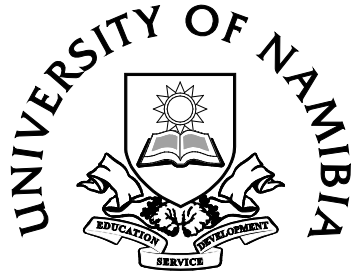
FACULTY PROSPECTUS 2011

FACULTY

OF

SCIENCE



Inspiring minds & shaping the future

NOTE

Regulations and curricula for 2011 may be amended without prior notice. General regulations and information appear in the **General Information and Regulations and Fees Prospectus**.

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

The information is correct up to 31 October 2010.

The fact that particulars of a specific course or field of study have been included in this Faculty Prospectus does not necessarily mean that such programme, subject, or module will be offered in 2011 or any consecutive year.

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

CONTENTS

FACULTY PREAMBLE

The mission of the Faculty of Science is to produce graduates of high caliber who will make a positive contribution to the socioeconomic development of Namibia and beyond, through the application of their knowledge and skills in various fields of science and technology. Given the past history, which did not encourage and promote effective teaching of science and mathematics, especially in the formerly disadvantaged communities, the Faculty 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 Faculty'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 Faculty 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 Major-Minor subject combinations in all the seven Departments of the Faculty. The degree programmes in the Faculty 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 Faculty 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 Faculty of Science allows us to offer modules and conduct research in these areas. By so doing, the Faculty of Science contributes immensely towards meeting the Vision and Mission of the University of Namibia. Through this, we are playing our part in helping Namibia achieve the goals set out in Vision 2030, the National Development Plans and the ETSIP targets.

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

ACADEMIC YEAR 2011

FIRST SEMESTER

10 January	University opens
20January	Academic staff resumes office duties
31 Jan - 18 February	Registration (Last day for Late Reg: 23 Febr)
21 February	**Lectures commence for FIRST SEMESTER**
26 April	**EASTER BREAK** starts
3 May	Instititutional Holiday
05 May	Lectures resume after Easter Break
10 June	**Lectures end for FIRST SEMESTER**
14 June	First Opportunity Examinations commence (Semester I modules)
01 July	First Opportunity Examinations end (Semester I modules)
01 July	**End of 1st Semester**
11-15 July	Mid-Year Recess

SECOND SEMESTER

25 July	**Lectures commence for SECOND SEMESTER**
12 September	SPRING BREAK starts
19 September	Lectures resume after Spring Break
04 November	**Lectures end for SECOND SEMESTER**
08 November	First Opportunity Examinations commence (Sem II & Double modules)
25 November	First Opportunity Examinations end (Sem II & Double modules)
25 November	**End of 2nd Semester**
13 December	Academic Year ends & University closes (until 09 January 2012)

2012 ACADEMIC YEAR

09 January 2012	University opens (2012 academic year)
10 January 2012	Second Opportunity Exams commence (Sem I, II & Double modules)
19 January 2012	Academic staff resumes office duties
26 January 2012	Second Opportunity Examinations end (Sem I, II & Double modules)

DUE DATES FOR THE 2011 ACADEMIC YEAR

(i) GENERAL

Last day for application of retention of continuous assessment mark ..... 18 February
Last day for application for exemption(s) ..... 18 February
Last day for Late Registration (*Late fee payable*) ..... 23 February
Last day for approval of exemption(s) ..... 23 February
Last day for approval of retention of continuous assessment mark ..... 23 February
Last day for approval of module(s) & qualification changes ..... 23 February
Last day to change Examination Centres at Regional Centres (Semester I modules) ..... 29 April
Last day for appeals (First Opportunity Examinations) (Semester I) ..... 29 July
Last day to submit outstanding documentation ..... 19 August
Last day to change Examination Centres at Regional Centres (Semester II modules – 1st & 2nd Opportunity Examinations)…23 Sept
Last day to cancel enrolment ..... 30 Sept
Last day for submission of Theses and Dissertations for examination ..... 18 Nov

(ii) CANCELLATIONS

Semester I modules

Last day to cancel Semester I modules ..... 06 May

Semester II modules

Last day to cancel Semester II modules ..... 30 Sept

Double modules (A double module normally extends over one academic year)

Last day to cancel Double modules ..... 30 Sept

(iii) FINANCE

Semester I modules

Last day to cancel with **100 %** credit ..... 11 March
Last day to cancel with **50 %** credit ..... 20 April

Semester II modules

Last day to cancel with **100 %** credit ..... 05 August
Last day to cancel with **50 %** credit ..... 02 Sept

Double modules (a double module normally extends over one academic year)

Last day to cancel with **100 %** credit 11March
Last day to cancel with **50 %** credit ..... 03 June

A. STRUCTURE AND PERSONNEL OF THE FACULTY

A.1. OFFICE OF THE DEAN

Dean

Prof E M R Kiremire, B.Sc.(Hons), University of East Africa, Makerere University College) Ph.D. (Uni. of New Brunswick, Canada)

Deputy Dean

Dr M A Kandawa-Schulz: M.Sc. Dr.rer.nat. (University of Rostock)

Faculty Officer

Ms T Tjipura, B.Econ, M. Admin (UNAM)

Faculty Secretary

Ms M Matengu-Lizazi, Dip Public Admin (Polytechnic of Namibia)

Typist Vacant

Cleaner: Ms. A. Amutenya: Grade. 6

General enquiries regarding the Faculty of Science and the qualifications offered by the Faculty should be directed to:

Mrs Tekla Tjipura:
The Faculty Officer
Faculty of Science
University of Namibia
Private Bag 13301
WINDHOEK

Telephone: +264-61-206-3047
Fax: +264-61-206 3791
E-mail: ttjipura@unam.na

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

A.2. ACADEMIC DEPARTMENTS

DEPARTMENT OF BIOLOGICAL SCIENCES

☎ (+264 61) 206 3423 🖷 (+264 61) 206 3791 💻 rbock@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr. R. Böck
Professor:	Vacant
Associate Professor:	Prof. I. Mapaure: B.Sc.Hons, MSc, Ph.D (Univ of Zimbabwe)
Senior Lecturer:	Dr. E. Maass: B.Sc., B.Sc. Hons, MSc, PhD (US)
Senior Lecturer:	Dr. J.K.E .Mfune: B.Sc.B.Sc.Hons (Malawi) M.Sc, Ph.D (Aberdn, U.K)
Senior Lecturer:	Dr. P.M. Chimwamurombe: B.Sc.Biochemistry, MSc. Biotechnology (UZ), PhD Plant Biotechnology (Univ of Pretoria, RSA)
Lecturer:	Dr. R. Böck: M.Sc. (Saarbrücken/Germany), Ph.D (Oklahoma State/USA)
Lecturer:	Dr. E.M. Julies: B.Sc.B.Sc.Hons (Rhodes Univ), PGDE (UNAM), M.Sc. (Univ of Ghent, Belgium), Dr. rer. nat. (Max Planck Inst. for Marine Microbiology, Bremen, Germany)
Lecturer	Dr. N. Shiponeni: B.Sc. (UNAM), M.Sc (Stellenbosch), PhD (Cape Town)
Lecturer:	Mr. B. Kaonjua: B.Sc. (State Univ of New York) M.Sc. (University of Brussels)
Lecturer:	Mr. A. Faul: B.Sc.Hons, MSc Conservation Ecology (Stellenbosch)
Lecturer:	Mr. V.M Haakuria: B.Sc.(UNAM), BSc Hons. (Rhodes Univ), M.Sc. (Wits Univ) [on study leave]
Lecturer:	Mr. K.C. Chinsembu: B.Sc. (Zambia), MSc. (Brussels)
Lecturer :	Mr. H. Eiman : BSc(Hons) Molecular and cell biology, MSc Molecular and cell biology (UCT)
Lecturer	Ms. W. C. Mukaru: B.Sc. (UNAM) , MSc. Biodiversity Management and Research (UNAM and Humboldt Universität zü Berlin)
Lecturer:	Mr. M. Hedimbi: B.Sc. MSc. Applied Biology (UNAM)
Guest Lecturer:	Dr. D. Mumbengegwi: B. Sc (Hons) Biological Sciences (Univ of Zimbabwe), M. Sc. Biotechnology and Molecular Biology (University of Hull, U.K), PhD. Pharmaceutical Sciences (University of Manchester, U.K)
Assistant Lecturer /Tutor:	Ms. C Amoo: B.Sc. Biology and Chemistry, M.Sc. Biochemistry (UNZA)
Assistant Lecturer/ Reseacher:	Ms. P. Kandhila-Muandingi B.Sc.(China)
Senior Technologist:	Mr. JD Uzabakiriho: B.Sc. M.Sc. (NUR)
Technologist:	Mr. A. Hijarunguru: B.Sc (US)
Technologist:	Ms. M. A Morkel: B.Sc. (Humboldt, USA)
Technologist:	Ms. M.J Johnson: B.Sc. (UNAM)
Technologist:	Mr. A.T Mbangu: B. Sc. (UNAM)
Lab. Ass. Technician:	Ms. R. Shimwooshili: Med and Lab Science Cert (Limbe Cameroon)

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

☎ (+264 61) 206 3384 🖷 (+264 61) 206 3791 💻 enaomab@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr E Naomab: B.Sc., MSc. (UNAM), MRes (Nottingham Trent, UK), PhD (Nottingham University, UK)
Professor:	Prof E M R Kiremire: B.Sc. (Hons), University of East Africa, Makerere University College) Ph.D. (Univ. of New Brunswick, Canada) **(Dean)**
Associate Professor:	Prof E F Archibong: PhD. (University of New Brunswick, Canada)
Associate Professor:	Prof Wang: M. Eng (China)
Senior Lecturer:	Dr H R Lotfy El -Sayed: B.Sc., MSc, PhD. (Mansaoura University- RPI, USA)
Senior Lecturer:	Dr M A Kandawa-Schulz: M.Sc. Dr.rer.nat. (University of Rostock)
Lecturer:	Dr ERT Elago: B.Sc. (UDW) PGDE (UNAM) B.Sc. Hons, MSc (UPE), PhD (NMMU)
Lecturer:	Dr E Naomab: B.Sc., MSc. (UNAM), MRes (Nottingham Trent, UK), PhD (Nottingham University, UK)
Lecturer:	Dr R Hans: B.Sc. (UNAM), MSc (University of Botswana), PhD (University of Cape Town)
Lecturer:	Dr G Kahaka: B.Sc. (UNAM), MSc & PhD (Nottingham University, UK)
Lecturer:	Ms C V Raidron: B.Sc., HED (UNAM), MPhil (Murdoch University, Australia)
Lecturer:	Mr V Uahengo: B.Sc. (UNAM), MSc. (Wuhan. Univ, China), Staff Development Fellow
Lecturer/Tutor:	Ms T Thomas B.Sc. (UNAM), MSc. (UCT)
Lecturer/Tutor:	Mr G Uiseb: B.Sc.(UNAM), MSc (Loughborough University, UK)
Researcher:	Ms N Pogori B.Sc. (UNAM), MSc, (Jiangnan University, China)
Senior Technologist:	Mr W Song: B. Eng. (South East University. China)
Technologist, MSc Student:	Ms C Mukakalisa: B.Sc. (UNAM)
Technologist, MSc Student:	Mr T Ndunge: B.Sc. (UNAM)
Technologist, MSc Student:	Mr N Gariseb B.Sc. (UNAM)
Technologist, MSc Student:	Ms S Potgieter: B.Sc. PGDE, Hon Science Education
Technologist, MSc Student:	Ms M Nyambe (UNAM), Hons (Stelellenbosch)
Technologist:	Ms A Shiimi: B.Sc. (UNAM), B. Sc Hons (UCT), MSc (UCT)
Technologist:	Ms N Shifeta B.Sc. (UNAM)
Technologist:	Ms H Hakwenye B.Sc. (UNAM)
Technologist:	Ms C Tjiurutue B.Sc. (UNAM) Staff Development Fellow
Technologist:	Mr D Likius: BSc (UNAM), MSc (UNAM) Staff Development Fellow
Assistant Technician:	Mr T Manuel

DEPARTMENT OF COMPUTER SCIENCE

☎ (+264 61) 206 3519 🖷 (+264 61) 206 3791 💻 jmbale@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr. J. Mbale Ph.D. (HIT, China), M.Sc. (Shanghai, China), B.A. (UNZA), Dip.Ed. (TVTC), CCAI, CISCO IT-Essentials: PC Hardware and Software
Professor:	Vacant
Senior Lecturer:	Dr. J. Mbale: Ph.D. (HIT, China), M.Sc. (Shanghai, China), B. A. (UNZA), Dip.Ed. (TVTC), CCAI, CISCO IT-Essentials: PC Hardware and Software
Senior Lecturer:	Mr. E. L. Mkusa: B.Sc. (Mech Eng) MBA (UDSM) M.Sc. (OR, Lancaster) M.Sc. (IT. Strathclyde)
Lecturer:	Ms. T. K. Mufeti: B.Sc. (UNAM), B.Sc.Hons (Rhodes), M.Sc. (Rhodes)
Lecturer:	Mrs. N. Suresh: BE (Eng), MTech (India)
Lecturer:	Mr J. J. Magenya: HND (ENG), (ESSEX, UK), M.Sc. (UNAM)
Lecturer:	Mr Frans David: M.Sc. (China); (*On Study Leave*)
Lecturer:	Mr James Mutuku: B.Sc.(Hons)(Nairobi), PGDE(UNAM), HDipCS (Wits), MSc (UCT)
Lecturer:	Vacant
Lecturer:	Vacant
Tutor:	Ms. S.R. Mwatilifange: B.Sc.(Strayer, USA)
Tutor.	Mr. S.P. Shihomeka: MBA (SA), B.Ed. (UNAM), ICDL (SA)
Tutor:	Ms. Theodora Mukaya: B.Sc. (UNAM)
Tutor:	Mr . F. Da Silva: B.Sc.Eng (HIMEE – Varna, Bulgaria)
Tutor:	Mr. P.K. Hangulah: B.Eng (HW, Scotland)
Technologist:	Mr. J. M. Mutonga: MCSE, CCNA 1, Computer Network Engineering and Management Certificate
Technologist:	Vacant

DEPARTMENT OF GEOLOGY

☎ (+264 61) 206 3712 🖷 (+264 61) 206 3791 💻 afkamona@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr A.F. Kamona
Professor:	Vacant
Senior Lecturer:	Dr F Kamona: B.Sc. (UNZA). MMinSc (UNZA), PhD (Aachen, Germany).
Senior Lecturer:	Dr B.S. Mapani: B.Sc. (UNZA), MSc. (Nancy), PhD (Melbourne)
Lecturer:	Dr.A. Macuvele, B.Sc. (Edward Mondlane), PhD (Aachen, Germany)
Lecturer:	Dr. A. Wanke: Diplom Arbeit/MSc (Göttingen), PhD (Würzburg).
Lecturer:	Vacant
Lecturer: (Part-time):	Dr B Corner: B.Sc.Hons, M.Sc, Ph.D. (Wits)
Lecturer: (Part-time):	Mr. M. Siyambango, B.Sc. (UNAM), M.Sc (Exeter, Camborne School of Mines)
Lecturer: (Part-time):	Ms. K. Dierkes, M.Sc (Univ. Regensburg) Germany
Tutor:	Mr. A. Vatuva B.Sc. (UNAM)
Tutor:	Ms. S. Uugulu; BSc (UNAM)
Tutor	Mr. F. Maske;
Technologist:	Ms. J. Kaluwapa: Nat. Dipl (Mech. Eng), Polytechnic of Namibia
Technologist:	Mr. G. Nghikongelwa: Nat. Dipl (Mech. Eng), Polytechnic of Namibia

DEPARTMENT OF MATHEMATICS

☎ (+264 61) 206 3793 🖷 (+264 61) 206 3791 💻 **fgideon@unam.na** ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr F Gideon
Professor:	Prof G Heimbeck: Dipl.-Math, Dr.rer.nat, Dr.rer.nat.habil (Würzburg)
Senior Lecturer:	Dr F Gideon: B.Sc. (UNAM), BSc-Hons, MSc (Rhodes Univ), Ph.D (University of North West)
Senior Lecturer:	Vacant
Lecturer:	Mr A Shikongo B.Sc. (UNAM) BSc-Hons (University of Pretoria), M.Sc. (UWC)
Lecturer:	Dr M M Mugochi B.Sc.Hons (UZ), Mphil (UZ) , PhD (UNISA)
Lecturer:	Mr D Iiyambo: B.Sc., PGDE (UNAM), BSc-Hons,(UCT), M.Sc (UCT)
Lecturer:	Mr Z Mushaandja: B.Sc. (UNAM) B.Sc.-Hons (UCT) M.Sc. (UCT) Ph.D (UCT)
Tutor:	Ms B B Nambahu: BSc (UNAM)
Tutor:	Mr P. Haihambo: BSc (UNAM)
Tutor:	Ms C Amakutsi: B.Sc. (UNAM) PGDE (UNAM)
Tutor:	Mr L Komomungondo B.Sc. (UNAM)
Tutor:	Mr J. Lichela: BSc (UNAM)
Staff Development Fellow:	Mr D Elago: B.Sc. (UNAM) PGDE (UNAM)
Staff Development Fellow:	Mr O Shuungula B.Sc. (UNAM) BSc-Hons, M.Sc. (UCT)

DEPARTMENT OF PHYSICS

☎ (+264 61) 206 3373 🖷 (+264 61) 206 3791 💻 oyedelej@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Prof J A Oyedele
Professor:	Prof J A Oyedele: B.Sc.(Ife), M.Sc., PhD (Mc Master, Canada)
Associate Professor:	Prof S Singh M.Sc. PhD. (India)
Senior Lecturer:	Dr R Steenkamp: Ph.D. (Potchefstroom)
Lecturer:	Ms P Dobreva: M.Sc. (Sofia, Bulgaria)
Lecturer:	Mr W Liu: B.Sc. (Harbin), M.Sc. (Heilongjiang, China)
Lecturer:	Mr. I Davids: B.Sc.., PGDE (UNAM), BSc.-Hons, M.Sc (North West, RSA)
Staff Development Fellow:	Mr. A. Chatu B.Sc.(UNAM), B.Sc.Hons. (WITS, RSA)
Tutor:	Ms. Q Auala: B.Sc. (UNAM)
Tutor:	Mr. S Shimboyo: B.Sc. (UNAM)
Laboratory Technologist:	Mr O Mutenda: B.Sc. (UNAM)
Laboratory Technologist:	Mr H C Hofmann: National Certificate N3 (RSA), Trade Diploma (Namibia)
Technical Assistant:	Ms E Shilongo: Diploma in Education (Mutare, Zimbabwe)

DEPARTMENT OF STATISTICS

☎ (+264 61) 206 3367 🖷 (+264 61) 206 3226 💻 nkanime@unam.na ✉ Private Bag 13301, Windhoek, Namibia

Head of Department:	Dr. N Indongo
Professor:	Vacant
Senior Lecturer:	Vacant
Lecturer:	Dr M A E Muller: B.Sc. Hons, (Unisa) , M.Sc. (UOFS), H.E.D.(Unisa) PhD. (Univ of Pretoria)
Lecturer:	Mr W Tjipueja B.Sc.(UNAM) M.Sc. (UHasselt - formerly LUC, Belgium)
Lecturer:	Dr I Neema: B.Sc. (UNAM), M.Sc. (WPI, USA); PhD in Statistics (Reading University, UK)
Lecturer:	Mr C J Mahindi: BA. (Dar-er Salaam) PGD, M.Phil. (Cairo)
Lecturer:	Ms Lillian Pazvakawambwa (MSc. Statistics, University of Zimbabwe)
Lecturer:	Dr. N Indongo: B.Sc. (UNAM), MSc. in Social Statistics (Soton, UK), PhD in Demography (Univ of Pretoria)
Staff Development Fellow:	Ms N. Nickanor: B.Sc. (UNAM), PGD (Population Studies - UB), M.A (Population Studies - UB)
Lecturer:	Mr PT Iiyambo: B.Sc. (UNAM), B.Sc. Hons in Statistics (Univ. of the Free State), MSc. in Statistics (Univ. of the Free State)
Staff Development Fellow:	Mr. K. Mutorwa: BSc. (UNAM)
Staff Development Fellow:	Mr I Kamwi: B.Sc.(UNAM),MSc in Statistics (UWC)

B. QUALIFICATIONS OFFERED BY THE FACULTY

The Faculty may award the following Undergraduate and Postgraduate degrees:

B.1. UNDERGRADUATE PROGRAMMES

(CODE)	DIPLOMA/DEGREE	MINIMUM DURATION
(11DSST)	Diploma in Appplied Statistics	2 years full-time
(11BSCI)	Bachelor of Science	4 years full-time
(11BSCP)	Bachelor of Science (Special in Population and Development)	4 years full-time
(11BSCD)	Bachelor of Science (Honours) Population Studies	4 years full-time
(11BEGL)	Bachelor of Science (Honours) Environmental Biology Major and Geology Minor	4 years full-time
(11BEGH)	Bachelor of Science(Honours) Environmental Biology Major and Geography Minor	4 years full-time
(11BMIC)	Bachelor of Science(Honours) Micro Biology and Chemistry Minor	4 years full-time
(11BMIB)	Bachelor of Science(Honours) Micro Biology and Biochemistry Minor	4 years full-time
(11BMOC)	Bachelor of Science(Honours) Molecular Biology and Chemistry Minor	4 years full-time
(11BMOB)	Bachelor of Science (Honours) Molecular Biology and Biochemistry Minor	4 years full-time
(11BCHP)	Bachelor of Science(Honours) Chemistry Major and Physics Minor	4 years full-time
(11BCHB)	Bachelor of Science (Honours) Chemistry Major and Biology Minor	4 years full-time
(11BCHG)	Bachelor of Science (Honours) Chemistry Major and Geology Minor	4 years full-time
(11BCBB)	Bachelor of Science (Honours) Biochemistry Major and Biology Minor	4 years full-time
(11BCBC)	Bachelor of Science (Honours) Biochemistry Major and Chemistry Minor	4 years full-time
(11BCMI)	Bachelor of Science Computer Science Major and Information Technology Minor	4 years full-time
(11BCMM)	Bachelor of Science (Honours) Computer Science Major and Mathematics Minor	4 years full-time
(11BCMS)	Bachelor of Science (Honours) Computer Science Major and Statistics Minor	4 years full-time
(11BGLY)	Bachelor of Science (Honours) Geology Single Major	4 years full-time
(11BMAS)	Bachelor of Science (Honours) Mathematics Major and Statistics Minor	4 years full-time
(11BMAC)	Bachelor of Science (Honours) Mathematics Major and Computer Science Minor	4 years full-time
(11BMAP)	Bachelor of Science(Honours) Mathematics Major and Physics Minor	4 years full-time
(11BPHM)	Bachelor of Science (Honours) Physics Major and Mathematics Minor	4 years full-time
(11BPHG)	Bachelor of Science (Honours) Physics Major and Geology Minor	4 years full-time
(11BPHC)	Bachelor of Science(Honours) Physics Major and Computer Science Minor	4 years full-time
(11BPHH)	Bachelor of Science (Honours) Physics Major and Chemistry Minor	4 years full-time
(11BSTC)	Bachelor of Science (Honours) Statistics Major and Computer Science Minor	4 years full-time
(11BSTP)	Bachelor of Science (Honours) Statistics Major and Population Studies Minor	4 years full-time
(11BSTM)	Bachelor of Science (Honours) Statistics Major and Mathematics Minor	4 years full-time
(11BSTE)	Bachelor of Science (Honours) Statistics Major and Economics Minor	4 years full-time
(11BPGE)	Bachelor of Science(Honours) Population Studies Major and Geography Minor	4 years full-time
(11BPST)	Bachelor of Science(Honours) Population Studies Major and Statistics Minor	4 years full-time
(11BPSO)	Bachelor of Science (Honours) Population Studies Major and Sociology Minor	4 years full-time

C. REGULATIONS PERTAINING TO UNDERGRADUATE STUDIES IN THE FACULTY

C.1. ADMISSION REQUIREMENTS

To register for a B.Sc. undergraduate degree programme a candidate must hold a valid Namibian Senior Secondary Certificate (NSSC) (ordinary or higher) or a recognised equivalent qualification.

English is a **compulsory** subject and should normally have been obtained as a Second Language at NSSC (O level) with a minimum C symbol, or English as a First Language at NSSC (O level) with a minimum D symbol.

In addition to the above, admission to the B.Sc. course of study requires at least a symbol C on NSSC or equivalent qualification in Mathematics.

A candidate should obtain a minimum of 25 points on the UNAM Evaluation Point Scale in his/her five (5) best subjects (of which Mathematics and English must be included) to be admitted to undergraduate studies (Refer to the **General Admission Criteria for Undergraduate Programmes** in the **General Information and Regulations Yearbook**). Obtaining the minimum number of points, however, **does not necessarily ensure admission. Admission is based on places available in modules, subjects and programmes and is awarded on the basis of merit.**

The Faculty reserves the right to interview students before admission.

Certain modules, subjects or programmes may require special written entry tests for screening candidates before admission is considered. Candidates who do not meet the requirements for admission to such modules, subjects or programmes may, however, register for any other modules, subjects or programmes to which they are admitted subject to relevant University and Faculty of Science regulations.

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

Please read this section in conjunction with the academic conditions stipulated in the **General Information and Regulations Prospectus**.

C.2. DURATION OF STUDY

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

C.2.1. TWO MODES OF STUDY FOR FIRST YEAR MATHEMATICS

All new students enrolling into the Faculty of Science are required to register for Basic Mathematics (SMAT 3511) and Precalculus (SMAT 3512). In order to assist students with a weaker background in mathematics, the Department of Mathematics has introduced two modes of teaching for its first year courses. The decision as to which mode a student shall take is reached upon sitting for the first class test in Basic Mathematics after the first four weeks of classes. Any student who scores a mark of 40% or higher, in the said test, shall proceed with the current mode of study, which enables such student to complete the first year mathematics courses in the first academic year of registration. The student who scores a mark below 40% shall proceed to a special mode in which the current content of first year mathematics is taught over a period of two years.

C.3. 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 Prospectus: Information, Regulations & Fees.

C.4. CLASS ATTENDANCE

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

C.5. PRACTICALS

Attendance of practical classes is compulsory.

C.6. CURRICULUM

C.6.1. MODULES, 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 module 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-module carries 8 credits and is taught at two (2) contact hours per week over one semester, i.e. 28 contact hours per semester. A half-module counts as one half (0.5) of a *module*.
A double-module carries 32 credits and is taught at four (4) contact hours per week over the full academic year (both semesters), i.e. 112 contact hours per academic year. A double-module is equivalent to two (2) *modules*.
Refer to the relevant programmes (to determine the credits and contact hours of any particular module).

C.6.2. CURRICULUM COMPILATION

To be awarded a Bachelor's degree by the Faculty, a student must pass all the modules prescribed for each Major / Minor combination.
In the BSc degree programme a student may compile his/her curriculum by selecting the major subjects and minor s subjects offered by a specific department, in accordance with Faculty and department regulations. For the B.Sc Geology programme set curricula are prescribed, although Geology deparments allow some of their modules as minors to certain deparments options within the Faculty curriculum. Refer to the relevant degree programmes for detailed information.

C.6.3. STUDENT REGISTRATION

C.6.3.1. UNIVERSITY CORE CURRICULUM

All students will take the equivalent of three (4) modules (48 credits) in the University Core Curriculum in the first year of study as part of their curriculum (i.e. as part of the equivalent of eleven (10) first year level modules to be passed at first year level.

All students register for the following two (2) half-modules:

SEMESTER	CODE	MODULE NAME
2	UCSI 3529	Contemporary Social Issues (half-module)
1	UCLC 3509	Computer Literacy (half-module)

Students furthermore add the equivalent of two (2) full English modules from the University Core Curriculum to their curriculum according to the following rules:

Students with any one of the following qualifications in English will apply to be **credited** for ULCE 3419 English Communication and Study Skills and will register for the module below: (a) a pass (minimum grade 4) in English First Language at NSSC Higher Level or the equivalent; (b) grade 1, 2 or 3 in English Second Language at NSSC Higher Level or the equivalent.

SEMESTER	CODE	MODULE NAME
1	ULCE 3419	English Communication and Study Skills
2	ULEA 3519	English for Academic Purposes

Students with a D symbol in English First/Second Language at NSSC Ordinary Level, or the equivalent, register for only the *double-module* below:

SEMESTER	CODE	MODULE NAME
1 & 2	ULEG 2410	English for General Communication *(double-module)*

C.6.3.2. UNIVERSITY CORE CURRICULUM MODULE DESCRIPTIONS

ULCE3419 ENGLISH COMMUNICATION & STUDY SKILLS **4L/week**

Module title:	**ENGLISH COMMUNICATION AND STUDY SKILLS**
Code:	**ULCE 3419**
NQF Level:	4
Contact hours:	4 hours per week for 14 weeks
Credits:	16
Module Assessment:	Continuous assessment (60%): two tests (reading and writing), two reading assignments, one oral presentation Examination (40%): one three hour examination paper
Pre-requisites:	None

Module description: This module is aimed at assisting students in the development of their reading, writing and speaking and listening skills, in order to cope with studying in a new academic environment and in a language which may not be their first language. The module also focuses on study skills that students need throughout their academic careers and beyond. The module serves as an introduction to university level academics, where styles of teaching and learning differ from those at secondary schools in that more responsibility is placed on the student. The module therefore, focuses on the skills that students need throughout their academic careers and beyond.

ULEA3419 ENGLISH FOR ACADEMIC PURPOSES **4L/week**

Module title:	**ENGLISH FOR ACADEMIC PURPOSES**
Code:	**ULEA 3519**

NQF level: 5
Contact hours: 4 periods per week for 14 weeks
Credits: 16
Module assessment: Continuous assessment (60%): 2 tests (reading and writing), 1 academic written essay,1 oral presentation
Examination (40%) : One three hour examination paper
Prerequisites: None
Module description: This module develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

UCLC3409 COMPUTER LITERACY

Module title: **COMPUTER LITERACY**
Code: **UCLC 3509**
NQF level: 4
Contact hours: 1 lecture theory and 1 lecture practical per week for 14 weeks
Credits: 8
Module assessment: Continuous Assessment 100%: 2 Practical Tests 50%, 2 Theory Tests 50%
Prerequisites: University Entry
Module description: The aim of this module is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.
Content: The module covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

UCSI 3429 CONTEMPORARY SOCIAL ISSUES **2L/week**

Module Title: **CONTEMPORARY SOCIAL ISSUES**
Code: **UCSI 3529**
NQF: 4
Contact Hours: 2 periods per week for 14 weeks
Credits: 8
Module Assessment: Continuous assessment (50%): test or assignment
Examination (50%): 1x2 hours paper
Prerequisite: None
Module Description: The module raises awareness on the need for a personal, national and global ethics. The main objectives of the course is to help students reflect on the social moral issues; to discover themselves in a learner-centered, contextual, religious and life related setting. It also stimulates students for critical thinking and help them to appreciate their values, standards and attitudes.
Furthermore it orientates students with regards to the epidemiology of HIV/AIDS; the prevalence of the disease on Namibia, Africa and Internationally. It also informs students on the psycho social and environmental factors that contribute to the spread of the disease, the impact of HIV/AIDS on their individual lives, family and communities at large. The unit further seeks to enhance HIV/AIDS preventive skills among students by means of paradigm shift and behavior change and also to impart general introductory knowledge on gender, to make students aware, as well as sensitize them towards gender issues and how they affect our society, Sub-Region and continent at large.

C.6.3.3. FACULTY CORE CURRICULUM

All students must register for the following two (2) full modules (32 credits):

SMAT 3511 Basic Mathematics
SMAT 3512 Precalculus

C.6.3.4. FACULTY CORE CURRICULUM MODULE DESCRIPTIONS

SMAT3511 BASIC MATHEMATICS	4L/week
Module name:	**BASIC MATHEMATICS**
Code:	**SMAT 3511**
NQF level:	5
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests) Examination 50% (3 hours examination paper).
Prerequisite:	None

Module description: Sets: notations and diagrams to represent sets, subset, empty set, equality of sets, intersection, union, complement. Algebraic expressions: simplification, expansion, polynomials, reminder and factor theorem, partial fractions. Trigonometry: trigonometric functions, basic trigonometric identities. The absolute value, linear equations, linear inequalities, quadratic equations, the quadratic formula, quadratic inequalities. Functions: domain, codomain, image, preimage, even function, odd function. Sequences: the general term, the geometric sequence, the arithmetic sequence. The Binomial Theorem.

SMAT3512 PRECALCULUS	**4L/week**
Module name:	**PRECALCULUS**
Code:	**SMAT 3512**
NQF level:	5
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	None

Module description: Functions: one-to-one and onto functions, horizontal line test, composition of functions, inverse of a function. Introduction to exponential and logarithmic functions. Limit of a function: definition, left and right limits, infinite limits, limits at infinity, continuity in terms of limits. Differentiation: rate of change, derivative of a function, rules of differentiation, increasing and decreasing functions and graph sketching. Integration: antiderivatives, the definite integral, area under a graph. Trigonometry: further trigonometric identities, area of a sector and segment of a circle, derivatives and integrals of trigonometric functions.

C.6.3.5. MAJORS AND MINORS

The choice of the major and the minor, if applicable, determines the compilation of the curriculum.

Each student must choose one major and minor from the following list:

C.6.3.5.1. DEPARTMENT OF BIOLOGICAL SCIENCE

Bachelor of Science (Honours) Environmental Biology Major and Geology Minor
Bachelor of Science (Honours) Environmental Biology Major and Geography Minor
Bachelor of Science (Honours) Micro Biology and Chemistry Minor
Bachelor of Science (Honours) Micro Biology and Biochemistry Minor
Bachelor of Science (Honours) Molecular Biology and Chemistry Minor
Bachelor of Science (Honours) Molecular Biology and Biochemistry Minor

C.6.3.5.2. DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Bachelor of Science (Honours) Chemistry Major and Physics Minor
Bachelor of Science (Honours) Chemistry Major and Biology Minor
Bachelor of Science (Honours) Chemistry Major and Geology Minor

Bachelor of Science (Honours) Biochemistry Major and Biology Minor
Bachelor of Science (Honours) Biochemistry Major and Chemistry Minor

C.6.3.5.3. DEPARTMENT OF COMPUTER SCIENCE

Bachelor of Science (Honours) Computer Science Major and Information Technology Minor
Bachelor of Science (Honours) Computer Science Major and Mathematics Minor
Bachelor of Science (Honours) Computer Science Major and Statistics Minor

C.6.3.5.4. DEPARTMENT OF GEOLOGY

Bachelor of Science (Honours) Geology Single Major

C.6.3.5.5. DEPARTMENT OF MATHEMATICS

Bachelor of Science (Honours) Mathematics Major and Statistics Minor
Bachelor of Science (Honours) Mathematics Major and Computer Science Minor
Bachelor of Science (Honours) Mathematics Major and Physics Minor

C.6.3.5.6. DEPARTMENT OF PHYSICS

Bachelor of Science (Honours) Physics Major and Mathematics Minor
Bachelor of Science (Honours) Physics Major and Geology Minor
Bachelor of Science (Honours) Physics Major and Computer Science Minor
Bachelor of Science (Honours) Physics Major and Chemistry Minor

C.6.3.5.7. DEPARTMENT OF STATISTICS

Bachelor of Science (Honours) Statistics Major and Computer Science Minor
Bachelor of Science (Honours) Statistics Major and Population Studies Minor
Bachelor of Science (Honours) Statistics Major and Mathematics Minor
Bachelor of Science (Honours) Statistics Major and Economics Minor
Bachelor of Science (Honours) Population Studies Major and Geography Minor
Bachelor of Science (Honours) Population Studies Major and Statistics Minor
Bachelor of Science (Honours) Population Studies Major and Sociology Minor

Depending on this choice, he/she either must follow a fixed curriculum or choose major and a minor.

C.7. EXAMINATION REGULATIONS

For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees. A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of 40%. Examination will be administered at the end of each semester.

C.8. RE-ADMISSION INTO THE FACULTY OF SCIENCE

C.8.1. MINIMUM REQUIREMENTS FOR RE-ADMISSION INTO THE FACULTY

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

- 4 modules (equivalent to 64 credits) by the end of the first year; 2 of these modules (equivalent to 32 credits) must be non-core (30%)
- 9 modules (equivalent to 144 credits) by the end of the second year (45%)
- 16 modules (equivalent to 256 credits) by the end of the third year (57%)
- 25 modules (equivalent to 400 credits) by the end of the fourth year (69%)

A student will not be re-admitted into the Faculty if he/she has not passed the above modules.

C.8.2. PASS REQUIREMENTS

C.8.2.1. ADVANCEMENT AND PROGRESSION RULES

A student advances to the following academic level of study when at least 2/3 of the modules of the curriculum for a specific year have been passed. If a student passed only 1/3 of the full curriculum of a specific year, he/she may not register for any modules of the following year. In all cases, prerequisites for modules have to be passed before a student can proceed to register for modules that require prerequisites.

- From year 1 to year 2:

At least 7 modules (equivalent to 112 credits) prescribed for year 1.

- From year 2 to year 3:

All first year modules plus at least 6 modules (equivalent to 96 credits) prescribed for year 2.

- From year 3 to year 4:

All second year modules plus at least 6 modules (equivalent to 96 credits) prescribed for year 3.

C.8.2.2. MAXIMUM NUMBER OF MODULES PER YEAR

No student will be allowed to register for more than 12 modules per year

.

C.9. MODULE RESTRICTIONS

A student will be admitted to a specific module only if he/she meets the requirements for the particular module. The UNAM CORE, as well as SMAT3511 Basic Mathematics and SMAT3512 Precalculus are compulsory for all first year B.Sc. degree students, including all students from other Faculties who wish to major in a subject offered by the Faculty of Science.

C.10. MODULES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

D. DEPARTMENT OF BIOLOGICAL SCIENCES

D.1. DEPARTMENTAL REGULATIONS

D.1.1 COMPULSORY REQUIREMENTS

- All students must have a dissecting kit of their own. Kits can be bought from the Campus Book Store or other sources in town.
- Lab coats are compulsory for practical sessions for all students.
- Students pursuing B.Sc.in Environmental Biology must do and pass SEBL3700 Field Ecology I and SEBL3800 Field Ecology II. Failure to take part in these field-based modules will disqualify students from sitting the theory examination of the specific co-requisite modules.

D.1.1.2 COMPILATION OF THE CA MARK

- Details on how the CA for each module is compiled are given under the respective modules.

D.1.1.3 WEIGHTING OF CA AND EXAM MARKS

- Unless otherwise indicated, the relationship between the CA mark and the Examination mark is 40:60.

