recovery plans (BCP, DRP). **60% CA mark and 40% Examination mark.**

S6902DR:	RESEARCH METHODOLOGY AND PROPOSAL
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours as per the arrangements with the supervisor(s).
Module assessment:	Assessment strategies: Continuous Assessment 100% (Minimum of 4 assignments).
Examination:	No Examination

Module Content: Overview of the research process; research questions of objectives; reviewing the literature; research participants and ethics; research strategies: surveys, design and creation, case studies, experiments, action research, ethnography; data collection strategies: interviews, observations, questionnaires, documents; quantitative data analysis; qualitative data analysis; presentation of research.

S6993DC:	THESIS
NQF level:	9
NQF Credits:	120
Contact hours:	2 hours as per the arrangements with the supervisor(s).
Module assessment:	CA of 100%. The thesis will be examined by one Internal Examiner and one External Examiner.
Examination:	No Examination

Module Content: A student will be expected to choose a topic and undertake a research project under the guidance of an approved supervisor(s). Focus is on research projects that combine aspects associated with cybersecurity within specific industries (such as government, health, education, banking, finance, and manufacturing). Topics include vulnerability assessment, threat analysis, crisis management, information privacy, identity management, incident response, disaster recovery, and business continuity planning. The project must reflect the integration and application of different areas of cybersecurity. Students will be expected to demonstrate master of key research steps including information choosing an appropriate topic, conducting a literature review, selecting appropriate methods, frameworks and tools, collecting data, analysis and interpretation of data, drawing conclusions and recommendations from data. Students will also be expected to present the findings and conclusions of their research in a thesis.

J.20. MASTER OF SCIENCE IN BLOCKCHAIN TECHNOLOGY (33MBCT) NQF LEVEL 9

J.20.1. ADMISSION REQUIREMENTS

To qualify for the **Master of Science in Blockchain Technology**, a candidate must hold a Bachelor of Science degree at NQF Level 8 in Computer Science, or Engineering, or Information Technology, or Mathematics, or Finance, or Business, or a related discipline from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

J.20.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or the highest scores obtained in the related Bachelor Honours (Level 8) programme.

J.20.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD degree at NQF Level 10 in Blockchain, Cryptography, Digital Assets** or any other related PhD programme at NQF Level 10.

J.20.4. 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.

J.20.5. ASSESSMENT CRITERIA

The Final Mark shall normally be made up of **60% Continuous Assessment and 40%** Final Examination, except for those Modules which are assessed based on 100% CA. The minimum Pass Mark in any Module is 50%. **Unless stated otherwise in the respective module descriptor, the following shall apply:** For modules assessed with Continuous Assessment (CA) and Examination. The final mark for each module shall be calculated using a ratio of continuous assessment (60%) and an examination (40%) 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. **For 100% Continuous Assessment modules:** the final mark will be constituted of 100% CA mark. a final aggregate mark of 50% shall be required to pass the module.

J.20.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the programme, a student must pass at least **72 credits** of the modules registered for, during the 1st-year. The student must pass at least **120 credits** at the end of 2nd year of registration. The student must pass at least **240 credits** at the end of 3rd year of registration. The programme must be completed in a maximum of three (3) years.

J.20.7. ADVANCEMENT AND PROGRESSION RULES

Students must have passed at least **96 credits**, including **Research Methodology and proposal** (to be able to proceed to Year 2 of Study.

J.20.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240** credits including a pass in **U6989LA** Academic Literacy for Postgraduate Students, and who have met all other relevant UNAM requirements. Master's by coursework students must present a conference paper on their own research work before graduation as outlined in the Higher Degrees Policy.

J.20.9. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN BLOCKCHAIN TECHNOLOGY (33MSBCT)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
YEAR 1 SEMESTER 1					
U6989LA	Academic Literacy for Postgraduate Students	9	NCB	None	Compulsory
S6911BD	Blockchain and Distributed Ledger	9	24	None	Compulsory
S6931CC	Cryptography and Cybersecurity	9	24	None	Compulsory
S6921SC	Smart Contracts	9	12	None	Compulsory
YEAR 1 SEMESTER 2					
S6972TK	Tokenomics	9	24	None	Compulsory
S6942BE	Blockchain Entrepreneurship	9	12	None	Compulsory
S6962RM	Research Methodology and Proposal	9	12	None	Compulsory
Elective Units - Students should select one of these modules					
S6902DF	DeFi & Cryptocurrencies	9	12	None	Elective
S6942BS	Blockchain for Social Impact	9	12	None	Elective
YEAR 2 SEMESTER 2					
S6993TS	THESIS	9	120	PRE. S6962RM	Compulsory
Total credits			**140**		

J.20.9.1. MODULE DESCRIPTOR: MASTER OF SCIENCE IN BLOCKCHAIN TECHNOLOGY (33MSBCT)

S6921DI:	BLOCKCHAIN AND DISTRIBUTED LEDGER
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of lectures & 3 hours practical per week per semester
Module assessment:	This module will be assessed through assessment strategies: **CA 60%**, and a final examination **40%.**
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Topics include: Defining blockchain and distributed ledger; History and evolution of blockchain; Key technical components; Consensus mechanisms; Cryptographic principles; Smart contracts; Potential applications and case studies; Current challenges and future prospects; Regulatory and legal considerations; Security and privacy issues; Scalability and performance; Industry standards and protocols.