D.2. ENVIRONMENTAL BIOLOGY

D.2.1. B.SC. ENVIRONMENTAL BIOLOGY: MAJOR AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc. Environmental Biology Major and Geology Minor (11BEGL)

Students opting for a major in Environmental Biology (with minors in Geology) must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3429	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
	Geology Minor:		
1	Introduction to Physical Geology & Surface Processes	GLY3521	Faculty entry requirements
1	Physics for Life Sciences	PHY3501	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Chemistry for Life Sciences	CHM3532	Faculty entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Geology Minor:		
2	Introduction to Earth Systems	GLY3502	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511, BLG3512
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511, BLG3512,
1	Statistics for Life Sciences I	STS3621	STS3522
1	Introduction to Ecology	EBL3631	BLG3511, BLG3512
	Geology Minor:		
1	Earth Resources	GLY3641	GLY3521
1	Introduction to Hydrology	GLY3621	MAT3512

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Plant Form and Function	BLG3612	BLG3511, BLG3512
2	Introduction to Microbiology	MBL3632	BLG3511, BLG3512
2	Statistics for Life Sciences II	STS3622	STS3511
2	Ecological Field Techniques	EBL3632	BLG3511, BLG3512
	Geology Minor:		
2	Stratigraphy & Geological Mapping	GLY3612	GLY3521

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Field Ecology I	EBL3700	EBL3711, EBL3712, EBL3732
1	Fresh Water & Marine Ecology	EBL3711	EBL3631
1	Population Ecology	EBL3731	EBL3631
1	Plant physiology	MBL3751	CHM3511, CHM3512
	Geology Minor:		
1	Plate Tectonics	GLY3721	GLY3612
1	Regional Geology of Namibia	GLY3761	None

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG3611
2	Ecosystem Ecology	EBL3712	EBL3631
2	Conservation Biology & Biodiversity	EBL3732	EBL3631, EBL3731
2	Research Methodology	BLG3702	STS3621, STS3622
	Geology Minor:		
2	Structural Geology I	GLY3712	GLY3612

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Field Ecology II	EBL3800	EBL3811, EBL3851, EBL3832
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Environmental Management	EBL3811	EBL3731, EBL3712, EBL3732
1	Biosystematics	EBL3831	EBL3632, BLG3612, BLG3611
1	Biogeography	EBL3851	EBL3631, EBL3712
1	Parasitology	MIC3802	MBL3711
	Geology Minor: No offering		

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Disturbance & Restoration Ecology	EBL3802	EBL3712, EBL3732
2	Management of Natural Resources	EBL3832	EBL3731, EBL3712, EBL3732
2	Behavioural Ecology	EBL3812	EBL3731
	Geology Minor: No offering		

QUALIFICATION: B.Sc. Environmental Biology Major and Geography Minor (11BEGH)

Students opting for a major in Environmental Biology (with minors in Geography) must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3529	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
	Geography Minor:		
1	Fundamentals of Physical Geography	GHE3521	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Chemistry for Life Sciences	CHM3532	Faculty entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Geography Minor:		
2	Fundamentals of Human Geography	GHE3532	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511, BLG3512
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511, BLG3512,
1	Statistics for Life Sciences I	STS3621	STS3522
1	Introduction to Ecology	EBL3631	BLG3511, BLG3512
	Geography Minor:		
1	Climatology & Geomorphology or Settlement & Economic Geography	GHE3611 or GHE3631	As in Respective Departmental Regulations
SEMESTER	**MODULE**	**CODE**	**PRE-/COREQUISITES**
2	Plant Form and Function	BLG3612	BLG3511, BLG3512
2	Introduction to Microbiology	MBL3632	BLG3511, BLG3512
2	Statistics for Life Sciences II	STS3622	STS3511
2	Ecological Field Techniques	EBL3632	BLG3511, BLG3512
	Geography Minor:		
2	Pedology & Biogeography	GHE3602	As in Respective Departmental Regulations
2	Social Geography	GHE3622	As in Respective Departmental Regulations

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Field Ecology I	EBL3700	EBL3711, EBL3712, EBL3732
1	Fresh Water & Marine Ecology	EBL3711	EBL3631
1	Population Ecology	EBL3731	EBL3631
1	Plant physiology	MBL3751	CHM3511, CHM3512
	Geography Minor:		
1	Environmental Studies or General Methods & Techniques in Geography or Geographic Analysis & Techniques	GHE3711 or GHE3731 or GIS3711	As in Respective Departmental Regulations

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG3611
2	Ecosystem Ecology	EBL3712	EBL3631
2	Conservation Biology & Biodiversity	EBL3732	EBL3631, EBL3731
2	Research Methodology	BLG3702	STS3621, STS3622
	Geography Minor:		
2	Regional Geography or Geographic Information Systems	GHE3752 or GIS3732	As in Respective Departmental Regulations

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Field Ecology II	EBL3800	EBL3811, EBL3851, EBL3832
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Environmental Management	EBL3811	EBL3731, EBL3712, EBL3732
1	Biosystematics	EBL3831	EBL3632, BLG3612, BLG3611
1	Biogeography	EBL3851	EBL3631, EBL3712
1	Parasitology	MIC3802	MBL3711
	Geography Minor: No offering		
SEMESTER	**MODULE**	**CODE**	**PRE-/COREQUISITES**
2	Disturbance & Restoration Ecology	EBL3802	EBL3712, EBL3732
2	Management of Natural Resources	EBL3832	EBL3731, EBL3712, EBL3732
2	Behavioural Ecology	EBL3812	EBL3731
	Geography Minor: No offering		

D.2.2 B.SC. IN ENVIRONMENTAL BIOLOGY: MODULE EQUIVALENTS

YEAR	SEMESTER	MODULE TITLE (new modules)	MODULE EQUIVALENT
1	1	SBLG3511 Introduction to Biology	BLG3101 Biology 1A
	2	SBLG3512 Diversity of Life	BLG3112 Biology 1B
2	1	SBLG3611 Animal Form and Function	BLG3212 Animal Biology
		SEBL3631 Introduction to Ecology	EBL3231 Introduction to Ecology
		SMBL3631 Cell Molecular Biology and Genetics	BLG3202 Cell and Molecular Biology
	2	SBLG3612 Plant Form and Function	BLG3211 Plant Biology
		SEBL3632 Ecological Field Techniques	EBL3222 Field Biology
		SMBL3632 Introduction to Microbiology	MBL3231 Introduction to Microbiology
3	1 & 2	SEBL3700 Field Ecology I	*None*
	1	SEBL3711 Freshwater and Marine Ecology	EBL3331 Freshwater and Marine Ecology
		SEBL3731 Population Ecology	EBL3311 Population Ecology
		SMBL3751 Plant Physiology	MBL3331 Plant Physiology
	2	SEBL3712 Ecosystem Ecology	EBL3312 Ecosystem Ecology
		SEBL3732 Conservation Biology and Biodiversity	EBL3332 Conservation Biology and Biodiversity
		SBLG3702 Research Methodology	*None*
		SMBL3752 Comparative Animal Physiology	MBL3312 Comparative Animal Physiology
4	1 & 2	SEBL3800 Field Ecology II	*None*
		SBLG3810 Research Project	BLG3410 Projects and advanced Skills in Biology
	1	SEBL3811 Environmental Management	*None*
		SEBL3831 Biosystematics	EBL3401 Taxonomy and Identification
		SEBL3851 Biogeography	EBL3411 Biogeography
	2	SEBL3802 Disturbance and Restoration Ecology	*None*
		SEBL3832 Management of Natural Resources	EBL3412 Management of Natural Resources
		SEBL3812 Behavioural Ecology	*None*

D.3. MICROBIOLOGY

D.3.1. B.SC.MICROBIOLOGY: MAJOR AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc. Microbiology Major and Biochemistry Minor (11BMIB)

Students opting for a major in Microbiology (with minor s in Biochemistry) must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3529	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
1	Physics for Life Sciences I	PHY3501	Faculty entry requirements
	Biochemistry Minor:		
1	Chemistry IA	CHM3511	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Biochemistry Minor:		
2	Chemistry IB	CHM3512	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511,BLG3512
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511,BLG3512,
1	Statistics for Life Sciences I	STS3621	STS3522
	Biochemistry Minor:		
1	Biochemistry I	CHB3611	CHM3511, CHM3512 and BLG3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Plant Form and Function	BLG3612	BLG3511,BLG3512
2	Introduction to Microbiology	MBL3632	BLG3511,BLG3512
2	Statistics for Life Sciences II	STS3622	STS3511
2	Human Biology*	MBL3652	CHM3511,CHM3512 BLG3512
	Biochemistry Minor:		
2	Biochemistry II	CHB3612	CHM3511, CHM3512 OR CHM3532 and BLG3511
2	Organic Chemistry I	CHM3612	CHM3511,CHM3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Plant physiology	MBL3751	CHM3511,CHM3512
1	Microbiology	MBL3711	MBL3632
1	Recombinant DNA Technology	MBL3731	MBL3632,MBL3631
	Biochemistry Minor:		
1	Biochemistry III	CHB3701	CHB3612, MBL3631
1	Organic Chemistry II	CHM3711	CHM3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG3611
2	Biotechnology	MBL3712	MBL3632,MBL3631
2	Genetics	MBL3732	MBL3632,MBL3631
2	Research Methodology	BLG3702	STS3621, STS3622
	Biochemistry Minor:		
2	Biochemistry IV	CHB3712	CHM3612,MBL3611

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Immunology	MBL3811	MBL3711
1	Applied Molecular Biology	MBL3831	MBL3731
1	Mycology	MIC3811	MBL3711
1	Parasitology	MIC3802	MBL3711
	Biochemistry Minor: No offering		

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Medical Microbiology	MIC3822	MBL3711
2	Environmental And Industrial Microbiology	MIC3812	MBL3711
2	Virology	MIC3832	MBL3711
	Biochemistry Minor: No offering		

QUALIFICATION: B.Sc.Microbiology Major and Chemistry Minor (11BMIC)

Students opting for a major in Microbiology (with minors in Chemistry) must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3529	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	UCLE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
1	Physics for Life Sciences I	PHY3501	Faculty entry requirements
	Chemistry Minor:		
1	Chemistry IA	CHM3511	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Chemistry Minor:		
2	Chemistry IB	CHM3512	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511,BLG3512
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511,BLG3512,
1	Statistics for Life Sciences I	STS3621	STS3522
	Chemistry Minor:		
1	Inorganic Chemistry I	CHM3611	CHM3511,CHM3512
1	Biochemistry I	CHB3611	CHM3511, CHM3512 and BLG3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Plant Form and Function	BLG3612	BLG3511,BLG3512
2	Introduction to Microbiology	MBL3632	BLG3511,BLG3512
2	Statistics for Life Sciences II	STS3622	STS3522
2	Human Biology*	MBL3652	CHM3511,CHM3512 BLG3512
	Chemistry Minor:		
2	Organic Chemistry I	CHM3612	CHM3511,CHM3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Plant physiology	MBL3751	CHM3511,CHM3512
1	Microbiology	MBL3711	MBL3632
1	Recombinant DNA Technology	MBL3731	MBL3632,MBL3631
	Chemistry Minor:		
1	Organic Chemistry II	CHM3711	CHM3612
1	Inorganic Chemistry II	CHM3701	CHM3611, MAT3512
1	Industrial Chemistry I	CHM3761	CHM3611, CHM3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG3611
2	Biotechnology	MBL3712	MBL3632,MBL3631
2	Genetics	MBL3732	MBL3632,MBL3631
2	Research Methodology	BLG3702	STS3621, STS3622
	Chemistry Minor:		
2	Physical Inorganic Chemistry	CHM3762	CHM3611

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Immunology	MBL3811	MBL3711
1	Applied Molecular Biology	MBL3831	MBL3731
1	Mycology	MIC3811	MBL3711
1	Parasitology	MIC3802	MBL3711
	Chemistry Minor: No offering		

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Medical Microbiology	MIC3822	MBL3711
2	Environmental And Industrial Microbiology	MIC3812	MBL3711
2	Virology	MIC3832	MBL3711
	Chemistry Minor: No offering		

D.2.3. B.Sc.in MICROBIOLOGY MODULE EQUIVALENTS

NEW MODULE	OLD MODULE
SBLG3511 Introduction to Biology	BLG3101 Biology 1A
SBLG3512 Diversity of Life	BLG3112 Biology 1B
SBLG3611 Animal Form and Function	BLG3212 Animal Biology
SMBL3631 Cell Molecular Biology and Genetics	BLG3202 Cell and Molecular Biology
SBLG3612 Plant Form and Function	BLG3211 Plant Biology
SMBL3632 Introduction to Microbiology	MBL3231 Introduction to Microbiology
SMBL3652 Human Biology*	BLG3231 Human Biology
SMBL3751 Plant physiology	MBL3331 Plant Physiology
SMBL3711 Microbiology	MBL3311 Microbiology and Molecular Genetics
SMBL3731 Recombinant DNA Technology	None
SMBL3752 Comparative Animal Physiology	MBL3312 Comparative Animal Physiology
SMBL3712 Biotechnology	None
SMBL3732 Genetics	None
SBLG3702 Research Methodology	None
SBLG3810 Research Project	BLG3410 Projects and Advanced Skills in Biology
SMBL3811 Immunology	MBL3411 Immunology
SMBL3831 Applied Molecular Biology	MBL3402 Applied Molecular Biology
SMIC3811 Mycology	None
SMIC3802 Parasitology	None
SMIC3822 Medical Microbiology	None
SMIC3812 Environmental And Industrial Microbiology	None
SMIC3832 Virology	None

D.4. MOLECULAR BIOLOGY

D.4.1. B.SC. MOLECULAR BIOLOGY: MAJOR AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc. Molecular Biology Major and Biochemistry Minor (11BMOB)

Students opting for a major in Microbiology must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3529	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
1	Physics for Life Sciences I	PHY3501	Faculty entry requirements
	Biochemistry Minor:		
1	Chemistry IA	CHM3511	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Biochemistry Minor:		
2	Chemistry IB	CHM3512	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511,BLG3512
1	Statistics for Life Sciences I	STS3621	STS3522
	Biochemistry Minor:		
1	Biochemistry I	CHB3611	CHM3511, CHM3512 and BLG3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Plant Form and Function	BLG3612	BLG3511,BLG3512
2	Introduction to microbiology	MBL3632	BLG3511,BLG3512
2	Statistics for Life Sciences II	STS3622	STS3522
2	Human Biology	MBL3652	CHM3511,CHM3512 ,BLG3512
	Biochemistry Minor:		
2	Biochemistry II	CHB3612	CHM3511, CHM3512 OR CHM3532 and BLG3511
2	Organic Chemistry I	CHM3612	CHM3511,CHM3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Plant Physiology	MBL3751	CHM3511,CHM3512
1	Microbiology	MBL3711	MBL3632
1	Recombinant DNA Technology	MBL3731	MBL3632, MBL3631
	Biochemistry Minor:		
1	Biochemistry III	CHB3701	CHB3612, MBL3631
1	Organic Chemistry II	CHM3711	CHM3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG 3611
2	Biotechnology	MBL3712	MBL3632, MBL3631
2	Genetics	MBL3732	MBL3632, MBL3631
2	Research methodology	BLG3702	STS3621, STS3622
	Biochemistry Minor:		
2	Biochemistry IV	CHB3712	CHM3612,MBL3611

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Immunology	MBL3811	MBL3711,
1	Applied Molecular Biology	MBL3831	MBL3731
1	Bioinformatics	MOL3811	MBL3631, MBL3632, MBL3732
	Biochemistry Minor: No offering		

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Applied Genetics	MOL3812	MBL3732
2	Plant Growth and Development	MOL3832	CHM3511,CHM3512
2	Animal Growth and Development	MOL3852	BLG 3611, SMBL 3732
	Biochemistry Minor: No offering		

QUALIFICATION: B.Sc. Molecular Biology Major and Chemistry Minor (11BMOC)

Students opting for a major in Molecular Biology (with minors in Chemistry) must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Contemporary Social Issues	UCSI3529	University entry requirements
1	Basic Mathematics	MAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Introduction to Biology	BLG3511	NSSC, Biology C
1	Physics for Life Sciences I	PHY3501	Faculty entry requirements
	Chemistry Minor:		
1	Chemistry IA	CHM3511	Faculty entry requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Pre-Calculus	MAT3512	Faculty entry requirements
2	English for Academic Purposes	ULEA3519	University entry requirements
2	Introduction to Statistics	STS3522	University entry requirements
2	Diversity of Life	BLG3512	NSSC, Biology C
	Chemistry Minor:		
2	Chemistry IB	CHM3512	Faculty entry requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Animal Form and Function	BLG3611	BLG3511,
1	Cell Molecular Biology and Genetics	MBL3631	BLG3511,BLG3512
1	Statistics for Life Sciences I	STS3621	STS35422
	Chemistry Minor:		
1	Biochemistry I	CHB3611	CHM3511, CHM3512 and BLG3511
1	Inorganic Chemistry	CHM3611	CHM3511, CHM3512

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Plant Form and Function	BLG3612	BLG3511,BLG3512
2	Introduction to Microbiology	MBL3632	BLG3511,BLG3512
2	Statistics for Life Sciences II	STS3622	STS3522
2	Human Biology	MBL3652	CHM3511,CHM3512 ,BLG3512
	Chemistry Minor:		
2	**Organic Chemistry I**	**CHM3612**	**CHM3511,CHM3512**

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Plant Physiology	MBL3751	CHM3511,CHM3512
1	Microbiology	MBL3711	MBL3632
1	Recombinant DNA Technology	MBL3731	MBL3632, MBL3631
	Chemistry Minor:		
1	**Inorganic Chemistry II**	CHM3701	CHM3611, MAT3512
1	**Organic Chemistry II**	CHM3711	CHM3612
1	**Industrial Chemistry**	CHM3761	CHM3611, CHM3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Comparative Animal Physiology	MBL3752	BLG 3611
2	Biotechnology	MBL3712	MBL3632, MBL3631
2	Genetics	MBL3732	MBL3632, MBL3631
2	Research Methodology	BLG3702	STS3621, STS3622
	Chemistry Minor:		
2	**Physical Inorganic Chemistry**	**CHM3762**	**CHM3611**

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	BLG3810	STS3621, STS3622, BLG3702
1	Immunology	MBL3811	MBL3711,
1	Applied Molecular Biology	MBL3831	MBL3731
1	Bioinformatics	MOL3811	MBL3631, MBL3632, MBL3732
	Chemistry Minor: No offering		

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Applied Genetics	MOL3812	MBL3732
2	Plant Growth and Development	MOL3832	CHM3411,CHM3512
2	Animal Growth and Development	MOL3852	BLG 3611, SMBL 3732
	Chemistry Minor: No offering		

D.4.2. B.SC.IN MOLECULAR BIOLOGY MODULE EQUIVALENTS

NEW MODULE	OLD MODULE
SBLG3511 Introduction to Biology	BLG3101 Biology 1A
SBLG3512 Diversity of Life	BLG3112 Biology 1B
SBLG3611 Animal Form and Function	BLG3212 Animal Biology
SMBL3631 Cell Molecular Biology and Genetics	BLG3202 Cell and Molecular Biology None
SBLG3612 Plant Form and Function	BLG3211 Plant Biology
SMBL3632 Introduction to microbiology	MBL3231 Introduction to Microbiology
SMBL3652 Human Biology	BLG3231 Human Biology
SMBL3751 Plant physiology	MBL3331 Plant Physiology
SMBL3711 Microbiology	MBL3311 Microbiology and Molecular Genetics
SMBL3731 Recombinant DNA Technology	None
SMBL3752 Comparative Animal Physiology	MBL3312 Comparative Animal Physiology
SMBL3712 Biotechnology	None
SMBL3732 Genetics	None
SBLG3702 Research methodology	None
SBLG3810 Research Project	BLG3410 Projects and Advanced Skills in Biology
SMBL3811 Immunology	MBL3411 Immunology
SMBL3831 Applied Molecular Biology	MBL3402 Applied Molecular Biology None
SMOL3811 Bioinformatics	None
SMOL3812 Applied Genetics	None
SMOL3832 Plant Growth and Development	MBL3332 Plant Growth and Development
SMOL3852 Animal Growth and Development	MBL3401 Animal Growth and Development None

D.5. DEPARTMENT OF BIOLOGICAL SCIENCES CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES

SBLG3511 INTRODUCTION TO BIOLOGY

Module title:	**INTRODUCTION TO BIOLOGY**
Code:	**SBLG 3511**
NQF level:	5
Contact hours:	4 lectures/ week for 14 weeks and one 3-hour practical session per week.
Credits:	16
Module assessment:	Continuous assessment (40%): Theory (not less than 3 tests and 2 assignments), 40% Practicals (not less than 10 marked assignment), 60% Examination (60%): 3 hour theory examination paper.
Prerequisites:	**NSCC** (Biology C or better)

Module description: It will consider organization of life, chemical basis of life, carbohydrates, proteins, nucleic acids, lipids and fats, water, cell structure and function, prokaryotic and eukaryotic cells, ultra-structure of plant and animal cells, cytoskeleton, membrane structure and function, cell communication, mitosis, meiosis, cell reproduction, cell cycle, and cell death. The following topics will be covered: Introduction to systems of classification, taxonomy and binomial nomenclature, including the five kingdoms and the three domain system. Definitions and categories/groups within the five kingdoms, evolution by natural selection (microevolution vs macroevolution), phylogeny and evolutionary relationships in five kingdoms. Concepts such as homology and analogy; body symmetry (radial, bilateral), cephalisation, body cavities: diploblastic, triploblastic (acoelomate and coelomate [deuterostomes and protostomes]) will be covered. The course content will also include genes, chromosomes, genomes, Mendelian genetics, extensions to Mendelian genetics, chromosome theory of inheritance, linkage and cross-over, recombination, sex determination. The course content will also cover an introduction to Ecology: Definitions, history, scales in ecology, application of ecology. Conditions and Resources: Environmental conditions, animals and their resources, plants and their resources.

SBLG3512 DIVERSITY OF LIFE

Module title:	**DIVERSITY OF LIFE**
Code:	**SBLG 3512**
NQF level:	5
Contact hours:	4 lecture periods / week for 14 weeks and one three hour practical session per week
Credits:	16
Module assessment:	Continuous assessment (40%): Theory 50% (not less that 3 tests and 2 assignments); Practicals 50% (not less that 10 marked assignments) Examination (60%): 1 x 3 hour theory paper
Prerequisites:	**NSCC** (Biology C or better)

Module description: This module is designed to give students a detailed understanding of the diversity of life. It gives students the broader appreciation of biodiversity in the different ecological habitats. The course shall describe diagnostic characteristics of principle taxonomic categories for each phylum. Coverage of each Phylum shall follow a phylogenetic (evolutionary) approach as well as introduce broad ecological and physiological principles. Various aspects of reproduction and development shall be highlighted. This module prepares students to understand subsequent courses such as Introduction to Ecology and Microbiology, Population Ecology, Comparative physiology, Biogeography, Plant and Animal Form and Function.

Topics covered will include viral, bacterial, fungal, algal, animal and plant diversity. It then considers the characteristics and life cycles of the following important algae, plant and animal groups: Chlorophyta, Phaeophyta, Rhodophyta, Chrysophyta, Euglenophyta, Pyrrophyta, Cryptophyta, bryophytes, seedless vascular plants, gymnosperms, and the angiosperms. Protostomate phyla: Nemertea, Mollusca, Anellida, Arthropoda, Nematoda, Rotifera, Lophophorates, Onychophora. Deuterostomate phyla: Echinodermata, Hemichordata and Chordata (Subphyla: Urochordata, Cephalochordata and Vertebrata: Class Myxiniformes, Petromyzontiformes, Placoderms, Chodrichthyes, Actinopterygii, Actinistia, Dipnoi, Amphibia, Reptilia, Aves, Mammalia). Examples from Namibia shall be used where possible and applicable. The course content shall be supplemented with appropriate weekly practical sessions in the laboratory and in the field.

SECOND YEAR MODULES

SBLG3611 ANIMAL FORM AND FUNCTION

Module title:	**ANIMAL FORM AND FUNCTION**
Code:	**SBLG3611**
. **NQF Level:**	6
Contact hours:	4 lecture periods per week for 14 weeks and one three hour practical session per week
Credits:	16
Module assessment:	Continuous assessment (40%): Theory 50% (not less than 2 tests and 2 assignments); Practicals 50% (not less than 10 marked assignments); Examination (60%): 1 x 3 hour theory examination paper
Prerequisites:	**SBLG3411** Introduction to Biology, **SBLG3512** Diversity of Life

Module description: This module intends to provide the student with a thorough understanding of the structures and functions of different body organs and systems in various animal species. Structure, types and general characteristics and functions of epithelial tissues, cell-to-cell contact , structure and function of soft and specialized connective tissues, structure and functions of skeletal, smooth and cardiac muscles, structure and functions of neurons, types of neurons, neuralgia and their functions. Mechanisms of homeostasis, positive feedback, information flow. Communication lines of vertebrate nervous systems, sodium-potassium pumps, chemical synapses and neurotransmitters. The invertebrate nervous system, the nerve net and function, the nerve cord. Functional divisions of vertebrate nervous systems, brain cavities and canals, blood – brain – barrier, the limbic system. Mechanoreceptors, thermo-receptors, pain receptors, chemo-receptors, osmo-receptors, photoreceptors. Senses of taste and smell, sense of balance. The structure and function of vertebrate eye and ear. The structure and functions of the endocrine glands.

Prostaglandins-types and functions. Feedback control of hormonal secretions. Role of hormones in arthropod metamorphosis. Integumentary system, vertebrate skin and structure and its functions. Bone structure and functions, skeletal joints, skeletal muscular system. The vertebrate and invertebrate circulatory systems, links with lymphatic system, functions of blood, blood volume and composition, the heart and dorsal vessel-structure and functions, blood pressure, cardiovascular disorders, the defense system – barrier to infection, specific and non-specific responses, inflammation, control of immune response, cell-mediated and antibody mediated responses, immunoglobulins and lymphocytes. Gas exchange, factors influencing gas exchange, gas transport pigments, vertebrate lungs and structures, breathing mechanisms, respiratory cycle, oxygen and carbon dioxide transport, chemoreceptors (carotid bodies and aortic bodies), respiratory systems of mammals, fish, birds and arthropods. Reproduction in vertebrates and invertebrates. Temperature regulation.

SEBL3631 INTRODUCTION TO ECOLOGY

Module title:	**INTRODUCTION TO ECOLOGY**
Code:	**SEBL 3631**
NQF level:	6
Contact hours:	4 lecture periods per week for 14 weeks and one three hour practical session per week
Credits:	16
Module assessment:	Continuous Assessment (40%): Practicals 50% (no less than 5 assessed practicals), Theory 50% (3 tests, 1 assignment) Examination 60%: 1 x 3 hr theory paper
Prerequisites:	**SBLG 3411** Introduction to Biology

Module description: This module provides solid background knowledge on the various sub-disciplines of Ecology while providing sound explanations of the basic terminology and definitions in Ecology. This module lays the foundation for environmental studies at higher level.The module starts by revising topics covered in Introduction to Biology and then proceed to the following sub-disciplines of Ecology: Population Ecology- Characteristics of populations: birth, death, movement, size, age structure, and sex ratios. Community Ecology- Patterns in conditions and resources, measuring biodiversity, biomes. Ecosystem ecology- Primary productivity, flux of matter and trophic structures, food chains and food webs, biogeochemical cycles (hydrological-, carbon-, nitrogen-, and sulfur and phosphorous- cycles. Conservation Ecology and Biodiversity- Definitions of biodiversity, distribution of the world's and Namibia's biodiversity; the current human caused mass extinction. History, concepts and definitions of Conservation Biology. Aquatic Ecology- The physical properties of water, Stream Ecology, Lake Ecology, Oceans, Coasts, Estuaries.

SMBL3631 CELL MOLECULAR BIOLOGY AND GENETICS

Module title:	**CELL MOLECULAR BIOLOGY AND GENETICS**
Code:	**SMBL3631**
NQF level:	6
Contact hours:	4 lecture periods per week for 14 weeks and one three hour practical session per week
Credits:	16
Module assessment:	Continuous assessment (40%): Theory - minimum of 2 tests and 1 assignment; Practicals – no less than 10 marked practicals Examination (60%): 3 hour theory paper
Prerequisites:	**SBLG3411** Introduction to Biology, **SBLG3512** Diversity of Life

Module description: An introduction to the chemical basis of cellular processes: important elements, compounds and molecules as well as chemical bonds and their importance and roles in biochemical reactions are being looked at. The organization of the chloroplast and mitochondrion and their principal metabolic pathways are also reviewed. An introduction to cancer starting with the distinction between normal and abnormal cell division as well as studying at the genetic basis of cancer. There will be an overview of Mendelian & non-Mendelian Genetics: chromosomal theory of inheritance, sex determination & sex-linked genes, basic genetic linkage and chromosome mapping, and the Genetic Code. Structure and function of eukaryotic chromosomes and mutations as the basis for genetic variations. This leads to the study of macromolecules such as proteins, enzymes and nucleic acids and their roles in cellular organization. This unit also examines the organization and control of genetic information in the production of proteins. The structure of DNA and and genome size and complexity will be described in the course as the fountation for Molecular Biology. An introduction to nucleic acid processes such as DNA replication covering the unit of replication (replicon), apparatus for DNA replication (primosomes and replisomes). An outline of Eukaryotic transcription and RNA processing : transcription complex including promoters, transcription factors ,RNA polymerase and the description of mechanisms of RNA splicing. An outline of Prokaryotic gene expression : control at initiation, RNA polymerase-promoter interactions, panolopy of operons and control at termination. Translation of Proteins through successive steps(initiation, elongation and termination) exploiting tRNA as the translational adaptor and ribosomes as the translational factory. The practical content in this will focus on : isolation of DNA from whole blood and tissues, introduction to gel electophoresis and introduction to PCR.

SBLG3612 PLANT FORM AND FUNCTION

Module title:	**PLANT FORM AND FUNCTION**
Code:	**SBLG3612**
NQF level:	6
Contact hours:	4 lecture periods per week for 14 weeks and one three hour practical session per week
Credits:	16
Module assessment:	Continuous assessment (40%): Theory 50% (not less than 2 tests and 2 assignments); Practicals 50% (not less than 10 marked assignments) Examination (60%): 1 x 3 hour theory paper (70%); 1x2 hour practical paper (30 %)
Prerequisites:	**SBLG3411** Introduction to Biology, **SBLG3512** Diversity of Life

Module description: This is a full course for one semester where a survey of vascular plants using evolutionary and ecological principles to interpret patterns of diversity in vascular plant form and function. Topics include morphological adaptations of plants, the genetic properties of plant populations, plant reproduction and mating system variation, a survey of biotic and abiotic ecological interactions important to flowering plants. The focus of the course is on the anatomy and functional morphology of photosynthetic organisms in both aquatic and terrestrial systems. Laboratory work will include a survey of flowering plant taxonomy and plant forms and functions. Laboratory projects will demonstrate methods used for establishing evolutionary relationships, assessing genetic structure in natural populations, and identifying adaptive features of plant form and function.

SEBL3632 ECOLOGICAL FIELD TECHNIQUES

Module title:	**ECOLOGICAL FIELD TECHNIQUES**
Code:	**SEBL3632**
NQF Level:	6
Contact hours:	4 lecture periods per week for 14 weeks, 3 hours practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (at least 5 assessed practicals (35%); 3 tests (35%); specimen collecting and preservation mini-project (30%) Examination 60%: 1 x 3 hrs theory paper
Pre-requisites:	**SBLG3512** Diversity of Life

Module description: This module will emphasize the practical field component where students should learn more hands-on practice and experience. In addition to other important aspects, the module places emphasis on the Scientific Method and specimen identification. This module lays the foundation for biodiversity studies at higher level.
Introduction and definitions; scientific method; important considerations in planning ecological research; important considerations in field sampling (objectives of sampling, type and behaviour of organism, habitat considerations, equipment requirements, selection of appropriate method, sampling design and strategy, data recording and storage, sampling regime); methods of sampling terrestrial vascular plants; methods of surveying fungi, lichens and mosses; 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 of in every case. 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); simple dichotomous keys and their uses (parallel keys, indented keys, flow-chart keys only); methods of assessing abiotic variables, data analysis methods (include basic statistics).

SMBL3632 INTRODUCTION TO MICROBIOLOGY

Module title:	**INTRODUCTION TO MICROBIOLOGY**
Code:	**SMBL3632**
NQA level:	6
Contact hours:	4 lecture periods per week for 14 weeks and one 3-hour practical session per week for 14 weeks.
Credits:	16
Module assessment:	Continuous assessment (40%): Theory 50% (not less than 2 tests and 2 assignments); Practicals 50% (not less than 10 marked assignments) Examination **(60%)**: 1 x 3-hour theory paper.
Prerequisites:	**SBLG 3411** Introduction to Biology, **SBLG3512** Diversity of Life.

Module description: The course will include principles of microbiology, importance of microorganisms, microorganisms as cells, microorganisms and their natural environments, impacts of microorganisms on humans, and pathways of discovery in microbiology. It will also give an overview of microbial life, cell structure and evolutionary history, physiological diversity of microorganisms, prokaryotic diversity, and eukaryotic microorganisms. Other topics are microscopy and cell morphology, microbial cell membranes and cell walls, surface structures and inclusions, endospores, microbial motility and chemotaxis, staining techniques, microbial nutrition, culture media, laboratory culture of microorganisms, enrichment and isolation, isolation of pure cultures, bacterial cell division, growth of bacterial populations, measuring microbial growth, environmental effects on microbial growth, control of microbial growth, microbial evolution and systematics, Eubacteria, Archae, eukaryotic microorganisms, viruses, bacteriophages, prions, diversity of microbial metabolism, microbial ecology, and methods in microbial ecology.

SMBL3652 HUMAN BIOLOGY

Module title:	**HUMAN BIOLOGY**
Code:	**SMBL3652**
NQF Level:	6
Contact hours:	4 lecture periods per week for 14 weeks, 1P/week for 14 weeks
Credits:	16
Module Assessment:	Continuous assessment: 40% (3 tests – 60% + at least 10 practical marks – 40%); Examination: 60% (1 x 3h examination paper)
Prerequisite:	**SCHM3512** Chemistry for Life Sciences, **SBLG3512** Diversity of Life

Module description: This module intends to provide the student with a thorough understanding of the structures and functions of different human body organs and systems, various diseases afflicting humans, e.g. Cancer, Stress and HIV/AIDS as well as the harmful effects of narcotic drugs. It will cover the following topics: Organs and accessory organs of the digestive system and their functions, digestion, absorption and nutrition of carbohydrates, proteins, lipids and, digestive enzymes, minerals and vitamins. The cardiovascular system, the structure and functions of the heart, blood vessels and cells. The pulmonary circuit and systemic circuit. Functions of blood, blood clotting mechanism and blood groups. The lymphatic system, structures of the lymphatic vessels and organs. The structures and functions of the respiratory system, external, internal and cellular respiration. Lung volumes. Exchange of gases in the alveoli. The functions of the respiratory epithelium and the mucus blanket. Factors affecting pulmonary ventilation. Kidney structure and functions. Glomerular filtration, tubular reabsorption and secretion. The role of juxtaglomerular apparatus in blood pressure regulation. The role of kidneys in electrolyte and acid base balance and homeostasis. The structure and functions of the peripheral nervous system, cranial and spinal nerves, action and resting potentials. Impulse transmission across synapses and neurotransmitters. The neuroglia and their functions. The somatic and autonomic systems. The sympathetic and parasympathetic systems. The reflex arch. The structure and functions of the central nervous system. The structures and functions of the eye and the ear. The chemoreceptors and olfactory cells. The structure of the endocrine glands, their hormones and functions. Structures and functions of the male and female reproductive organs. The formation of male and female gametes. The role of hormones in reproduction. Human development and aging. Human population growth and pollution. Sexually-transmitted diseases including HIV/AIDS. Causes and prevention of cancers. Carcinogens, heredity and immunodeficiency. Characteristics of cancer cells and classification of cancers. Stress and the role of hormones in stress development. Drug Abuse: alcohol, nicotine, marijuana, cocaine, heroine, and their effects on body systems

THIRD YEAR MODULES

SEBL3700 FIELD ECOLOGY I

Module title:	**FIELD ECOLOGY I**
Code:	**SEBL3700**
NQF level:	7
Contact hours:	4 weeks (up to) field trip for all modules combined
Credits:	8
Module assessment:	Continuous assessment: 100% (Field reports)
Co-requisites:	**SEBL3711** Freshwater & Marine Ecology (1st semester), **SEBL3712** Ecosystem Ecology and **SEBL3732** Conservation Biology & Biodiversity (both 2nd semester)

Module description: Students must carry out compulsory field courses for the modules SEBL3711 Freshwater and Marine Ecology (1st semester), SEBL3712 Ecosystem Ecology and SEBL3732 Conservation Biology & Biodiversity (both 2nd semester). The field courses will be conducted in various localities, either jointly or separately and tasks may vary from year to year depending on the issues at hand.

Any student who does not take part in the field course will NOT be allowed to sit the examinations of the respective modules.

SEBL3711 FRESHWATER AND MARINE ECOLOGY

Module title:	**FRESHWATER AND MARINE ECOLOGY**
Code:	**SEBL3711**
NQF Level:	7
Contact hours:	4 lectures / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60%: 1 x 3 hours theory paper
Prerequisites:	**SEBL3631** Introduction to Ecology

Module description: Aquatic ecosystems cover more than 70% of the Earth's surface and play an important role in global geochemical cycles, which affect the global climate. In addition, Namibia is an arid country with a limited amount of surface water. It is also a country with a highly productive coastline, because of upwelling processes. The study of freshwater and marine ecology is therefore crucial to provide the students a basis for further studies that will allow proper management of our wetland ecosystems. Any student who does not take part in the field course in SEBL3700 Field Ecology I will NOT be allowed to sit the examination. Freshwater Ecology: Ecology of lakes and dams (lentic ecosystems): Thermal stratification of lentic systems and its effects on primary production; Seasonal lake turnover and its effect on primary production and the ecology of lentic systems; Energy flow and food webs in lentic systems; Eutrophication and algal blooms. Ecology of rivers and streams (lotic ecosystems): Distinguishing characteristics of rivers; The river continuum concept; Ephemeral river dynamics; floodplain dynamics; Energy flow and food webs in lotic systems. Freshwater wetland systems of Namibia. Principles of freshwater aquaculture (Aquaculture in Namibian state dams, aquaculture in traditional settings, general problems experienced in aquaculture).
Marine Ecology: Physical and chemical Oceanography (the extent and depth of the oceans, Ocean currents, Temperature, Pressure, Illumination, Gases, chemical composition of seawater). Ocean circulation; the great conveyer system in the Ocean; the physics of waves in the ocean. The generation of tides – physical processes. Upwelling: Physical processes involved in upwelling – Ekman drift; the importance of upwelling in productivity; The Namibian upwelling system as one of the most productive upwelling systems in the world. Organic production in the marine environment (Nutrients, Plankton, Red tides, Sulfur eruption on the Namibian coast, Energy flow and food webs in the pelagic marine environment). Intertidal zone ecology – Rocky shores and sandy shores. Life in the deep oceans (adaptations of organisms). Aquatic biogeochemistry and ecology: The carbon, nitrogen, sulfur and iron cycles in freshwater and marine aquatic environments. Discuss the difference between these cycles in the sediment and in the water column of aquatic systems. Define what is meant by fluxes out of the sediment and its importance in the biogeochemical cycles. The measurement and calculation of biogeochemical rates and fluxes in sediments. The use of radioactive and stable isotopes in biogeochemistry. Extreme Marine environments (Hydrothermal vents, Hypersaline aquatic environments, cold seeps, sea ice). Ocean fertilization and its effect on the biogeochemical cycles in aquatic systems.

SEBL3731 POPULATION ECOLOGY

Module title:	**POPULATION ECOLOGY**
Code:	**SEBL3731**
NQF Level:	7
Contact hours:	4 lecture periods per/ week; 3 hours practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60% (1 x 3 hr theory paper)
Pre-requisites:	**SEBL3631** Introduction to Ecology

Module description: This module is designed to equip students with the necessary understanding of population dynamics. This forms the basis of understanding concepts of interactions among different species and between species and their environment. This will enable them to fully understand the importance of these issues with respect to managing these species and their environments. It also prepares students for later modules in conservation biology, behavioural ecology, natural resources management and others.
Introduction and definitions; Properties of populations (population density, population dispersion, age structure, sex ratios); Mortality, natality and survivorship; Population growth (density-dependent, density-independent, population fluctuations and cycles, key factor analysis, extinction); Population regulation (mechanisms of population regulation, intra-specific competition, dispersal, social interactions); Life history patterns (mating systems, types of sexual reproduction, reproductive effort, r- and k-selection, sexual selection); Inter-specific competition (competitive exclusion principle, resource partitioning, differential resource utilization); Predation (models of predation, classical predator-prey systems, plant-herbivore interactions, functional response, numerical response, foraging theory, cannibalism); Parasitism (classes of parasites, hosts as habitats, parasite population dynamics, evolutionary aspects of parasitism, social parasitism – kleptoparasitism and brood parasitism); Population genetics (genetic variation, natural selection, inbreeding, genetic drift); Mutualism (definitions, types and examples of mutualism); Pest control and management (definitions, chemical control, biological control, genetic control, integrated pest management).