S6931CC:	CRYPTOGRAPHY AND CYBERSECURITY
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of lectures & 3 hours practical per week per semester
Module assessment:	This module will be assessed through assessment strategies: **CA 60%**, and a final examination **40%.**
Examination:	1 x 3-hour practical examination paper **(40%)**

Module Content: Topics include: Historical evolution of cryptography; Symmetric vs. Asymmetric encryption; Basic cryptographic algorithms; Application of cryptography in cybersecurity; Blockchain-specific aspects of cryptography; Cryptanalysis and vulnerabilities; Cryptographic hash functions; Public key infrastructure (PKI) and digital certificates; Zero-knowledge proofs and their applications; Advanced encryption standards (AES) and their usage; Elliptic curve cryptography (ECC) and its advantages; Cryptographic protocols and their implementation; Security implications of quantum computing on cryptography; Cryptographic methods for secure communication; Digital signatures and authentication mechanisms; Role of cryptography in decentralized applications (dApps); Emerging trends in cryptographic research and technologies.

S6921SC:	SMART CONTRACTS
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of lectures & 1 hours practical per week per semester
Module assessment:	100% Continuous assessment (tests, assignments, and portfolio).

Module Content: Topics include: Smart contract fundamentals; Ethereum and its development environment; Solidity programming; Testing and debugging smart contracts; Security vulnerabilities and mitigations; Decentralized applications (DApps); Smart contract design patterns; Gas optimization techniques; Interacting with smart contracts through web3.js; Upgradable smart contracts; Cross-chain smart contract development; Legal considerations for smart contracts; Use cases of smart contracts in various industries; Best practices for smart contract development.

S6972TK:	TOKENOMICS
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours of lectures & 3 hours practical per week per semester
Module assessment:	This module will be assessed through assessment strategies: **CA 60%**, and a final examination **40%.**
Examination:	1 x 3-hour practical examination paper **(40%)**

Module Content: Topics include: Economic principles of blockchain; Role and purpose of tokens; Token valuation models; Regulatory and financial implications; Future financial systems; Token issuance and initial coin offerings (ICOs); Decentralized finance (DeFi); Blockchain's impact on traditional banking; Cryptoeconomics; Governance models in blockchain networks; Security tokens and their regulations; Stablecoins and their role in the economy; Cross-border transactions and remittances; Blockchain for financial inclusion.

S6942BE:	BLOCKCHAIN ENTREPRENEURSHIP
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of lectures & 1 hours practical per week per semester
Module assessment:	This module will be assessed through assessment strategies: **CA 60%**, and a final examination **40%.**
Examination:	1x2-hour Examination practical paper **(40%)**

Module Content: Topics include: Identifying opportunities in the blockchain space; Business plan formulation; Investor engagement strategies; Regulatory landscape; Ethical considerations in blockchain entrepreneurship; Tokenomics and token design; Smart contract development and deployment; Blockchain scalability solutions; Security best practices for blockchain applications; Case studies of successful blockchain startups; Market analysis and competitive landscape; Legal considerations and compliance; Community building and marketing strategies; Decentralized finance (DeFi) opportunities; Cross-chain interoperability; Future trends in blockchain technology.

S6962RM:	RESEARCH METHODOLOGY AND PROPOSAL
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of lectures & 1 hours practical per week per semester
Module assessment:	100% 100% (tests, assignments, and portfolio).

Module Content: Overview of the research process; research questions of objectives; reviewing the literature; research participants and ethics; research strategies: surveys, design and creation, case studies, experiments, action research, ethnography; data collection strategies: interviews, observations, questionnaires, documents; quantitative data analysis; qualitative data analysis; presentation of research.

S6902DF:	DEFI & CRYPTOCURRENCIES
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of lectures & 1 hours practical per week per semester.
Module assessment:	CA 100% (tests, assignments, and portfolio).
Examination:	No Examination.

Module Content: Topics include: Introduction to DeFi; Role of FinTech in blockchain; Cryptocurrency taxonomy; Risks in DeFi and FinTech; Future of finance in the blockchain age; Tokenomics and yield farming; Smart contract development and auditing; Decentralized exchanges (DEXs); Regulatory and compliance challenges; Security best practices in DeFi; Case studies of successful DeFi projects; Cross-chain interoperability in DeFi; Decentralized lending and borrowing platforms; Stablecoins and their impact on DeFi; Decentralized insurance solutions; Governance in decentralized autonomous organizations (DAOs); Emerging trends and innovations in DeFi.

S6942BS:	BLOCKCHAIN FOR SOCIAL IMPACT
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours of lectures & 1 hours practical per week per semester
Module assessment:	This module will be assessed through assessment strategies: **CA 60%**, and a final examination **40%.**
Examination:	1x2-hour Examination practical paper **(40%)**

Module Content: Topics include: Blockchain for social good; Case studies in blockchain impact; Blockchain in sustainability and conservation; Ethical implications; Community-driven blockchain initiatives; Blockchain in healthcare; Decentralized identity management; Blockchain for supply chain transparency; Social impact of blockchain technology; Blockchain in education; Governance models in blockchain; Blockchain and humanitarian aid; Developing blockchain solutions for non-profits; Legal and regulatory considerations for blockchain in social impact; Measuring blockchain's social impact.
60% CA mark and 40% Examination mark.

S6992CP:	THESIS
NQF level:	9
NQF Credits:	120
Contact hours:	2 hours of lectures & 1 hours practical per week per semester
Module assessment:	100%. The thesis will be examined by one Internal Examiner and one External Examiner.
Examination:	No Examination.

Module Content: Topics include: Blockchain for social good; Case studies in blockchain impact; Blockchain in sustainability and conservation; Ethical implications; Community-driven blockchain initiatives; Blockchain in healthcare; Decentralized identity management; Blockchain for supply chain transparency; Social impact of blockchain technology; Blockchain in education; Governance models in blockchain; Blockchain and humanitarian aid; Developing blockchain solutions for non-profits; Legal and regulatory considerations for blockchain in social impact; Measuring blockchain's social impact.

J.21. MASTER OF SCIENCE IN MATHEMATICS – (33MSMA) NQF LEVEL 9

J.21.1. ADMISSION REQUIREMENTS

To qualify for the **Master of Science in Mathematics**, a candidate must hold a Bachelor of Science degree at NQF Level 8 in Mathematics from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

J.21.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or the highest scores obtained in the related Bachelor Honours (Level 8) programme.

J.21.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD degree at NQF Level 10 in Mathematics**, or any other related PhD programme at NQF Level 10.

J.21.4. DURATION OF STUDY

The Master of Science in Information Technology is offered through coursework and a 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.

J.21.5. ASSESSMENT CRITERIA

The Final Mark shall normally be made up of **60% Continuous Assessment and 40%** Final Examination, except for those Modules which are assessed based on 100% CA. The minimum Pass Mark in any Module is 50%. **Unless stated otherwise in the respective module descriptor, the following shall apply:** For modules assessed with Continuous Assessment (CA) and Examination. The final mark for each module shall be calculated using a ratio of continuous assessment (60%) and an examination (40%) 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. **For 100% Continuous Assessment modules:** the final mark will be constituted of 100% CA mark. a final aggregate mark of 50% shall be required to pass the module.

J.21.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

To be re-admitted into the Master of Science in Mathematics, a full-time student must have obtained at least:
72 credits at the end of the 1st year of registration. **120 credits** at the end of the 2nd year of registration. The programme must be completed in a maximum of three (3) years. **To be re-admitted into the Master of Science in Mathematics, a part-time student must have obtained at least: 24 credits** at the end of the 1st year of registration. **72 credits** at the end of the 2nd year of registration. **120 credits** at the end of the 3rd year of registration. The programme must be completed in a maximum of four (4) years.

J.21.7. ADVANCEMENT AND PROGRESSION RULES

A full-time student advances to the 2nd year of study upon obtaining **120 credits** of the coursework. A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year only upon obtaining **120 credits** of the coursework.

J.21.8. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240** credits including a pass in **U6989LA** Academic Literacy for Postgraduate Students, and who have met all other relevant UNAM requirements. Masters by coursework students must present a conference paper on their own research work before graduation as outlined in the Higher Degrees Policy.

J.21.9. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN MATHEMATICS - 33MSMA NQF LEVEL 9

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
YEAR 1 SEMESTER 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	NCB	None	Compulsory
S6911MC	Codes and Cryptography	9	24	None	Compulsory
Stream A: Pure Mathematics					
S6921MA	Topics in Algebra	9	12	None	Compulsory
S6931MT	Topics in Topology	9	24	None	Compulsory
Stream B: Applied Stream					
S6921MM	Mathematical Modeling	9	12	None	Compulsory
S6931MB	Mathematical Biology	9	24	None	Compulsory
YEAR 1 SEMESTER 2					
S6902MR	Research Methodology	9	12	None	Compulsory
S6922ML	Mathematical Logic	9	12	None	Compulsory
Stream A: Pure Stream					
S6912MG	Differential Geometry	9	24	None	Compulsory
S6942MA	Algebraic Topology	9	12	None	Compulsory
Stream B: Applied Stream					
S6912MS	Stochastic Differential Equations	9	24	None	Compulsory
S6942MC	Optimal Control Theory	9	12	None	Compulsory
YEAR 2 SEMESTERS 1 AND 2					
S6953MT	MSc Thesis	9	120	**None**	Compulsory
Total credits			**240**		