SMBL3751 PLANT PHYSIOLOGY

Module title:	**PLANT PHYSIOLOGY**
Code:	**SMBL3751**
NQF level:	7
Contact hours:	4 lecture periods per week for 14 weeks, 3 hour practicals per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment: 40% (at least 2 tests and 8 practical marks) Examination: 60% (1 x 3h theory paper)
Prerequisites:	**SCHM3411** Chemistry 1A OR **SCHM3512** Chemistry 1B OR **SCHM 3532** Chemistry for Life Sciences

Module description: This module intends to provide students with a sound knowledge of plant metabolism and water relations, with emphasis on how physiological adaptations contribute to the ecological success of plants. The module will introduce the concept of energy and its use by plants energy transformations and the role of electron carriers and ATP. The process of photosynthesis will be examined by discussing aspects such as the leaf as a photosynthetic machine, photochemical reactions, the regulation of energy distribution, photoinhibition of photosynthesis, the PCR cycle and its regulation. This leads to an explanation of C4 and CAM photosynthesis and the ecological advantages of these adaptations. Aerobic and anaerobic respiration as well as the alternative electron transport pathways found in plants and their ecological implications will be discussed in detail. The module will further consider biological nitrogen fixation, nitrogen assimilation and nitrogen cycling. Water & solute uptake by plant cells will be discussed against the background of the concept of water potential, and principles and energetics of solute absorption. The soil as main source of mineral nutrition, as well as ways in which plants supplement this nutrition through bacterial and fungal interactions will be investigated. The module will conclude with a discussion of the photosynthesis-transpiration compromise, the cohesion theory of transpiration, cavitations and the vulnerability of the xylem, hydraulic lift, source-sink relationships, the Münch pressure flow model, as well as phloem loading and unloading.

SEBL3712 ECOSYSTEM ECOLOGY

Module title:	**ECOSYSTEM ECOLOGY**
Code:	**SEBL3712**
NQF level:	7
Contact hours:	4 hours lectures / week, 3 hrs practicals per week
Credits:	16
Module assessment:	Continuous assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60% (1x3 hours theory paper)
Prerequisites:	**SEBL 3631** Introduction to Ecology

Module description: This module will provide an insight into the structure and function of nature at the community, ecosystem and biome levels of biological organization. Students will be introduced to the science of ecosystem ecology, a study of communities of plants and animals and how they interact with each other and their physical environment. Applied aspects of ecology such as deforestation and desertification will also form an important component of the module. Any student who does not take part in the field course in SEBL3700 Field Ecology I will NOT be allowed to sit the examination.

Basic components of ecological systems, essential processes of ecological systems: Photosynthesis and decomposition. Nature of ecosystem energetics. Primary production; environmental factors facilitating and / or limiting primary production. Secondary production; environmental factors facilitating and / or limiting, food chains and food webs; trophic levels and ecological pyramids, Food chains and poisons in the environment, models of energy flow in ecosystems. Biogeochemical cycles: Gaseous cycles (oxygen cycle, carbon cycle, nitrogen cycle) Sedimentary cycles (phosphorous cycle, surphur cycle). What is a community? Physical (vertical and horizontal) structure, biological structure (species dominance, species diversity); species diversity hypotheses, species abundance, edge communities, community population interactions, community patterns in space and time. Theory of island biogeography, habitat fragmentation, habitat corridors, applications of island biogeography theory to design of protected areas. 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. What is community succession? 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, attributes of succession during succession, time and direction in succession, changes in ecosystem attributes, time and direction of succession, succession and animal life, degradative succession. Definition and classification of biomes. Desert biome, Tropical savanna biome, Tropical rain forest biome, grassland biome. For each biome, shall cover: geographic location, climate, soils, life forms, and human activities. Classification of biomes of Namibia. Desert biome, savanna biome, woodland biome, Karroo biome, Coastal and marine biome, wetland biome, land use practices in terrestrial and aquatic biomes of Namibia. What are arid environments? Causes and classification of arid ecosystems, characteristics of arid ecosystems; water (surface and ground), floods, Humidity, temperature, wind and wind erosion, soils, dust & dust storms, adaptations of organisms to arid environments. What is desertification? Causes of desertification (proximate and ultimate causes), manifestations of desertification, action to combat desertification, What is deforestation? Causes of deforestation (proximate and ultimate causes), Effects of deforestation; deforestation in Namibia, possible solutions to deforestation.

SEBL3732 CONSERVATION BIOLOGY AND BIODIVERSITY

Module title:	**CONSERVATION BIOLOGY AND BIODIVERSITY**
Code:	**SEBL3732**
NQF level:	7
Contact hours:	4 lecture period per week for 14 weeks, 3 hours practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous Assessment 40% : Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60%: 1 x 3 hr theory paper
Prerequisites:	**SEBL3631** Introduction to Ecology

Module description: Any student who does not take part in the field course in SEBL3700 Field Ecology I will NOT be allowed to sit the examination.

Students will study in depth: Global patterns, distribution and measurement of biodiversity with special emphasis on Namibian biodiversity; Biodiversity inventories; rapid biodiversity assessment. Environmental ethics, Ecological Economics (valuation of biodiversity) with emphasis on the direct use value, indirect use value, option value, and existence value. Threats to biological diversity and extinction with special emphasis on the causes of extinction (habitat destruction, habitat fragmentation, habitat degradation and pollution, global climate change, overexploitation, invasive and alien species, and disease) as well as species vulnerability to extinction; Applying the Island Biogeography model to estimation of extinction rates. Conservation at the population and species level: Species categories (keystone, indicator, flagship, umbrella and economically important species), Essential concepts and problems of small populations, Applied population biology: Studying populations, population viability analysis, metapopulations, establishing new populations, Ex Situ conservation, Conserving biological communities: Prioritising, establishing and classifying protected areas, Reserve design and conservation networks, SLOSS model, managing protected areas. Restoration Ecology. Biodiversity conservation agreements.

SBLG3702 RESEARCH METHODOLOGY

Module title:	**RESEARCH METHODOLOGY**
Code:	**SBLG3702**
NQF level:	7
Contact hours:	2 lecture session per week, 3 hour practical every other week for 14 weeks
Credits:	8
Module assessment:	Continuous assessment 100% (5 assessed assignments, 1 test)
Prerequisites:	**SSTS3621** Statistics for Life Sciences I and **SSTS3622** Statistics for Life Sciences II

Module description: This module is designed to provide students with understanding of the general theoretical aspects of scientific principles that are followed in order to conduct research and communicate scientific results. The scientific method will form the basis of discussion in this module. In the module, students will acquire relevant skills in planning, developing as well as conducting scientific researchOverview of research. 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. Summary statistics: measures of central tendency, measures of dispersion. Statistical significance, Testing hypotheses. Experimental (research study /project) design. Data collection & keeping / documenting research data & other records. Presentation of data in the scientific reports/ theses / dissertation. Scientific writing, Plagiarism, Finding and using literature references, Citation of references. Writing a literature review. Report writing. Giving a good oral presentation (including use of power point).

SMBL3752 COMPARATIVE ANIMAL PHYSIOLOGY

Module title:	**COMPARATIVE ANIMAL PHYSIOLOGY**
Code:	**SMBL3752**
NQF Level:	7
Contact hours:	4 lecture periods per week for 14 weeks, 1 practical session per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment: 40% (3 tests – 60% + at least 10 practical marks – 40%); Examination: 60% (1 x 3h examination paper)
Pre-requisites:	**SCHM3411** Chemistry 1A and **SCHM3512** Chemistry 1B; OR **SCHM 3412** Chemistry for Life Sciences

Module description: This module intends to provide the student with a thorough understanding of the functioning of different animal species and their adaptations that enable them to survive in different environments. It will cover the following topics: Cellular and animal energetics, physico-chemical effects of temperature, avenues for heat exchange between animals and their environments, patterns of thermoregulation in various animal groups. Metabolism in hibernating animals. Membrane physiology and solute regulation by cells and electrophysiology of cells. Physiology of excitable cells (sensory physiology and nervous systems). Animal movement by means of cilia, flagella and muscular contractions, animal locomotion in water, land and air. Control of various body functions e.g. growth and regeneration, reproduction, iono-and osmoregulation, cellular metabolism and color by neurohormonal and classic hormonal systems. Aquatic and aerial respiration and how physical principles involved in gas exchange apply to various gas exchange structures e.g. body surface, gills, lungs and tracheal system. Structures and functions of circulatory system. Physiological role of water and solute regulation in terrestrial and aquatic animals. Structures and functions of specific excretory organs, e.g. coelomoducts, nephrons, Malpighian tubules, etc. Structures and functions of respiratory systems (lungs, gills, skin, tracheae, etc). Feeding mechanisms, cell secretion and movement (secretion and peristalsis by gut tube), cellular biochemistry (digestive enzymes and biochemistry of hydrolysis of various organic substrates) and nutrition (role of vitamins). Adaptations to low and high temperatures and altitude.

SMBL3711 MICROBIOLOGY

Module title:	**MICROBIOLOGY**
Code:	**SMBL 3711**
NQF level:	7
Contact hours:	4 lecture periods / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (minimum of 2 tests and 2 Assignments), Examination 60% (1 x 2 hour examination paper)
Prerequisites:	**SMBL 3632** Introduction to Microbiology

Module description: Identification of bacteria: Microscopy, culture characteristics, biochemical tests, rapid methods. Bacterial photosynthesis: oxygenic photosynthesis, anoxigenic photosynthesis. Microbial metabolism: chemolithotrophy,, reduction of inorganic molecules, Generation of energy: Breakdown of glucose to pyruvate, Embden-Meyerhof-Parnas pathway, Entner-Doudoroff pathway, Pentose-phosphate pathway. Aerobic and anaerobic respiration, fermentations. Oxidation of inorganic molecules, methanogenesis, acetogenesis. Microbial genetics and genetic engineering: Organization and replication of prokaryotic DNA. Mutations: point mutations, base-pair substitution, frameshift mutations, pyrimidine dimmers. Causes of mutations: UVlight/radiation, chemical base analogues, mutagenesis. Mutation repair mechanisms: SOS repair, post-transcription repair, base excision repair. Conjugation, transformation and transduction. Isolation, specific cleavage and synthesis of DNA. Vectors, Transformation, Identifying recombinants. Good microbiology laboratory practice, techniques in microbiology.

SMBL3752 COMPARATIVE ANIMAL PHYSIOLOGY

Module title:	**COMPARATIVE ANIMAL PHYSIOLOGY**
Code:	**SMBL 3752**
NQF Level:	7
Contact hours:	4L/week for 14 weeks + 1P/week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment: 40% (3 tests – 60% + at least 10 practical marks – 40%); Examination: 60% (1 x 3h examination paper)
Pre-requisites:	**SCHM3411** Chemistry 1A and **SCHM3512** Chemistry 1B; OR **SCHM 3412** Chemistry for Life Sciences

Module description: This module intends to provide the student with a thorough understanding of the functioning of different animal species and their adaptations that enable them to survive in different environments. It will cover the following topics: Cellular and animal energetics, physico-chemical effects of temperature, avenues for heat exchange between animals and their environments, patterns of thermoregulation in various animal groups. Metabolism in hibernating animals. Membrane physiology and solute regulation by cells and electrophysiology of cells. Physiology of excitable cells (sensory physiology and nervous systems). Animal movement by means of cilia, flagella and muscular contractions, animal locomotion in water, land and air. Control of various body functions e.g. growth and regeneration, reproduction, iono-and osmoregulation, cellular metabolism and color by neurohormonal and classic hormonal systems. Aquatic and aerial respiration and how physical principles involved in gas exchange apply to various gas exchange structures e.g. body surface, gills, lungs and tracheal system. Structures and functions of circulatory system. Physiological role of water and solute regulation in terrestrial and aquatic animals. Structures and functions of specific excretory organs, e.g. coelomoducts, nephrons, Malpighian tubules, etc. Structures and functions of respiratory systems (lungs, gills, skin, tracheae, etc). Feeding mechanisms, cell secretion and movement (secretion and peristalsis by gut tube), cellular biochemistry (digestive enzymes and biochemistry of hydrolysis of various organic substrates) and nutrition (role of vitamins). Adaptations to low and high temperatures and altitude

SMBL3731 RECOMBINANT DNA TECHNOLOGY

Module title:	**RECOMBINANT DNA TECHNOLOGY**
Code:	**SMBL 3731**
NQF level:	7
Contact hours:	4 L / week for 14 weeks + 3h P/week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment: 40% (3 tests – 60% + at least 10 practical marks – 40%) Examination: 60% (1 x 3h examination paper)
Prerequisites:	**SMBL3632** Introduction to Microbiology, **SMBL3631** Cell Molecular Biology and Genetics

Module description: Recombinant DNA techniques were developed through discoveries in Molecular Biology. Although the experimental techniques used may vary, depending on the objectives of the investigation, a number of experimental protocols have been developed that could be considered to form the basic techniques in recombinant DNA technology. The students will critically assess and analyse the links between the research questions and the techniques to be used in order to develop the student's understanding of and appreciation for molecular biological processes. Students will have hands-on experience in laboratory sessions in both planning and executing experimental procedures. The principles and applications of the following techniques will be discussed: nucleic acid extraction, gel electrophoresis, restriction and other modifying enzymes, cloning vehicles and the cloning process, polymerase chain reaction, transformation, gene libraries, identifying recombinants, sequencing and characterizing genes.

SMBL3712 BIOTECHNOLOGY

Module title:	**BIOTECHNOLOGY**
Code:	**SMBL 3712**
NQF level:	7
Contact hours:	4 lecture periods / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (minimum of 2 tests and 1 assignment) Examination 60% (1 x 3 hour examination paper)
Prerequisites:	**SMBL 3631** Cell Molecular Biology and Genetics, **SMBL3731** Recombinant DNA Technology , Biochemistry I **CHB3611**

Module description: This course is aimed at giving students a sound basic knowledge and skills in biotechnology related topics: Introduction to biotechnology: Definitions, scope of biotechnology, principles and techniques in genetics, biochemistry and microbiology, issues around GMOs. Genomics: Definitions, concepts of gene expression and analysis, 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, concepts of gene regulation in prokaryotes and eukaryotes and analysis, Techniques- cDNA libraries and analysis, Northern blots, applications. Metabolomics: definitions, concepts of metabolism and analysis, primary and secondary metabolites, Techniques-metabolic pathways and analysis, site-directed mutagenesis, applications. Introduction to Bioinformatics: definitions, principles of bioinformatics, Techniques-databases and database searches, software usage, applications.

SMBL3732 GENETICS

Module title:	**GENETICS**
Code:	**SMBL 3732**
NQF level:	7
Contact hours:	4 lecture periods / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (minimum of 2 tests and 2 Assignments) Examination 60% (1 x 3 hour examination paper)
Prerequisites:	Cell Molecular Biology and Genetics **SMBL3631**, Introduction to Microbiology **SMBL3632**

Module description: Chromosomes and gene maps: genetic recombination, linkage mapping, chromosome structure and number, construction of genetic linkage maps in humans, determining gene sequence during mapping, locating genes along a chromosome, identification of genes for disease. Evolutionary genetics: Causes and consequences of genetic variation at molecular level, detection of variation in proteins and DNA, gene families, genome evolution, comparison of prokaryotic and eukaryotic genomes, genetic organization of viruses. Genetic code, structure of DNA, DNA Organization in chromosomes, gene expression, Genome size and complexity, genome analysis, genetic mapping and analysis in bacteria, repetitive DNA, Extranuclear inheritance. The behaviour of chromosomes in dividing cells will be examined. Organisation of eukaryotic and prokaryotic genomes. Population Genetics : Darwin's Revolution, Variation and its Modulation, Selection Theory, Random Events and Polymorphism. Quantitative Genetics : Basic Statistical Norms, Genotypes and Phenotypic Distribution, Quantification of Heritability, Counting Locating Genes and Analysis of Variance. Advanced Transmission Genetics : Mapping Functions, Tetrad Analysis, Mitotic Segregation and Recombination and Mapping Human Chromosomes. Gene Mutations : Somatic versus Germinal Mutations, Types of Mutations, Mutation Induction and Detection and Mutation Breeding.

FOURTH YEAR MODULES

SEBL3800 FIELD ECOLOGY II

Module title:	**FIELD ECOLOGY II**
Code:	**SEBL3800**
NQF level:	8
Contact hours:	4 weeks field trip (2 weeks in each semester – up to 1 week for each module)
Credits:	8
Module assessment:	Continuous assessment: 100% (field report)
Co-requisites:	**SEBL3811** Environmental Management and **SEBL3851** Biogeography (both 1st semester), **SEBL3852** Behavioural Ecology and **SEBL3832** Management of Natural Resources (both 2nd semester)

Module description: Students must carry out compulsory field courses for the modules SEBL3811 Environmental Management an**d SEBL3851** Biogeography (both 1st semester), SEBL3852 Behavioural Ecology and SEBL3832 Management of Natural Resources (both 2nd semester). The field courses will be conducted in various localities, either jointly or separately and tasks may vary from year to year depending on the issues at hand. Any student who does not take part in the field course will NOT be allowed to sit the examinations of the respective modules.

SBLG3810 RESEARCH PROJECT

Module title:	**RESEARCH PROJECT**
Code:	**SBLG3810**
NQF level:	8
Contact hours:	Research project for one year
Credits:	32
Module assessment:	Continuous assessment: 100% (Oral presentation of research proposal (10%); written research proposal (20%), oral presentation of results (20%), written research report (50%)
Prerequisites:	**SBLG3702** Research Methodology, **SSTS3621** Statistics for Life Sciences I, **SSTS3622** Statistics for Life Sciences II

Module description: This module is designed to develop the research skills of students through the completion of a research project on an approved topic in the context of the major. Students will be expected to develop a research proposal with the guidance of the supervisor, present this proposal both orally and in writing, collect and analyze data using appropriate statistical tests, present the findings both orally and in the form of a research report; the report should be between 20 and 30 pages (Times New Roman 12 pt, 1.5 line spacing) and include a statement of the research problem, literature review including recent journal resources, objectives and hypotheses, methodology, results & data analysis, conclusion.

SEBL3811 ENVIRONMENTAL MANAGEMENT

Module title:	**ENVIRONMENTAL MANAGEMENT**
Code:	**SEBL3811**
NQF level:	8
Contact hours:	4 lecture periods per week, 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous Assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60%: 1x 3 hours theory paper
Pre-requisites:	**SEBL3731** Population Ecology, and **SEBL3712** Ecosystem Ecology, and **SEBL3732** Conservation Biology and Biodiversity

Module description: This course is multidisciplinary and aims to provide students with in-depth understanding of environmental management and its application. It addresses biophysical, social and economic issues affecting natural resources such as water, soil, air, plant and animal communities and their use through agriculture, forestry, fisheries, human settlement and industry. Any student who does not take part in the field course in SEBL3800 Field Ecology II will NOT be allowed to sit the examination.
The concept of sustainable development and management of natural resources. Principles of environmental management, Human dimension in resource and environmental management, International Environmental conventions and treaties, Environmental legislation and policies in environmental protection with special reference to Namibia. Environmental Management Systems (EMS); ISO 14000 series of standards, Integrated Environmental Management Systems (IMS); Principles of IMS, proactive planning, informed decision making, open participatory approach, accountability for decisions and information on which they are based. Environmental impact assessment (EIA): history and evolution of EIA, the overall EIA process. Social Impact assessment; Law, policy and institutional arrangements for EIA systems, Public involvement, screening, scoping, assessment of impacts, mitigation and impact management, Reporting, Review, decision-making, monitoring and implementation. Environmental Management Plans. Project management, Environmental Audits, Environmental Cost Benefit Analysis, Clean technologies: current and best practices in methodologies of clean technology in waste minimization, prevention of pollution, cleaner production, cleaner processing. Problems associated with generation of waste and pollution. Management of solid and hazardous waste; current issues in environmental management.

SEBL3831 BIOSYSTEMATICS

Module title:	**BIOSYSTEMATICS**
Code:	**SEBL3831**
NQF Level:	8
Contact hours:	4 lecture periods per week, 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40%: Practicals 35% (5 or more assessed practicals), Theory 50% (2 tests, 1 assignment), Specimen Collecting project (15%). Examination 60%: (1 x 3 hours theory paper)
Pre-requisites:	**SEBL3632** Ecological Field Techniques, and **SBLG3612** Plant Form & Function, and **SBLG3611** Animal Form & Function

Module description: This module is designed to thoroughly prepare candidates for biodiversity assessments and curation of natural history collections. The module emphasizes the collection, identification, curation (physical and taxonomic) and general management of natural history collections – thus endowing candidates with the necessary knowledge and skills to meet the above objective.
Definitions, scope and importance of biosystematics; History and Development of biosystematics; Sources of taxonomic information; Types, use and construction of taxonomic keys; Evolution, variation and biosystematics; Principles of taxonomy; Principles of biological nomenclature, including provisions of Codes of Botanical and Zoological Nomenclature; Classification systems (The process of classification, Phenetic classification, Phylogenetic classification, Cladistics and the use of molecular techniques in phylogenetic analyses); Natural history collections (Collection and preservation of specimens, Herbarium collections and their management, Museum collections and their management, The value of Natural History Collections); Current issues in biosystematics; Biosystematics Collecting Project (Students will be required to carry out a compulsory mini-project on the collection and preservation of selected plant and animal specimens. These specimens will be accessioned as the UNAM Natural History Museum and UNAM Herbarium).

SEBL3851 BIOGEOGRAPHY

Module title:	**BIOGEOGRAPHY**
Code:	**SEBL3851**
NQF level:	8
Contact hours:	4 lecture periods per week, 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous Assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (1 assignment, 2 tests) Examination 60%: (1x3 hours theory paper)
Pre-requisites:	**SEBL3631** Introduction to Ecology and **SEBL3712** Ecosystem Ecology

Module description: This module will introduce students to the science of BIOGEOGRAPHY; a study of the distribution of past and present life on the earth. This module will cover the distribution patterns of wild plants and animals over the earth's surface. It will describe factors that determine temporal (in time) and spatial (in space) patterns of biological diversity (biodiversity). Historical changes in distribution of plants and animals will be examined using data and concepts from different disciplines such as geology, ecology, evolutionary biology and physical geography. Important biogeographic processes such as speciation, dispersal and extinction will be covered. The course will further describe past changes in the physical geography of the earth in an attempt to understand the role of such changes to the present and past distribution of plants and animals. As far as possible, and where applicable, relevant and appropriate examples from Namibia will be used. Any student who does not take part in the field course in SEBL3800 Field Ecology II will NOT be allowed to sit the examination. Biogeography: definition, relationship with other sciences, philosophy and basic principals, brief history, applications of biogeography, Limits of species distributions: ecological niche, physical limiting factors, limitation by biotic interactions, adaptation and gene flow. Historical biogeography: Past changes in the physical geography of the earth: Geologic time scale, continental drift model, continents of the Paleozoic and early Mesozoic and early past changes in the physical geography of the earth: break-up of Gondwanaland. Speciation and extinctions: speciation, adaptive radiation, extinction, species selection. Dispersal: definition, mechanisms of biotic movement, nature of barriers to biotic movement, establishing a colony, dispersal routes. Invasive species will be used as case studies to illustrate various aspects of dispersal. Endemism, Provincialism & Disjunction: endemism, cosmopolitanism, types of endemics; provincialism – terrestrial biogeographic regions, biogeographic lines, classifying islands, aquatic regions and provinces, quantifying similarity among biota; Disjunction- definition & causes. Biogeographic distribution patterns of terrestrial animals: abilities of land creatures to cross water barriers amphibians, reptiles, mammals. Biogeographic distribution patterns of flying animals: bird, bats and insects. Biogeographic distribution patterns of plants: factors limiting growth and reproductive success of plants, regional endemism and patterns of speciation in plants, distribution patterns of non-vascular plants. Latitudinal taxonomic diversity gradients; latitudinal gradients in species. diversity, factors that may account for geographic patterns of species diversity: historical perturbations, productivity, harshness, climatic stability, habitat heterogeneity, competition, predation, mutualism.

SEBL3802 DISTURBANCE AND RESTORATION ECOLOGY

Module title:	**DISTURBANCE AND RESTORATION ECOLOGY**
Code:	**SEBL3802**
NQF Level:	8
Contact hours:	2 lecture periods per week, 3 hour practical per week for 7 weeks
Credits:	8
Module assessment:	Continuous assessment 40%: Practicals 50% (at least 3 assessed practicals), Theory 50% (1 test, 1 assignment) Examination 60%: (1 x 2 hour theory paper)
Pre-requisites:	**SEBL3712** Ecosystem Ecology and **SEBL3732** Conservation Biology and Biodiversity

Module description: The world today is grappling with problems of degradation of habitats due to various factors. Such factors are usually referred to as 'disturbance factors' since they make these habitats less suitable for the original species to occupy. Such habitats have to be restored, somewhat, in order to conserve biological diversity. This module is designed to equip students with the knowledge about various disturbance factors and their impacts on the quality of habitats. The module also presents various approaches of restoring degraded/disturbed landscapes.
Disturbance ecology: Introduction (definitions, importance of disturbance, natural and anthropogenic disturbance, short-term and long-term aspects of disturbance, temporal and spatial aspects, reversible and non-reversible disturbance, disturbance regimes); resilience and stability in the face of disturbance; susceptibility to disturbance; types of disturbances and their impacts on ecosystem structure, function and productivity (include case examples to demonstrate impacts of fire, pollution, deforestation, unsustainable land management practices, over-exploitation, climate change, volcanoes, alien species, etc on the provision of goods and services by various ecosystems); interactive/synergistic impacts of disturbance factors; responses to disturbance from the organism level upwards the hierarchy, disturbance and biodiversity (include the intermediate disturbance hypothesis); modeling as a tool in disturbance ecology.
Restoration Ecology: Introduction (definitions, the need and importance of restoration); indicators of ecosystem degradation; principles of ecological restoration; planning for ecological restoration (various ecosystems); ecological restoration in practice (include case examples on various ecosystems); natural restoration; involvement of local communities in restoration work (case examples); Bio-monitoring and evaluation of the restoration process; challenges and opportunities for improving degraded landscapes.

SEBL3832 MANAGEMENT OF NATURAL RESOURCES

Module title:	**MANAGEMENT OF NATURAL RESOURCES**
Code:	**SEBL3832**
NQF Level:	8
Contact hours:	4 lecture periods per week, 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40%: Practicals 50% (at least 5 assessed practicals), Theory 50% (2 tests, 1 assignment) Examination 60%: (1 x 3 hrs theory paper)
Pre-requisites:	**SEBL3731** Population Ecology, and **SEBL3712** Ecosystem Ecology, and **SEBL3732** Conservation Biology and Biodiversity

Module description: This module prepares students to be able to get employment in sectors dealing with natural resources management such as Forestry, Fisheries and National Parks. It is designed to give good grounding in natural resources management on which candidates can build. It is expected that candidates will quickly adapt to the work environment after doing this course, once employed. Any student who does not take part in the field course in SEBL3800 Field Ecology II will NOT be allowed to sit the examination.

Definitions: management, sustainable management, natural resources; Objectives of natural resources management; classification of natural resources and how the classes may be linked (stock, flow, renewable, non-renewable, perpetual, exhaustible, non-exhaustible); measures of stock resource availability (resource base, proven reserves, conditional, reserves, hypothetical resources, speculative resources, ultimately recoverable resources); measures of flow resource availability (maximum resource potential, sustainable capacity, absorptive capacity, carrying capacity); indigenous traditional/technical knowledge (ITK) systems in natural resource management; Community based natural resource management (CBNRM) practices in southern Africa; Adaptive management of natural resources; Communities and protected areas (conflicts in natural resource use including human-wildlife conflict, biosphere reserve concept); Management of fisheries resources (commercial fisheries (include yield models), seaweeds, fisheries regulations, causes and consequences of coastal pollution); Wildlife/Game management (management of game for tourism and harvest, manipulation of animal numbers, concept of maximum sustained yield, CITES and international trade (selected case species); management of forest resources (include non-timber forest products); natural resource accounting and economic valuation (cost-benefit analysis, multi-objective cost-benefit analysis, identifying cost-benefit flows – problems of selection bias, calculating material costs and benefits, placing money values on non-market goods); current issues in natural resources management.

SEBL3812 BEHAVIOURAL ECOLOGY

Module title:	**BEHAVIOURAL ECOLOGY**
Code:	**SEBL3812**
NQF level:	8
Contact hours:	4 lecture periods per week, 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous Assessment 40%: Theory 50% (at least 5 assessed practicals), Theory 50% (2 tests) Examination 60%: (1x 3 hours theory paper)
Pre-requisites	**SEBL3731** Population Ecology

Module description: This module will introduce students to the role of behavior in understanding ecology of organisms. 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. Any student who does not take part in the field course in SEBL3800 Field Ecology II will NOT be allowed to sit the examination.

Introduction: definition of behavior, nervous system and behavior, simple (reflexes) and complex behavior. Development (Ontogeny) 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, ritualisation. 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: definition, evolution and use of signals in communication, information content of signals e.g. honey bees, 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 defenses, 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, aggression, altruism, parental care, territoriality , primate social organisation, insect social organisation.

SMBL3811 IMMUNOLOGY

Module title:	**IMMUNOLOGY**
Code:	**SMBL3811**
NQF level:	8
Contact hours:	4 lecture periods per week and 3 hour practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (minimum of 2 tests and 1 assignment) Examination 60% (3 hour examination paper)
Prerequisites:	**MBL 3711** Microbiology

Module description: The course will introduce the immune system by addressing procesess and components such as : immunoglobulin classes, structure and functions of antibody molecules, lymphoid organs , antigen processing ,cells involved in the immune system, T-cell receptors, Major-Histocompatiblity Complex and complement pathways. Different types of immunity such cellular mediated immunity,humoral immunity and autoimmunity will also be addressed in the course. Various human diseases caused by viruses, bacteria and parasites such as HIV/AIDS tuberculosis and malaria will then be discussed in order to give an applied perspective of immunology. Related aspects like vaccination and drug efficacy will also be covered as complementary components of the course. Contemporary issues pertaining to immunology such as gene therapy, and stem cell research will also be looked at. The practical content will include preparation of serum from whole blood, doing the Enzyme Linked Immuno-Sorbent Assays(ELISA), doing agglutination tests, antibody conjugation assays and inoculation of laboratory animals and monitoring antibody titre.

SMBL 3831 APPLIED MOLECULAR BIOLOGY

Module title:	**APPLIED MOLECULAR BIOLOGY**
Code:	**SMBL 3831**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks and one three hour practical session
Credits:	16
Module assessment:	Continuous assessment: Theory (not less that 2 tests and 2 assignments) 40%, Practicals (not less that 10 marked assignments) 50% Examination: 60% (1 x 3 hour examination paper)
Prerequisites:	**SMBL 3731** Recombinant DNA Technology

Module description: This course will deal with new and exciting concepts and applications of molecular biology.. This module aims to develop a better understanding of the many molecular methodologies that are utilized in current research. Topics such as FISH, GISH techniques, Advanced PCR techniques, Site- directed mutagenesis and analysis, Recombinant protein expression, Foot print technologies, Techniques for measuring transcript levels, RNA subtraction techniques, Reporter gene technologies, How to study protein-protein interactions - yeast 2-hybrid and immuno-precipitation technologies, Gene fusions, epitope- and fluorescent-tagging of proteins, How transgenic organisms are made, Examples of generating transgenic plants and animals and Biosafety aspects will be covered. This will be provided via consideration of DNA, RNA and proteins separately. A detailed account will be provided of how they are made and of the available methods for studying and manipulating them. Methodologies for the creation of transgenic organisms will also be provided and biosafety. Student will also gain hands on experience of some of the basic skills in molecular biology. This course will have laboratory sessions and the lectures will be given in a highly interactive manner.

SMIC3811 MYCOLOGY

Module title:	**MYCOLOGY**
Code:	**SMIC3811**
Course Equivalent:	none
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks and one three hour practical session per week per semester
Credits:	16
Module assessment:	Continuous assessment: Theory (not less than 2 tests and 2 assignments) 40%, Practicals(not less than 10 marked assignments) 50% Examination: 60% (1 x 3 hour examination paper)
Prerequisites:	**SMBL3711:** Microbiology

Module description: This course will deal with concepts and applications of mycology. Topics will include Morphology, genetics, classification, ecology, and economic importance of Imperfect Fungi, Oomycetes, and Zygomycetes. Emphasis in the laboratory is on isolation, culture, and laboratory techniques. A survey of those fungi classified as Ascomycetes (such as yeasts, morels, powdery mildews and as Basidiomycetes (such as rusts, smuts, boletes, mushrooms, polypores). Emphasi in the laboratory is on anatomy and morphology as well as field identification. Biology of diseases affecting trees in the forest and forest nursery. Emphasis is on field identification using symptoms exhibited by diseases tree and characteristics of the pathogens. This course is intended to introduce the student to a quite diverse group of organisms and the many roles that they play in everyday life. The fungal kingdom and other organisms traditionally considered as fungi profoundly impact humans and the environment in both positive and negative ways. Certain fungi are responsible for production of food, while others have been responsible for devastating famines. Fungi have led to great advances in the treatment of infections through the discovery of antibiotics yet some fungi are the agents that cause many serious illnesses, especially among immuno-compromised patients. One of the most important roles that fungi play is that of recycler of organic material, which reduces complex molecules to simpler ones that can be re-used by other organisms. The course will involve group discussions of recent papers in mycological journals. This course will also include excursions to industries and the lectures will be given in a highly interactive manner.

SMIC3802 PARASITOLOGY

Module title:	**PARASITOLOGY**
Code:	**SMIC3802**
NQF level:	8
Contact hours:	2 lecture periods and 1 practical period per week for 14 weeks
Credits:	8
Module assessment:	Continuous Assessment 40% (2 tests). Examination 60% (2 hour paper)
Prerequisites:	Microbiology **(SMBL3711)** (Pre), Immunology **SMBL3811**(Co)

Module description : Emphasis will be put on major parasitic groups that include parasitic protozoa, monogeneans, digeneans, cestodes, nematodes, acanthocephalans, and parasitic arthropods. Parasites will be studied based on life cycles, host specificity, parasite biochemistry, molecular parasitology and parasites behavior. There will be a substantial basic introduction to endoparasites, ectoparasites, obligate parasites, facultative parasites as well as host-parasite interaction aspects such as symbiosis, commensalisms and mutualism. Medical Parasitology focusing on parasites that infect man and causing diseases like malaria, trypanosomiasis, leishmaniasis, schistosomiasis and etc will constitute an important component of the course. The course will also address Veterinary Parasitology to discuss those parasites that are causing economic losses in agriculture and aquaculture or which infect companion animal. The practical content will include: identification and isolation of intestinal parasites using Glucose Flotation Method/Sedimentation. Method and the microscopic preparation and examination of blood parasites.

SMIC3822 MEDICAL MICROBIOLOGY

Module title:	**MEDICAL MICROBIOLOGY**
Code:	**SMIC 3822**
NQF level:	8
Contact hours:	2 lectures per week for 14 weeks and one 2-hour practical session per week per semester.
Credits:	8
Module assessment:	Continuous assessment (40%): Theory (not less than 2 tests and 2 assignments, 50%, Practicals (not less than 10 marked assignments) 50% Examination (60%): One 3-hour examination paper.
Prerequisites:	Introduction to Microbiology **(SMBL3632)** and Microbiology **(SMBL3711)**

Module description: This is an applied course equivalent to Clinical Microbiology or Diagnostic Microbiology. It will start with a discussion of the purpose and philosophy of medical microbiology, laboratory safety, laboratory organization, quality control and assessment, sterilization and disinfection, managing a clinical laboratory, handling clinical specimens. The course will then look at normal microbial flora versus pathogens, morphology and taxonomy, optical methods for laboratory diagnosis of infectious disease, cultivation and isolation of viable pathogens, conventional and rapid microbiological methods for identification of pathogens. Non-traditional methods for identification and detection of pathogens or their products (particle agglutination, ELISA, flourogenic substrates, genetic probes, blotting techniques, PCR), diagnostic immunological principles and methods, antibiotics, antiviral strategies, methods for testing antimicrobial effectiveness, principles of automated methods of diagnosis, biochemical tests, histology, and histochemistry. Specific examples will be drawn from microorganisms encountered in the blood, cerebrospinal fluid, respiratory tract, gastrointestinal tract, urinary tract, wounds, abscesses, skin, soft tissue lesions, bones, head and neck, genital and sexually transmitted pathogens. Methods for identification of aetiological agents of infectious diseases will be based on selected examples such as parvo- and adenoviruses, herpes, and poxviruses, hepatitis viruses, picornaviruses, reo- and rotaviruses, arthropod- and rodent-borne viruses, orthomyxoviruses, paramyxoviruses and rubella, coronaviruses, rabies, prion diseases, lentiviruses and HIV, tumour viruses, bacilli, clostridium, anaerobes, corynebacterium, Listeria, actinomycetes, Streptococcus, Enterococci, Staphylococcus, Vibrio, Campylobacter, Helicobacter, Haemophilus, Brucella, Bordetella, Yersinia, Francisella, Pasteurella, Pseudomonas, Chlamydia, Neisseria, fungi, protozoa, and helminthes.

SMIC3812 ENVIRONMENTAL AND INDUSTRIAL MICROBIOLOGY

Module title:	**ENVIRONMENTAL AND INDUSTRIAL MICROBIOLOGY**
Code:	**SMIC 3812**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (minimum of 2 tests and 2 assignments) Examination 60% (1 x 2 hour examination paper)
Prerequisites:	Microbiology **SMBL 3711**, Genetics **SMBL 3732**,
Co-requisites:	Recombinant DNA Technology **SMBL 3731**, **CHB3612** Biochemistry II

Module description: Industrial fermentation: Bioprocess development- isolation and screening of target organisms, strain selection, strain improvement, master culture preservation, media design, scale-up, fermentation vessels, oxygen transfer rate, bioprocess control, downstream processing. Batch culture, fed-batch culture, continuous culture, Crabtree effect, Pasteur effect. Production of antibiotics (eg. Penicillin), vaccines (eg. hepatitis B vaccine), beer, aminoacids (eg. Lysine, glutamate), organic acids (eg. Citric acid) and vitamins (eg. ascorbic acid), algal cultures. Design, operation and monitoring of a facility for manufacture of sterile products. Bioconversions, biodegradation, bioleaching. Factors that may influence sterility in manufacturing. Environmental microbiology: The role of microorganisms in the Environment. Terrestrial Environment: soils. Soil microorganism associations with plants. Marine Environment and Freshwater Environment including lakes and rivers. Sewage treatment: Conventional sewage and wastewater treatment , anaerobic digesters, constructed wetlands, septic tanks. Analysis of water purity. Indicator organisms, biocontrol, Baculovirus as a control agent, biomining, bioremediation, biostimulation, bioaugmentation.