J.21.10. MODULE DESCRIPTOR: MASTER OF SCIENCE IN MATHEMATICS - 33MSMA NQF LEVEL 9

S6911MC:	CODES AND CRYPTOGRAPHY
NQF level:	9
NQF Credits:	24
Contact hours:	*70 hours (4 contact lecture periods per week and one tutorial session per week for one semester)*
Module assessment:	50% CA consists of a minimum of 3 (three) class tests **(40%)** & a seminar **(10%).**
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Entropy: Discrete probability spaces, entropy and joint entropy; **prefix-free codes :** Kraft's inequality, efficient codes, Shannon-Fano codes, optimal codes, Huffman codes; **compression:** block codes, noisy channels, Shannon's noisy channel theorem, check digits, Hamming code; **error-correcting codes:** Hamming distance, error detecting and correcting, covering estimates; **information capacity,** noisy coding theorem; **linear codes:** Reed-Muller codes, cyclic codes, BCH codes; **cryptography:** equivocation, unicity; **symmetric and asymmetric ciphers:** Feistel ciphers, asymmetric ciphers; **complexity:** polynomial time, analysis of RSA ciphers, Rabin ciphers; **signatures:** Guarantees, hash functions.
50% CA mark and 50% Examination mark.

S6921MA:	TOPICS IN ALGEBRA
NQF level:	9
NQF Credits:	24
Contact hours:	42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).
Module assessment:	50% CA consists of a minimum of 2 (two) class tests **(40%)** & a seminar **(10%).**
Examination:	1x2-hour Examination paper **(50%). 50% CA mark and 50% Examination mark.**

Module Content: Field theory: the characteristic of a field, quotient rings, field extensions, primitive extensions, algebraic field extensions, splitting fields, algebraic closure, normal field extensions, finite fields; **Galois Theory**: automorphisms of a field extension, separability, perfect fields, the Galois group of a field extension, the Galois correspondence, solution of polynomial equations by radicals; the general equation of nth degree, application to constructions with straight-edge and compass.

S6931MT:	TOPICS IN TOPOLOGY
NQF level:	9
NQF Credits:	24
Contact hours:	70 hours (4 contact lecture periods per week and one tutorial session per week for one semester).
Module assessment:	50% CA consists of a minimum of 2 (two) class tests **(40%)** & a seminar **(10%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: Lattice of topologies on a set, weak topology, strong topology and the quotient topology. **Lattices and pointfree topology:** lattices, complete lattices, frames and their category. **Product Spaces**: The product of the sets, projection maps, product topology, Tychonoff's Theorem, and its equivalence to the Axiom of Choice. **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. **Compactifications**: Definition, Alexandroff's one – point compactification, Stone-Ćech compactification. **Uniform spaces**: uniformities, uniform spaces, preuniformities, preuniform spaces (entourage approach and cover approach), metric uniform spaces, uniform topology, uniform continuity, quasi-uniform spaces. **50% CA mark and 50% Examination mark.**

S6921MM:	MATHEMATICAL MODELING
NQF level:	9
NQF Credits:	12
Contact hours:	42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).
Module assessment:	50% CA consists of a minimum of 2 (two) class tests **(40%)** & a seminar **(10%).**
Examination:	1x2-hour Examination paper **(50%)**

Module Content: Introduction; **Discrete-time models:** difference equations, linear and nonlinear discrete models, formulation and analysis; **Continuous models using ordinary differential equations:** formulation and analysis, stability, linearization, phase portraits, bifurcations; **Introduction to spatial models using partial differential equations:** models using diffusion, linear stability analysis. **50% CA mark and 50% Examination mark.**

S6931MB:	MATHEMATICAL BIOLOGY
NQF level:	9
NQF Credits:	24
Contact hours:	70 hours (4 contact lecture periods per week & one practical session per week for one semester).
Module assessment:	50% CA consists of a minimum of 3 (three) class tests **(40%)** & a seminar **(10%).**
Examination:	1x3-hour Examination paper **(50%)**

Module Content: 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.

S6902MR:	RESEARCH METHODOLOGY
NQF level:	9
NQF Credits:	12
Contact hours:	*42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).*
Module assessment:	Continuous Assessment counts for 100% towards final mark for the module.

Module Content: *The module is designed to equip students with the know-how of conducting mathematical research.* Writeup and presentation of a research proposal, presentation involving books and research articles.

S6922ML:	MATHEMATICAL LOGIC
NQF level:	9
NQF Credits:	24
Contact hours:	70 hours (4 contact lecture periods per week & one practical session per week for one semester).
Module assessment:	50% CA consists of a minimum of 2 (two) class tests **(40%)** & a seminar **(10%).**
Examination:	1x2-hour Examination paper **(50%).**

Module Content: **Propositional logic and First-order predicate logic:** recall and summary; **Gödel's completeness theorem:** A calculus of natural deduction, proof of the theorem, non-standard models of analysis, enumerability and decidability; **incompleteness and undecidability:** Recursive and primitive recursive functions, gödelisation, theorems of Gödel, Tarski, Church.

S6912MG:	DIFFERENTIAL GEOMETRY
NQF level:	9
NQF Credits:	24
Contact hours:	70 hours (4 contact lecture periods per week and one tutorial session per week for one semester).
Module assessment:	50% CA consists of a minimum of 3 (three) class tests **(40%)** & a seminar **(10%).**
Examination:	1x2-hour Examination paper **(50%)** **50% CA mark and 50% Examination mark.**

Module Content: **Multilinear algebra:** tensors, differential forms; **Connections:** Riemannian metrics, connections, covariant derivatives, geodesics, Riemannian connections, exponential map, normal coordinates, geodesics and curves minimizing distances; **Curvature:** the curvature tensors, Christoffel symbols, the Bianchi identity, Ricci curvature, scalar curvature, Riemannian submanifolds, the second fundamental form, The Gauss equation, the Weingarten equation, principal curvature, Gaussian and mean curvature, Gauss' Theorema Egregium, sectional curvature, the uniformisation theorem, the Gauss-Bonnet theorem, Jacobi fields, conjugate points; **Further study:** depending on time and interest, an introduction to one of the following topics may be considered: minimal surfaces, Einstein field equations and some exact solutions, further local/global results in higher dimension (constant curvature metrics, Cartan-Hadamard), gauge theories, Kähler and Calabi-Yau manifolds.

S6942MA:	ALGEBRAIC TOPOLOGY
NQF level:	9
NQF Credits:	12
Contact hours:	*42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).*
Module assessment:	CA of a minimum of 2 (two) class tests counting for 40% and a seminar counting for 10%.
Examination:	1x2-hour Examination paper **(50%).** **50% CA mark & 50% Examination mark.**

Module Content: *The course will show how one can study the topology of a space by pushing into it a simpler test space and extracting in this way "algebraic" objects.* Homotopy of paths, the fundamental group, homotopy equivalence, the homotopy category, the Van Kampen theorem, CW complexes; **Homology and cohomology:** singular homology, some homological algebra, the Mayer-Vietoris sequence, excision, cellular homology, cohomology (hints).

S6912MS:	STOCHASTIC DIFFERENTIAL EQUATIONS
NQF level:	9
NQF Credits:	24
Contact hours:	*70 hours (4 contact lecture periods per week and one tutorial session per week for one semester)*
Module assessment:	CA of a minimum of 3 (three) class tests counting for 40% and a seminar counting for 10%.
Examination:	1x3-hour Examination paper **(50%).** **50% CA mark & 50% Examination mark.**

Module Content: Introduction: Bertrand's paradox, Buffon's Needle, Sigma-algebras, stochastic processes, probability distribution, independence, Rademacher functions, Borel-Cantelli Lemma, characteristic functions, strong law of large numbers, central limit theorem, fluctuations, Laplace-Demoivre Theorem, conditional expectation; **martingales:** definition, martingale inequalities; **Brownian motion and white noise:** random walks, Wiener processes, construction of Brownian motion, sample paths, nowhere differentiability, Markov property; **Stochastic integrals:** Ito's 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.

S6942MC:	OPTIMAL CONTROL THEORY
NQF level:	9
NQF Credits:	12
Contact hours:	*42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).*
Module assessment:	CA of a minimum of 2 (two) class tests counting for 40% and a seminar counting for 10%.
Examination:	1x2-hour Examination paper **(50%).**

Module Content: Introduction: **Introduction:** The basic optimal control problem: **Controllability and observability:** Definitions, review of ODEs, controllability of linear systems, observability, the bang-bang principle; **Linear time-optimal control:** Existence of time-optimal controls, the maximum principle for linear time-optimal control. **The Pontryagin Maximum Principle:** Hamiltonian dynamics, review of Lagrange multipliers, statement of the Pontryagin maximum principle, maximum principle with transversality conditions, maximum principle with state constraints, applications. **Dynamic Programming:** Bellman's equation, relationship with the Pontryagin maximum principle. **50% CA mark and 50% Examination mark.**

S6953MT:	THESIS
NQF level:	9
NQF Credits:	120
Contact hours:	*42 hours (2 contact lecture periods per week and one tutorial session per week for one semester).*
Module assessment:	CA of a minimum of 2 (two) class tests counting for 40% and a seminar counting for 10%.
Examination:	1x2-hour Examination paper **(50%)**

Module Content: Introduction: The purpose of the dissertation to enable students to develop a robust understanding of more advanced and practical issues in Pure or Applied Mathematics. The dissertation provides an ideal opportunity to enable students to stimulate independent learning and critical thinking through a supervised research project.

J.22. MASTER OF SCIENCE IN FINANCIAL MATHEMATICS (33MMFM) NQF LEVEL 9

J.22.1. ADMISSION REQUIREMENTS

To qualify for this programme, a candidate must hold a **Bachelor of Science Honors degree (NQF Level 8) in Financial Mathematics, Quantitative Risk Management, Data Science, Mathematics, Physics, Computer science, Engineering, Economics,** from the University of Namibia (or an equivalent qualification from a recognized institution of higher education) with at least a 60% average.

J.22.2. ADDITIONAL SELECTION CRITERIA

Based on space availability, the final selection for qualifying candidates may be based on additional criteria such as equity considerations or the highest scores obtained in the related Bachelor Honours (Level 8) programme.

J.22.3. ARTICULATION OPTIONS

This qualification may articulate into a **PhD in Financial Mathematics, in Mathematical Finance, in Actuarial Science** or any other Quantitative Finance-related PhD programme at NQF Level 10.