SMIC 3832 VIROLOGY

Module title:	**VIROLOGY**
Code:	**SMIC3832**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks and one three hour practical session per week per semester
Credits:	16
Module assessment:	Continuous assessment: Theory (not less than 2 tests and 2 assignments) 40%, Practicals (not less than 10 marked assignments) 50% Examination: 60% (1 x 3 hour examination paper)
Prerequisites:	**SMBL3711** Microbiology

Module description: This course will deal with exciting concepts of virology and is intended to provide students with the latest information in virological methods and provide advanced knowledge,. Topics will include an introduction to viruses, their nature and structure. Nomenclature, classification and diversity of viruses. Principal events involved in replication: Adsorption, penetration, uncoating nucleic acid and protein synthesis, assembly, maturation and release. Replicative strategies employed by plant and animal DNA and RNA viruses. Identification of virus prototypes associated with different RNA and DNA virus replication schemes. Bacterial, plant and animal virus genetics. Host–virus interactions with emphasis on phenomena occurring at the molecular level and on the regulated control of gene expression in virus-infected cells. Viral pathogenesis and treatment using examples of common and emerging animal and plant viruses. Throughout the virology course, attempts are made at emphasizing those infectious diseases that are of great actual or potential importance to humans.

SMOL3811 BIOINFORMATICS **4L + 1PS / week**

Module title:	**BIOINFORMATICS**
Code:	**SMOL3811**
NQF level:	8
Contact hours:	4 L / week for 14 weeks + 3h P/week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment: 40% (3 tests – 60% + at least 10 practical marks – 40%) Examination: 60% (1 x 3h examination paper)
Prerequisites:	Cell Molecular Biology and Genetics **SMBL3631**, Genetics **SMBL3732**,
Co-requisite	Applied Molecular Biology **SMBL3831**

Module description: The development of rapid DNA sequencing techniques has led to an information revolution in molecular biology. Computer based technologies are therefore applied and employed in the management and analysis of such biological data. This course is a hand-on and interactive course in which students will acquire knowledge on information networks, the world wide web as a tool and resource for molecular biology. They will gain skills and knowledge in using these resources in sequence and structure analysis. The various genomic and proteomic databases and the levels of stored data will be discussed. The information retrieval and analysis tools such as sequence similarity and alignment will be discussed and applied in depth. This will lead to the identification of characteristic profiles, protein families, evolutionary relationships, etc. The module will also include the design of PCR and oligonucleotide primers for cloning and mutagenesis as well as identifying open-reading frames (ORFs) in nucleotide sequences The course will consist of lectures, student presentations and assignments.

SMOL3812 APPLIED GENETICS **4L + 1PS / week**

Module title:	**APPLIED GENETICS**
Code:	**SMBL3812**
Course Equivalent:	none
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks and one three hour practical session per week per semester
Credits:	16
Module assessment:	Continuous assessment:Theory (not less than 2 tests and 2 assignments) 40% Practicals (not less than 10 marked assignments) 50%
Examination:	60% (1 x 3 hour examination paper)
Prerequisites:	**SMBL3732** Genetics

Module description: This is a senior undergraduate course designed to allow students to conceptualise the applications of genetics in dealing with day to day situations in agriculture, medicine and the environment. This course will deal with exciting concepts in genetics. Topics will include plant breeding, animal breeding, medical genetics and the genetics of industrial fungi. These are usually taught separately, but they are all linked by strong central concepts regarding the generation, control, fate and use of genetic variation at the levels of genes, chromosomes, genomes and populations. Systematically, the course with cover: Aims of Applied Genetics, The Inheritance and Analysis of Qualitative and Quantitative Characters. Regression, Transgression, Environmental Effects and Heritability, Correlations between Characters, Genotype, Phenotype and Breeding Values. Applied aspects of Population Genetics: Allele Frequencies, Genetic Equilibria, Population Mixing, Genetic Drift and Gene Flow. Types and uses of Selection. Departures from Random Mating. Mutation and its uses. Recombination and mapping. Breeding methods and examples. Applied aspects of human and medical genetics. Genetic Engineering in Plants, Animals and Micro-Organisms, and Human Gene Therapy. Genetic Variation in Wild and Agricultural Populations, Genetics of Conservation. Genetic methods of insect Pest Control. Reproductive Physiology in Plants, Animals and Humans, Crossing Methods. Applied fungal genetics. The economics of Agricultural Products and Breeding programmes.

SMOL3852 ANIMAL GROWTH AND DEVELOPMENT **4L + 1PS / week**

Module title: **ANIMAL GROWTH AND DEVELOPMENT**
Course equivalent: Animal Growth and Development (MBL 3432)
Code: SMOL 3852
NQF level: 8
Contact hours: 4 lecture periods / week for 14 weeks
Credits: 16
Module assessment: Continuous assessment 40% (minimum of 2 tests and 2 Assignments)
Examination 60% (1 x 2 hour examination paper)
Prerequisites: Animal Form and Function **SBLG 3212**, Genetics **SMBL 3732**
Module description: This course will cover animal growth, including the genetic control of cell growth, differentiation and morphogenesis, development of the gametes, fertilization, all stages of pre-embryonic and post-embryonic development such as cleavage, blastulation, gastrulation and organogenesis. The two developmental paths followed by animals namely regulative development and mosaic development will be discussed. Evolutionary Development. Aging: Telomere-deletion hypothesis, wear-and-tear hypothesis, Gene-clock hypothesis, accumulated mutation hypothesis and effects of various physiological and Environmental factors affecting these processes. Cancer: cell-cycle regulation and genetics of cancer, causes and development of cancer. Stem cells: embryonic stem cells, somatic stem cells, therapeutic stem cell cloning etc. Animal tissue culture and Cloning: tissue culture techniques, tissue culture media, cloning.

SMOL3832 PLANT GROWTH AND DEVELOPMENT **4L + 1PS / week**

Module title: **PLANT GROWTH AND DEVELOPMENT**
Code: **SMOL3832**
NQF level: 8
Contact hours: 4 L/week for 14 weeks + 3h P/week for 14 weeks
Credits: 16
Module assessment: Continuous assessment 40%: (at least 2 tests and at least 8 practical marks) Examination 60%: (1 x 3h paper)
Prerequisites: **SCHM3411** (Chemistry 1A) OR **SCHM3512** (Chemistry 1B) OR **SCHM3412** Chemistry for Life Sciences
Module description: This module is designed to provide students with an understanding and appreciation of the complex processes of plant growth and development from a molecular perspective. The module will examine the characteristics of plant growth, with emphasis on the meristematic nature of this growth,. The process of growth will be discussed from a physical perspective taking into account Heyn's concept of cell wall extensibility and the role of pH and expansins. A number of developmental control mechanisms will be considered with emphasis on the interdependency between genetic, hormonal and environmental mechanisms, as well as signal perception and transduction by second messengers. The role of the six classes of plant hormones in the regulation of cell division, cell enlargement, cell differentiation with emphasis on tissue cultures, will be discussed. The control of processes such as seed development, shoot & root development, senescence and abscission, as well as flower and fruit development will be investigated, mainly from results obtained with mutagenic studies. The module will further examine the structure, characteristics and functions of plant photoreceptors with emphasis on photocontrol of seed germination, the processes of etiolation & de-etiolation, canopy shading and photoreceptor signal transduction. Plant movements such as nyctinasty, thigmonasty, phototropism and gravitropism will be discussed in detail. The concept of photoperiodism and the role of biological clocks will be investigated taking into account the ecological aspects of photoperiodism, response types, perception of the photoperiodic signal, transduction of the floral stimulus, rhythmic responses, Zeitgebers, and time measurement in photoperiodism. The module will conclude with an investigation of flowering by considering aspects such as floral induction and floral development. .

SERVICE MODULES FOR EDUCATION STUDENTS ONLY

Module Title: **CELL MOLECULAR BIOLOGY, MICROBIOLOGY AND GENETICS FOR EDUCATORS**
Module equivalent: New module
Code: **SMBE 3771**
NQF level: 7
Contact hours: 4 lecture periods / week for 14 weeks
Credits: 16
Module assessment: Continuous assessment 40% (minimum of 2 tests and 2 Assignments) Examination 60% (1 x 3hour examination paper)
Prerequisites: **SBLG3612** Plant Form and Function, **SBLG3611** Animal Form and Function, **MBL3652** Human Biology
Module description: This is a broad based course that will start with an introduction to the chemical basis of cellular processes, an overview of mitosis and meiosis, Mendelian & non-Mendelian Genetics: monohybrid crosses, dihydrid cross, test crosses, chromosomal theory of inheritance, sex determination & sex-linked genes, basic genetic linkage and chromosome mapping, and the genetic code; structure and function of eukaryotic chromosomes and mutations as the basis for genetic variations and their effects and natural selection. Macromolecules : proteins, carbohydrates fatty acids and nucleic acids and their roles in cellular organization; the structure of DNA and genome sizes and complexity; DNA replication; Eukaryotic transcription and RNA processing. The module will include principles of microbiology, importance of microorganisms, microbial cell structure, physiological diversity of microorganisms, prokaryotic diversity, microscopy and cell morphology, microbial cell membranes and cell walls, surface structures and inclusions, endospores, microbial motility and bacterial taxis, staining techniques, microbial nutrition and metabolism, culture media, laboratory culture of microorganisms, enrichment and isolation, isolation of pure cultures, bacterial cell division, growth of bacterial populations, measuring microbial growth, environmental effects on microbial growth, control of microbial growth, Identification of bacteria; Microbial genetics and genetic engineering: conjugation, transformation and transduction; Mutations, causes and uses of mutations; DNA Isolation; molecular cloning, genetic recombination, detection of variation in proteins and DNA. Genetically Modified Organisms: examples, risks and benefits.

Module Title: **ENVIRONMENTAL BIOLOGY FOR EDUCATORS**
Module equivalent: New Module
Module Code: **SEBE 3772**
NQF Level: 7
Credits: 16
Module Assessment: CA 40% Exam 60% - 1 x 3 hour paper
Prerequisite: **SBLG3611** Animal Form and Function, **SBLG 3612** Plant Form and Function

Module description: This module is designed to equip students with the necessary understanding of various topics in environmental studies.
The main focus of this module is to enhance understanding of relationships of organisms with one another and with their environment including the human dimension. The following will be covered in this module: Ecology and environment: definitions. Basic components of ecological systems, essential processes of ecological systems: photosynthesis and decomposition. Primary and secondary production, energy flow and flux of matter and trophic structures, food chains and food webs, trophic levels and ecological pyramids, Food chains and poisons in the environment. Biogeochemical cycles (water-, carbon- nitrogen and phosphorous -cycles) and human influence cycles. Climate change: definition, causes, mitigation and adaptations. Climate change conventions and protocols. Namibia and climate change. Biomes: definition, classification and characteristics of biomes of the world and biomes of Namibia. Population Ecology: characteristics of populations- birth, death, immigration, emigration, size, age structure, and sex ratios. Population density, dispersion, mortality, natality and survivorship, population growth, parasitism (classes and characteristics of parasites, hosts as habitats, parasite population dynamics, evolutionary aspects of parasitism, social parasitism), Population regulation (mechanisms of population regulation, intra-specific competition, dispersal, social interactions). Arid environments: causes, classification and characteristics of arid ecosystems, surface and ground water, floods, Humidity, temperature, wind and wind erosion, soils, dust & dust storms, adaptations of organisms to arid environments. Desertification: definitions, causes of desertification (proximate or immediate and ultimate or underlying causes), manifestations of desertification, action to combat desertification. Deforestation: causes (proximate or immediate and ultimate or underlying causes) and effects of deforestation, deforestation in Namibia and possible solutions to deforestation. Conservation ecology: definitions, global patterns, distribution and measurement of biodiversity with special emphasis on Namibian. Conservation and sustainable exploitation of natural resources. Threats to biological diversity (including habitat destruction, habitat fragmentation, habitat degradation and pollution, global climate change, overexploitation, invasive and alien species, and disease). Human influences on ecosystems; damage to the environment, urbanization. Aquatic Ecology: the physical properties of water, stream ecology, lake ecology, physical and chemical properties of oceans, food chains and webs in the marine environment, estuarine ecology.

E. DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

E.1. DEPARTMENTAL REGULATIONS

Students who want to register for Chemistry and Biochemistry must have at least a "C" symbol in Physical Science at NSSC-O level (IGCSE level).
All practical sessions are compulsory. At least 80% of practical attendance is required to qualify for the final examination.
Tutorial sessions are compulsory in the modules where they are offered.
To qualify for the second opportunity examination, you need a final mark of between 45-49%, a subminimum of 40% for the exam mark as well as a 50% in either your exam or CA mark.

E.1.1. B.SC.CHEMISTRY: MAJORS AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B. Sc. Chemistry Major and Physics Minor (11BCHP)
Students opting for a major in Chemistry with minor in Physics must take all of the following modules:

Year 1

Semester	Module Name	Codes	Pre- Requisites
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements
1	Analytic Geometry, Complex Numbers & Matrices	SMAT3531	Faculty Entry Requirements
1	Basic Mathematics	SMAT3511	Faculty Entry Requirements
1	English Communication and Study Skills	ULCE3419	Faculty Entry Requirements
	Physics Minor:		
1	Physics for Physical Sciences I	SPHY3511	Faculty Entry Requirements

Semester	Module Name	Codes	Pre- Requisites
2	Chemistry 1B	SCHM3512	Faculty Entry Requirements
2	Precalculus	SMAT3512	Faculty Entry Requirements
2	English for Academic Purposes	ULEA3519	Faculty Entry Requirements
2	Contemporary Social Issues	CSI3529	Faculty Entry Requirements
2	Computer Literacy	UCLC3509	Faculty Entry Requirements
	Physics Minor:		

2	Physics for Physical Sciences II	SPHY3512	Faculty Entry Requirements

Year 2

Semester	Module Name	Codes	Pre- Requisites
1	Inorganic Chemistry I	SCHM3611	SCHM3511 & SCHM3512
1	Physical Chemistry I	SCHM3631	SCHM3511 & SCHM3512,& SMAT3511, SMAT3512
1	Calculus I	SMAT3611	SMAT3512 + 1 Full Mathematics Module
	Physics Minor:		
1	Classical Mechanics	SPHY3611	SPHY3511, SMAT3511, SMAT3512
1	Waves and Optics	SPHY3631	SPHY3511, SPHY3512

Semester	Module Name	Codes	Pre- Requisites
2	Analytical Chemistry I	SCHM3602	SCHM3511 & SCHM3512
2	Organic Chemistry I	SCHM3612	SCHM3511 & SCHM3512
2	Introduction to Statistics	SSTS3522	Faculty Entry Requirements
2	Calculus II	SMAT3612	SMAT3512 + 1 Full Mathematics Module
2	Elementary Linear Algebra	SMAT3652	SMAT3511
	Physics Minor:		
2	Modern Physics I	SPHY3602	SPHY3511, SPHY3512, SMAT3511, SMAT3512

Year 3

Semester	Module Name	Codes	Pre- Requisites
1	Industrial Chemistry I	SCHM3761	SCHM3611, SCHM3612
1	Inorganic Chemistry II	SCHM3701	SCHM3611,SMAT3512
1	Analytical Chemistry II	SCHM3721	SCHM3602
1	Organic Chemistry II	SCHM3711	SCHM3612
1	Numerical Methods	SMAT3621	Any 2 full 1st Year Mathematics Modules
1	Programming Fundamentals I	CMP3511	
	Physics Minor:		
1	Thermodynamics & Kinetic Theory	SPHY3701	SPHY3611, SMAT3612
1	Computational Physics with C++	SPHY3721	None

Semester	Module Name	Codes	Pre- Requisites
2	Instrumental Analysis I	SCHM3702	SCHM3602, SCHM3612
2	Physical Chemistry II	SCHM3712	SCHM3631, SMAT3611, SMAT3612
2	Ordinary Differential Equations	SMAT3642	Any 2 full 1st Year Mathematics Modules
2	Research Methodology	SCHM3722	All second year chemistry modules
	Physics Minor:		
2	Modern Physics II	SPHY3732	SPHY3602

Year 4

Semester	Module Name	Codes	Pre- Requisites
1	Instrumental Analysis II	SCHM3801	SCHM3702, SCHM3711
1	Organic Chemistry III	SCHM3811	SCHM3711
1	Physical Chemistry III	SCHM3831	SCHM3631, SMAT3612
1	Research Projects	SCHM3810	All third year chemistry modules
1	Physical Inorganic Chemistry	SCHM3841	SCHM3701
	Physics Minor: No offering		

Semester	Module Name	Codes	Pre- Requisites
2	Inorganic Chemistry III	SCHM3802	SCHM3701
2	Industrial Chemistry II	SCHM3812	SCHM3712, SCHM3761
2	Molecular Spectroscopy	SCHM3832	SCHM3631, SMAT3612
2	Advanced Topics in Chemistry	SCHM3842	All third year chemistry modules
2	Research Projects	SCHM3810	All third year chemistry modules
	Physics Minor: No offering		

QUALIFICATION: B. SC Chemistry Major and Biology Minor (11BCHB)

Students opting for a major in Chemistry with minor in Biology must take all of the following modules:

Year 1

Semester	Module Name	Codes	Pre- Requisites
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements
1	Physics for Physical Sciences I	SPHY3511	Faculty Entry Requirements
1	Basic Mathematics	SMAT3511	Faculty Entry Requirements
1	English Communication and Study Skills	ULCE3419	Faculty Entry Requirements
	Biology Minor		
1	Introduction to Biology	SBLG3511	NSSC Biology C

Semester	Module Name	Codes	Pre- Requisites
2	Chemistry 1B	SCHM3512	Faculty Entry Requirements
2	Precalculus	SMAT3512	Faculty Entry Requirements
2	Computer Literacy	UCLC3509	Faculty Entry Requirements
2	Contemporary Social Issues	UCSI3529	Faculty Entry Requirements
2	English for Academic Purposes	ULEA3519	Faculty Entry Requirements
	Biology Minor		
2	Diversity of Life	SBLG3512	NSSC Biology C

Year 2

Semester	Module Name	Codes	Pre- Requisites
1	Inorganic Chemistry I	SCHM3611	SCHM3511 & SCHM3512
1	Physical Chemistry I	SCHM3631	SCHM3511 & SCHM3512, & SMAT3511, SMAT3512
1	Calculus I	SMAT3611	SMAT3512 + 1 Full Mathematics Module
1	Biochemistry I	SCHB3611	SCHM3511 & SCHM3512 & SBLG3511
	Biology Minor		
1	Cell Molecular Biology & Genetics	SMBL3631	SBLG3511, SBLG3512

Semester	Module Name	Codes	Pre- Requisites
2	Analytical Chemistry I	SCHM3602	SCHM3511 & SCHM3512
2	Organic Chemistry I	SCHM3612	SCHM3511 & SCHM3512
2	Calculus II	SMAT3612	SMAT3512 + 1 Full Mathematics Module
2	Biochemistry II	SCHB3612	SCHM3511 & SCHM3512 & SBLG3511
2	Introduction to Statistics	SSTS3522	Faculty Entry Requirements
	Biology Minor		
2	Introduction to Microbiology	SMBL3632	SBLG3511, SBLG3512

Year 3

Semester	Module Name	Codes	Pre- Requisites
1	Industrial Chemistry I	SCHM3761	SCHM3611, SCHM3612
1	Inorganic Chemistry II	SCHM3701	SCHM3611, SMAT3512
1	Analytical Chemistry II	SCHM3721	SCHM3602
1	Organic Chemistry II	SCHM3711	SCHM3612
1	Biochemistry III	SCHB3701	SCHB3612, SMBL3631
	Biology Minor		
1	Microbiology	SMBL3711	SMBL3632
1	Recombinant DNA Technology	SMBL3731	SMBL3631, SMBL3632

Semester	Module Name	Codes	Pre- Requisites
2	Instrumental Analysis I	SCHM3702	SCHM3602, SCHM3612
2	Physical Chemistry II	SCHM3712	SCHM3631, SMAT3611, SMAT3612
2	Biochemistry IV	SCHB3712	SCHB3612, SMBL3631
2	Research Methodology	SCHM3722	All second year chemistry modules
	Biology Minor: No offering		

Year 4

Semester	Module Name	Codes	Pre- Requisites
1	Instrumental Analysis II	SCHM3801	SCHM3702, SCHM3711
1	Organic Chemistry III	SCHM3811	SCHM3711
1	Physical Chemistry III	SCHM3831	SCHM3631, SMAT3612
1	Natural Product Chemistry I	SCHB3821	SCHM3711
1	Research Projects	SCHM3810	All third year chemistry modules
1	Physical Inorganic Chemistry	SCHM3841	SCHM3701
	Biology Minor: No offering		

	Module Name	Codes	Pre- Requisites
2	Inorganic Chemistry III	SCHM3802	SCHM3701
2	Industrial Chemistry II	SCHM3812	SCHM3712, SCHM3761
2	Natural Product Chemistry II	SCHB3822	SCHM3711
2	Advanced Topics in Chemistry	SCHM3842	All third year modules
2	Research Projects	SCHM3810	All third year modules
	Biology Minor: No offering		

QUALIFICATION: B. Sc Chemistry Major and Geology Minor (11BCHG)

Students opting for a major in Chemistry and minor in Geology must take all of the following modules:

Year 1

Semester	Module Name	Codes	Pre- Requisites
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements
1	Physics for Physical Sciences I	SPHY3511	Faculty Entry Requirements
1	Basic Mathematics	SMAT3511	Faculty Entry Requirements
1	Analytic Geometry, Complex Numbers & Matrices	SMAT3531	Faculty Entry Requirements
1	English Communication and Study Skills	ULCE3419	Faculty Entry Requirements
	Geology Minor:		
1	Intro. to Physical Geology & Surface Processes	SGLY3521	Faculty Entry Requirements

Semester	Module Name	Codes	Pre- Requisites
2	Chemistry 1B	CHM3512	Faculty Entry Requirements
2	Precalculus	SMAT3512	Faculty Entry Requirements
2	Contemporary Social Issues	UCSI3529	Faculty Entry Requirements
2	Computer Literacy	UCLC3509	Faculty Entry Requirements
2	English for Academic Purposes	ULEA3519	Faculty Entry Requirements
	Geology Minor:		
2	Intro. To Earth Systems	SGLY3502	Faculty Entry Requirements

Year 2

Semester	Module Name	Codes	Pre- Requisites
1	Inorganic Chemistry I	SCHM3611	SCHM3511 & SCHM3512
1	Physical Chemistry I	SCHM3631	SCHM3411 & SCHM3512, & SMAT3511, SMAT3512
1	Calculus I	SMAT3611	SMAT3512 + 1 Full Mathematics Module
	Geology Minor:		
1	Earth Resources	SGLY3641	SGLY3521
1	Introduction to Hydrology	SGLY3621	SMAT3512

Semester	Module Name	Codes	Pre- Requisites
2	Analytical Chemistry I	SCHM3602	SCHM3511 & SCHM3512
2	Organic Chemistry I	SCHM3612	SCHM3511 & SCHM3512
2	Physics for Physical Sciences II	SPHY3512	Faculty Entry Requirements
2	Calculus II	SMAT3612	SMAT3512 + 1 Full Mathematics Module
2	Introduction to Statistics	SSTS3522	Faculty Entry Requirements
	Geology Minor:		
2	Introduction to Geochemistry	SGLY3642	SGLY3521 & SMAT3512
2	Crystallography and Mineral Chemistry	SGLY3632	SMAT3512

Year 3

Semester	Module Name	Codes	Pre- Requisites
1	Industrial Chemistry I	SCHM3761	SCHM3611, SCHM3612
1	Inorganic Chemistry II	SCHM3701	SCHM3611, SMAT3512
1	Analytical Chemistry II	SCHM3721	SCHM3602
1	Organic Chemistry II	SCHM3711	SCHM3612
	Geology Minor:		
1	Coal, Petroleum & Gas	SGLY3701	SGLY3521; SGLY3600 (co-requisite)
1	Regional Geology of Namibia	SGLY3761	SGLY3600 (co-requisite)
1	Mineralogy	SGLY3711	SGLY3632; SGLY3600 (co-requisite)
1	Field Geology I	SGLY3600	None

Semester	Module Name	Codes	Pre- Requisites
2	Instrumental Analysis I	SCHM3702	SCHM3602, SCHM3612
2	Physical Chemistry II	SCHM3712	SCHM3631, SMAT3611, SMAT3612
2	Research Methodology	SCHM3722	All second year chemistry modules
	Geology Minor:		
2	Exploration Geochemistry & Geostatistics	SGLY3782	SGLY3642; SGLY3600 (co-requisite)
2	Hydrogeology I	SGLY3702	SGLY3621; SGLY3600 (co-requisite)
2	Field Geology I	SGLY3600	None

Year 4

Semester	Module Name	Codes	Pre- Requisites
1	Instrumental Analysis II	SCHM3801	SCHM3702, SCHM3711
1	Organic Chemistry III	SCHM3811	SCHM3711
1	Physical Chemistry III	SCHM3831	SCHM3631, SMAT3612
1	Physical Inorganic Chemistry	SCHM3841	SCHM3701
1	Research Projects	SCHM3810	All third year chemistry modules
	Geology Minor: No offering		

Semester	Module Name	Codes	Pre- Requisites
2	Inorganic Chemistry III	SCHM3802	SCHM3701
2	Industrial Chemistry II	SCHM3812	SCHM3712, SCHM3761
2	Molecular Spectroscopy	SCHM3832	SCHM3631, SMAT3612
2	Advanced Topics in Chemistry	SCHM3842	All third year chemistry modules
2	Research Projects	SCHM3810	All third year chemistry modules
	Geology Minor: No offering		

QUALIFICATION: B. SC Biochemistry Major and Biology Minor (11BCBB)

Students opting for a major in Biochemistry and minor in Biology must take all of the following modules:

Year 1

Semester	Module Name	Codes	Pre- Requisites
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements
1	Physics for Life Sciences I	SPHY3501	Faculty Entry Requirements
1	Basic Mathematics	SMAT3511	Faculty Entry Requirements
1	English Communication and Study Skills	ULCE3419	Faculty Entry Requirements
1	Computer Literacy	UCLC3509	Faculty Entry Requirements
	Biology Minor:		
1	Introduction to Biology	SBLG3511	NSSC Biology C

Semester	Module Name	Codes	Pre- Requisites
2	Chemistry 1B	SCHM3512	Faculty Entry Requirements
2	Precalculus	SMAT3512	Faculty Entry Requirements
2	Introduction to Statistics	SSTS3522	Faculty Entry Requirements
2	Contemporary Social Issues	UCSI3529	Faculty Entry Requirements
2	English for Academic Purposes	ULEA3519	Faculty Entry Requirements
	Biology Minor:		
2	Diversity of Life	SBLG3512	NSSC Biology C

Year 2

Semester	Module Name	Codes	Pre- Requisites
1	Inorganic Chemistry I	SCHM3611	SCHM3511 & SCHM3512
1	Physical Chemistry I	SCHM3631	SCHM3511 & SCHM3512, & SMAT3511, SMAT3512
1	Calculus I	SMAT3611	SMAT3512 + 1 Full Mathematics Module
1	Biochemistry I	SCHB3611	SCHM3511 & SCHM3512 & SBLG3511
1	Statistics for Life Sciences I	SSTS3621	SSTS3522
	Biology Minor:		
1	Cell Molecular Biology & Genetics	SMBL3631	SBLG3511, SBLG3512

Semester	Module Name	Codes	Pre- Requisites
2	Analytical Chemistry I	SCHM3602	SCHM3511 & SCHM3512
2	Organic Chemistry I	SCHM3612	SCHM3511 & SCHM3512
2	Statistics for Life Sciences II	SSTS3622	SSTS3522
2	Biochemistry II	SCHB3612	SCHM3511 & SCHM3512 & SBLG3511
	Biology Minor:		
2	Introduction to Microbiology	SMBL3632	SBLG3511, SBLG3512

Year 3

Semester	Module Name	Codes	Pre- Requisites
1	Inorganic Chemistry II	SCHM3701	SCHM3611, SMAT3512
1	Analytical Chemistry II	SCHM3721	SCHM3602
1	Organic Chemistry II	SCHM3711	SCHM3612
1	Biochemistry III	SCHB3701	SCHB3612, SMBL3631
	Biology Minor:		
1	Microbiology	SMBL3711	SMBL3632
1	Recombinant DNA Technology	SMBL3731	SMBL3631, SMBL3632

Semester	Module Name	Codes	Pre- Requisites
2	Instrumental Analysis I	SCHM3702	SCHM3602, SCHM3612
2	Research Methodology	SCHM3722	All second year chemistry modules
2	Biochemistry IV	SCHB3712	SCHB3612, SMBL3631
2	Medical Biochemistry	SCHB3732	SCHB3612
	Biology Minor:		
2	Genetics	SMBL3732	SMBL3632, SMBL3631

Year 4

Semester	Module Name	Codes	Pre- Requisites
1	Nutritional Biochemistry	SCHB3801	SCHB3612, SCHM3702
1	Natural Product Chemistry I	SCHB3821	SCHM3711
1	Bioinformatics for Biochemistry	SCHB3831	SCHB3612, SMBL3631
1	Physical Inorganic Chemistry	SCHM3841	SCHM3701
1	Research Projects	SCHB3810	All third year chemistry modules
	Biology Minor: No offering		

Semester	Module Name	Codes	Pre- Requisites
2	Professional Training in Biochemistry	SCHB3832	SCHB3712, SMBL3632
2	Environmental Biochemistry	SCHB3812	SCHB3702
2	Natural Product Chemistry II	SCHB3822	SCHM3711
2	Advanced Topics in Biochemistry	SCHB3852	All third year chemistry modules
2	Research Projects	SCHB3810	All third year chemistry modules
	Biology Minor: No offering		

QUALIFICATION: B. Sc. Biochemistry Major and Chemistry Minor (11BCBC)

Students opting for a major in Biochemistry and minor in Chemistry must take all of the following modules:

Year 1

Semester	Module Name	Codes	Pre- Requisites
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements
1	Physics for Life Sciences I	SPHY3501	Faculty Entry Requirements
1	Introduction to Biology	SBLG3511	NSSC Biology C
1	Basic Mathematics	SMAT3511	Faculty Entry Requirements
1	English Communication and Study Skills	ULCE3419	Faculty Entry Requirements
1	Computer Literacy	UCLC3509	Faculty Entry Requirements

Semester	Module Name	Codes	Pre- Requisites
2	Precalculus	SMAT3512	Faculty Entry Requirements
2	Diversity of Life	SBLG3512	NSSC Biology C
2	Chemistry 1B	SCHM3512	Faculty Entry Requirements
2	Introduction to Statistics	SSTS3522	Faculty Entry Requirements
2	Contemporary Social Issues	UCSI3529	Faculty Entry Requirements
2	English for Academic Purposes	ULEA3519	Faculty Entry Requirements

Year 2

Semester	Module Name	Codes	Pre- Requisites
1	Calculus I	SMAT3611	SMAT3512 + 1 Full Mathematics Module
1	Biochemistry I	SCHB3611	SCHM3511 & SCHM3512 & SBLG3511
1	Cell Molecular Biology & Genetics	SMBL3631	SBLG3511, SBLG3512
1	Statistics for Life Sciences I	SSTS3621	SSTS3522
	Chemistry Minor:		
1	Inorganic Chemistry I	SCHM3611	SCHM3511 & SCHM3512
1	Physical Chemistry I	SCHM3631	SCHM3511 & SCHM3512, & SMAT3511, SMAT3512

Semester	Module Name	Codes	Pre- Requisites
2	Biochemistry II	SCHB3612	SCHM3511 & SCHM3512 & SBLG3511
2	Introduction to Microbiology	SMBL3632	SBLG3511, SBLG3512
2	Calculus II	SMAT3612	SMAT3512 + 1 Full Mathematics Module
	Chemistry Minor:		
2	Analytical Chemistry I	SCHM3602	SCHM3511 & SCHM3512
2	Organic Chemistry I	SCHM3612	SCHM3511 & SCHM3512

Year 3

Semester	Module Name	Codes	Pre- Requisites
1	Biochemistry III	SCHB3701	SCHB3612, SMBL3631
1	Recombinant DNA Technology	SMBL3731	SMBL3631, SMBL3632
	Chemistry Minor:		
1	Industrial Chemistry I	SCHM3761	SCHM3611, SCHM3612
1	Inorganic Chemistry II	SCHM3701	SCHM3611, SMAT3512
1	Analytical Chemistry II	SCHM3721	SCHM3602
1	Organic Chemistry II	SCHM3711	SCHM3612

Semester	Module Name	Codes	Pre- Requisites
2	Biochemistry IV	SCHB3712	SCHB3612,SMBL3631
2	Research Methodology	SCHM3722	All second year chemistry modules
2	Medical Biochemistry	SCHB3732	SCHB3612
	Chemistry Minor:		
2	Instrumental Analysis I	SCHM3702	SCHM3602, SCHM3612
2	Physical Chemistry II	SCHM3712	SCHM3631, SMAT3611, SMAT3612

Year 4

Semester	Module Name	Codes	Pre- Requisites
1	Nutritional Biochemistry	SCHB3801	SCHB3612, SCHM3702
1	Natural Product Chemistry I	SCHB3821	SCHM3711
1	Bioinformatics for Biochemistry	SCHB3831	SCHB3612, SMBL3631
1	Physical Inorganic Chemistry	SCHM3841	SCHM3701
1	Research Projects	SCHB3810	All third year chemistry modules
	Chemistry Minor: No offering		

Semester	Module Name	Codes	Pre- Requisites
2	Professional Training in Biochemistry	SCHB3832	SCHB3712, SMBL3632
2	Environmental Biochemistry	SCHB3812	SCHB3702
2	Natural Product Chemistry II	SCHB3822	SCHM3711
2	Advanced Topics in Biochemistry	SCHB3852	All third year chemistry modules
2	Research Projects	SCHB3810	All third year chemistry modules
	Chemistry Minor: No offering		

E.1.2. B.SC.CHEMISTRY AND BIOCHEMISTRY CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES

SCHM3411 CHEMISTRY 1A

Module Title: Chemistry 1A
Code: SCHM3511
NQF Level: 5
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 75 %, laboratory component 15 %, tutorial assignments 10%). Final Exam: 50%; (1 x 3 hour exam paper)
Prerequisites: Faculty Entry Requirements

Module Description: This module is a brief introduction to general chemistry and it lays the foundation of basic facts necessary for further studies in chemistry. The following topics are covered:

Content: An Introduction To Chemistry: Classification of Matter; The Three States of Matter; Physical and Chemical Properties of Matter; Measurement; Handling Numbers (scientific notation, significant figures); Factor-Label Method in Solving Problems. Atoms, Molecules and Ions: The Structure of the Atom; Atomic Number, Mass Number, and Isotopes; Molecules and Ions; Chemical Formulas (molecular and empirical); Naming Compounds. Mass Relationships in Chemical Reactions: Atomic Mass; Avogadro's Number and Molar mass; Molecular Mass; Percent Composition of Compounds; Experimental Determination of Empirical Formulas; Chemical Reactions and Chemical Equations; Stoichiometry (amounts of reactants and products); Limiting & Excess Reagents; Reaction Yield; Concentration of Solutions. Reactions in Aqueous Solutions: General Properties of Aqueous Solutions; Precipitation Reactions; Acid-Base Reactions; Oxidation and Reduction Reactions (assigning oxidation states, writing redox equations, balancing redox reactions). Quantum Theory and the Electronic Structure of Atoms: The Photoelectric Effect; Bohr's Theory of the Hydrogen Atom; Quantum Numbers; Atomic Orbitals; Electron Configuration; The Building-up Principle. Periodic Relationships Among Elements: Periodic Classification of the Elements; Periodic Variation in Physical Properties (effective nuclear charge, atomic radius, ionic radius); Ionization Energy; Electron Affinity; Variation in Chemical Properties of the Representative Elements (main group elements). Chemical Bonding: Lewis Dot Symbols; Ionic Bonding; Covalent Bonding; Metallic Bonding; Electronegativity; Writing Lewis Structures; Formal Charge; Concept of Resonance; Bond Enthalpy. Basic Molecular Geometry and Hybridization of Atomic Orbitals: Molecular Geometry; Dipole Moments; Valence Bond Theory; Hybridization of Atomic Orbitals; Molecular Orbital Theory; Molecular Orbital Configurations.

SCHM3512 CHEMISTRY 1B

Module Title: **CHEMISTRY 1B**
Code: **SCHM3512**
NQF Level: 5
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 75%, laboratory component 15%,tutorial assignments 10%)
Final Exam: 50%; (1 x 3 hour exam paper)
Prerequisites: Faculty Entry Requirements

Module Description: This module is a continuation of Chemistry 1A and it introduces the students to properties of gases, thermochemistry, chemical kinetics,chemical equilibrium, Introduction to laws of thermodynamics, electrochemistry and organic chemistry. The following topics are covered:

Content: Gases: Pressure of a Gas; The Gas Laws; The Ideal Gas Equation; Gas Stoichiometry; The Kinetic-Molecular Theory of Gases; Deviation from Ideal Behaviour. Basic Thermochemistry: The Nature of Energy and Types of Energy; Energy Changes in Chemical Reactions; Introduction to Thermodynamics; Enthalpy of Chemical Reactions; Calorimetry; Standard Enthalpy of Formation and Reaction; Heat of Solution and Dilution. Introductory Chemical Kinetics: Rate of Reaction; Rate Law; Relation between Reactant Concentration and Time; Activation Energy and Temperature Dependence of Rate Constants; Reaction Mechanisms; Catalysis. Introduction to Chemical Equilibrium: The Equilibrium Constant; Writing Equilibrium Constant Expressions; Relationship between Chemical Kinetics and Chemical Equilibrium; What Does the Equilibrium Constant tell Us? Factors that Affect Chemical Equilibrium. Acid-Base Equilibria & Solubilty Equilibria: The Common Ion Effect; Buffer Solution; Acid – Base Titrations; Acid-Base Indicators; Solubility Equilibria; Separation of Ions by Fractional Precipitation; The Common Effect and Solubility; pH and Solubility; Complex Ion Equilibria and Solubility. Entropy, Free Energy and Equilibrium: The Three Laws of Thermodynamics; Spontaneous Processes; Entropy; The Second Law of Thermodynamics; Gibbs Free Energy; Free Energy and Chemical Equilibrium; Thermodynamics in Living Systems. Introduction to Electrochemistry: Galvanic Cells; Standard Reduction Potentials; Spontaneity of Redox Reactions; Effect of Concentration of Cell EMF; Electrolysis. Introduction to Organic Chemistry: Classes of Organic Compounds; Structure and Nomenclature Main Functional Groups (alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, carboxylic acids, esters, amines, amides). Introduction to carbohydrates, lipids and porphyrins.

THE FOLLOWING SERVICE MODULE IS OFFERED FOR AGRICULTURE AND ENVIRONMENTAL BIOLOGY STUDENTS ONLY.

SCHM3532 CHEMISTRY FOR LIFE SCIENCES

Module Title:	**CHEMISTRY FOR LIFE SCIENCES**
Code:	**SCHM3532**
NQF Level:	5
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks.
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 75%, laboratory component 15%, tutorial assignments 10%) Final Exam: 50%; (1 x 3 hour exam paper)
Pre-requisites:	Faculty Entry Requirements

Module Description: This module is designed for students that have insufficient background in chemistry and for non-chemistry majors .It is an introduction to topics in general and organic chemistry, and biochemistry. The following will be covered*:*

Content: Classification of Matter: Mixtures and Pure substances; Physical States of Matter; Physical and Chemical Properties. Extensive and Intensive properties. Measurements: Units, Significant figures; Precision and Accuracy, Factor Label Method. Atomic structure and the Periodic table; Electron configuration; Physical and Chemical properties as predicted from groups. Ionic compounds and Molecular compounds: Writing chemical formulae and naming of ionic and molecular compounds. Average Atomic Mass. The Mole Concept; Percent Composition, Empirical formula and Molecular formula. Stoichiometry: limiting reagent, percent yield. Solutions: electrolytes and non-electrolytes, aqueous solutions, ionic equations; concentrations: percent concentration; molarity, molality; dilution of solutions; structure and solubility. Types of bonds; Lewis structures; Resonance structures; Molecular geometry: the VSEPR model, Polarity of molecules. Acid-base equilibrium: properties of acids and bases; relations of acids and bases, self ionisation of water; strengths of acids and bases; the pH scale; hydrolysis of salts; buffers; acid-base titration. Introduction to organic chemistry: organic compounds; structural formulae and conformations; functional groups; Classes of hydrocarbons: alkanes, cycloalkanes: alkanes; alkenes and alkynes; oxidation and reduction; addition reactions; stereo-isomerism. Alcohols, phenols, thiols, ethers: organic compounds of oxygen; common alcohols and phenols. Carboxylic acids and esters, amines and amides: Introduction to carbohydrates, lipids and porphyrins.