J.22.4. ASSESSMENT CRITERIA

Unless stated otherwise in the respective module descriptor, the following shall apply: For modules assessed with Continuous Assessment (CA) and Examination,

- ✓ the final mark for each module shall be calculated using a ratio of CA (50%) and an examination (50%)
- ✓ A minimum CA mark of 40% is required to gain entrance into the relevant module examination.
- ✓ 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.

For 100% Continuous Assessment modules

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

J.22.5. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

- ✓ A full-time student must pass at least **72 credits** (60% of the total 120) of the courses registered for, during the 1st year, to be re-admitted to the programme. The student must pass **120 credits** at the end of the 2nd year of registration. **The programme must be completed in a maximum of three (3) years.**
- ✓ A part-time student must pass at least **24 credits** (20% of the total 120) of the courses registered for during the 1st year to be re-admitted to the programme. By the end of the 2nd year, the student will be expected to have passed **72 credits** to be re-admitted to the programme. **The programme must be completed in a maximum of four (4) years.**

J.22.6. ADVANCEMENT AND PROGRESSION RULES

- ✓ A full-time student advances to the 2nd year of study (thesis) upon obtaining **120 credits** of the coursework.
- ✓ A part-time student advances to the 2nd year of study upon obtaining **48 credits**, and advances to the 3rd year upon obtaining **120 credits** of the coursework.

J.22.7. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of **240** credits, including a pass in **U6989LA** Academic Literacy for Postgraduate Students, and who have met all other relevant UNAM requirements. Master's by coursework students must present a conference paper on their own research work before graduation as outlined in the Higher Degrees Policy.

J.22.8. CURRICULUM FRAMEWORK FOR THE MASTER OF SCIENCE IN FINANCIAL MATHEMATICS (33MMFM)

CODE	COURSE NAME	NQF	CREDITS	CO/PRE-REQUISITE	Compulsory/Elective
YEAR 1 - SEMESTER 1					
U6989LA	Academic Literacy for Post-Graduate Students	9	NCB	None	Compulsory
S6911MF	Financial Markets	9	24	None	Compulsory
S6931MF	Option Pricing Theory	9	24	None	Compulsory
S6901MF	Fixed Income Securities	9	12	None	Compulsory
YEAR 1 SEMESTER 2					
S6912MS	Stochastic Differential equations	9	24	None	Compulsory
S6972MF	Topics in Finance	9	24	None	Compulsory
S6902MF	Quantitative Data Analysis	9	12	None	Compulsory
S6922MF	Machine Learning	9	12	None	Compulsory
YEAR 2 SEMESTER 1 & 2					
S6953MF	Financial Mathematics Thesis	9	120	None	Compulsory
Total credits			**240**		

J.22.8.1. MODULE DESCRIPTOR: MASTER OF SCIENCE IN FINANCIAL MATHEMATICS (33MMFM)

S6911MF:	FINANCIAL MARKETS
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of minimum of 3 tests, 2 assignments and 3 quizzes.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Topics covered includes: The roles and determinants of interest rates, fixed income securities markets, equity markets, foreign exchange markets, and option markets: Types of markets and Regulation (Organized vs OTC; primary vs secondary market) Equity securities; Debt securities; Forex and Derivatives; Fixed income markets-The bond market; Relationship between interest rates and Bond prices, Valuating bonds. Interest Risk vs Cash flow risk Bond markets in the real world. The Stock Market Concepts, market structure, participants and products The Foreign Exchange Market Forex Exchange rates (spot & Forward) Arbitrage the Derivatives Markets Futures (Swap, Fras and forward contracts) & Option Hedging vs speculating with derivatives.

S6931MF:	OPTION PRICING THEORY
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of minimum of 3 tests, 2 assignments and 3 quizzes.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Introduction to Options theory; market price, strike price, volatility, interest rate, and time to expiration, value an option, types of options, Forward and futures contracts; Asset Price Random Walks; Common Models of option pricing: Black-Scholes, binomial option pricing, and Monte-Carlo simulation. The Arbitrage Theorem; Pricing Derivatives: Models and Notation; Martingales and Martingale Representations.

S6901MF:	FIXED INCOME SECURITIES
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of minimum of 3 tests, 2 assignments and 3 quizzes.
Examination:	1x2-hour Examination paper **(40%)**

Module Content: Modeling the term-structure movements of interest rates; mathematics of term-structure models in continuous time, fixed-income markets such as day-count conventions, duration of coupon-paying bonds and yield curve construction; arbitrage theory; short-rate models; the Heath-Jarrow-Morton methodology; consistent term-structure parametrizations; affine diffusion processes and option pricing with Fourier transform; LIBOR market models; and credit risk.

S6912MS:	STOCHASTIC DIFFERENTIAL EQUATIONS
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of 3 tests, 2 assignments, 2 quizzes & 1 oral presentation.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: Introduction: Bertrand's paradox, Buffon's Needle, Sigma-algebras, stochastic processes, probability distribution, independence, Rademacher functions, Borel-Cantelli Lemma, characteristic functions, strong law of large numbers, central limit theorem, fluctuations, Laplace-Demoivre Theorem, conditional expectation; martingales: definition, martingale inequalities; Brownian motion and white noise: random walks, Wiener processes, construction of Brownian motion, sample paths, nowhere differentiability, Markov property; Stochastic integrals: Ito's 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.

S6972MF:	TOPICS IN FINANCE
NQF level:	9
NQF Credits:	24
Contact hours:	4 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of 3 tests, 2 assignments, 3 quizzes.
Examination:	1x3-hour Examination paper **(40%)**

Module Content: 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.

S6902MF:	QUANTITATIVE DATA ANALYSIS
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of 2 tests, 2 assignments, 3 quizzes.
Examination:	1x2-hour Examination paper **(40%)**

Module Content: Parametric and non-parametric regression, and supervised learning techniques, linear models, logistic regression, additive models, LASSO, kernel methods, clustering methods and applications, support vector machines and classification, dimension reduction techniques, including principal components analysis: Examples taken from financial models.

S6922MF:	MACHINE LEARNING
NQF level:	9
NQF Credits:	12
Contact hours:	2 hours lectures 1 tutorial per week/ semester.
Module assessment:	**60%** CA of 2 tests, 2 assignments, 3 quizzes.
Examination:	1x2-hour Examination paper **(40%)**

Module Content: Introduction to machine learning including example applications and classes of machine learning techniques. Introduction to decision trees (classification trees and regression trees); over-fitting; pruning; application example, Bayesian Learning: Bayes' theorem/rule; maximum likelihood; maximum a posteriori; naive Bayes classifier; application example, Artificial Neural Networks: Introduction to perceptrons, and perceptron-based artificial neural networks; linear separability; activation functions; back-propagation; application example, Support Vector Machines.

S6953MF:	FINANCIAL MATHEMATICS THESIS
NQF level:	9
NQF Credits:	120
Contact hours:	Consultations with supervisor(s), seminars presentations, conferences.
Module assessment:	100% Continuous assessment
Examination:	No Examination

Module Content: The purpose of the dissertation to enable students to develop a robust understanding of more advanced and practical issues in Financial Mathematics like the many applications in risk quantification or risk management, or other areas in financial engineering. The dissertation provides an ideal opportunity to enable students to stimulate independent learning and critical thinking through a supervised research project.

J.23. DOCTOR OF PHILOSOPHY IN MATHEMATICS - 33DMAT (NQF LEVEL 10)

For admission requirements, please see J.26.1/2

J.24. DOCTOR OF PHILOSOPHY IN APPLIED STATISTICS – 33DPST (NQF LEVEL 10)

For admission requirements, please see J.26.1/2

J.25. DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE – 33DPCO (NQF LEVEL 10)

For admission requirements, please see J.26.1/2

J.26. DOCTOR OF PHILOSOPHY IN FINANCIAL MATHEMATICS (PHD) - 33DMFM (NQF LEVEL 10)

For admission requirements, please see J.26.1/2

J.27. DOCTOR OF PHILOSOPHY IN POPULATION STUDIES (NQF LEVEL 10) – 33DPOP (NQF LEVEL 10)

J.27.1. ADMISSION REQUIREMENTS

To be eligible for this PhD programme, the candidate must have completed a **Master's Degree at NQF level 9 in Mathematics, Applied Statistics and Demography, Computer Science, Information Technology, Cybersecurity, Financial Mathematics, Population Studies** or related areas from the University of Namibia or equivalent qualification from a recognized institution of higher education. **Applicants with foreign qualifications must submit a certificate of evaluation from the Namibia Qualifications Authority (NQA).** Along with the application, candidates must submit a detailed research proposal that highlights their proposed area of research, objectives, methodology, and a review of existing literature. The research proposal will be evaluated for relevance, novelty, feasibility and availability of a supervisor. As per **Section B. 3.3.** of the Higher Degrees Policy Procedures, Rules and Regulations, Departments review the submitted **concept note**s and identify potential supervisor(s) and recommend the applicant for admission through the Admission and Examination Board, considering the applicant's fulfilment of the minimum admission requirements, availability of supervisors and space.

J.27.2. ADDITIONAL SELECTION CRITERIA

In case of the demand exceeding capacity, matters of equity shall be taken into consideration as outlined by National Policies. In addition to the admission entry requirements **in Section J.29.1,** and should there be a need to limit intake numbers, Departments reserve the right to run a **Departmental Entry selection test**, **or a pre-selection interview** at the discretion of the department before approving and offering admission into the programme to candidates who score a mark of at least **50%** in the test. This type of test is an **aptitude test** that is normally given before registration to enable students who do not qualify to select other programs. Before applying for PhD admission, **applicants may contact potential supervisor(s),** provide evidence of having conducted supervised research at NQL level 9 and prepare a research concept note before registration. In addition, the research proposal proposed by the prospective student will be presented to the possible supervisor. The allocation of approved graduate supervision to incoming graduate students for this programme is the responsibility of the department. Further, procedures will be fully explained to each prospective student during this time.