SECOND YEAR MODULES

SCHM3611 INORGANIC CHEMISTRY I

Module Title:	**INORGANIC CHEMISTRY I**
Code:	**SCHM3611**
NQF level:	6
Contact hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests and assignments 80%, laboratory component 20%) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisite:	**SCHM3411** (Chemistry 1A), **SCHM3512** (Chemistry 1B)

Module Description: This is an introductory course to inorganic chemistry. It builds upon what is covered in the First Year chemistry courses. Students are expected to review the structure of the atom on their own, then the course progresses into its reactivity to form simple and complex molecule.

Content: Atomic parameters:- radii, ionization energy, electronegativity,and electron affinity; In-depth studies of chemical bonding; (valence bond theory (VBT), shapes of molecules and hybridization; molecular orbital theory (MOT) in diatomic and polyatomic molecules); Delocalized multiple bonding. S-block elements: The chemistry of alkali and alkaline earth elements (groups 1 and 2); reactivity with hydrogen, oxygen, halogens, water, and liquid ammonia; Classification of oxides, and their reaction with water; P-block elements (groups 13 to 18): Reactivity with oxygen and halogens; The hydrides of P block elements; Hydrolysis and ammonolysis of P-block halides; Brief introduction to the organometallic chemistry of s-block elements with emphasis on organometallic chemistry of lithium and magnesium; Brief introduction to d-block chemistry: Occurrence, recovery and common oxidation states and compounds.

SCHM3631 PHYSICAL CHEMISTRY I

Module title:	**PHYSICAL CHEMISTRY I**
Code:	**SCHM3631**
NQF Level:	6
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks.
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 3 hour exam paper)
Pre-requisites:	**SCHM3411** (Chemistry 1A), **SCHM3512** (Chemistry 1B), **SMAT3511** (Basic Mathematics), **SMAT3512** (Precalculus)

Module Description: The course deals with equilibrium thermodynamics for chemistry majors and minors. Laws of thermodynamics are treated in a more rigorous way and applied to chemical problems. The following topics are covered:

Content: Empirical gas laws. The perfect gas. The Kinetic model of gases. Real Gases: Molecular interaction, The van der Waals equation. The principle of corresponding states. The First Law of Thermodynamics. Work, heat, and energy, The internal energy, Expansion Work, Heat transactions, Enthalpy, Adiabatic Changes. Thermochemistry. Standard enthalpy changes, Standard enthalpies of formation, The temperature-dependence of reaction enthalpies. State functions and exact differentials, Exact and inexact differentials, Changes in internal energy, The Joule-Thompson effect. The Second Law of Thermodynamics. The direction of spontaneous change and The dispersal of energy, Entropy, Canot Cycle, Entropy changes accompanying specific processes, The Third Law of thermodynamics, The Helmholtz and Gibbs energies, Standard reaction Gibbs energies. Combining the First and Second Laws of Thermodynamics, The properties of internal energy, The properties of Gibbs energy. Physical Transformations of Pure Substances. Phase diagrams, The stabilities of phases, Phase boundaries, The thermodynamics criterion of equilibrium, The location of phase boundaries, Ehrenfest classification of phase transitions. Simple Mixtures. The thermodynamic description of mixtures, Partial molar quantities, The thermodynamics of mixing, The chemical potentials of liquids. The properties of solutions, Liquid mixtures, Colligative Properties. Two-component systems: Vapour pressure diagrams, Temperature-composition diagrams, Liquid-liquid phase diagrams, Liquid-solid phase diagrams. Chemical equilibrium. The Gibbs energy minimum. The description of equilibrium, The response of equilibria to pressure and temperature.

SCHB3611 BIOCHEMISTRY I

Module Title:	**BIOCHEMISTRY I**
Code:	**SCHB3611**
NQF Level:	6
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests and assignments 80%, laboratory component 20%,)
Final Exam:	50% (1 x 3 hour exam paper)
Prerequisites:	**SCHM3411** (Chemistry 1A, and **SCHM3512** (Chemistry 1B) and **SBLG3411** (Introduction to Biology)

Module Description: This module forms the basis for further studies in biochemistry. The following topics are covered:

Content: Chemical bonds in Biochemistry; Composition and structure of biochemicals; Biochemical reactions in aqueous solutions; Energy and biochemical reactions; Application of stereoisomers and chirality in biochemical systems; In-depth studies of Carbohydrates: classification and configurations; glycosides; and reactions; Lipids: classification; terpenes and steroids; fatty acids; triacylglycerols; glycerophospholipids and glycosphingolipids; Active and passive transport of ions; Biomineralization; metabolism and activation; occurrence and function of essential elements; Proteins: structure of amino acids, structure of proteins; physical and chemical properties; ionisation; folding and conformation; Introduction to Enzymes: nomenclature; proteins as catalysts; kinetics measurements; factors influencing enzyme-catalysed reactions.

SCHM3602 ANALYTICAL CHEMISTRY I

Module Title:	**ANALYTICAL CHEMISTRY I**
Code:	**SCHM3602**
NQF Level:	6
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	**SCHM3411** (Chemistry 1A), **SCHM3512** (Chemistry 1B)

Module Description: This module provides general introduction to sampling and evaluation of analytical data. It deals in depth with analytical tools like titrimetric analysis, gravimetric analysis and it gives basic information about spectroscopic methods of analysis.

Content: Review of some fundamental concepts; 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 and their use in solving multiple ion and complex ion equilibria; principles of titrimetry; acid-base titrations; titration curves and indicators; polyprotic acid-base equilibria, applications of acid-base titrations; gravimetric methods of analysis; solubility and solubility product; common ion and diverse ion effects; precipitation titrations; indicators used in precipitation titrations.

SCHM3612 ORGANIC CHEMISTRY I

Module Title:	**ORGANIC CHEMISTRY I**
Code:	**SCHM3612**
NQF Level:	6
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 3 hour exam paper)
Prerequisites:	**SCHM3411** (Chemistry IA), **SCHM3512** (Chemistry IB)

Module Description: This module is a survey of the chemistry of carbon compounds, their nomenclature, physical properties, structure and reactions with an introduction to reaction mechanisms and stereochemistry. The following topics will be covered.
Content: Alkanes and cycloalkanes: nomenclature, physical properties, bond rotation, conformations, ring strain, bicyclic and polycyclic alkanes, reactions and synthesis of alkanes. Alkenes and alkynes: Properties and synthesis, hydrogenation, index of hydrogen deficiency, preparation, addition reactions, Markovnikov's rule, hydroboration, Radical reactions: free radicals, halogenation of alkanes, chain reactions. Alcohols and ethers: synthesis, reactions, mesylates and tosylates, epoxides, crown ethers, phase transfer catalysis. Stereochemistry: stereoisomers, enantiomers, chirality, diastereomers, racemates, meso compounds, optical activity, resolution. Nucleophilic substitution and elimination: nucleophiles and electrophiles, SN2 and SN1 reactions; carbocations and carbanions, E1 and E2 reactions.

SCHB3612 BIOCHEMISTRY II

Module Title:	**BIOCHEMISTRY II**
Code:	**SCHM3612**
NQF Level:	6
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%, Final Exam: 50% (1 x 3 hour exam paper)
Prerequisites:	**SCHM3411** (Chemistry 1A, and **SCHM3512** (Chemistry 1B) and **SBLG3411** (Introduction to Biology)

Module Description: This module introduces the students to glycogen and amino acids metabolism, fat catabolism, synthesis of lipids, citric acid cycle. The following topics are covered:
Content: Metabolism: catabolism and anabolism pathways; glycolysis; gluconeogenesis; glyoxylate cycle, regulation of central metabolism. Glycogen metabolism: (structure and function, synthesis and degradation, and storage). Lipid synthesis and transport: fatty acids and triglycerol; biosynthesis; bile acids; complex lipids; prostaglandins and related compounds; phospholipids and glycolipids. Citric acid cycle: stoichiometry and regulation; hexose monophosphate pathways. Fat catabolism: digestion and absorption. Amino Acids metabolism: digestion of dietary proteins; transport of amino acids into cells; removal of nitrogen from amino acids; urea cycle; metabolism of ammonia; catabolism of the carbon skeletons of amino acids; role of folic acid in amino acid metabolism, biosynthesis of non essential amino acids.

THE FOLLOWING SERVICE MODULE IS OFFERED FOR EDUCATION STUDENTS ONLY.

SCHE3622 ORGANIC CHEMISTRY FOR EDUCATORS (FOR EDUCATION STUDENTS ONLY!)

Module Title:	**ORGANIC CHEMISTRY FOR EDUCATORS**
Code:	S**CHE3622**
NQF Level:	6
Contact Hours:	28 hours lectures, 21 hours of practical sessions
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	S**CHM3411** (Chemistry IA), **SCHM3512** (Chemistry IB)
Module Description:	This module is a survey of the chemistry of carbon compounds, their nomenclature, physical properties, structure and reactions with an introduction to reaction mechanisms and stereochemistry. The following topics will be covered.

Content: Alkanes and cycloalkanes: nomenclature, physical properties, bond rotation, conformations, ring strain, bicyclic and polycyclic alkanes, synthesis and reactions of alkanes; Alkenes and alkynes: physical properties and synthesis (Zaytev's Rule), addition reactions (hydrogenations, halogenations, hydrations), Markovnikov's Rule, index of hydrogen deficiency; Ionic reactions: nucleophilic substitutions, elimination reactions; Radical reactions: free radicals, halogenation of alkanes, chain reactions; Stereochemistry: stereoisomers, enantiomers, chirality, diastereomers, meso compounds, optical activity. Alkyl halides: physical properties, synthesis, reactions; Alcohols and ethers: physical properties, synthesis, reactions.

THIRD YEAR MODULES

SCHM3701 INORGANIC CHEMISTRY II

Module Title:	**INORGANIC CHEMISTRY II**
Code:	**SCHM3701**
NQF Level:	7
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 2 hour exam paper)
Prerequisite:	**SCHM3611** (Inorganic Chemistry I), **SMAT3512** (Precalculus)

Module Description: This course covers the chemistry of transition metals. This means the student would have been equipped with adequate background from the chemistry of main group elements. With such a background the student will be in a position to follow the chemistry of transition metals.
Content: Transition metal chemistry: transition metal complexes (constitution, nomenclature, isomerism, classification of ligands); Bonding-Application of Valence Bond Theory (VBT); Crystal Field Theory (CFT); Ligand Field Theory (LFT). Molecular Orbital Theory (MOT); Reaction Mechanisms and rate of reactions; Ligand substitution; Dissociative and Associative mechanisms; redox and photochemical reactions in transitional complexes; Molecular symmetry: symmetry elements; plane of symmetry; proper and improper axes; principal axis; point of inversion ; classification of molecules into point groups.

THE FOLLOWING SERVICE MODULE IS OFFERED FOR EDUCATION STUDENTS ONLY.

SCHE3732 INORGANIC CHEMISTRY FOR EDUCATORS (FOR EDUCATION STUDENTS ONLY)

Module Title: **INORGANIC CHEMISTRY FOR EDUCATORS**
Code: **SCHE3732**
NQF Level: 7
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisite: **SCHM3411** (Chemistry IA), **SCHM3512** (Chemistry IB)
Module Description: This course covers the chemistry of transition metals. This means the student would have been equipped with adequate background from the chemistry of main group elements. With such a background the student will be in a position to follow the chemistry of transition metals.
Content: The brief introduction to the chemistry of alkali and alkaline earth elements (groups 1 and 2); reactivity with hydrogen, oxygen, halogens, water, and liquid ammonia; Classification of oxides, and their reaction with water; P-block elements (groups 13 to 18): Reactivity with oxygen and halogens; The hydrides of P block elements; Hydrolysis and ammonolysis of P-block halides. Delocalized multiple bonding. S-block elements. In-depth studies of chemical bonding (valence bond theory (VBT), shapes of molecules and hybridization, molecular orbital theory (MOT) in diatomic and polyatomic molecules) and Bonding-Application of VBT; CFT; LFT, MOT; Introduction to transition metal chemistry (d-block elements): transition metal complexes (constitution, nomenclature, isomerism, classification of ligands); Reaction Mechanisms and rate of reactions; Ligand substitution; Dissociative and Associative mechanisms; redox and photochemical reactions in transitional complexes; Molecular symmetry: symmetry elements; plane of symmetry; proper and improper axes; principal axis; point of inversion ; classification of molecules into point groups. Introduction to the organometallic chemistry of s-block elements (magnesium and lithium).

SCHM3711 ORGANIC CHEMISTRY II

Module Title: **ORGANIC CHEMISTRY II**
Code: **SCHM3711**
NQF Level: 7
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 80%, laboratory component 20%)
Final Exam: 50%; (1 x 3 hour exam paper)
Prerequisites: **SCHM3612** (Organic Chemistry I)
Module Description: This module is a continuation of Organic Chemistry I. Units covered include an in-depth study of the following topics show below.
Content: Conjugated systems: allyl radical and allyl cation, alkadienes and polyunsaturated hydrocarbons, 1,2- and 1,4- addition, Diels-Alder reaction. Aromatic compounds: Hückel's rule, aromatic-, antiaromatic-, nonaromatic-classification; annulenes, fullerenes, nanotubes. Heterocyclic compounds. Electrophilic aromatic substitution: halogenation of benzene, nitration, sulfonation, Friedel-Crafts-alkylations and acylations. Aldehydes and ketones: synthesis; addition to carbon-oxygen double bond, hydride, hydrogen cyanide, alcohols, derivatives of ammonia; Wittig reaction. Tautomers, enolates, aldol reactions, aldol condensation. Protecting and blocking groups. Retrosynthetic analysis.

SCHM3721 ANALYTICAL CHEMISTRY II

Module Title: **ANALYTICAL CHEMISTRY II**
Code: **SCHM3721**
NQF Level: 7
Contact Hours: 2 lecture periods per week and 1 practical session per week for 7 weeks.
Credits: 8
Module Assessment: CA: 50% (minimum 2 tests 80 %, laboratory component 20%)
Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites: **SCHM3602** (Analytical Chemistry I)
Module Description: This module introduces the students to EDTA titrations and provides detain information about voltaic cells, redox titrations and potentiometric methods of analysis.
Content: Complexometric and EDTA titrations; oxidation reduction, oxidation states and balancing redox equations, the half cell concept; voltaic cells and the Nernst equation; redox titrations and redox titration curves; applications of redox titrimetry. Potentiometric methods; Coulometry and electrogravimetry.

SCHB3701 BIOCHEMISTRY III

Module Title:	**BIOCHEMISTRY III**
Code:	**SCHB3701**
NQF Level:	7
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%, Final Exam: 50% (1 x 2 hour exam paper)
Prerequisites:	**SCHB3612** (Biochemistry II), **SMBL3631** (Cell Molecular Biology & Genetics)

Module Description: This module is designed to teach the students the biochemistry of Nucleic acids. The following topics are covered:

Content: Expression and transmission of genetic information: Nucleic acids structure and functions; chemical modification of nucleotides and nucleic acids; Primary, secondary and tertiary of DNA and RNA (different types and its synthesis control of transcription, processing) and sequence induced conformation types, gene expression and protein synthesis. Sequence based analysis and functional regions and genome analysis; Fidelity of DNA replication; Translation: Genetic code; transfer RNA and its aminoacylation; Protein degradation. Exploring genes, manipulating the genes of Eukaryotes; Hybridization of nucleic acid strands, process of thermodynamics and kinetics, nucleic acids binding proteins, enzymology of gene manipulation.

SCHM3761 INDUSTRIAL CHEMISTRY I

Module Title:	**INDUSTRIAL CHEMISTRY I**
Code:	**SCHM3761**
NQF Level:	7
Contact hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%); Final Exam 50% (1 × 2 hour exam paper)
Prerequisites:	Inorganic Chemistry I **(SCHM3611)**, Organic Chemistry I **(SCHM3612)**

Module Description: This module introduces the processes and technologies in industrial chemistry, the techniques of treatment and control of pollution, and technological economics in chemical industry. The following topics are covered

Content: Sources of chemical industry: inorganic chemicals, organic chemicals from biomass, coke, natural gas, crude oil. The world's major chemical industries: introduce the major companies and products. Environmental pollution control: the techniques of pollution control including physic, chemical and biological methods. Material and energy balance: equations of balances. Technological economics: cost and profit of producing processes, effects of scale and flow rate of operation. Oil and fat industry: structure, isolation, additives, applications. Coatings industry: composition, pigments, binders, solvents. Soap and domestic industry: soap, surfactant, detergent. Leather industry: softening, evaluating effects of fat in leather. Flavor industry: vehicles, fixatives, synthetics used in perfume and flavors; perfume formation. Pharmaceutical industry: type of drugs, antibacterial agents, steroids, analgesics, antihistamines. Meat industry, fish industry; dairy industry: prepared and preserved products. Biotechnology industry: beer, cheese. Sulfuric acid and fertilizer industry: manufacture of sulfuric acid and fertilizer. Salt industry: manufacture of caustic. Uranium industry: extraction, concentration and purification of uranium. Cement industry: the compositions and manufacture of cement, processes in the solidification cement.

SCHM3702 INSTRUMENTAL ANALYSIS I

Module Title:	**INSTRUMENTAL ANALYSIS I**
Code:	**SCHM3702**
NQF Level:	7
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	**SCHM3602** (Analytical Chemistry I), **SCHM3612** (Organic Chemistry I)

Module Description: This module provides general introduction to flame emission and atomic absorption spectrometry. It provides the students with the necessary information to analyze NMR, mass spectrometry and infrared data.

Content: Instrumental methods of analysis; Flame emission and atomic absorption spectrometry; ICP; X-ray methods; Molecular fluorescence and phosphorescence; NMR spectroscopy; theory and experimental methods of NMR spectroscopy; applications of proton and C-13 NMR spectroscopy. Mass spectrometry; ultraviolet; Infrared absorption spectroscopy; Theory and applications of IR and Raman spectroscopy.

SCHM3712 PHYSICAL CHEMISTRY II

Module title:	**PHYSICAL CHEMISTRY II**
Code:	**SCHM3712**
NQF level:	7
Contact hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 3 hour exam paper)
Pre-requisites:	**SCHM3631** (Physical Chemistry I), **SMAT3611** (Calculus I), **SMAT3612** (Calculus II)

Module Description: The course is for chemistry major students. It deals with chemical kinetics, chemical dynamics, equilibrium electrochemistry, dynamic electrochemistry, molecular interactions and processes at the solid surfaces. The following topics are covered:

Content: Chemical kinetics: Rate and rate law. Order and molecularity. Integrated rate equations and half-life expressions for 0, 1, 2, 3 and nth order reactions. Pseudo-order reactions. Kinetics of radioactive decay and carbon dating. Methods of determining order and rate coefficient. Temperature dependence of rate coefficients (Arrhenius equation). Complex reactions – parallel, opposing, consecutive and chain reactions. Mechanisms. Theories of reaction rates – unimolecular and bimolecular reactions. Activated complex. Effect of catalyst. Experimental methods for studying slow and fast reactions. Electrochemistry: Definitions and units relating to electricity. Ohm's law. Faraday's laws of electrolysis. Definition and measurement of conductivity and molar conductivity. Strong/weak electrolytes. Arrhenius theory. van't Hoff measurements. Ostwald dilution law. Kohlrausch's law of independent migration. Ionic mobilities and transport numbers. Applications of conductivity measurements – dissociation constant, solubilities and solubility products of sparingly soluble salts, conductometric titrations. Thermodynamics of electrolyte solutions. Electrochemical cells and electrode processes. Fuel cells. Photovoltaics (as renewable energy technology). Overpotential. Corrosion. Thermodynamics of electrochemical cells, Surface chemistry and colloids: Chemical, biological and medicinal applications of colloids. Surface tension and interfacial tension, Spreading of one liquid on another. Insoluble monolayer films and their application in water evaporation control. Detergency. Formation and stability of emulsions, Adsorption and absorption isotherms, Langmuir, Freundlich, BET and Tempkin adsorption equations, Chermisorption and heterogeneous catalysis–Langmuir-Hinshelwood and Eley-Rideal mechanisms.

SCHM3722 RESEARCH METHODOLOGY

Module Title:	**RESEARCH METHODOLOGY**
Code:	**SCHM3722**
NQF Level:	8
Contact Hours:	2 lecture periods per week
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests and assignments) Final Exam 50%. (1 x 2 hour exam paper)
Prerequisites:	Pass in all second year chemistry modules

Module description: This module is designed to provide students with knowledge of theoretical aspects of scientific principles that are followed in order to conduct research, analyze and interpret data, and communicate scientific results properly.

Content: Ethics of Research; 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; Analysis of variants (ANOVA); Regression analysis; Validation of experimental data (quality control); Experimental design; Optimization of parameters; Use of existing literature; Using the internet and the university library; Report Writing; Oral presentation using state-of-the-art equipment; Ethical considerations in research; Plagiarism; Finding and using literature references; Citation of references; Writing a literature review; Presenting results as posters

SCHB3732 MEDICAL BIOCHEMISTRY

Module Title:	**MEDICAL BIOCHEMISTRY**
Code:	**SCHB3732**
NQF Level:	7
Contact hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisites:	**SCHB3612** (Biochemistry II)
Module Description:	This module is designed for students that are considering a career in research into the biochemical basis of disease and therapeutic medicine. It discusses some of the current developments in the area of medical biochemistry. The following topics are covered:

Content: Blood and Transport Proteins, Hemostasis and Thrombosis. Bioenergetics and Oxidative Metabolism. Anaerobic Metabolism of Glucose in the Red Cell. Carbohydrate Storage: Synthesis in Liver and Muscles; obesity. Biosynthesis of Cholesterol in Liver. Special Liver Function. Muscle: Energy Metabolism and Contraction. Glucose Homeostasis and Fuel Metabolism. Water and Electrolyte Balance: Kidney Function. Diseases of the Lung and Kidneys: The Control of Acid-Base Balance. Calcium and Bone: osteoporosis; Metabolism. Neurochemistry. Neurotransmitters: psychosis and other nervous disorders.

SCHB3712 BIOCHEMISTRY IV

Module Title:	**BIOCHEMISTRY IV**
Code:	**SCHB3712**
NQF Level:	7
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80 %, laboratory component 20 %) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisites:	**SCHB3612** (Biochemistry II), **SMBL3631** (Cell Molecular Biology & Genetics)

Module Description: This module is designed to deepen the knowledge of inheritance and, biochemical evolution. The following topics are covered:

Content: In depth discussion of inheritance in eukaryotes; Biochemistry and the Genomic Revolution: Studying the relationship between form and function through DNA. Biochemical unity as a basis for biological diversity; Biochemical Evolution: How organic molecules are utilized by living systems; Energy transformations necessary for sustaining living systems; Cells and their response to changes in the environment; Novel Proteins which can be engineered by site specific mutagenesis; Immunobiochemistry: Synthesis of plasma membrane; secretory pathways and lysosomal proteins; interaction between antigens and antibodies; control of the immune response. Protein separation and analytical techniques (chromatography, electrophoresis, protein and enzyme activity determination).

FOURTH YEAR MODULES

SCHM3811 ORGANIC CHEMISTRY III

Module Title:	**ORGANIC CHEMISTRY III**
Code:	**SCHM3811**
NQF Level:	8
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, 20% laboratory component) Final Exam: 50%; (1 x 3 hour exam paper)
Prerequisites:	**SCHM3711** (Organic Chemistry II)

Module Description: This module is a description of Carboxylic acids and their derivatives and various rearrangement reactions.

Content: Carboxylic acids and their derivatives: acids, acyl chlorides, acid anhydrides, esters, lactones, amides and imides, lactams. Amines: preparations, reactions, Hofmann and Cope elimination reactions. Phenols. Organo-sulfur compounds. Rearrangement reactions: Baeyer-Villiger, Beckmann, pinacol-pinacolone. Pericyclic reactions: electrocyclic and cycloaddition reactions; sigmatropic rearrangements. Chemistry of carbohydrates. Selected examples of multistep synthesis of organic compounds.

SCHM3831 PHYSICAL CHEMISTRY III

Module title:	**PHYSICAL CHEMISTRY III**
Code:	**SCHM3831**
NQF Level:	8
Contact Hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests, tutorial tests and assignments 80%, laboratory component 20%) Final Exam: 50%; (1 x 3 hour exam paper)
Pre-requisites:	**SCHM3631** (Physical Chemistry I), **SMAT3612** (Calculus II)

Module Description: It introduces topics in quantum mechanics with applications to chemical systems. The second part of the course deals with statistical thermodynamics. The following topics are covered:

Content: Quantum Chemistry: Classical mechanics and failure; Quantization of energy; Wave and particle nature of light and electrons; Experimental evidence of diffraction of the light and electrons and photoelectric effect; de Broglie relationship; Electromagnetic radiation and the electromagnetic spectrum; Spectrum of the hydrogen atom; Operators; Schrödinger wave equation and its solution; Interpretation of the wave function; Wave functions for (1) particle-in-a-box: application to conjugated systems and (2) simple harmonic oscillator as model of vibrating molecule; Postulates of quantum mechanics; Operators; Eigenvalues; Zero point energy; Vibrational - Infrared and Raman spectroscopy; Electronic spectroscopy of atoms and molecules; Electron spin resonance spectroscopy; Nuclear magnetic resonance; Photoelectron spectroscopy.

Statistical Thermodynamics: The distribution of molecular states, configuration and weights, the Boltzmann distribution; the molecular partition function; the internal energy and entropy, the canonical partition function; the thermodynamic function and the molecular partition function; using statistical thermodynamics (mean energies, heat capacities, equations of state, residual entropies and equilibrium constants). Translational, rotational, vibrational and electronic partition functions.

SCHM3841 PHYSICAL INORGANIC CHEMISTRY

Module Title:	**PHYSICAL INORGANIC CHEMISTRY**
Code:	**SCHM 3841**
NQF Level:	8
Contact hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%,) Final Exam: 50% (1 x 2 hour exam paper)
Prerequisite:	**SCHM3701** (Inorganic Chemistry II)

Module Description: This course applies simple concepts of group theory to molecular geometry. Certain aspects of vibrational and electronic properties of molecules can be deduced from the molecular geometry using simple group theory concepts.

Content: Chemical applications of group theory: Continuation of symmetry elements and symmetry operations, point group and character table. Symmetry applications; Infrared and Raman spectroscopy. In-depth treatment of chemical bonding and molecular orbital theory; Electronic spectra of transition metal complexes; Russell-Saunders and ligand field terms, selection rules and electronic transitions.

SCHM3801 INSTRUMENTAL ANALYSIS II

Module Title:	**INSTRUMENTAL ANALYSIS II**
Code:	**SCHM3801**
NQF Level:	8
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	**SCHM3702** (Instrumental Analysis I)

Module Description: This module is designed to teach the students about different methods of separation, provide enough information about different types of chromatography with emphasis on high performance liquid chromatography (HPLC). The module also provides information about advanced NMR and 2-dimensional NMR.

Content: Separation methods; fractional processes; solvent extraction; introduction to chromatographic methods of separation; general description of chromatography. GC, GLC, LC, TLC, HPLC; supercritical fluid chromatography; important relationships from chromatography; qualitative and quantitative analysis by chromatography; gas chromatography; principles of gas-liquid chromatography; high performance liquid chromatography, column efficiency and chromatographic mobile phases; partition chromatography; adsorption chromatography ion-exchange chromatography; size exclusion chromatography; planar chromatography; different types of detectors used in chromatographic separations; solid phase extraction (SPE) method; Advanced NMR: Fourier Transformation in NMR, 1-dimensional NMR, DEPT, NOE, 2 dimensional NMR, theory, experimental methods and interpretation of spectra, 1H-1H COSY, HETCOR, NOESY.

SCHB3801 NUTRITIONAL BIOCHEMISTRY

Module Title:	**NUTRITIONAL BIOCHEMISTRY**
Code:	**SCHB3801**
NQF Level:	8
Contact hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 2 hour exam paper)
Prerequisites:	**SCHB3612** (Biochemistry II), **SMBL3632** (Introduction to Microbiology)
Module Description:	This module is designed to enhance the students' knowledge of nutrition and metabolism. The following topics are covered:

Content: Biochemistry and Nutrition (proximate of nutrients, function of water, vitamins and minerals); Food groups and how these are linked to Digestion and Absorption; Nutrition and Metabolism; Link between food and health (A case study in connectivity among metabolic pathways, nutrition, regulation and immune system); Concept of energy, specific dynamic action, basal metabolism, measurement of food stuff, caloric value of protein.

SCHB3821 NATURAL PRODUCT CHEMISTRY I

Module Title:	**NATURAL PRODUCT CHEMISTRY I**
Code:	**SCHB3821**
NQF Level:	8
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks.
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	**SCHM3711** (Organic Chemistry II)

Module Description: This module explores the basic biosynthesis pathway of secondary metabolites. We will learn how natural products are normally classified according to their biosynthetic origins and chemical properties. A special emphasis will be placed on how chemical structure affects the physiological function of various natural products. The following will be covered.

Content: Distinguishing primary and secondary metabolites; NMR techniques in biosynthesis studies (13C NMR, Isotopic incorporation). Polyketide pathway: Fatty acids, cyclization of polyketides to aromatics, skeletal types of polyketides. The shikimic acid pathway: biosynthesis of shikimic acid and aromatic amino acids, phenylpropanoid metabolism, other metabolites from shikimate pathway. Isoprenoids: biosynthesis of mevalonic acids, monoterpenes, sesquiterpenes, diterpernes, sesterterpenes, triterpenes, tetraterpenes and steroids.

SCHB3831 BIOINFORMATICS FOR BIOCHEMISTRY

Module Title:	**BIOINFORMATICS FOR BIOCHEMISTRY**
Code:	**SCHB3831**
NQF Level:	8
Contact hours:	4 lecture periods per week and 1 practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisites:	**SCHB3612** (Biochemistry II), **SMBL3631** (Cell Molecular Biology and Genetics,

Module Description: The development of rapid DNA sequencing techniques has led to an information revolution in molecular biology. Computer based technologies are therefore applied and employed in the management and analysis of such biological data. This course is a hand-on and interactive course in which students will acquire knowledge on information networks, the world wide web as a tool and resource for molecular biology. They will gain skills and knowledge in using these resources in sequence and structure analysis. The various genomic and proteomic databases and the levels of stored data will be discussed. The information retrieval and analysis tools such as sequence similarity and alignment will be discussed and applied in depth. This will lead to the identification of characteristic profiles, protein families, evolutionary relationships, etc. The module will also include the design of PCR and oligonucleotide primers for cloning and mutagenesis as well as identifying open-reading frames (ORFs) in nucleotide sequences. The course will consist of lectures, student presentations and assignments.

SCHM3810 RESEARCH PROJECTS (FOR CHEMISTRY MAJORS ONLY)

Module Title:	**RESEARCH PROJECT**
Code:	**SCHM3810**
NQF Level:	8
Contact Hours:	Research project for one year.
Credits:	32
Module Assessment:	CA: 100% (Oral presentation of results – 30%, Consultation and efforts shown during the year- 20 %; written research report - 50%)
Prerequisites:	Pass in all third year chemistry modules and at least one statistics module

Module description: This module is designed to provide students with knowledge of theoretical aspects of scientific principles that are followed in order to conduct research, analyze and interpret data, and communicate scientific results properly.

Content: An independent project carried out in small groups, under the supervision of a member of staff. Topics will be given to students before the end of the first semester. The work will extend over the term and as a guide, should occupy the equivalent of one whole day per week. The practical work must be completed by six weeks before the session ends and must be submitted by two weeks before the session end. The competed report is expected to be between 25-35 pages long and will be examined by the supervisor and one external examiner and will be defended by oral examination.

SCHB3810 RESEARCH PROJECTS (FOR BIOCHEMISTRY MAJORS ONLY)

Module Title:	**RESEARCH PROJECT**
Code:	**SCHB3810**
NQF Level:	8
Contact Hours:	Research project for one year.
Credits:	32
Module Assessment:	CA: 100% (Oral presentation of results – 30%, Consultation and efforts shown during the year- 20 %; written research report - 50%)
Prerequisites:	Pass in all third year chemistry modules and at least one statistics module

Module description: This module is designed to provide students with knowledge of theoretical aspects of scientific principles that are followed in order to conduct research, analyze and interpret data, and communicate scientific results properly.

Content: An independent project carried out in small groups, under the supervision of a member of staff. Topics will be given to students before the end of the first semester. The work will extend over the term and as a guide, should occupy the equivalent of one whole day per week. The practical work must be completed by six weeks before the session ends and must be submitted by two weeks before the session end. The competed report is expected to be between 25-35 pages long and will be examined by the supervisor and one external examiner and will be defended by oral examination.

SCHM3802 INORGANIC CHEMISTRY III

Module Title:	**INORGANIC CHEMISTRY III**
Code:	**SCHM3802**
NQF level:	8
Contact hours:	2 lecture periods per week and 1 practical session per week for 7 weeks.
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%, Final Exam: 50% (1 x 2 hour exam paper)
Prerequisite:	**SCHM3701** (Inorganic chemistry II), **SCHM3711** (Organic chemistry II)

Module Description: This course deals with the organometallic chemistry which is a hybrid discipline comprising the knowledge of inorganic and organic chemistry.

Content: Organometallic chemistry: organometallic compounds of d block elements with emphasis to iron complexes; Physical and chemical properties of organometallic compounds; Reactivity of coordinated cyclopentadienyl and cyclobutane ligands. Transition metal carbonyls: metal clusters, bonding and synthesis; Catalysis involving organometallic compounds. Chemistry of f-block elements; Nuclear Chemistry.

THE FOLLOWING SERVICE MODULE IS OFFERED FOR EDUCATION STUDENTS ONLY.

SCHE3862 INORGANIC CHEMISTRY III (FOR EDUCATION STUDENTS ONLY)

Module Title: **INORGANIC CHEMISTRY III (FOR EDUCATION STUDENTS ONLY)**
Code: **SCHE3862**
NQF level: 8
Contact hours: 28 hours lectures, 21 hours practical sessions.
Credits: 8
Module Assessment: CA: 50% (minimum 2 tests 80%, laboratory component 20%, Final Exam: 50% (1 x 2 hour exam paper)
Prerequisite: **SCHE3732** (Inorganic Chemistry for Educators)
Module Description: This course deals with the organometallic chemistry which is a hybrid discipline comprising the knowledge of inorganic and organic chemistry.
Content: Organometallic chemistry: organometallic compounds of d block elements with emphasis to iron complexes; Physical and chemical properties of organometallic compounds; Reactivity of coordinated cyclopentadienyl and cyclobutane ligands. Transition metal carbonyls: metal clusters, bonding and synthesis; Catalysis involving organometallic compounds. Chemistry of f-block elements; Nuclear Chemistry.

SCHM3812 INDUSTRIAL CHEMISTRY II

Module Title: **INDUSTRIAL CHEMISTRY II**
CODE: **SCHM3812**
NQF Level: 8
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 80%, laboratory component 20%); Final exam 50% (1 × 3 hours exam paper)
Prerequisites: Physical Chemistry II **(SCHM3712)**; Industrial Chemistry I **(SCHM3761)**
Module Description: This module introduces the principles of fluid flow, heat exchange, distillation and their applications. The students will be able to calculate and analyse the equipments in chemical industry.
Content: Petroleum industry: technologies and equipments of producing petrochemicals including ethylene, propylene, aromatics. Fluid mechanics: fluid statics and its applications; fluid-flow phenomena; Basic equations of fluid flow; Flow of incompressible fluids in conduits and thin layers; Flow past immersed bodies; transportation of fluid. Heat transfer and its applications: heat transfer by conduction in solids; principles of heat flow in fluids; heat transfer to fluids without phase change; heat transfer to fluids with phase change; radiation heat transfer; heat-exchange equipment and its applications. Mass transfer and its applications: equilibrium-stage operations; distillation: flash distillation, continuous distillation, operating lines, design and operating characteristics of plate columns, enthalpy balances for fractionating columns.

SCHB3812 ENVIRONMENTAL BIOCHEMISTRY

Module Title: **ENVIRONMENTAL BIOCHEMISTRY**
Code: **SCHB3812**
NQF Level: 8
Contact hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests 80%, laboratory component 20%,)
Final Exam: 50% (1 x 2 hour exam paper)
Prerequisites: **SCHB3712** (Biochemistry IV)
Module Description: This module is designed to study the interactions between environmental contaminants and living organisms. It looks at the behaviour of xenobiotics into living organisms particularly the biotransformation reactions and reactive species formation and it also looks at the effects that chemical xenobiotics can cause on biological processes.
Content: Chemical Xenobiotics: classification and behaviours. Bioaccumulation and biomagnification of xenobiotics. Behaviour of xenobiotics into living organisms: absorption, distribution, biotransformation, toxic effects and elimination. The fate and impact of synthetic and natural molecules in the environment. Important pollutants will be used as case studies to illustrate the principles. Principles of toxicology; chemical and biochemical mechanism; pesticide toxicity. Analysis of specific health and environmental impact of hazardous waste.

SCHM3832 MOLECULAR SPECTROSCOPY

Module title: **MOLECULAR SPECTROSCOPY**
Code: **SCHM3832**
NQF Level: 8
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50% (minimum 3 tests, tutorial tests and assignments 80%, laboratory component 20%)
Final Exam: 50%; (1 x 3 hour exam paper)
Pre-requisites: **SCHM3631** (Physical Chemistry I), **SMAT3612** (Calculus II)
Module Description: This course is designed for chemistry majors who preferably have taken Physical Chemistry III (SCHM 3831). The course is a theoretical approach to molecular spectroscopy using quantum mechanics:
Content: Brief review of matrix algebra, group theory and quantum chemistry. Polarization and the Clausius_Mosotti relation: induced polarization (nonpolar molecules), orientation polarization (polar molecules), distortion polarization in an alternating field. The Time-Dependent Schroendinger Equation. The Einstein Absorption and Emission Coefficients. Magnetic dipole and electric quadrupole transitions. Spectral line widths. Theoretical treatment of microwave spectroscopy and molecular rotation: applications to diatomic and polyatomic molecules Theoretical treatment of infrared and Raman spectroscopy and molecular vibration: applications to diatomic and polyatomic molecules. Theoretical treatment of UV-visible spectroscopy and molecular electronic energy levels: applications to diatomic and polyatomic molecules. Nonlinear optics.

Production of excited states. Radiation processes: fluorescence, phosphorescence, kinetics, quantum yields and lifetimes. Radiationless processes: the statistical limit, the resonance limit and the intermediate case.

SCHB3822 NATURAL PRODUCT CHEMISTRY II

Module Title:	**NATURAL PRODUCT CHEMISTRY II**
Code:	**SCHB3822**
NQF Level:	8
Contact Hours:	2 lecture periods per week and 1 practical session per week for 7 weeks
Credits:	8
Module Assessment:	CA: 50% (minimum 2 tests 80%, laboratory component 20%) Final Exam: 50%; (1 x 2 hour exam paper)
Prerequisites:	**SCHM3711** (Organic Chemistry II)

Module Description: This is the continuation of natural products chemistry I. In this module, the student will be provided with sound knowledge on principles and techniques involved in the extraction and isolation of chemical constituents from natural sources and how to determine their structures

Content: Alkaloids; alkaloids derived from ornithine and lysine, alkaloids derived from tyrosine, alkaloids derived from tryptophan. Metabolites of mixed biosynthetic origin: metabolites derived from acetate and mavalonate; metabolites derived from shikimate and mevalonate; metabolites derived from acetate and shikimate; and metabolites derived from tryptophan and mevalonate. Isolation of natural products: Chemical screening of different classes/groups of natural products; Bioassay-directed isolation of natural products; (use of different bioassay and chromatographic techniques). Determining the chemical structure of isolated compounds: Techniques; IR, UV, NMR and mass spectroscopy (very brief theoretical treatment, but detailed application of these techniques in structure determination).

SCHB3832 PROFESSIONAL TRAINING IN BIOCHEMISTRY

Module Title:	Professional Training in Biochemistry
Code:	SCHB3832
NQF Level:	8
Contact hours:	4 lecture periods per week and 2 weeks full-time practical in-service training in industry during recess period if possible or one practical session per week for 14 weeks
Credits:	16
Module Assessment:	CA: 50% (minimum 3 tests 80%, laboratory component 20%, assignments 10 %) Final Exam: 50% (1 x 3 hour exam paper)
Prerequisites:	**SCHB3712** (Biochemistry IV), **SMBL3632** (Introduction to Microbiology)

Module Description: This module is designed to expose the students to the application of biochemistry in the industries. The course will be jointly delivered by academics and professionals in the selected fields. Method of delivery will include seminars, workshops and job attachments. Following topics under each profession will be covered. However, delivery of some topics will depend on the availability of expertise in a specific field. It covers the following topics:

Pharmacology: Careers in Pharmacology, the kinetics of drug-receptor interaction, drug metabolism, pharmacokinetics and molecular pharmacology. **Forensic science:** Careers in forensic science, History and Nature of Forensic Science, Crime Scene Investigation, Biological Evidence, Forensic DNA Analysis, Illicit Drugs; Forensic Toxicology. **Oncology:** Careers in oncology, biochemical and molecular basis of cancer, multistage nature of cancer, including the roles of the environment and somatic mutation, Explore the known genetic mechanisms leading to cancer, Discuss approaches to targeted therapies for different cancers. **Toxicology:** Careers in toxicology, Methods in isolating, identifying and quantifying toxic substances or radiation; assessing toxicity and creating safety profiles, Safe handling of toxic substances and radiation, risk assessments on potential new drugs. **Pathology:** Careers in pathology, scientific investigation of the biology of human disease, 'Genes and the cell in health and disease' and 'Infection, Inflammation and immunity, Histochemistry, Immunocytochemistry. **Brewing science:** Brewing technologies, Quality control and management. **Veterinary Science:** Animal diseases, Food hygiene, Best practices in veterinary science.

SCHM3842 ADVANCED TOPICS IN CHEMISTRY

Module Title:	**ADVANCED TOPICS IN CHEMISTRY**
Code:	**SCHM3842**
NQF Level:	8
Contact Hours:	2 lecture periods per week for 14 weeks
Credits:	8
Module Assessment:	CA: 50% ; Final Exam 50%.
Prerequisites:	Pass in all third year chemistry modules

Module Description: The course reviews aspects of advanced developments in the field of Inorganic Chemistry, Organic Chemistry, Analytical Chemistry, Physical Chemistry, Biotechnology and Biochemistry, which relate to the interests of the students. Only two topics are covered every year. Topics to be covered include:

Content: Waste Water Treatment: Water quality parameters; Drinking water processing; Primary chemical processes involved in water treatment for example, Chlorination and Ozonation; Biological wastewater treatment; Chemical wastewater treatment. Electronic Structure Calculations: Z-matrix for simple molecules; Spin multiplicities for any system; basis sets with regards to electronic structure calculations; The number of functions and primitives employed for a given molecule in electronic structure. Natural Product Chemistry: Introduction & History of Natural Product Research; Discovery and development of drugs from natural resources. Chemical characterization of pharmacologically active compounds from plants. Agricultural Biotechnology and Nanotechnology: The science behind biotechnology: Scope; Principles and techniques of agricultural biotechnology (genetic engineering). Technology Studies: Risk assessment; Pesticide producing crops; Herbicide-tolerant transgenic crops; Insect-resistance transgenic crops. Environmental and food safety of transgenic crops; Ethical and cultural issues in biotechnology; cloning and tissue engineering; Patenting Life; Surveying of Methods and Uses of Animal Biotechnology. Considerations regarding animal biotechnology; human safety; animal welfare; and sociological effects. Scope, principles and techniques of nanotechnology; preparation of nano particles and their properties, application of nanotechnology in biotechnology. Principles of bioethics and biolaw: ethics; philosophy; law issues in relation to biosciences; Regulation of human tissue and stem cells; International environmental law; Intellectual property law and the biosciences.

Sustainable Renewable Energy: Desirable characteristics of energy sources; Current and potential energy sources. Solar energy: How solar energy can be converted to other forms of energy; Principles of using solar energy for space heating; Discuss the methods for converting solar

energy into electricity; Converting solar energy into electricity Inorganic Chemistry: Explain the basic features of electronic spectra of transition metal complexes. Industrial Chemistry: Petroleum refinement: petroleum separation and cracking.

SCHB3852 ADVANCED TOPICS IN BIOCHEMISTRY

Module Title: **ADVANCED TOPICS IN BIOCHEMISTRY**
Code: **SCHB3852**
NQF Level: 8
Contact Hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: 50 % (minimum 3 tests 80%, 42 hours practical sessions 20%)
Final Exam: 50 % (1 x 3 hour exam paper)
Prerequisites: All third year biochemistry modules
Module Description: The course reviews aspects of advanced developments in the field of Biotechnology and Biochemistry, which relate to the interests of the students. Topics to be covered include:
Content: Criminology, Crime Detection and Investigation, Enforcement, Substantive Criminal Aspects, Human Behaviour, Criminal and Delinquent Behaviour, Introduction to Research Methods in Criminology, Environmental Chemistry, Introduction to Archaeology and Anthropological fieldwork, Textiles Evaluation, Crime Scene Investigation, Crime Scene Analysis using modern techniques, DNA Fingerprints, Shoe and lip prints, Forensic DNA profiling, Chromatography techniques, ELISA techniques, Sequencing, Molecular markers, Micro-arrays, Method validations.

Department of Chemistry and Biochemistry: Modules Failed and Equivalences

Old Curriculum Module Failed (up to 2007)	Equivalent Module To Be Taken (from 2008)
CHM3101 Chemistry IA	SCHM3411 & SCHM3511 Chemistry IA
CHM3112 Chemistry IB	SCHM3512 Chemistry IB
CHM3192 Chemistry For Life Sciences	SCHM3532 Chemistry For Life Sciences
CHM3211 Inorganic Chemistry I	SCHM3611 Inorganic Chemistry I
CHM3261 Physical Chemistry I	SCHM3631 Physical Chemistry I
CHM3361 Biochemistry I	SCHB3611 Biochemistry I
CHM3242 Analytical Chemistry I	SCHM3602 Analytical Chemistry I
CHM3232 Organic Chemistry I	SCHM3612 Organic Chemistry I
CHM3362 Biochemistry II	SCHB3612 Biochemistry II
CHM3381 Inorganic Chemistry II	SCHM3701 Inorganic Chemistry II
CHM3321 Organic Chemistry II	SCHM3711 Organic Chemistry II
CHM3341 Analytical Chemistry II	SCHM3721 Analytical Chemistry II
CHM3472 Industrial Chemistry I	SCHM3761 Industrial Chemistry I
CHM3342 Instrumental Analysis I	SCHM3702 Instrumental Analysis I
CHM3332 Physical Chemistry II	SCHM3712 Physical Chemistry II
CHM3421 Organic Chemistry III	SCHM3811 Organic Chemistry III
CHM3461 Physical Chemistry III	SCHM3831 Physical Chemistry III
CHM3441 Instrumental Analysis II	SCHM3801 Instrumental Analysis II
CHM3480 Research Projects	SCHM3810 or SCHB3810(for Biochemistry majors) Research Projects
CHM3422 Inorganic Chemistry III	SCHM3802 Inorganic Chemistry III
CHM3442 Advanced Topics	SCHM3842 Advanced Topics in Chemistry

F. DEPARTMENT OF COMPUTER SCIENCE

F.1. DEPARTMENTAL REGULATIONS

COMPULSORY REQUIREMENTS

- In addition to the Faculty of Science entry requirements, students wishing to major in Computer Science will be expected to pass a Departmental Entry Requirement test. This test is an aptitude test and will in no way affect students that are coming from backgrounds without computer studies as a subject. The test is normally taken a week after the registration, but before subject changes for the Faculty are closed, to enable students who do not qualify to select other majors/minors.
- All fourth years are required to do a research project: SCMP 3810 (prerequisite for this course the student should have passed all third year modules).
- The MSc Infromation Technology (IT) Programme (11MSCI) is based on a pool of taught courses and the completion of a dissertation.

COMPILATION OF THE CA MARK

- Details on how the CA for each module is compiled are given under the respective modules.

WEIGHTING OF CA AND EXAM MARKS

- Unless otherwise indicated, the relationship between the CA mark and the Examination mark is 50:50.

F.2. COMPUTER SCIENCE MAJOR

F.2.1. B.SC.COMPUTER SCIENCE MAJOR AND INFORMATION TECHNOLOGY MINOR (11BCMI)

Students opting for a major in Computer Science and minor in Information Technology must take all of the following modules:

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	Programming Fundamentals I	SCMP 3511	Departmental Entry Test
1	Fundamentals of Digital Electronics	SCMP 3521	Departmental Entry Test
	Information Technology Minor:		
1	Introduction to Information Technology	SCME3511	Departmental Entry Test

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Programming Fundamentals II	SCMP 3512	SCMP3511 Programming Fundamentals I
2	Computer Organization	SCMP 3532	Departmental Entry Test
2	Introduction to Statistics	SSTS3522	Faculty entry requirements
	Information Technology Minor:		
2	Introduction to Web Design	SCME3512	Departmental Entry Test

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Introduction to Database Systems	SCMP 3611	SCMP 3511 Programming Fundamentals I
1	Object Oriented Programming	SCMP 3631	SCMP3511 Programming Fundamentals I
1	Software Engineering I	SCMP 3641	SCMP 3511 Programming Fundamentals I
1	Mathematics for Computer Science I	SCMP 3671	SMAT 3511 Basic Mathematics
	Information Technology Minor:		
1	Telecommunications	SCME 3611	SCMP 3521 Fundamentals of Digital Electronics

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Advanced Databases	SCMP 3622	Co-Requisite: SCMP3611 Introduction to Database Systems
2	Data Structures and Algorithms	SCMP 3612	Co-Requisite: SCMP 3631 Object Oriented Programming
2	Foundations of Data Communications	SCMP 3632	SCMP 3532 Computer Organization
2	Software Engineering II	SCMP 3652	Co-Requisite: SCMP 3641 Software Engineering I
2	Mathematics for Computer Science II	SCMP 3672	Co-Requisite: SCMP 3671 Mathematics for Computer Science I
	Information Technology Minor:		
2	Networking and Emerging Technologies	SCME 3612	SCME 3511 Introduction to Information Technology Co-Requisite: SCME 3611 Telecommunications

YEAR 3

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Computer Networks	SCMP 3721	SCMP 3632 Foundations of Data Communications
1	Computer Theory	SCMP 3741	SCMP 3672 Mathematics for Computer Science II
1	Computer Architecture	SCMP 3761	SCMP 3532 Computer Organization SCMP 3521 Fundamentals of Digital Electronics
1	Artificial Intelligence	SCMP 3771	SCMP 3511 Programming Fundamentals I
	Research Methodology I	SCMP 3701	SSTS 3522 Introduction to Statistics **OR** SSTS3531 Descriptive Statistics
	Information Technology Minor:		
1	Introduction to Network Security	SCME 3731	SCME 3612 Networking and Emerging Technologies

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Operating Systems	SCMP 3722	SCMP 3532 Computer Organization **OR** SCMP 3612 Data Structures and Algorithms
2	Human Computer Interaction and Computer Ethics	SCMP 3742	SCMP 3652 Software Engineering II
2	Computer Graphics	SCMP 3762	SCMP 3612 Data Structures and Algorithms
2	Internet Technologies and Applications	SCMP 3712	Co-Requisite: SCMP 3721 Computer Networks
2	Research Methodology II	SCMP 3702	Co-Requisite: SCMP 3701 Research Methodology I
	Information Technology Minor:		
2	Advanced Web Programming	SCME 3732	SCME 3512 Introduction to Web Design SCMP 3512 Programming Fundamentals II

YEAR 4

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Research Project	SCMP 3810	Pass all Third Year Modules
1	Network Systems Security	SCMP 3821	SCMP 3721 Computer Networks
1	Wireless and Mobile Computing	SCMP 3841	SCMP 3721 Computer Networks
	Choose Any Two Full Modules (Subject to Dept Approval)		
1	Software Project Management	SCMP 3819	SCMP 3742 Human computer Interaction and Computer Ethics
1	Numerical Methods	SCMP 3811	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Operations Research	SCMP 3831	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Distributed Systems	SCMP 3851	SCMP 3721 Computer Networks SCMP 3612 Data Structures and Algorithms
1	Advanced Computer System Design	SCMP 3871	SCMP 3532 Computer Organization SCMP 3761 Computer Architecture

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Research Project	SCMP 3810	Pass all Third Year Modules
2	Field Attachment	SCMP 3802	Pass all Third Year Modules
2	Data Warehousing and Data Mining	SCMP 3822	SCMP 3622 Advanced Databases
	Choose Any Two Full Modules (Subject to Dept Approval)		
2	Digital Libraries	SCMP 3839	SCMP 3622 Advanced Databases
2	Network Administration	SCMP 3882	SCMP 3721 Computer Networks SCMP 3722 Operating Systems
2	Real Time Multimedia	SCMP 3812	SCMP 3742 Human computer Interaction and Computer Ethics
2	Entrepreneurship and Management of IT Systems	SCMP 3832	SCMP 3742 Human computer Interaction and Computer Ethics
2	Database Programming	SCMP 3872	SCMP 3512 Programming Fundamentals II SCMP 3622 Advanced Databases
2	Expert Systems	SCMP 3852	SCMP 3771 Artificial Intelligence

F.2.2. B.SC.COMPUTER SCIENCE MAJOR AND AND MATHEMATICS MINOR (11BCMM)

Students opting for a major in Computer Science and minor in Mathematics must take all of the following modules:

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test
1	Fundamentals of Digital Electronics	SCMP3521	Departmental Entry Test
1	Analytical Geometry, Complex Numbers and Matrices	SMAT3531	Faculty entry requirements

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Programming Fundamentals II	SCMP3512	SCMP3511 Programming Fundamentals I
2	Computer Organization	SCMP3532	Departmental Entry Test
2	Introduction to Statistics	SSTS3522	Faculty entry requirements
2	Pre-calculus	SMAT3512	Faculty entry requirements

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Introduction to Database Systems	SCMP3611	SCMP 3511 Programming Fundamentals I
1	Object Oriented Programming	SCMP3631	SCMP3511 Programming Fundamentals I
1	Software Engineering I	SCMP3641	SCMP 3511 Programming Fundamentals I
1	Mathematics for Computer Science I	SCMP3671	SMAT 3511 Basic Mathematics
1	Sets and Numbers	SMAT3601	Any two full modules of first year mathematics
1	Numerical Methods	SMAT3621	Any two full modules of first year mathematics
SEMESTER	**MODULE NAME**	**CODE**	**PRE-/COREQUISITES**
2	Advanced Databases	SCMP3622	Co-Requisite: SCMP3611 Introduction to Database Systems
2	Data Structures and Algorithms	SCMP3612	Co-Requisite: SCMP 3631 Object Oriented Programming
2	Foundations of Data Communications	SCMP3632	SCMP 3532 Computer Organization
2	Software Engineering II	SCMP3652	Co-Requisite: SCMP 3641 Software Engineering I
2	Mathematics for Computer Science II	SCMP3672	Co-Requisite: SCMP 3671 Mathematics for Computer Science I
2	Elementary Linear Algebra	SMAT3652	Any two full modules of first year Mathematics

YEAR 3

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Computer Networks	SCMP3721	SCMP 3632 Foundations of Data Communications
1	Computer Theory	SCMP3741	SCMP 3672 Mathematics for Computer Science II
1	Computer Architecture	SCMP3761	SCMP 3532 Computer Organization SCMP 3521 Fundamentals of Digital Electronics
1	Artificial Intelligence	SCMP3771	SCMP 3511 Programming Fundamentals I
1	Research Methodology I	SCMP3701	SSTS 3422 Introduction to Statistics **OR** SSTS3531 Descriptive Statistics
1	Linear Algebra I	SMAT3711	SMAT3601 Sets and Numbers SMAT3652 Elementary Linear Algebra

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Operating Systems	SCMP3722	SCMP 3532 Computer Organization **OR** SCMP 3612 Data Structures and Algorithms
2	Human Computer Interaction and Computer Ethics	SCMP3742	SCMP 3652 Software Engineering II
2	Computer Graphics	SCMP3762	SCMP 3612 Data Structures and Algorithms
2	Internet Technologies and Applications	SCMP3712	Co-Requisite: SCMP 3721 Computer Networks
2	Research Methodology II	SCMP3702	Co-Requisite: SCMP 3701 Research Methodology I
2	Linear Algebra II	SMAT3712	SMAT3601 Sets and Numbers SMAT3652 Elementary Linear Algebra

YEAR 4

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Research Project	SCMP 3810	Pass all Third Year Modules
1	Network Systems Security	SCMP 3821	SCMP 3721 Computer Networks
1	Wireless and Mobile Computing	SCMP 3841	SCMP 3721 Computer Networks
	Choose Any Two Full Modules (Subject to Dept Approval)		
1	Software Project Management	SCMP 3819	SCMP 3742 Human computer Interaction and Computer Ethics
1	Numerical Methods	SCMP 3811	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Operations Research	SCMP 3831	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Distributed Systems	SCMP 3851	SCMP 3721 Computer Networks SCMP 3612 Data Structures and Algorithms
1	Advanced Computer System Design	SCMP 3871	SCMP 3532 Computer Organization SCMP 3761 Computer Architecture

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Research Project	SCMP 3810	Pass all Third Year Modules
2	Field Attachment	SCMP 3802	Pass all Third Year Modules
2	Data Warehousing and Data Mining	SCMP 3822	SCMP 3622 Advanced Databases
	Choose Any Two Modules (Subject to Dept Approval)		
2	Digital Libraries	SCMP 3839	SCMP 3622 Advanced Databases
2	Network Administration	SCMP 3882	SCMP 3721 Computer Networks SCMP 3722 Operating Systems
2	Real Time Multimedia	SCMP 3812	SCMP 3742 Human computer Interaction and Computer Ethics
2	Entrepreneurship and Management of IT Systems	SCMP 3832	SCMP 3742 Human computer Interaction and Computer Ethics
2	Database Programming	SCMP 3872	SCMP 3512 Programming Fundamentals II SCMP 3622 Advanced Databases
2	Expert Systems	SCMP 3852	SCMP 3771 Artificial Intelligence

F.2.3. B.SC.COMPUTER SCIENCE MAJOR AND AND STATISTICS MINOR (11BCMS)

Students opting for a major in Computer Science and minor in Statistics must take all of the following modules:

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test
1	Fundamentals of Digital Electronics	SCMP3521	Departmental Entry Test
1	Descriptive Statistics	SSTS3531	Faculty entry requirements

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Programming Fundamentals II	SCMP3512	SCMP3511 Programming Fundamentals I
2	Computer Organization	SCMP3532	Departmental Entry Test
2	Pre-calculus	SMAT3512	Faculty entry requirements
2	Introduction to Probability	SSTS3532	Faculty entry requirements

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Introduction to Database Systems	SCMP3611	SCMP 3511 Programming Fundamentals I
1	Object Oriented Programming	SCMP3631	SCMP3511 Programming Fundamentals I
1	Software Engineering I	SCMP3641	SCMP 3511 Programming Fundamentals I
1	Mathematics for Computer Science I	SCMP3671	SMAT 3511 Basic Mathematics
1	Probability Theory	SSTS3611	SSTS3532 Introduction to Probability SMAT3611 Pre-calculus

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Advanced Databases	SCMP3622	Co-Requisite: SCMP3611 Introduction to Database Systems
2	Data Structures and Algorithms	SCMP3612	Co-Requisite: SCMP 3631 Object Oriented Programming
2	Foundations of Data Communications	SCMP3632	SCMP 3532 Computer Organization
2	Software Engineering II	SCMP3652	Co-Requisite: SCMP 3641 Software Engineering I
2	Mathematics for Computer Science II	SCMP3672	Co-Requisite: SCMP 3671 Mathematics for Computer Science I
2	Statistical Inferences	SSTS3632	SSTS 3532 Introduction to Probability

YEAR 3

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Computer Networks	SCMP3721	SCMP 3632 Foundations of Data Communications
1	Computer Theory	SCMP3741	SCMP 3672 Mathematics for Computer Science II
1	Computer Architecture	SCMP3761	SCMP 3532 Computer Organization SCMP 3521 Fundamentals of Digital Electronics
1	Artificial Intelligence	SCMP3771	SCMP 3511 Programming Fundamentals I
1	Research Methodology I	SCMP3701	SSTS 3422 Introduction to Statistics **OR** SSTS3531 Descriptive Statistics
1	Sampling Methods	SSTS3731	SSTS 3531 Descriptive Statistics

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Operating Systems	SCMP3722	SCMP 3532 Computer Organization **OR** SCMP 3612 Data Structures and Algorithms
2	Human Computer Interaction and Computer Ethics	SCMP3742	SCMP 3652 Software Engineering II
2	Computer Graphics	SCMP3762	SCMP 3612 Data Structures and Algorithms
2	Internet Technologies and Applications	SCMP3712	Co-Requisite: SCMP 3721 Computer Networks
2	Research Methodology II	SCMP3702	Co-Requisite: SCMP 3701 Research Methodology I
2	Nonparametric and Categoral Data Analysis	SSTS3712	SSTS 3632 Statistical Inference

YEAR 4

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
1	Research Project	SCMP3810	Pass all Third Year Modules
1	Network Systems Security	SCMP3821	SCMP 3721 Computer Networks
1	Wireless and Mobile Computing	SCMP3841	SCMP 3721 Computer Networks
	Choose Any Two Full Modules (Subject to Dept Approval)		
1	Software Project Management	SCMP3819	SCMP 3742 Human computer Interaction and Computer Ethics
1	Numerical Methods	SCMP3811	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Operations Research	SCMP3831	SCMP 3672 Mathematics for Computer Science II **OR** CEEM 3672 Intermediate Mathematical Economics
1	Distributed Systems	SCMP3851	SCMP 3721 Computer Networks SCMP 3612 Data Structures and Algorithms
1	Advanced Computer System Design	SCMP3871	SCMP 3532 Computer Organization SCMP 3761 Computer Architecture

SEMESTER	MODULE NAME	CODE	PRE-/COREQUISITES
2	Research Project	SCMP3810	Pass all Third Year Modules
2	Field Attachment	SCMP3802	Pass all Third Year Modules
2	Data Warehousing and Data Mining	SCMP3822	SCMP 3622 Advanced Databases
	Choose Any Two Modules (Subject to Dept Approval)		
2	Digital Libraries	SCMP3839	SCMP 3622 Advanced Databases
2	Network Administration	SCMP3882	SCMP 3721 Computer Networks SCMP 3722 Operating Systems
2	Real Time Multimedia	SCMP3812	SCMP 3742 Human computer Interaction and Computer Ethics

2	Entrepreneurship and Management of IT Systems	SCMP3832	SCMP 3742 Human computer Interaction and Computer Ethics
2	Database Programming	SCMP3872	SCMP 3512 Programming Fundamentals II SCMP 3622 Advanced Databases
2	Expert Systems	SCMP3852	SCMP 3771 Artificial Intelligence

F.2.4. B.SC.COMPUTER SCIENCE CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES

UCLC3409 COMPUTER LITERACY

Module title: **COMPUTER LITERACY**
Code: **UCLC 3509**
NQF level: 5
Contact hours: 1 lecture theory and 1 lecture practical per week for 14 weeks
Credits: 8
Module assessment: Continuous Assessment 100%: 2 Practical Tests 50%, 2 Theory Tests 50%
Prerequisites: University Entry
Module description: The aim of this module is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment.
Content: The module covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

SCMP 3511 PROGRAMMING FUNDAMENTALS I

Module title: **PROGRAMMING FUNDAMENTALS I**
Code: **SCMP 3511**
NQF level: 5
Contact hours: 4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits: 16
Module Assessment Continuous Assessment 50% (Minimum of 2 tests and 2 assignments)
Final Examinations 50%
Prerequisites: Departmental Entry Test
Module description: This module introduces the students to the foundational skills for all computing disciplines. It develops the student's skills and concepts that are essential to good programming practice and problem solving. The module will cover the following topics: -
PROBLEM SOLVING STRATEGIES: The role of algorithms in the problem solving process, Implementation strategies for algorithms, Debugging strategies, The concept and properties of algorithms. PROGRAM DEVELOPMENT STEPS: Planning Phase, Analysis, Design, Implementation, Testing, Maintenance. PROGRAMMING CONSTRUCTS: Primitive data types, Variables, Expressions & assignment, Strings and string processing, Arrays, Records, Files, Scope and lifetime of variables, Strategies for choosing the right data structures. CONDITIONAL AND ITERATION CONSTRUCTS: The Selection structure, Comparison operators, Logical operators, Nested selection structures, The Case selection structure, The Repetition structure, The For…Next Statement, The Do…Loop Statement. EVENT-DRIVEN PROGRAMMING CONSTRUCTS: Event-handling methods, Event propagation, Exception handling, Functions and Parameter passing, Structured Decomposition.

SCMP 3521 FUNDAMENTALS OF DIGITAL ELECTRONICS

Module title : **FUNDAMENTALS OF DIGITAL ELECTRONICS**
Code: **SCMP 3521**
NQF level: 5
Contact hours: 2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits: 8
Module Assessment: Continuous Assessment 50% (Minimum of 2 tests and 2 assignments)
Final Examinations 50%
Prerequisites: Departmental Entry Test
Module Description: This module introduces the student to the basic theory of semi-conductor electronics. The student is able to appreciate the functional characteristics of the various semi-conductor devices that form the building blocks of integrated digital circuits. These include diodes, BJT transistors, FET etc. The topics covered in the module are;
The atomic structure: - The molecule; atomic and molecular bonds; ionic binding; covalent binding; metallic bonds; insulators and semiconductors. Band model; intrinsic semiconductors; conduction by electrons and holes; carrier concentration. Extrinsic semiconductors; Photo-conduction and voltaic effects:- The P-N junction; V-I characteristics; diode resistance; Zener, tunnel, photo and light emitting diodes; Diode circuits; The bipolar junction transistor; common base, common emitter, common collector configurations and their characteristics; Transistor circuits; The transistor as a switch; Field effect transistors.

SCMP 3512 PROGRAMMING FUNDAMENTALS II

Module title:	**PROGRAMMING FUNDAMENTALS II**
Code:	**SCMP 3512**
NQF level:	5
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-Requisites:	SCMP 3511 Programming Fundamentals I

Module description: This module is a follow up on Programming Fundamentals 1 and provides the student with a rich set of tools to create advanced programs as required in today's business environment. The module will cover the following topics:
Introduction to vb.net applications: Design and Implementation of the .NET Framework, The Common Language Runtime, The .NET Framework Class Library, Creating a .NET Application. Designing windows based applications using the Visual Studio.NET IDE: Organizing a Windows based application, Using controls (e.g. Scroll Bar, groupbox, etc), Introduction to event handlers, Dynamic event handling. Creating programs using component based programming: Introduction to Component Based Programming, Controlling Visibility with Access Modifiers, Introduction to Classes, Introduction to the Object-Oriented Paradigm, Exception handling.

SCMP 3532 COMPUTER ORGANIZATION

**Module title : **	**COMPUTER ORGANIZATION**
Code:	**SCMP 3532**
NQF level:	5
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	Departmental Entry Test

Module Description : This module gives a general introduction to digital computer systems. It introduces key terminologies and concepts that give a clear understanding of the computer as a digital computing machine including functional organization, memory categorization and addressing, units of memory measurement, input/output devices, serial and parallel communication. It also introduces the classical Von Neumann Architecture. The following topics will be covered in the module: -
Introduction to Computers; Circuit Technology; Binary (Boolean) Algebra; Introduction to Memories; Memory and Registers Instructions; Memory organization; Arithmetic and Logic Instructions; Useful Circuits; Input and Output organization; Control Unit; Bus; Data Representation; a Simple Computer; Addressing Modes; Topics; High-Level Circuit Design; Hardware Elements; Examples of Coding; Exceptions; Subroutines and Macros.

FIRST YEAR COMPUTER SCIENCE MINOR MODULES

SCME 3511 INTRODUCTION TO INFORMATION TECHNOLOGY

Module title:	**INTRODUCTION TO INFORMATION TECHNOLOGY**
Code:	**SCME 3511**
NQF level:	5
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Prerequisites:	Departmental entry test

Module Description: This module is intended to introduce students to the basic elements of IT. The following topics will be covered: Hardware and software; classification of computers; software applications; Unix operating system; other operating systems e.g. DOS, MAC, Windows, Linux; Introduction to programming – language levels, language samples; hardware fundamentals – CPU, Registers, memory; Spreadsheets; graphics; Databases – MS Access; Input/output devices; Report writing.

SCME 3512 INTRODUCTION TO WEB DESIGN

Module title:	**INTRODUCTION TO WEB DESIGN**
Code:	**SCME 3512**
NQF level:	5
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Prerequisites:	Departmental entry Test

Module Description: This module is intended to teach fresh university students the principles behind web design and create a website. The following topical areas will be covered: Basic concepts of web site design using hypertext Mark up language (HTML); Creating Web pages using Ms FrontPage or Macromedia Dream weaver; Introduce Web servers e.g. IIS and Apache; Creating a database with Mysql or Ms-Access; Concepts of Web page/database connectivity using Active Server Pages (ASP) and or PHP; Web Publishing techniques.

SECOND YEAR MODULES

SCMP 3611 INTRODUCTION TO DATABASE SYSTEMS

Module title:	**INTRODUCTION TO DATABASE SYSTEMS**
Code:	**SCMP 3611**
NQF level:	6
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	**SCMP3511** – Programming Fundamentals I

Module Description: This module covers material necessary to provide the students with the required skills for working with a variety of database systems. The module will cover the following topics:- Types of databases; Evolution of Database technologies; Database technology versus conventional file-processing systems; The Systems Development Life Cycle (SDLC); The prototyping methodology ;The enterprise data model; Conceptual Data Modeling; Types of entities; ER diagrams; Business rules; Integrity Control Statements; Writing SQL statements; ER Diagram to relation transformation; Functional Dependencies; Normalization and Demoralization.

SCMP 3631 OBJECT ORIENTED PROGRAMMING

Module title:	**OBJECT ORIENTED PROGRAMMING**
Code:	**SCMP 3631**
NQF level:	6
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	**SCMP3511** – Programming Fundamentals I

Module Description: This module introduces a student to the Object Oriented paradigm that is widely adopted in modern software design and implementation. The student should demonstrate an in-depth understanding of Object-Oriented concepts and apply these concepts using a selected OOP language like Java or C++ to solve simple to medium sized programming tasks. The module will cover the following topics: - Introduction to OOP, and Java; Objects and classes, understanding class definitions; Object interaction; Grouping objects; More sophisticated behavior - libraries; Well-behaved objects - testing, maintaining, debugging; Designing classes; Well-behaved objects - testing, maintaining, debugging; Designing classes; Inheritance; Polymorphism; Threads; Further abstraction techniques: abstract classes and interfaces; Building Graphical User Interfaces; Handling errors; Designing applications; Networking and Case study.

SCMP 3641 SOFTWARE ENGINEERING I

Module title:	**SOFTWARE ENGINEERING I**
Code:	**SCMP 3641**
NQF level:	6
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	**SCMP 3511** Programming Fundamentals I

Module Description: This module is intended to introduce the need, importance and concepts of software Engineering. The module shows how software systems undergo the processes of specification, development, management and evolution. The following topics will be covered: Definition of Software Engineering; Ethical and professional issues related to Software Engineering; FAQ about Software Engineering; Software process and a software process models; Examples of software process models; Software requirements engineering; Software development; Software testing; Evolution; Software project management; Tasks of software project managers; Why project planning is essential; Graphical representations; Risk management; Fundamentals of software costing and pricing; Metrics for software productivity assessment; Estimating software costs and schedule; Testing techniques; Testing of component interfaces; Component testing for object oriented systems; Integration testing for object oriented systems; CASE tools; Define Software reuse; Benefits of reusing software components; Problems of reuse; Types of reusable components; Design processes for reuse; Concept of real-time systems; Concurrent processes; Design process for real-time systems; Real-time executive; Monitoring and control systems; Data acquisition systems.

SCMP 3671 MATHEMATICS FOR COMPUTER SCIENCE I

Module Title:	**MATHEMATICS FOR COMPUTER SCIENCE I**
Code:	**SCMP 3671**
NQF Level:	6
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Pre-Requisites:	**SMAT 3511** Basic Mathematics

Module Description: This module provides the students with the necessary skills that are essential for the mathematical analysis of problems with emphasis on representation of the mathematical formulation of the problems for solution with the application of the computer. The module provides the beginning student with an initial but practical orientation to mathematics for computing and its basic theorems with a view to applying them to the solution of real life problems. The module will cover the following topics:
Number Systems, Representation Of Numbers In The Computer, Computer Arithmetic, Errors, Computer Codes, Logical Statements And Truth Tables, Predicate Logic, Algorithms, Flowcharts, Pseudocode Programs. Set Theory, Relations, Functions or Mapping, Graphs, Algebraic

Structures. Number Theory and Methods of Proof, Division Algorithm, The Fundamental Theorem of Arithmetic, Methods of Proof. Rectangular Coordinate System in the Plane, Coordinate Geometry of a Point in the Plane, Equation of a Line, The Straight Line, Second Order Lines, Polar Coordinates, Parametric Equations of Lines, Coordinates On the Computer Screen. Numerical and Algebraic Expressions, Monomials and Polynomials, Factoring Polynomials, Algebraic Fractions and Irrational Expressions, Equations and Inequalities. Elementary Linear Algebra, Matrices and Determinants of the Second and Third Order, Matrix Multiplication, Subscripted Variables, Matrix Representation of a System of Linear Equations, Systems of Linear Equations in Two and Three Unknowns, Gauss-Jordan Elimination Procedure. Fundamental Principles of Counting, Factorial Notation, Permutations and Combinations, Binomial Theorem, Tree Diagrams, Multinomial Theorem, Elements of Probability Theory.

SCMP 3622 ADVANCED DATABASES

Module title:	**ADVANCED DATABASES**
Code:	**SCMP 3622**
NQF level:	6
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-requisites:	**SCMP 3611** Introduction to Database Systems

Module Description: This module is a follow up of Introduction to databases and is intended to consolidate the students design and use of databases and concentrates mainly on database Administration security and other advanced aspects in database systems. The following topics will be covered:Discretionary and mandatory Access Control; The role of the database administrator; Security in statistical databases and encryption; The concept of a transaction; Concurrent Execution of Transactions; Role of Lock-Based Concurrency control; Crash Recovery; Relational Query Optimization; System Catalog in DBMS; architectures of Parallel Databases; architectures of Distributed Databases; distributed query processing; distributed Concurrency Control; deadlock ; recovery; HTML; XML; XML DTDs; XML-QL; Indexing for Text Search; Multidimensional Data model and OLAP queries; Views ; Decision support systems; Spatial Data Management; recursive queries; warehousing ; data mining; mining for rules; Tree-structured rules; decision Trees ; Clustering.

SCMP 3612 DATA STRUCTURES AND ALGORITHMS

Module title:	**DATA STRUCTURES AND ALGORITHMS**
Code:	**SCMP 3612**
NQF level :	6
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-requisites:	**SCMP 3631** Object Oriented Programming

Module Description: The purpose of this module is to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. The main objective of the module is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This module is also about showing the correctness of algorithms and studying their computational complexities. This module offers the students a mixture of theoretical knowledge and practical experience. The study of data structures and algorithms is carried out within an object-oriented framework. When implementations are considered, the Java programming language is used. The module will cover the following topics: -Programming Strategies; Data Structures; Introduction; Programming Strategies Data Structures; Introduction; Programming Strategies; Data Structures; Analysis of algorithms; Hard or Intractable problems; Searching; Sequential Searches; Dynamic Algorithms; Dictionaries; Hash tables; Graphs; Complexity; Queues; Sorting; Searching Revisited; Eulerian or Hamiltonian Paths and Traveling Salesman's Problem.

SCMP 3652 SOFTWARE ENGINEERING II

Module title:	**SOFTWARE ENGINEERING II**
Code:	**SCMP 3652**
NQF level:	6
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-requisites:	**SCMP 3641** Software Engineering I

Module Description: This module is intended to teach students the in-depth of Software Engineering. It is an addition to the work covered in Software engineering I. The module will cover the following topics:Formal specifications techniques; Algebraic techniques of formal specification; Model-based formal techniques; Software design; Activities in general object-oriented design process; Models for documentation of an object oriented design; UML; UML diagrams; Comparison of CASE tools and UML; Definition of Cleanroom Philosophy; Effectiveness of cleanroom method; Legacy stems; Structure of legacy systems; Function-oriented design; Legacy system assessment; Definition of Encryption; Benefits of data encryption; Definition of PGP; How to use PGP; Human memory; Problem solving; Motivation ;Team dynamics; Selecting and Retaining staff; Software Development Legal issues.

SCMP 3672 MATHEMATICS FOR COMPUTER SCIENCE II

Module Title:	**MATHEMATICS FOR COMPUTER SCIENCE II**
Code:	**SCMP 3672**
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-Requisites:	**SCMP 3671** Mathematics for Computer Science I

Module Description: This module provides the students with the necessary skills that are essential for the mathematical analysis of problems with emphasis on representation of the mathematical formulation of the problems for solution with the application of the computer. The module aims to provide the beginning student with an initial but practical orientation to mathematics for computing and its basic theorems with a view to applying them to the solution of real life problems. The module will cover the followings: -Variables and Functions, Review of Basic Elementary Functions, Empirical Functions, Interpolation of Functions, Limits and Continuity, The Derivative of a Function, Basic Derivative Theorems, Applications of the Derivative, Differentials, Indefinite Integral, The Definite Integral, Application of the Definite Integral. Complex Numbers, Complex Function of a Real Variable, The Concept of a Function of a Complex Variable, Series. The Concept of a Function of Several Variables, Continuity, Partial Derivatives of the First-Order, The Total Differential of a Function, Application of the Differential of a Function to Approximate Computations, Partial Derivatives of Higher Order, Test for the Total Differential, The Extremum of a Function of several Variables, Constructing Empirical Formulas by the Method of Least Squares. Differential Equations of the First-Order, First-Order Equations with Variables Separable, First-Order Homogeneous Differential Equations, First-Order Linear Differential Equations, Euler's Method, Differential Equations of the Second Order, Integrating a Differential Equation with the Aid of Power Series, Second-Order Linear Homogenous Differential Equations with Constant Coefficients, Partial Differential Equations, Linear Partial Differential Equations. Line Integrals of the First Kind, The Line Integral of the Second Kind, The Physical Meaning of the Line Integral of the Second Kind, Conditions under Which the Line Integral of the Second Kind is Independent Path, The Work Performed by a Potential Force, Double Integrals, Triple Integrals

SCMP 3632 FOUNDATIONS OF DATA COMMUNICATIONS

Module title:	**FOUNDATION OF DATA COMMUNICATIONS**
Code:	**SCMP 3632**
NQF level:	6
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-requisites:	**SCMP 3532** Computer Organisation

Module Description: This module covers: data communication and open system standards; data transmission; data link controls; Network architectures, layered protocols, network service interface; local networks long-haul networks; internet protocols; link protocols; addressing; routing; flow control; higher level protocols.