J.27.3. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE SCHOOL / PROGRAMME

As per Section C.1.4 of the University's Higher Degrees Policy, Rules, and Regulations, all students enrolled for higher degrees shall be required to register every year for the duration of the specific programme, unless approval has been granted for an academic break in studies. Furthermore, as per Section M.15 of the University's Higher Degrees Policy, Rules, and Regulations, students who have exceeded their prescribed number of years shall not be allowed to continue with their studies unless they apply and are approved for re-admission (ANNEX 19B). The programme must be completed in a maximum of 5 years.

J.27.4. ADVANCEMENT AND PROGRESSION RULES

As per Section D.2.3 of the University's Higher Degrees Policy, Rules, and Regulations, the main supervisor has the responsibility of ensuring that their students make progress in their studies. Where there are challenges affecting the student's research progress, these shall be communicated to the relevant leadership structures within the Faculty and could be escalated to the Centre for Research Services: Postgraduate Research Support Services Unit through the Head of the Department and Faculty Postgraduate Coordinator. Each supervisor and the student are expected to submit progress reports as per the Annex 3A (for students) and Annex 3B (for supervisors).

J.27.5. ASSESSMENT CRITERIA

Assessment will be done based on examination of the dissertation as per the University's Higher Degrees Policy, Rules, and Regulations. Candidates are expected to secure a minimum of 50% marks in their dissertation work. In addition to the dissertation, candidates must appear for a Viva Voce (oral examination) conducted by a panel of examiners. Passing the Viva Voce is a mandatory requirement for the successful completion of the PhD programme.

J.27.6. REQUIREMENTS FOR QUALIFICATION AWARD

This qualification will be awarded to candidates credited with a minimum of 360 credits and who have met all other relevant UNAM requirements.

J.27.7. DOCTOR OF PHILOSOPHY IN MATHEMATICS - 33DMAT (NQF LEVEL 10)

J.27.8. DOCTOR OF PHILOSOPHY IN APPLIED STATISTICS – 33DPST (NQF LEVEL 10)

J.27.9. DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE – 33DPCS (NQF LEVEL 10)

J.27.10. DOCTOR OF PHILOSOPHY IN FINANCIAL MATHEMATICS (PHD) - 33DMFM (NQF LEVEL 10)

J.27.11. DOCTOR OF PHILOSOPHY IN POPULATION STUDIES (NQF LEVEL 10) – 33DPOP (NQF LEVEL 10)

J.27.12. CURRICULUM FRAMEWORK FOR ALL DOCTOR OF PHILOSOPHY IN SCIENCE- NQF LEVEL 10

MODULE CODES	MODULE NAMES	NQF	CREDIT
U6989LA	Academic Literacy for Post-Graduate Students	**9**	**16**
S7083FM/ S7073DD/ S7053MT/ S7083SD/ S7083PD	Dissertation	**10**	**360**
TOTAL CREDITS FOR PROGRAM			**360**

J.27.13. MODULE DESCRIPTOR FOR ALL DOCTOR OF PHILOSOPHY IN SCIENCE- NQF LEVEL 10

S7083FM/ S7073DD/ S7053MT/ S7083SD/ S7083PD:	DISSERTATION
NQF level:	9
NQF Credits:	120
Contact hours:	Consultations with supervisor(s), seminars presentations, conferences.
Module assessment:	100% Continuous assessment
Examination:	No Examination

Module Content: **Core elements of the module include the support of academic skills such as:**

- ✓ **Literature survey:** Comprehensive literature survey of studies and recent developments in the area of study (majorly in the last five years with a few longer where necessary). Here, chronological presentation of thoughts will be encouraged. This is essential towards the development and submission of logical research proposals. Students shall be encouraged to access both paper-based and online databases, abstracts and articles relevant to the proposed research title.
- ✓ **Development of research title:** The outcome of the literature survey will inform the student under the guidance of the supervisor of the need to amend (if necessary) the title of the research based on findings, intended scope of work and relevance of the research to the society, scientific, technological and industrial development. The ability to transform the conceptualized research idea into a proposal through the proposal writing process coherently and chronologically forms the basis of this learning stage.
- ✓ **Implementation of the acceptable and approved research proposal (methodology/experimental process):** At this stage, the student will implement the proposal through the stated methodology/experimental process. Here, the student will demonstrate the ability to conduct independent research work under the guidance of a supervisor.
- ✓ **Data presentation, interpretation and discussion:** Skills and ability to apply relevant statistical analysis for data presentation and sound scientific and technical interpretation and discussion of the results will be displayed.
- ✓ **Presentation skills:** Students' written, and oral presentation skills will be revealed. Here, the ability to summarize a report e.g., writing of abstract, conclusion etc. will be revealed. Knowledge of the student in preparing research outcomes for scientific communication (draft manuscript, PowerPoint presentation will be accessed.
- ✓ **Writing and submission of thesis for assessment:** The compilation of all the different sections of the research work into coherent chapters in the form of a thesis.
- ✓ **Ethical procedures:** Students will be required to adhere to all ethical requirements of research work and processes during study. The issue of plagiarism will be reiterated.
- ✓ **Formal presentation of thesis:** Students are expected to successfully present their theses following the Rules for Postgraduate Studies.