SECOND YEAR INFORMATION TECHNOLOGY MODULES

SCME 3611 TELECOMMUNICATIONS

Module Title:	**TELECOMMUNICATIONS**
Code:	**SCME 3611**
NQF Level:	6
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Pre-Requisites:	**SCMP 3521** Fundamentals of Digital Electronics

Module Description: This module covers the principles and practice of wireless communications. The module presents the concepts of frequency re-use and cellular structure and cover propagation effects, multipath fading, digital and analogue modulation, diversity and equalization, multiple access and wireless networks. The module also presents modern communication systems and standards. The module also introduces the use and application of fibre and satellite systems to telecommunication as well as packet switching, traffic and queuing theory. Application of electromagnetic wave propagation and communication theory to teleccommunication networks. The focus of the module is to combine communication at a system level and is designed as a senior elective.

SCME 3612 NETWORKING AND EMERGING TECHNOLOGIES

Module title:	**NETWORKING AND EMERGING TECHNOLOGIES**
Code:	**SCME 3612**
NQF Level:	6
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Pre-requisites:	**SCME 3511** Introduction to Information technology
Co-Requisites:	**SCME 3611** Telecommunications

Module description: The Networking and Emerging Technologies Program provides instruction in various network designs, computer-related equipment, network management, systems and application software. In addition, the program will introduce the student to exciting emerging technologies; such as, network security, wireless networks, Voice Over IP, and remote network management. This program offers course work designed to train the network administrator in standard networking principles as well as new and emerging technologies.

THIRD YEAR MODULES

SCMP 3721 COMPUTER NETWORKS

Module title:	**COMPUTER NETWORKS**
Code:	**SCMP 3721**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	**SCMP 3632** Foundation of Data Communications

Module description: This module introduces the problems, solutions, and limitations associated with interconnecting computers by communication networks (LAN or WAN). The seven layer ISO Open Systems Interconnection (OSI) reference model serves as a framework for the module with major emphasis on the physical layer standards, data link protocols, network and transportation layer protocols. Topics include: modems, baseband and broadband communications, HDLC, Ethernet and token ring LANs, cell and frame relay networks, bridges, routers, services of the upper layers (Session, Presentation, Application), and network security.

SCMP 3741 COMPUTER THEORY

Module title:	**COMPUTER THEORY**
Code:	**SCMP 3741**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites:	**SCMP3672** Mathematics for Computer Science II

Module description: This module introduces the student working with mathematical proofs and the concepts, notations, and techniques of the theories of Automata, formal languages, and Turning machines; and to provide historical perspective on the creation of the computer with a profound understanding of some of its capabilities and limitations. This module is necessary in understanding of the modules on Computer design, Artificial Intelligence, the analysis of algorithms. The module also provides the basis for the development of the abilities to recognize and manipulate context-free grammars and to understand the power of the recursive interaction of parts of a procedure. The module will cover the following topics: -Functions, Relations ,Sets, Propositional Logics : Logic, graphs, trees and algebraic structures,Tautologies, contradictions and contingencies., Logical equivalence and logical implication, Argument evaluation and rules of inference. Predicate logic, Combining quantifiers, Proving mathematical theorems. Proof by induction, Recursive definitions and recurrence relations, Recurrence relations (cont) and expert systems, Program correctness. Graph and Trees: : Graphs, , Simple graphs and connectedness , Paths in graphs , Hamilton paths and Euler paths , Hamilton circuit of least possible total weight, Matrix representations of graphs, isomorphisms and planarity, Isomorphisms and planarity, Isomorphisms and trees , Rooted and binary trees, Huffman codes, Algebraic structures, Semigroups, Groups, Subgroups, Semigroups obtained from finite alphabets Error-detecting/correcting capabilities of codes, Generator matrices and codes , Characteristics of error detecting/correcting codes, Parity-check matrices, Syndromes, Syndromes, error correction and Hamming codes. Theory of Computation : Regular Languages, Finite Automata, equivalence, minimization, Myhill-Nerode Theorem, introduction to nondeterminism, Context free grammars, Pushdown automata, equivalence and applications. Turing machines, Recursive and Recursively enumerable sets, non-determinism, RAMs and equivalence, Universal Turing Machines, undecidability, Rice's theorems for RE sets, Post machines, Basics of Recursive function theory. Equivalence, Church's thesis, computational complexity, space and time complexity of Turing Machines, Relationships, Savage's theorem, Complexity classes, Complete problems, NP-completeness, Cook-Levin theorem. Automata theory : Deterministic finite Automata and Non-deterministic finite automata. Equivalence of DFAs and NFAs, Regular expressions, the pumping lemma for Regular expressions, Push-down Automata (PDAs), relations of PDAs and context-free grammars and its properties, Turning machines, sets and languages, Chomsky hierarchy, the church turning thesis, decidability, tracability

SCMP 3761 COMPUTER ARCHITECTURE

Module title:	**COMPUTER ARCHITECTURE**
Code:	**SCMP 3761**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Prerequisites	**SCMP 3532** Computer Organization **SCMP 3521** Fundamentals of Digital Electronics

Module description: This module refers to those attributes of a system visible to a programmer or those attributes that have a direct impact on the logical execution of a program. It introduces how a Microprocessor inside a computer can perform many different activities or tasks have been performed by the same machine controlling extra pieces of hardware attached to it (what goes on inside a computer). The module will cover the following topics: -CPU design, memory systems, bus structure, processing exceptions, language features that influence architecture, memory management, Microprogramming, Microprocessors, bit slice architecture, multiprocessor architectures, shared memory, associative processors, interconnection networks, pipelined architectures, tagged architecture, data flow architecture, special purpose architecture, performance evaluation, RAID architectures, cache memories, language for parallel/distributed computation, case studies, graphics systems, computer peripherals. It deals with Processor data path design, Input/Output organization, interrupts and DMA. Design and modelling of disks, disk caches, Redundant Arrays of Inexpensive Disks (RAID) devices, parallel I/O subsystems, parallel file systems, and Flash memory.

SCMP 3771 ARTIFICIAL INTELLIGENCE

Module Title:	**ARTIFICIAL INTELLIGENCE**
Code:	**SCMP 3771**
NQF Level:	7
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Pre-Requisites:	**SCMP 3511** Programming Fundamentals I

Module Description: This module provides the framework for the development of the necessary skills that are essential for the application of Artificial Intelligence to real-life problem situations. The emphasis is on developing the necessary theory and programming skills required in building and deploying Artificial Intelligence systems. The module provides practical projects that constitute the best way of learning and developing skills in Artificial Intelligence through the use of industry strong Artificial Intelligence programming language. By integrating theory and practice, the module provides the concepts, skills, tools, and techniques required for the development of appropriate skills in Artificial Intelligence. The module will cover the following topics: -
Artificial Intelligence Problems and the Underlying Assumptions; Problems, Problem Spaces, and Search; Heuristic Search Techniques; Knowledge Representation and Issues; Using Predicate Logic; Representing Knowledge Using Rules; Statistical Reasoning; Slot-and-Filter Structures; Game Playing; and Planning. Introduction to PROLOG, The PROLOG Language, PROLOG in AI, More PROLOG in AI, Expert Systems, Perception and Action. Natural Language Processing, Understanding, Parallel and Distributed Artificial Intelligence, Learning, Connectionist Models, and Common Sense.

SCMP 3701 RESEARCH METHODOLOGY I

Module Title:	**RESEARCH METHODOLOGY I**
Code:	**SCMP 3701**
NQF Level:	7
Contact Hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks 1½-hour tutorial /week for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 2 hour exam)
Pre-Requisites:	**SSTS 3422**: Introduction to Statistics or SSTS 3531 Descriptive Statistics

Module Description: This module provides the framework for the development of the necessary skills that are essential for conducting and reporting the results of a research. The emphasis is on the development of methods for doing research both for scientific contribution in the field of computer science and in the development of computing and information related projects. The module will cover the following topics: -
Research Methodology, Quantitative and Qualitative Research Cycles, The Research Topic, Statement of the Research Problem, Research Design, Research Hypotheses, The Cyclic Progress of the Scientific Expansion of Knowledge. Literature Review, Literature Searches, Compiling a Literature Review, The Reference System, Reference in the Text, Language Reference. Research Design: Population and Types of Samples, The Sampling Frame, Random Sampling, Other Types of Probability Sampling, Non-probability Sampling, Sample Size (n). The Research Proposal, Requirements of a Research Topic, Designing a Research Project, Sections of a Research Proposal, Evaluation Criteria for a Research Proposal, the Student-Study Supervisor Role.

SCMP 3722 OPERATING SYSTEMS

Module title:	**OPERATING SYSTEMS**
Code:	**SCMP 3722**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 2 hour exam)
Prerequisites:	**SCMP 3532** Computer Organisation or SCMP 3612 Data Structures and Algorithms

Module description: This module introduces the student to the concepts that underlie Operating Systems (OS).It is essential for a computer scientist to know what operating systems are,what they do and how they are designed. The module will cover the following topics:Processes in OS, synchronization,Interprocess communication, scheduling,deadlocks,memory management, virtual memory, secondary storage , device management and security.

SCMP 3742 HUMAN COMPUTER INTERFACE AND COMPUTER ETHICS

Module title:	**HUMAN COMPUTER INTERFACE AND COMPUTER ETHICS**
Code:	**SCMP 3742**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 2 hour exam)
Prerequisites:	**SCMP 3652** Software Engineering II

Module description: This module introduces the student to Human Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interfaces so that they better support users in carrying out their tasks. It also highlights the importance of IT professionals in making ethically informed decisions that are within the boundaries of relevant legal systems and professional codes of conduct.

The module will cover the following topics: -User and task analysis, human factors, ergonomics, accessibility standards and cognitive psychology. The module also examines the various ethical issues surrounding computers and expected from computer professionals including piracy, hacking, viruses, responsibility and liability for the use of software and invasion of privacy.

SCMP 3762 COMPUTER GRAPHICS

Module title:	**COMPUTER GRAPHICS**
Code:	**SCMP 3762**
NQF level:	7
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 2 hour exam)
Prerequisites:	**SCMP 3612** Data Structures and Algorithms

Module description: This module introduces the student to the basic principles of graphical systems. Graphical systems have become an increasingly important area within computer science, and the purpose of this module is to investigate the principles, techniques and tools that have enabled advances in Computer graphics. Implementation is a central component of the module, but its mathematical underpinnings will also be emphasized. The module will cover the following topics: -Graphical Algorithms, Graphical user-interface design, Choosing interaction styles and interaction techniques, HCI aspects of interface design, Dynamics of color, Structuring a view for effective understanding. Raster and Vector graphics systems, Video display devices, Physical and logical input devices, Issues facing the developer of graphical systemsComputer animation and Multimedia Techniques.

SCMP 3712 INTERNET TECHNOLOGIES AND APPLICATIONS

Module title:	**INTERNET TECHNOLOGIES AND APPLICATIONS**
Code:	**SCMP 3712**
NQF level:	7
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour exam)
Co-requisites:	**SCMP 3721** Computer Networks

Module Description: This module is intended to teach students the technologies governing the working of the Internet and its relationship with the World Wide Web (WWW).The following topics will be covered:Review of the OSI model; Internet protocols - TCP and TCP/IP; TCP/IP as the de-facto Internet protocol; HTML and XTML codes; Use HTML to create a simple web page; Use the Internet to search for other scripting languages; Client applications; Standards for Client applications; Types of security; Security Implementation; Digital certificates; Digital signatures; Secure protocols; Use of Dreamweaver application; Use My Sql, Oracle or Ms-Access to create a database; Link at least 3 tables in the database; Primary and foreign keys; ASP technology; PHP technology; Database linkage to Website; Electronic payment systems; Internet fraud; Conveniences of using credit cards; Risks of using credit cards; Culture in Electronic Commerce; Contracts; Legal issues related to usage of the Internet;

SCMP 3702 RESEARCH METHODOLOGY II

Module Title:	**RESEARCH METHODOLOGY II**
Code:	**SCMP 3702**
NQF Level:	7
Contact Hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50%
Co-Requisites:	**SCMP 3701** Research Methodology I

Module Description: This module provides the framework for the development of the necessary skills that are essential for conducting and reporting the results of a research. The emphasis is on the development of methods for doing research both for scientific contribution in the field of computer science and in the development of computing and information related projects. The module will cover the following topics: -
Types of Quantitative Research Designs; Quasi-Experimental Research; Non-experimental Research; Validity of Conclusions; Suitability of Research Designs; Internal Validity and Threats; External Validity and Threats. Systematic Observation and Quantitative Measurement, Measurement Theory, Construct Validity of the Dependent Variable, Reliability, Pilot Study in the Development of an Instrument, Measuring Instruments, Developing and Constructing Questionnaires, Interview Schedules, and Attitude Items, Ethical Considerations. Qualitative Research Design, Historical Research, The Phenomenological Approach, Qualitative Methods, Case Study Research, Participant Observation, Unstructured and In-depth Interviews and Focus Groups, Participatory Research, Action Research, Content Analysis. Statistical Validity and Techniques, Statistical Techniques and Coding, Presenting the Results, Report Writing, The Sections of a Research Report, Conventions, Grammar, and Style, Evaluation Criteria for a Research Report.

THIRD YEAR INFORMATION TECHNOLOGY MODULES

SCME 3731 INTRODUCTION TO NETWORK SECURITY

Module title:	**INTRODUCTION TO NETWORK SECURITY**
Code:	**SCME 3731**
NQF level:	7
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Pre-requisites:	**SCME 3612** Networking and Emerging Technologies

Module description: The course covers theory and practice of Network security, focusing in particular on the security aspects of the web and Internet. It prepares the student for the security issues and concerns they will face in professional environments. It starts with an overview of TCP/IP stacks, their strengths and weaknesses, followed by topics like intrusion detection, worm modeling and detection, VPNs, IPSEC, PKIs etc. It surveys cryptographic tools used to provide security, such as shared key encryption (DES, 3DES, RC-4/5/6, etc.); public key encryption, key exchange, and digital signature (Diffie-Hellmann, RSA, DSS, etc.). It then reviews how these tools are utilized in the internet protocols and applications such as Kerberos, SSL, IPSEC, TLS, PGP, S/MIME, SET, and others. System security issues, such as viruses, intrusion, firewalls, and others will also be covered. Last but not least, wireless security issues will also be discussed. Application of cryptographic protocols for secure communication across a network.

SCME 3732 ADVANCED WEB PROGRAMMING

Module title:	**ADVANCED WEB PROGRAMMING**
Code:	**SCME 3732**
NQF level:	7
Contact hours:	4 lecture periods/week; 3 hour practical session per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) Final Examinations 50% (1x 3 hour examination)
Prerequisites:	**SCME 3512** Introduction to Web design **SCMP 3512** Programming Fundamentals II

Module Description: This module is intended to teach the students advanced features in web programming. The following topical areas will be covered: Introduction to XML; How XML can be used; XML Syntax; XML Elements; XML Attributes; XML Validation; XML Validator; XML Browser support; Viewing XML in Browsers; Displaying XML with CSS; Displaying XML with XSL;XML embedded in HTML. Advanced features of XML: XML Namespaces; XML CDATA; XML Encoding; XML Server; XML Applications; XML HTTP Requests; XML Save Data to an XML File; Behaviors for HTML and XML;XML Technologies; XML Editor; XML Summary.

FOURTH YEAR MODULES

SCMP 3810 RESEARCH PROJECT

Module Title:	**Research Project**
Code:	**SCMP 3810**
NQF Level:	8
Contact Hours:	Research Project Running for one year
Credits:	32
Module Assessment:	Continuous Assessment: 100% Oral Presentation of Proposal: 10%Written Research Proposal: 20%Oral Presentation of Results: 20% Written Research Report: 50%
Pre-Requisites:	Pass all third year modules

Module Description: This module provides the framework for the development of the necessary research skills through the completion of a supervised research project in the context of the major. Students will be expected to develop a research proposal under the guidance of the supervisor, present the proposal in the written and oral form, collect and analyze relevant data in order to prepare a requirements document, prepare the relevant design documentation for the project, produce workable software, test the software and implement it. The student is expected to produce a report on the project according to the accepted format adopted by the Department of computer Science. The student is expected to present the final report orally and in the written form.

SCMP 3819 SOFTWARE PROJECT MANAGEMENT

Module Title:	**Software Project Management**
Code:	**SCMP 3819**
NQF Level:	8
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment	Continuous Assessment 50% (minimum of 2 tests and 2 ssignments) 1×3 Hrs Final Examination 50%
Pre-Requisites:	**SCMP 3742** Human Computer Interaction and Computer Ethics

Module Description: This module provides the framework for the development of the necessary skills that are essential for the management of Information Technology projects. The emphasis is on the application of the nine project management knowledge areas (project integration, scope, time, cost, quality, human resources, communication, risk, and procurement management) and the all the five process groups (initiating, planning, executing, controlling, and closing) to information technology projects. The module provides practical lessons in project management through the use of project management software. By integrating theory and practice, the module provides the concepts, skills, tools, and techniques required for information technology project management. The module will cover the following topics: -Project Management Context and Processes, A Methodology for Information Technology Management, Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resources Management, Project Communication Management, Project Risk Management, Project Procurement Management, Using Project Management Software to assist Project Management areas. Initiating a Project, Planning a Project, Executing a Project, Controlling a Project, Closing a Project.

SCMP 3821 NETWORK SYSTEMS SECURITY

Module title:	**NETWORK SYSTEMS SECURITY**
Code:	**SCMP 3821**
NQF level:	8
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment	Continuous Assessment 50% (minimum of 2 tests and 2 ssignments) 1×2 Hrs Final Examination 50%
Prerequisites	**SCMP 3721**Computer Networks

Module description: The module covers theory and practice of Network security, focusing in particular on the security aspects of the web and Internet. It prepares the student for the security issues and concerns they will face in professional environments. It starts with an overview of TCP/IP stacks, their strengths and weaknesses, followed by topics like intrusion detection, worm modeling and detection, VPNs, IPSEC, PKIs etc. It surveys cryptographic tools used to provide security, such as shared key encryption (DES, 3DES, RC-4/5/6, etc.); public key encryption, key exchange, and digital signature (Diffie-Hellmann, RSA, DSS, etc.). It then reviews how these tools are utilized in the internet protocols and applications such as Kerberos, SSL, IPSEC, TLS, PGP, S/MIME, SET, and others. System security issues, such as viruses, intrusion, firewalls, and others will also be covered. Last but not least, wireless security issues will also be discussed. Application of cryptographic protocols for secure communication across a network.

SCMP 3841 WIRELESS AND MOBILE COMPUTING

Module title:	**WIRELESS AND MOBILE COMPUTING**
Code:	**SCMP 3841**
NQF level:	8
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×2 Hrs Final Examination 50%
Prerequisites	**SCMP 3721** Computer Networks

Module description: This module covers fundamental techniques in design and operation of first, second, and third generation wireless networks: cellular systems, medium access techniques, radio propagation models, error control techniques, handoff, power control, common air protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc), radio resource and network management. As an example for the third generation air interfaces, WCDMA is discussed in detail since it is expected to have a large impact on future wireless networks. In addition the module covers fundamental techniques about wireless communication, wireless networks, and wireless applications. It gives a good insight in the significance that wireless systems and the user's mobility have on the construction and handling of a data or telecommunication network, and also gives an overview of present technologies. The problem approach includes the transmission and network aspects of communication systems.

SCMP 3811 NUMERICAL METHODS

Module Title:	**NUMERICAL METHODS**
Code:	**SCMP 3811**
NQF Level:	8
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks 3-hour practical / week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Pre-Requisites:	**SCMP 3672**: Mathematics for Computer Science II Or **CEEM 3672** Intermediate Mathematical Economics

Module Description: This module provides the students with the necessary skills that are essential for the numerical analysis of problems with emphasis on precision of numerical representation, error analysis, numerical techniques, parallel architectures and algorithms, modeling and simulation, and scientific visualization in view to applying as the computer and available software to the solution of numerical problems. Learners who take modules in this area have an opportunity to apply these techniques in a wide range of application areas that require numerical results. These are many and cover the economic, scientific, and technical areas. The module will cover the following topics: -
Finding Roots of Equations, Bisection Method, Regula Falsi or the Method of False Position, Secant Method, Newton's Method, Polynomial Equations, Systems of Nonlinear Equations, Fractal Basins of Attraction, Hybrid Schemes. Polynomial Interpolation and Numerical Differentiation, Polynomial Interpolation, Errors in Polynomial Interpolation, Estimating Derivatives and Richardson Extrapolation, Numerical Integration, Definite Integral, Trapezoidal Rule, Newton-Cotes Rules, Romberg Integration, Adaptive Simpson's Scheme, Gaussian or Gaussian-Legendre Quadrature Formulas. Systems of Linear Equations, Gauss Elimination, Gauss Elimination with Scaled Partial Pivoting, Matrix Factorization or Decomposition, Iterative Methods, Eigenvalues and Eigenvectors. Approximation by Spline Functions, First-Degree and Second-Degree Splines, Natural Cubic Splines, B Splines, Interpolation and Approximation. Ordinary Differential Equations, Initial-Value Problem: Analytical Versus Numerical Solution, Taylor Series Methods, Runge-Kutta Methods, Stability and Adaptive Runge-Kutta and Multi-Step Methods, Systems of Ordinary Differential Equations, Methods of First-Order Systems, Higher-Order Equations and Systems, Adams-Bashforth-Moulton Methods, Boundary Value Problems for Ordinary Differential Equations. Smoothing of Data and Data Fitting, Method of Least Squares, Orthogonal Systems and Chebyshev Polynomials. Monte Carlo Methods and Simulation, Random Numbers, Numerical Integration, Simulation. Partial Differential Equations, Parabolic Problems, Hyperbolic Problems, Elliptic Problems. Numerical Optimization of Functions, Unconstrained and Constrained Optimization. One-Variable Case, Multivariate Case, Linear Programming, Standard Forms and Duality, Simplex Method, Approximate Solutions of Inconsistent Linear Systems. Algorithms for numerical methods. Pseudocode to implement those algorithms. Numerical Methods with MatLab, Numerical Methods with Visual Basic 2005, Numerical Methods with Visual C# 2005, Numerical Methods with C++, Numerical Methods with Java.

SCMP 3831 OPERATIONS RESEARCH

Module Title:	**OPERATIONS RESEARCH**
Code:	**SCMP 3831**
NQF Level:	8
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Pre-Requisites	**SCMP 3672** Mathematics for Computer Science II Or **CEEM 3672** Intermediate Mathematical Economics

Module Description: This module provides the students with the necessary skills that are essential for the analysis of problems with emphasis on mathematical model formulation and model building as well as the application of the computer and available software to the solution of problems using the fundamental principles of operations research. This module will cover the following topics: - Formulating and Building Linear Programming Models, Graphical Solution of Linear Programming Problems, The Simplex Algorithm and Goal Programming, Sensitivity Analysis and Duality in Linear Programming, Data Envelopment Analysis. Transportation Problems, Assignment Problems, Network Models, Integer Programming, Advanced Topics in Linear Programming. Nonlinear Programming, Introductory Concepts, Convex and Concave Functions, Solving NLPs with One Variable, Golden Section Search, Unconstrained Maximization and Minimization Problems with Several Variables, The Method of Steepest Ascent, Lagrange Multipliers, The Kuhn-Tucker Conditions, Quadratic Programming, Separable Programming, The Method of Feasible Directions, Pareto Optimality and Tradeoff Curves. Decision Making under Uncertainty, Utility Theory, Flaws in Expected Maximization of Utility: Prospect Theory and Framing Effects, Decision Trees, Baye's Rule and Decision Trees, Decision Making with Multiple Objectives, The Analytic Hierarchy Process, Game Theory. Deterministic EOQ Models, Probabilistic Inventory Models, Introduction to Stochastic Processes, Defining Markov Chains, Classification of States in a Markov Chain, Steady-State Probabilities and Mean First Passage Times, Absorbing Chains, Examples of the Application of Markov Chains. Deterministic Dynamic Programming, Examples of Application of Dynamic Programming, Formulating Dynamic Programming Recursions, The Wagner-Whitin Algorithm and the Silver-Meal Heuristic, Using Excel to Solve Dynamic Programming Problems, Probabilistic Dynamic Programming, When Current Stage Costs are Uncertain, but the Next Period's State is Certain, A Probabilistic Inventory Model, How to Maximize the Probability of a Favorable Event Occurring, Examples of Probabilistic Dynamic Programming Formulations, Markov Decision Processes. Queuing Theory and Queuing Terminology, Modeling Arrival and Service Processes, Birth-Death Processes, Queuing Systems, Finite Source Models: The Machine Repair Model, Exponential Queues in Series and in Open Networks, Queuing System with Blocked Customers Cleared, How to Tell Whether Interarrival Times and Service Time Are Exponential, Closed Queuing Networks, Priority Queuing Models, Transient Behavior of Queuing Systems. Discrete-Event Simulation, Random Numbers and Monte Carlo Simulation, Simulation with Continuous Random Variables, Statistical Analysis in Simulations, Simulation Languages, The Simulation Process, Simulation with Process Model, Simulation with the Excel Add-in @ Risk. Time Series Models, Moving Average Forecasting Methods, Simple Exponential Smoothing, Holt's Method: Exponential Smoothing with Trend, Winter's Method: Exponential Smoothing with Season, Ad Hoc Forecasting, Simple Linear Regression, Multiple Regression, Nonlinear Regression. Numerical Methods with Operations Research Packages, Simulation with SIMULA, Operations Research with Visual Basic 2005, Operations Research with Visual C# 2005, Operations Research with C++, Operations Research with Java.

SCMP 3851 DISTRIBUTED SYSTEMS

Module Title:	**DISTRIBUTED SYSTEMS**
Code:	**SCMP 3851**
NQF Level:	8
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites	**SCMP 3721** Computer Networks, **SCMP 3612** Data Structures and Algorithms

Module Description: The aim of this module is to provide students with an understanding of the principles, techniques, and practice in the design and implementation of distributed systems, with a particular focus on infrastructure software. The module presents the principles underlying the functioning of distributed systems; creates an awareness of the major technical challenges in distributed systems design and implementation; exposes students to current technology and to past and current research issues in the field of distributed systems and provides experience in the implementation of typical algorithms used in distributed systems. The following topics will be covered in the module;
Introduction to Distributed Systems; System Architecture & Communication; Distributed Shared Memory; Distributed Objects and Middleware; Synchronization & Coordination; Replication & Consistency; Fault Tolerance; Naming, Peer-to-peer, Distributed File Systems; Parallel Programming, Clusters and Grid; Security and Research issues

SCMP 3871 ADVANCED COMPUTER SYSTEMS DESIGN

Module title:	**ADVANCED COMPUTER SYSTEMS DESIGN**
Code:	**SCMP 3871**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Pre-Requisites:	**SCMP 3532** Computer Organization, **SCMP 3761** Computer Architecture

Module Description: This module covers the following topics:Computer organization and Computer architecture for the system design, Study the interfacing of different sub-systems and develop an entire CPU, Solve Maintenance, troubleshooting and software problems, Identify VLSI techniques and apply it practically applying CAD tools, Case study of telecommunication systems. Design of power supplies for systems, Interfacing electronic systems to input devices, output devices and databases. Synthesis of interfacing of electronic systems/communication systems. NMOS and CMOS VLSL sub system design, CPU design and Computer Maintenance cell.

SCMP 3802 FIELD ATTACHMENT

Module Title:	**FIELD ATTACHMENT**
Code:	**SCMP 3802**
NQF Level:	8
Contact Hours:	Filed Attachment running for 8 Weeks
Credits:	8
Module Assessment	Continuous Assessment: 100% Oral Presentation of field reportl: 20% Written Field Report: 80%
Pre-Requisites:	Pass all third year modules

Module Description: This module provides the framework for the development of the necessary interpersonal and other work related communications skills through the completion of a supervised field attachment period in the context of the major. Students will be expected to prepare a filed report and present the report. The report will be assessed by the company providing the field attachment and the Department of computer Science. The student is expected to present the field report orally and in the written form.

SCMP 3822 DATA WAREHOUSING AND DATA MINING

Module title:	**DATA WAREHOUSING AND DATA MINING**
Code:	**SCMP 3822**
NQF level:	8
Contact hours:	2 lecture periods / week for 14 weeks; 3 hour practical session/two weeks, for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites:	**SCMP 3622** Advanced Databases

Module Description : This module aims to introduce the foundation of data warehousing, the theories of various data mining techniques and explore the practice of developing data mining applications. This module is one of the advanced database module series. The module is designed to be practical. As such, real-life examples of data mining issues and applications will also be used throughout the module. The following topics will be covered in the module;Data Warehouse; Data Model for Data Warehouses.; Architecture, relational OLAP, 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.

SCMP 3839 DIGITAL LIBRARIES

Module title:	**DIGITAL LIBRARIES**
Code:	**SCMP 3839**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites:	**SCMP 3622** Advanced Databases

Module Description: This module introduces the student to Digital Libraries (DLs) which are increasingly popular research area that encompass more than traditional information retrieval or database methods and techniques. It looks at the various policy and technical issues involved in building digital libraries, as well as relevant standards and practices that are broadly applicable to networked system design in general and specifically Web application design. Case studies will be performed on various DLs. The class will focus heavily on project work, especially writing and/or coding. The following topics will be covered;Introduction and Overview to Digital Libraries; Digital Library Initiatives; XML & Metadata; Digital Objects and System Architecture of Digital Libraries; Social and Economic Factors of Digital Libraries; Digital Collections & Content Organization; Access and User Interfaces to Digital Libraries; Human Factors of Digital Libraries; Digital Preservation and Future Technology and Digital Libraries.

SCMP 3882 NETWORK ADMINISTRATION

Module title:	**NETWORK ADMINISTRATION**
Code:	**SCMP 3882**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites:	**SCMP 3721** Computer Networks, **SCMP 3722** Operating Systems

Module description: This module will focus on managing and maintaining physical and logical network devices, network users, computers, and groups, and access to network resources. Modules include general system administration, core networking with extensive lab work, routing, security analysis and implementation. This module is designed to provide the student with an understanding of the fundamental concepts and tools necessary to administrate Unix based computer systems and network services. The module also aimed at providing hands on experience on Linux server setup, configuration and maintenance.

SCMP 3812 REALTIME MULTIMEDIA

Module title:	**REALTIME MULTIMEDIA**
Code:	**SCMP 3812**
NQF level:	8
Contact hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites	**SCMP 3742** Human Computer Interaction and Computer Ethics

Module description: The module offers a practical introduction to real-time multimedia in packet networks, and more specifically IP networks. The module will introduce transmission protocols used for the delivery of real-time multimedia as well as the protocols responsible for the setup, maintenance and release of the communication sessions. Various issues surrounding multimedia communication networks from basic signaling to service creation will also be discussed. The module will cover the following topics: -
Session Initiation Protocol (Sip). Transmission Of Real-Time Multimedia In Packet Networks Using Rtp/Rtcp. Softswitches . Asterisk

SCMP 3832 ENTREPRENEURSHIP AND MANAGEMENT OF IT SYSTEMS

Module Title:	**ENTREPRENEURSHIP AND MANAGEMENT OF IT SYSTEMS**
Code:	**SCMP 3832**
NQF Level:	8
Contact Hours:	4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment 50% (minimum of 2 tests and 2 assignments) 1×3 Hrs Final Examination 50%
Prerequisites:	**SCMP 3742** Human Computer Interaction and Computer Ethics

Module Description: This module provides the framework for the management of IT systems in small and large originations. The emphasis is on the examination of how information technology can be leveraged for strategic advantage by incorporating it into business strategy formulation, how to formulate IT strategies, and how to manage IT in an organization of any size. The module provides both analytical and practical lessons in the management of IT systems. By integrating theory and practice, the module provides the concepts, skills, tools, and techniques required for the management of IT Systems. The module provides a non-technical but a managerial approach to Management of IT systems. The module will cover the following topics: -
Entrepreneurship: Definitions of Entrepreneurship; The entrepreneurial mind; Overview of challenges of small businesses; Starting a new business; Home based businesses; Legal and accounting concerns; Business plans; The economic characteristics of New Ventures; The Namibian context and entrepreneurial action; Critical success factors in New Venture development; Common reasons for New Venture failure; New Venture evaluation processes and feasibility testing; The 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, The 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 System Strategy, Formulating IT Strategy. Formulating Information

Management Strategy. Organizing IT Activities, Controlling IT Activities, Financing IT, Appraising IT, Responsibility Accounting for IT, Evaluating IT, Integrating IT and the Organization.

SCMP 3872 DATABASE PROGRAMMING

Module Title: **DATABASE PROGRAMMING**
Code: **SCMP 3872**
NQF Level: 8
Contact Hours: 4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits: 16
Module Assessment: Continuous Assessment 50% (minimum of 2 tests and 2 assignments)
1×3 Hrs Final Examination 50%
Pre-Requisites: **SCMP 3512** Programming Fundamentals II, SCMP 3622 Advanced Databases

Module Description: This module provides the framework for the development of the necessary skills that are essential for developing and deploying database applications, including remote applications that run on the Web. The emphasis is on the design and development of GUIs, server development, and middle tier implementation. The module will cover the following topic: -
Fundamentals of Database programming with ADO.NET, Review of databases, Structured Query Language (SQL), Transact-SQL Programming, Overview of ADO.NET Classes, Windows Application and ADO.NET. Connecting to a Database, Executing Database Commands, Using DataReader Objects to Read Results, Using DataSet to store Data, Using DataSet Objects to Modify Data, Navigating and Modifying Related Data, Using Data View Objects. Advanced Transaction Control, Web Applications Design and Implementation, ASP.NET, Using SQL Server's XML Support, Web Services.

SCMP 3852 EXPERT SYSTEMS

Module Title: **EXPERT SYSTEMS**
Code: **SCMP 3852**
NQF Level: 8
Contact Hours: 4 lecture periods / week for 14 weeks; 3 hour practical session per week, for 14 weeks
Credits: 16
Module Assessment: Continuous Assessment 50% (minimum of 2 tests and 2 assignments)
1×3 Hrs Final Examination 50%
Pre-Requisites: **SCMP 3771** Artificial Intelligence

Module Description: This module provides the framework for the development of the necessary skills that are essential for the application of Expert Systems to real life problem situations. The emphasis is on imparting the necessary theoretical knowledge and developing practical skills in the programming of expert systems. The module provides practical projects that constitute the best way of learning and developing skills in expert system through the use of industry strong expert systems tool. By integrating theory and practice, the module provides the concepts, skills, tools, and techniques required for expert systems skills development. The module will cover the following topics: -
Characteristics of Expert Systems, The Development of Expert Systems Technology, Expert Systems Application and Domains, Elements of an Expert System, Programming Paradigms, Representation of Knowledge, Semantic Nets, Schemata, Frames, Methods of Inference, Reasoning under Uncertainty. Introduction to CLIPS, The CLIPS Tool, CLIPS in Expert Systems, Expert Systems Design Examples. The Design of Expert Systems, Pattern Matching, Modular Design and Execution Control. Efficiency in Rule-Based Languages, A Pattern Matching Algorithm, The Pattern Network, Built-in Pattern Matching Constraints, General Rules v/s Specific Rules, Simple Rules v/s Complex Rules, Loading and Saving Facts.

COMPUTER SCIENCE DEPARTMENT: COURSE EQUIVALENTS

OLD MODULES	NEW MODULES
CMP3111 Computing 1A	SCMP3511 Programming Fundamentals I
CMP3112 Computing 1B	SCMP3512 Programming Fundamentals II
CMP3211 Data management and databases	SCMP3611 Introduction to Database Systems
CMP3220 Advanced and Object Oriented Programming	SCMP3631 Object Oriented Programming
CMP3212 Computer theory	SCMP3672 Mathematics for Computer Science II
CMP3332 Operating systems	SCMP3612 Data Structures and Algorithms
CMP3311 Software engineering I	SCMP3641 Software Engineering I
CMP3312 Software engineering II	SCMP3652 Software Engineering II
CMP3331 Networking and Data Communications	SCMP3632 Foundations of Data Communications
CMP3482 Artificial intelligence and Heuristics	SCMP3771 Artificial Intelligence
CMP3422 Web Development and E-commerce	SCMP3712 Internet Technologies and Applications
CMP3421 Client Server Systems and Advanced Networks	SCMP3821 Networks Systems Security
CMP3441 Numerical methods and Operational Research	SCMP3831 Operations Research
CMP3481 Parallel processing Architecture/Concurrent Systems	SCMP3851 Distributed Systems
CMP3462 Advanced data management Techniques	SCMP3871 Advanced Computer System Design
CMP3442 Management of IT Systems	SCMP3832 Entrepreneurship and Management of IT Systems
CMP3462 Advanced Data management Techniques	SCMP3622 Advanced Databases

No exact equivalencies - new subjects offered	4th year options

G. DEPARTMENT OF GEOLOGY

The B.Sc. Geology Single Major qualification is equivalent to an Honours degree that allows graduates to enter a professional career. 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 participate in field trips without exception. Practical competences will be learned and sharpened in the field. The 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 course. In their final year, geology students also conduct research as part of the new honours equivalent geology single major BSc degree programme. This research work develops skills in scientific writing, solving of geological problems and academic communication.

G.1. DEPARTMENTAL REGULATIONS

To register in the B.Sc.Geology Degree, a candidate must hold a valid NSSC-O or NSSC-A certificate or equivalent with passes in at least five subjects which add up to 25 points, calculated using the UNAM specified scale. In addition to the above requirements, the candidate must have at least a 'C" symbol in English and in Mathematics on NSSC or equivalent qualification. First year students are required to pass a departmental aptitude test before admission to the single major geology programme. Mature age entrants will gain admission as per UNAM mature age entry regulations contained in the General Prospectus: Information, Regulations and Fees.

Field work to various mines and places of geological interest are an integral part of the geology curriculum. 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 the field trips are therefore required to be medically fit for outdoor activities.

Advancement and Progression rules:
From Year 1 to Year 2: To progress to the second (2nd) year of study, all first year students registered for the geology single major programme must pass **all the first (1st) year level modules.**

From Year 2 to Year 3: In order to advance to the third (3rd) year level of study, a student must have passed all first year modules and at least **6 second year level modules (equivalent to 96 credits)**. Furthermore, students may not register for third year level courses without the necessary pre-requisites for such courses.

Year 3 to Year 4: In order to advance to the fourth (4th) year level of study, a student must have passed all second year modules and at least **6 third year level modules (equivalent to 96 credits)**. Furthermore, students may not register for fourth year level courses without the necessary pre-requisites for such courses.

Graduation
Students must pass **all** prescribed modules in order to graduate as a Geology Major. The Geology Department shall approve all successful candidates who should graduate with a BSc Geology single major degree.

G.1.1. QUALIFICATION: B.SC.GEOLOGY SINGLE MAJOR

QUALIFICATION: B.Sc.Geology Single Major (11BGLY)

Students opting for a major in geology single major must take all of the following modules:

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
1	Computer Literacy	UCLC 3509	Faculty entry requirements
1	English Communication & Study skills	ULCE 3419	NSSC ENGLISH 'C'
1	Chemistry 1A	SCHM 3511	Faculty entry requirements
1	Physics for Physical Sciences I	SPHY 3511	Faculty entry requirements
1	Introduction to Physical Geology & Surface Processes	SGLY 3521	Departmental entry requirements
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	Faculty entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
2	Contemporary Social Issues	UCSI 3529	Faculty entry requirements
2	Introduction to Earth Systems	SGLY 3502	Departmental entry requirements
2	Chemistry 1B	SCHM 3512	Faculty entry requirements
2	Physics for Physical Sciences II	SPHY 3512	Faculty entry requirements
2	Pre-Calculus	SMAT 3512	Faculty entry requirements
2	English for Academic Purposes	ULEA 3519	NSSC ENGLISH 'C'
2	Introduction to Statistics	SSTS3522	Faculty entry requirements

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
1&2	Field Geology I	SGLY 3600	NONE
1	Calculus I	SMAT 3611	SMAT3512
1	Inorganic Chemistry I	SCHM 3611	SCHM3511 and CHM3512
1	Introduction to Hydrology	SGLY 3621	SMAT3512; SGLY3600
1	Waves & Optics	SPHY 3631	SPHY3511 & SPHY3512
1	Physical chemistry I	SCHM 3631	SCHM3511, CHM3512, MAT3511 & SMAT3512
1	Earth Resources	SGLY 3641	SGLY3521

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
2	Calculus II	SMAT3612	SMAT3611
2	Stratigraphy & Geological Mapping	SGLY 3612	SGLY3521; SGLY3600
2	Crystallography & Mineral Chemistry	SGLY 3632	SMAT3512
2	Introduction to Geochemistry	SGLY 3642	SMAT3512 & SGLY 3521; SGLY3600
2	Introduction to Petrology	SGLY 3652	SGLY3521; SGLY3600

YEAR 3

SEMESTER	MODULE NAME	CODE	PRE/ CO- REQUISITES
1 & 2	Field Geology II	SGLY 3700	SGLY3600
1	Coal, Petroleum and Gas*	SGLY 3701 *	SGLY 3521
1	Inorganic Chemistry II*	SCHM3701*	SCHM3611 & SMAT3512
1	Mineralogy	SGLY 3711	SGLY3632 ; SGLY 3600
1	Plate Tectonics	SGLY 3721	SGLY3612; SGLY 3600
1	Exploration Geochemistry and Geostatistics	SGLY 3749	SGLY3642; SGLY 3600
1	Igneous Petrology	SGLY 3729	SGLY3652; SGLY 3600
1	Sedimentology & Palaeontology	SGLY 3731	SGLY 3521 & SGLY3652
1	Regional Geology of Namibia	SGLY 3761	SGLY 3600
1	Environmental & Engineering Geology I	SGLE 3771	SGLY3642 & SMAT3512; SGLY 3600

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
2	Ordinary Differential Equations*	SMAT 3642 *	SMAT3512
2	Field Geology II	SGLY 3700	SGLY3600
2	Hydrogeology I	SGLY 3702	SGLY3621; SGLY 3600
2	Structural Geology I	SGLY 3712	SGLY3612; SGLY 3600
2	Igneous Petrology	SGLY 3729	SGLY3652; SGLY 3600
2	Metamorphic Petrology	SGLY 3742	SGLY3652; SGLY 3600
2	Exploration Geochemistry and Geostatistics	SGLY 3749	SGLY3642; SGLY 3600
2	Research Methodology	SGLY3762	SGLY 3600

YEAR 4

SEMESTER	MODULE NAME	CODE	PRE/ CO- REQUISITES
1	Field Geology III	SGLY 3800	SGLY3700; SGLY3810
1	Environmental and Engineering Geology II*	SGLE 3801 *	SGLE3771
1	Industrial Minerals and Gemstones*	SGLY 3801 *	SGLY3641; SGLY 3700
1	Research Project	SGLY 3810	SGLY3711, SGLY3712 & SGLY 3762; SGLY 3700; SGLY 3800
1	Igneous Petrogenesis	SGLY 3821	SGLY3729; SGLY 3700
1	Economic Geology	SGLY3831	SGLY3711 & SGLY3721; SGLY 3700
1	Metamorphic Petrogenesis	SGLY 3841	SGLY3742; SGLY 3700

SEMESTER	MODULE NAME	CODE	PRE/CO- REQUISITES
2	Hydrogeology II	SGLY 3812	SGLY3702; SGLY 3700
2	Field Geology III	SGLY 3800	SGLY3700; SGLY3810
2	Research Project	SGLY 3810	SGLY3711, SGLY3712 & SGLY 3762; SGLY 3700; SGLY 3800
2	Exploration Geology and Geophysics	SGLY 3832	SGLY3712 & SGLY3782; SGLY 3700
2	Remote Sensing & GIS	SGLY 3852	SGLY3712; SGLY 3700
2	Structural Geology II	SGLY 3862	SGLY3712; SGLY 3700

*Elective course

G.1.2. B.SC.GEOLOGY CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES

SGLY3521: INTRODUCTION TO PHYSICAL GEOLOGY AND SURFACE PROCESSES

Module title:	**Introduction to Physical Geology and Surface Processes**
Code:	**SGLY3521**
NQF level:	5
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 5 practicals, 2 tests, 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	Faculty entry requirements for geology minor students; departmental entry requirements for geology major students

Module description (content): Plate Tectonics, The rock cycle, Introduction to Rocks & Minerals; Introduction to Physical Geology , Earth materials and their uses; The Environment, Natural geological hazards and mitigation measures, Geomorphology and land forms; Introduction to Aerial Photography.

SGLY3502: INTRODUCTION TO EARTH SYSTEMS

Module Title:	**INTRODUCTION TO EARTH SYSTEMS**
Code:	**SGLY 3502**
NQF level:	5
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module Assessment:	Continuous 40%: At least 5 practicals; 1-test and at least one assignment. Examination 60%: One 3 hour exam paper.
Pre-requisites:	Faculty entry requirements for geology minor students; departmental entry requirements for geology major students

Module Description: The Earth as a planet in space; orbit and rotational parameters; Effects of orbit and rotational parameters on glaciers; sediments; and the magnetic field; paleomagnetism; plate tectonics as a unifying principle in the rock cycle; sources of heat in the earth; evolution of planet earth through time; Energy Resources; coal, petroleum; gas; geothermal and solar energy; nuclear energy and other energy sources

SECOND YEAR MODULES

SGLY3600: FIELD GEOLOGY I

Module Title:	**Field Geology I**
Code:	**SGLY 3600**
NQF level:	6
Contact hours:	1 week of field mapping in a suitable area of Namibia or neighbouring country.
Credits:	1
Module Assessment:	Continuous 100%: Field note books, field reports and field trip participation.
Pre-requisites:	None
Co-requisite:	All Geology Modules at level 6, i.e., the second academic year of studying geology as a single major.

Module Description: Introduction to field Mapping Techniques, horizontal and dipping strata; deformed and foliated rocks; igneous bodies, extrusive and intrusive.

SGLY3621: INTRODUCTION TO HYDROLOGY

Module title:	**INTRODUCTION TO HYDROLOGY**
Code:	**SGLY3621**
NQF level:	6
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 5 practicals, 2 tests, 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	SMAT 3512 Precalculus

Module description (content): The hydrologic cycle: Inventory of water resources on planet earth; elements of the hydrologic cycle; rainfall run-off relationships; stream hydrograph analysis; separation of baseflow and run-off, spring flow analysis. Infiltration & percolation: Infiltration capacity of soil; methods for determining infiltration capacity; soil moisture. Hydraulic properties of geological materials: Porosity; permeability, aquifers & confining units; confined and unconfined aquifers; homogeneity & isotropy in aquifers; geology of groundwater occurrence; primary and secondary permeability in aquifers. Principles of groundwater flow: Darcy's Law, specific discharge, average linear velocity, hydraulic head concept, potentiometric surface; equipotential lines; flow lines & transmissivity. Storage properties of aquifers: Specific storage; storativity and specific yield. Natural chemical evolution of groundwater: Hydrochemical facies; graphical methods of representation of hydrochemical facies (piper diagrams, stiff diagrams & fence diagrams);closed and open system behaviour. Overview of Hydrogeological region in Namibia.

SGLY3641: EARTH RESOURCES

Module title:	**EARTH RESOURCES**
Code:	**SGLY3641**
NQF level:	6
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 4 practicals; 1 test and 1 assignment Examination 60%: One 3 hour exam paper.
Prerequisites:	SGLY3521 Itroduction to Physical Geology & Surface Processes

Module description: Earth resources: types, characteristic properties and industrial uses. Mineral and energy resources: the geology of renewable and non-renewable resources -energy, metallic, and nonmetallic resources; Mineral resources of Namibia: outline of the geology, mineral and energy resources of Namibia.

SGLY3612: STRATIGRAPHY & GEOLOGICAL MAPPING

Module Title:	**STRATIGRAPHY & GEOLOGICAL MAPPING**
Code:	**SGLY 3612**
NQF level:	6
Contact hours:	4 lecture hours per week; 3 practical hours per week.
Credits:	16
Module Assessment:	Continuous 40%: At least 6 practicals; 2 tests and 1 assignment. Examination 60%: One 3 hour theory exam; one 3 hour practical Exam
Pre-requisites:	SGLY3521 Itroduction to Physical Geology & Surface Processes

Module Description: Principles of stratigraphy, including Walthers's law; applications of stratigraphic principles and type examples; introduction to the geological time scale; geological history of Namibia; geological maps and structures; geological mapping techniques; structures due to deformation.

SGLY3632: CRYSTALLOGRAPHY AND MINERAL CHEMISTRY

Module title:	**CRYSTALLOGRAPHY & MINERAL CHEMISTRY**
Code:	**SGLY3632**
NQF level:	6
Contact hours:	4 lecture hours per week; 3 practical hours per week
Credits:	16
Module assessment:	Continuous 40%: At least 7 practicals; 2 tests and 2 assignments. Examination 60%: One 3 hour theory paper and one 3 hour practical paper.
Prerequisites:	SMAT 3512 Precalculus

Module description: Crystals, lattices and Crystal symmetry; Crystal morphology: and Crystal projections; Space groups, internal order and translational symmetry; Crystal structures and Crystal chemistry. X-ray crystallography and X-ray diffraction. Mineral chemistry – minerals in the Earth's crust; chemical analytical techniques (X-ray diffraction, X-ray fluorescence, electron microprobe analysis); mineral compositions and variations; exsolutions; calculation of mineral analyses; Graphic representation of mineral composition.

SGLY3642: INTRODUCTION TO GEOCHEMISTRY

Module Title:	**INTRODUCTION TO GEOCHEMISTRY**
Code:	**SGLY 3642**
NQF level:	6
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module Assessment:	Continuous 40%: At least 6 practicals; 2 tests and 1 assignment. Examination 60%: One 3 hour exam paper.
Pre-requisites:	SGLY3521 Itroduction to Physical Geology & Surface Processes

Module Description: The compositon of the solid earth, its atmosphere, and surrounding universe. The origin and evolution of the earth as a whole, as well as its constituent parts and its structure. Thermodynamics of crystals and minerals, crystal chemistry, magmatism and igneous rocks, sedimentation and sedimentary rocks, isotope geochemistry, Eh-pH diagrams and surface environments, metamorphism as a geochemical process; geochemistry of ore deposits.

SGLY3652: INTRODUCTION TO PETROLOGY

Module Title:	**INTRODUCTION TO PETROLOGY**
Code:	**SGLY 3652**
NQF level:	6
Contact hours:	4 lecture hours per week; 3 practical hours per week.
Credits:	16
Module Assessment:	Continuous 40%: At least 6 practicals; 2 tests and 1 assignment. Examination 60%: One 3 hour theory exam; one 3 hour practical Exam.
Pre-requisites:	SGLY3521 Itroduction to Physical Geology & Surface Processes

Module Description: Part A: Introduction to Igneous Rocks-their textures, classification of igneous rocks, granites; monzonites; monzodiorites; silicic volcanics; syenites, trachytes; latites; diorites; andesites; gabbros; basalts; ultramafic igneous rocks; nepheline syenites; phonolites; lamprophyres; pyroclastics.
Part B: Introduction to sedimentary rocks-sedimentary textures; argillaceous rocks; aranaceous rocks; calcareous rocks; dolomites; siliceous rocks; ferruginous rocks; carbonaceous rocks. Part C: Metamorphic rocks- metamorphism, deformation and recrystallisation; metasomatism and melting; the facies classification; progressive regional metamorphism of pelites and basic rocks.

THIRD YEAR MODULES

SGLY3700: FIELD GEOLOGY II

Module Title:	**Field Geology II**
Code:	**SGLY 3700**
NQF level:	7
Contact hours:	2-3 weeks of field mapping; logging; geochemical sampling in any given area of Namibia or neighbouring country or at a mine or exploration site. At the end of the academic year, students are expected to be attached to a mining company; exploration firm; geochemical firm; hydrogeological firm; and/or environmental firm (with a bias towards metal pollution mitigation or engineering geology).
Credits:	1
Module Assessment:	Continuous 100%: Field note books, field reports and field trip participation.
Pre-requisites:	SGLY3600 Field Geology I
Co-requisite:	All Geology Modules at level 7, i.e., the second academic year of studying geology as a single major.

Module Description: Introduction to field Mapping Techniques, horizontal and dipping strata; deformed and foliated rocks; igneous bodies, extrusive and intrusive; complexly folded areas; excursions; mine visits; geochemical sampling.

SGLY3701: COAL, PETROLEUM AND GAS

Module Title:	**COAL, PETROLEUM AND GAS**
Code:	**SGLY 3701**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 4 practicals, 1 test, 1 assignment. Exam 60%: One 3 hour exam paper.
Prerequisites:	SGLY 3521 Introduction to Physical Geology and Surface Processes

Module description (content): Sedimentary basins and sequence stratigraphy; development of peat; climates associated with coal development; the preservation of coal; the coalification process; petrology of coal and its origins; types of coal and the environs in which they develop; methods of coal exploration; coal mining; Origin of petroleum and Gas; migration and accumulation of oil and gas; chemical characteristics of oil; source and reservoir rocks; reservoir fluids; reservoir traps; reservoir conditions; introduction to reservoir mechanics; subsurface and exploration for oil and gas; exercises in seismic stratigraphy.

SGLY3711: MINERALOGY

Module title:	**MINERALOGY**
Code:	**SGLY3711**
NQF level:	7
Contact hours:	4 lecture hours per week; 3 practical hours per week
Credits:	16
Module assessment:	Continuous 40%: At least 7 practicals; 2 tests and 2 assignments. Examination 60%: One 3 hour theory and one 3 hour practical papers.
Prerequisites:	SGLY3632 Crystallography and Mineral Chemistry

Module description: Classification of minerals. Physical properties of minerals: colour, streak, lustre, diaphaneity, luminescence, form, cleavage, parting, fracture, hardness, tenacity; magnetism, electricity, radioactivity, specific gravity, thermal properties.
Optical mineralogy: optical properties of minerals: isotropic and anisotropic crystals, polarized light, the polarizing microscope. The optical indicatrix: isotropic, uniaxial and biaxial crystals; opaque minerals. Systematic mineralogy: common rock forming minerals, their occurrence and uses (nesosilicates, sorosilicates, cyclosilicates, inosilicates, phyllosilicates and tectosilicates); Gemstones - their classification and properties; Nonsilicate minerals.

SGLY3721: PLATE TECTONICS

Module Title:	**PLATE TECTONICS**
Code:	**SGLY 3721**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight..
Credits:	8
Module Assessment:	Continuous 40%: At least 4 practicals; 1-test and at least one assignment. Examination 60%: One 3 hour exam paper.
Pre-requisites:	SGLY 3612 Stratigraphy & Geological Mapping

Module Description: Concept of sea floor spreading and plate consumption and generation; the Wilson cycle; plate Motions and stress distribution in plates; geomagnetism-reversals in the Earth's magnetic field, process of rock magnetization; hot spots and plumes, Super continents-how they are recognized; Seismic crustal structure, Benioff zone and earthquake distribution; Plate tectonic settings and rock associations; Crustal Provinces.

SGLY3731: SEDIMENTOLOGY & PALAEONTOLOGY

Module Title:	**SEDIMENTOLOGY & PALAEONTOLOGY**
Code:	**SGLY 3731**
NQF level:	7
Contact hours:	4 lecture hours per week for 14 weeks; 1-3hour practical session per week for 14 weeks.
Credits:	16
Module Assessment:	Continuous 40%: At least 6 practicals; 2-tests and 1 assignment.. Examination 60%: One 3 hour theory exam; one 3 hour practical Exam.
Pre-requisites:	SGLY3612 Stratigraphy & Geological Mapping and SGLY 3652 Introduction to Petrology.

Module Description: Sediments cover 75% of continents and most of the ocean floor. They also host most of the mineral deposits in the world. The following topics will be covered; weathering of rocks; paleoclimates; origin and transport of sedimentary materials; deposition of siliciclastic materials; physical properties of sedimentary rocks; sedimentary textures; sedimentary structures; siliciclastic sedimentary rocks; carbonate sedimentary rocks; biochemical and carbonaceous sedimentary rocks; depositional environments; continental environments; marginal marine environments; siliciclastic marine environments; carbonate and evaporate environments; lithostratigraphy; sequence stratigraphy; magnetostratigraphy; seismic stratigraphy; biostratigraphy; PalAeontology: taphanomy; fossils and evolution; fossils and paleoecology; fossils and paleogeography; identification & classification of fossils; common fossils in geologic time.

SGLY3761: REGIONAL GEOLOGY OF NAMIBIA

Module title:	**REGIONAL GEOLOGY OF NAMIBIA**
Code:	**SGLY3761**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 5 practicals, 2 tests, 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	none

Module description (content): Regional Geology of Southern Africa. Cratons and cratonic evolution of Southern Africa,mobile belts of Southern Africa. Geology of Namibia, from the Archaean to the Pleistocene. Mineral deposits of Southern Africa according to tectonic settings.

SGLE3771: ENVIRONMENTAL & ENGINEERING GEOLOGY I

Module title:	**ENVIRONMENTAL & ENGINEERING GEOLOGY I**
Code:	**SGLE3771**
NQF level:	7
Contact hours:	4 lecture hours per week; 3 practical hours per week
Credits:	16
Module assessment:	Continuous 40%: At least 7 practicals, 2 tests, 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	SMAT 3512 Precalculus; SGLY 3642 Introduction to Geochemistry

Module description (content): Environmental geochemistry; Types of contaminants in natural water resources; anthropogenic sources of Geochemistry of weathering, equilibrium constants and pollution buffering in different rock types. Groundwater pollution. Engineering properties of rocks and rock masses. Geotechnical site investigations in sedimentary, igneous and metamorphic rocks; Soil description for engineering processes; Reservoirs & Dams structures; Slope stability.

SGLY3702: HYDROGEOLOGY I

Module title:	**HYDROGEOLOGY I**
Code:	**SGLY3702**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 5 practicals, 2 tests, 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	SGLY3621 Introduction to Hydrology

Module description (content): Groundwater flow equations & flow net analysis; Piezometers, piezometer nests and potentiometric surface map; Regional groundwater flow systems; Ground recharge mechanisms and estimation techniques (Chloride Mass Balance Method, stable isotope method, Hydrograph analysis technique); Aquifer Hydraulics: Theis Equation; computing drawdown caused by a pumping well; determining aquifer parameters from Time-Drawdown data; slug tests, intersecting pumping cones and well interference; effect of hydrogeologic boundaries; aquifer test design; well loss; well efficiency; well specific capacity & optimum pumping rates.

Solute transport in aquifers: Diffusion; advection; dispersion; retardation; sorption reactions; redox reactions; cation exchange; carbonate dissolution & precipitation reactions. The advection-dispersion equation; mass transport with reaction; first order kinetic reactions; equilibrium sorption reactions.

SGLY3712: STRUCTURAL GEOLOGY I

Module Title:	**STRUCTURAL GEOLOGY I**
Code:	**SGLY 3712**
NQF level:	7
Contact hours:	4 lecture hours per week; 3 practical hours per week..
Credits:	16
Module Assessment:	Continuous 40%: At least 6 practicals; 2-tests and 1 assignment. Examination 60%: One 3 hour theory exam; one 3 hour practical exam.
Pre-requisites:	SGLY3612 Stratigraphy & Geological Mapping and SMAT3612 Calculus II

Module Description: The module will cover the following topics: Analysis of stress:- its components, the stress ellipsoid, examples of stress in the crust and associated structures with different stress regimes.Analysis of Strain:- the strain ellipsoid, inhomogeneous strain, progressive deformation and strain paths, determination of strain in deformed rocks.Material response to Stress:- brittle behaviour, brittle-ductile behaviour, ductile behaviour, classes of material response to stress and strain.Microstructures:- crystal defects, microstructural development at various grades, deformation mechanisms and associated textures.Primary Structures:- bedding, unconformities, sedimentary versus tectonic structuresFolds:- their description, fold systems and orientation, classification and development of folds.Foliations:- axial plane foliations, fracture cleavage, crenulation cleavage, slaty cleavage, schistosity, differential layering, orientation of foliation in response to strain, and transposed foliations. Lineations:- slickenside striae, lineations associated with folds, lineations due to intersection of foliations, mineral lineations, pebbles, boulders and ooids and the origin of lineations.Faults and JointsGeometrical analysis:- scale, style, overprinting and generations, analysis of simple areas, analysis of complex areas.Structural associations.Tectonics.

SGLY3729: IGNEOUS PETROLOGY

Module Title:	**IGNEOUS PETROLOGY**
Code:	**SGLY 3729**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight..
Credits:	8
Module Assessment:	Continuous 40%: At least 5 practicals; 1 test and 1 assignment. Examination 60%: One 2 hour theory exam; one 2 hour practical Exam.
Pre-requisites:	SGLY3652 Introduction to Petrology

Module Description: Nature and scope of petrology; Classification of rocks; Rocks and Earth Structures. The Igneous Rocks: Structures and textures; Chemistry, mineralogy and classification. The Phase rule and Phase diagrams. Petrogenesis, movement and modification of magmas. Common igneous rocks: basalts; rhyolites, andesites, granites, granodiorites, alkaline rocks and carbonatites.

SGLY3742: METAMORPHIC PETROLOGY

Module Title:	**METAMORPHIC PETROLOGY**
Code:	**SGLY 3742**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight..
Credits:	8
Module Assessment:	Continuous 40%: At least 6 practicals; 2 tests and 1 assignment. Examination 60%: One 2 hour theory exam; one 2 hour practical Exam.
Pre-requisites:	SGLY3652 Introduction to Petrology

Module Description: Basics of metamorphism:- grade, metamorphic zones and facies, Pressure-Temperature depth time paths, types of metamorphism and the geothermal and geobaric gradients. Study progressive metamorphism of pelites and basic rocks for the greenschist, amphibolite, granulite and eclogite facies.Fundamental relations of thermodynamics, producing P-T paths from mineral assemblages; The use of the petrogenetic grid Calculation of AFM and ACF diagrams Calculation of Mineral formulas. Examination of the Duhem theorem and facies concept, activities and mixing, Gibbs Free Energy

SGLY3749: EXPLORATION GEOCHEMISTRY AND GEOSTATISTICS

Module title:	**Exploration Geochemistry and Geostatistics**
Code:	**SGLY3749**
NQF level:	7
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module assessment:	Continuous 40%: At least 7 practicals; 2 tests and 1 assignment. Examination 60%: One 3 hour exam paper.
Prerequisites:	SGLY3642 Introduction to Geochemistry

Module description: Exploration geochemistry: primary and secondary dispersion aureoles and anomalies; geochemical sampling, analysis and interpretation; geochemical patterns of mineral deposits. Geostatistics and geostatistical methods of ore reserve estimation. Laws of distribution for ore deposits; Kriging and error estimation. The module will only cover Linear Geostatistics at this level. Case studies of various deposit types.

SGLY3762: RESEARCH METHODOLOGY

Module Title: **RESEARCH METHODOLOGY**
Code: **SGLY 3762**
NQF level: 7
Contact hours: 2 lecture hours per week; 3 practical hours per fortnight.
Credits: 8
Module Assessment: Continuous 100% : 5 assessed assignments, 1 test.
Examination: Not applicable
Pre-requisites: None
Module Description: Overview of research. Ethics of research. The scientific method: logic and the scientific, natural observations, formulation of hypothesis, predictions. Types of hypotheses. Summary statistics: measures of central tendency, measures of dispersion. Statistical significance, Testing hypotheses. Experimental (research stydy/project) design. Data collection, Documenting research data and other records. Presentation of data in scientific reports/theses/dissertation. Scientific writing, Plagiarism, Finding and using literature references, Citation of references. Writing a literature review. Report writing. Giving a good oral presentation (including use of powerpoint).

FOURTH YEAR MODULES

SGLY3800: FIELD GEOLOGY III

Module Title: **Field Geology III**
Code: **SGLY 3800**
NQF level: 8
Contact hours: 4 weeks of field mapping; logging; geochemical sampling in any given area of Namibia or neighbouring country.
Credits: 2
Module Assessment: Continuous 100%: Field note books, field reports and field trip participation.
Pre-requisites: SGLY3700 Field Geology II
Co-requisite: SGLY3810 Research Project
Module Description: Introduction to field Mapping Techniques, horizontal and dipping strata; deformed and foliated rocks; igneous bodies, extrusive and intrusive; complexly folded areas; excursions; mine visits; geochemical sampling. During the year, a student may be attached to mining company; exploration firm; geochemical firm; hydrogeological firm; engineering geology company and/or environmental firm with a bias towards metal pollution mitigation as part of the requirements for the Project.

SGLE3801: ENVIRONMENTAL & ENGINEERING GEOLOGY II*

Module title: **ENVIRONMENTAL & ENGINEERING GEOLOGY II**
Code: **SGLE3801**
NQF level: 8
Contact hours: 2 hrs lectures per week (14 weeks) & 1x3 hours practical per week for 7 weeks
Credits: 8
Module assessment: Continuous 40%: At least 5 practicals, 2 tests, 1 assignment.
Examination 60%: One 3 hour exam paper.
Prerequisites: SGLE 3771 Environmental & Engineering Geology I
Module description (content): Stress distribution and elastic theory; soil mechanics; analysis of rock slopes; excavation methods and design; control, maintenance and protection of rock slopes; the influence of groundwater and weathering on rock slope stability. Standard practice in Site Investigation. Engineering solutions to construction problems arising from ground conditions (soils and rocks). Earth materials in relation to engineering; ground engineering problems including ground improvement, mining settlement; foundation engineering; retaining structures; groundwater control . Assessment of contaminated land and water; risk assessment and the legal framework; reclamation and remediation of contaminated sites; the nature of contaminants; ground improvement methods and risk-based strategies for land reclamation and containment of pollutants; potential environmental effects of landfill waste disposal; Pollution associated with metalliferous deposits, acid mine drainage and its remediation, pollution associated with gold deposits, dangers and its remediation, pollution associated with industrial pollutants of petroleum origin and its remediation. Environmental Impact Assessment, including the aims and objectives of EIA, design and implementation of EIA, screening and scooping, impact prediction and mitigation.

SGLY3801: INDUSTRIAL MINERALS AND GEMSTONES*

Module Title: **INDUSTRIAL MINERALS AND GEMSTONES**
Code: **SGLY 3801**
NQF level: 8
Contact hours: 2 lecture hours per week; 3 practical hours per fortnight..
Credits: 8
Module Assessment: Continuous 40%: At least 6 practicals; 2-tests and 1 assignment.
Examination 60%: One 3 hour exam paper.
Pre-requisites: SGLY3641 Earth Resources
Module Description: The module will cover two parts; first industrial minerals, the second gemstones. Under industrial minerals the following topics will be covered: Importance of Industrial Minerals; Standard of living Index as determined by industrial minerals usage; aggregates and construction materials; cement and concrete; glass; gypsum; fluorite; clays in general; kaolinite; smectites and montmorrilonites; evaporates; graphite; sillimanite; kyanite; andalusite; limestone and dolomite; magnesite and magnesia; olivine; perlite; phosphates; asbestos; abrasives; nepheline syenite; slate; wollastonite.
The second part will be gemstones: Introduction to gemstones; host rocks and processes of formation; the economics and valuing of gemstones; gem mining; gem cutting; megagems; precious gemstones: diamonds; sapphires; emerald; aquamarines; Semi-precious stones.

SGLY3810: RESEARCH PROJECT

Module Title:	**Research Project**
Code:	**SGLY3810**
NQF level:	8
Contact hours:	Independent Research and Mapping Project by the student, under close supervision from the Lecturer. The lecturer will require an average of one hour contact per week and one week supervision in the field.
Credits:	32
Module Assessment:	Continuous 100%: Report 60%, Presentation 15%, Oral Exam 25%
Pre-requisites:	SGLY3711 Mineralogy, SGLY3712 Structural Geology, and SGLY 3762 Research Methodology.
Co-requisite:	SGLY3800 Field Geology III

Module Description: The module will be based on a research topic chosen by a student in the previous year. The field work will be compulsory, and one of the products in the project will normally be production of a geological map and cross-section.

SGLY3821: IGNEOUS PETROGENESIS

Module title:	**IGNEOUS PETROGENESIS**
Code:	**SGLY3821**
NQF level:	8
Contact hours:	2 lecture hours per week for 14 weeks; 1x3 hour practical session per fortnight for 14 weeks
Credits:	8
Module assessment:	Continuous 40%: At least 7 practicals; 2 test and 2 assignment Examination 60%: 2 hour theory and 2 hour practical papers.
Prerequisites:	SGLY3722 Igneous Petrology

Module description: Magmas, magmatism and global tectonic processes. Igneous rocks as petrogenetic indicators. Partial melting processes: primary magma, fractionation, fractional crystallization, convection and mixing, crustal contamination. Magmatism within plates and at plate boundaries. Palaeotectonic settings.

SGLY3831: ECONOMIC GEOLOGY

Module title:	**ECONOMIC GEOLOGY**
Code:	**SGLY3831**
NQF level:	8
Contact hours:	4 lecture hours per week; 3 practical hours per week
Credits:	16
Module assessment:	Continuous 40%: At least 7 practicals; 2 tests and 2 assignment. Examination 60%: One 3 hour theory paper and one 3 hour practical paper.
Prerequisites:	SGLY3711 Mineralogy and SGLY3721 Plate Tectonics

Module 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. Petroleum: origin, exploration and production. Geopolitical effects of mineral resources and petroleum. Metallogeny: mineral provinces, epochs, and plate tectonic controls.

SGLY3841: METAMORPHIC PETROGENESIS

Module Title:	**METAMORPHIC PETROGENESIS**
Code:	**SGLY 3841**
NQF level:	8
Contact hours:	2 lecture hours per week for 14 weeks; 1-3hour practical session per fortnight for 14 weeks.
Credits:	8
Module Assessment:	Continuous 40%: At least 6 practicals; 2-tests and 1 assignment. Examination: 60%: One 2 hour theory exam; one 2 hour practical Exam.
Pre-requisites:	SGLY3742 Metamorphic Petrology

Module Description: Mineral chemistry and mineral sites; exchange vectors and P-T-d relationships. Chemical thermodynamics:- equilibrium in metamorphic systems, species, phases, components, kinetics, state variables and their transformation, Fundamental relations of thermodynamics.Examination of the Duhem theorem and facies concept, activities and mixing, Gibbs Free Energy, Enthalpy and Equilibrium constant. Thermogeobarometry. Metamorphic reactions:- in basic rocks, pelites and in carbonates. The facies concept, the AFM diagram, ACF diagram, the X-CO2 diagram for carbonates, μ-μ diagrams for mineral assemblages and the petrogenetic grid. Mineral chemistry and geothermobarometry.

- Upper Amphibolite facies, Eclogite facies; Granulite facies; blue schist facies and metamorphism of hydrothermally altered rocks.
- Metamorphism, tectonics and pressure-temperature-time-depth paths.
- Heat flow in the crust.

SGLY3812: HYDROGEOLOGY II

Module title:	**HYDROGEOLOGY II**
Code:	**SGLY3812**
NQF level:	8
Contact hours:	4 hrs lectures per week & 1x3 hours practical per week for 14 weeks
Credits:	16
Module assessment:	Continuous 40% - At least 7 practicals, 2 tests, 1 assignment. Examination 60% - 1x 3 hrs theory paper, 1 x 3hrs practical paper
Prerequisites:	SGLY3702 Hydrogeology I

Module description (content): Groundwater flow modelling: Types of groundwater flow models; governing equations, numerical & analytical techniques, conceptual model design, boundary conditions; initial conditions; steady state & transient simulations; model calibration; sensitivity analysis; predictive modelling; finite difference & finite element models, different types of computer codes; Introduction to modelling with MODFLOW. Groundwater age dating: Carbon-14 method; tritium method; chlorine-36 method; Chlorofluorocarbons; oxygen-18 and deuterium. Contaminant hydrogeology: contaminant plumes; field tracer tests; multiphase fluid systems. Groundwater and ore deposits: Roll-front uranium deposits, lead-zinc deposits, saline soils & evaporates. Groundwater Exploration, development & management: Groundwater resource evaluation, groundwater budgets, conjunctive use groundwater & surface water. Groundwater pollution processes.

SGLY3832: EXPLORATION GEOLOGY AND GEOPHYSICS

Module title:	**EXPLORATION GEOLOGY AND GEOPHYSICS**
Code:	**SGLY3832**
NQF level:	8
Contact hours:	4 lecture hours per week for 14 weeks; 1x3 hour practical session per week for 14 weeks
Credits:	16
Module assessment:	Continuous 40%: At least 7 practicals; 2 test and 2 assignment Examination 60%: One 3 hour theory exam; one 3 hour practical exam.
Prerequisites:	SGLY3712 Structural Geology I and SGLY3742 Exploration geochemistry and geostatistics

Module description: Exploration techniques: Geological mapping and prospecting. Application of photogeology and remote sensing in mineral exploration. Deep sampling methods: pitting and trenching, auger drilling, hand-held percussion drills, Wagon and Banka drilling; .Mineral resource evaluation and ore reserve estimation using conventional methods. Exploration geophysics: principles and applications of seismic, magnetic, gravity, resistivity, electromagnetic induced polarization and radiometric techniques.

SGLY3852: REMOTE SENSING AND GIS

Module Title:	**REMOTE SENSING AND GIS**
Code:	**SGLY 3852**
NQF level:	8
Contact hours:	4 lecture hours per week; 3 practical hours per week.
Credits:	16
Module Assessment:	Continuous Assessment 40%: At least 6 practicals; 2-tests and 1 assignment. Examination 60%: One 3 hour theory exam; one 3 hour practical Exam.
Pre-requisites:	SGLY3712 Structural Geology I

Module Description: This module will cover the following themes: The Electromagnetic spectrum .Remote sensing systems, how they function and life times. .Data acquisition and storage on Remote Sensing Systems. Interpretation of Remote Sensing Images . Image Processing and filtering.Photogeology-interpretation and analysis. Applications of Remote Sensing in Earth and Atmospheric sciences .GIS platforms. Digital mapping techniques. Image analysis using GIS and modeling with GIS.

SGLY3862: STRUCTURAL GEOLOGY II

Module Title:	**STRUCTURAL GEOLOGY II**
Code:	**SGLY 3862**
NQF level:	8
Contact hours:	2 lecture hours per week; 3 practical hours per fortnight.
Credits:	8
Module Assessment:	Continuous 40%: At least 6 practicals; 1 test and 1 assignment. Examination 60%: One 3 hour exam paper.
Pre-requisites:	SGLY3712 Structural Geology I

Module Description: The module will cover the following topics: Microstructures and microtectonics: Advanced analysis of stress:- its components, the stress ellipsoid, examples of stress in the crust and associated structures with different stress regimes.Further topics in Strain analysis:- the strain ellipsoid, inhomogeneous strain, progressive deformation and strain paths, determination of strain in deformed rocks. Cross-section balancing for regions and smaller areas.Construction of block diagrams; depth to detachment and regional shortening calculations; uplift rates, continents and super continents, cycles of the Earths' magnetic field . Advanced geometrical analysis and stereographic projections for boreholes: scale, style, overprinting and generations, analysis of simple areas, analysis of complex areas.
Heat flow in the earths' interior. Geochronology as applied to deformation and crustal evolution

*

GEOLOGY DEPARTMENT: COURSE EQUIVALENTS

OLD CURRICULUM MODULES FAILED	NEW CURRICULUM MODULES TO BE TAKEN
GLY 3211 Physical Geology	SGLY 3521 Physical Geology and Surface Processes
GLY 3202 Crystallography	SGLY 3632 Crystallography & Mineral Chemistry
GLY 3212 Stratigraphy & Geological Mapping	SGLY 3612 Stratigraphy & Geological Mapping
GLY 3200 Field Geology I	SGLY 3600 Field Geology I
GLY 3301 Mineralogy	SGLY 3711 Mineralogy
GLY 3331 Sedimentology and Paleontology	SGLY 3731 Sedimentology and Paleontology
GLY 3341 Principles of Geochemistry	SGLY 3672 Introduction to Geochemistry
GLY 3302 Petrology	SGLY 3652 Introduction to Petrology
GLY 3322 Plate Tectonics	SGLY 3721 Plate Tectonics
GLY 3332 Structural Geology	SGLY 3732 Structural Geology I
GLY 3300 Field Geology II	SGLY 3700 Field Geology II
GLY 3411 Igneous & Metamorphic Petrogenesis	SGLY 3729 Igneous Petrology & SGLY 3742 Metamorphic Petrology
GLY 3431 Economic Geology	SGLY 3831 Economic Geology
GLY 3432 Exploration Geology & Geophysics	SGLY 3839 Exploration Geology & Geophysics
GLY 3422 Hydrogeology	SGLY 3702 Hydrogeology I
GLY 3402 Remote Sensing & GIS	SGLY 3852 Remote Sensing and GIS
GLY 3400 Field Geology III	SGLY 3800 Field Geology III

H. DEPARTMENT OF MATHEMATICS

Here are our Departmental Regulations:

- All students must have a Scientific Calculator. Any non-programmable Scientific Calculator may be used.
- In addition to the Unam regulations on Examination qualification, students must attend at least 80% of the tutorial session to qualify for the Examination of that particular module.
- The contribution of the CA mark and the Examination mark toward the final mark is 50:50.

H.1. MATHEMATICS MAJOR

H.1.1. B.SC. MATHEMATICS: MAJOR AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc.Mathematics Major and Statistics Minor (11BMAS)

Students opting for a major in Mathematics and Statistics minor must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC 3509	University entry requirements
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	Faculty Entry Requirements
	Statistics Minor:		
1	Descriptive Statistics	SSTS 3531	Faculty Entry Requirements
1	Programming Fundamentals I	SCMP 3511	Departmental Entry Test
1	Fundamentals of Digital Electronics	SCMP 3531	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Precalculus	SMAT 3512	Faculty Entry Requirements
2	Introduction to Probability	SSTS3532	Faculty entry requirements
	Statistics Minor:		
2	Programming Fundamentals II	SCMP 3512	SCMP3511 Programming Fundamentals I

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Calculus I	SMAT 3611	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
1	Sets and Numbers	SMAT 3601	Any two following modules: SMAT3511, SMAT3531, SMAT3512
1	Numerical Methods	SMAT 3621	Any two following modules: SMAT3511 , SMAT3531, SMAT3512
	Statistics Minor:		
1	Probability Theory	SSTS 3611	SSTS 3532 and SMAT 3512
1	Statistical Estimation	SSTS 3631	SSTS3532
1	Software Engineering I	SCMP 3641	SCMP3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Calculus II	SMAT 3612	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Ordinary Differential Equations	SMAT 3642	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Elementary Linear Algebra	SMAT 3652	Any two following modules: SMAT3511, SMAT3531, SMAT3512
	Statistics Minor:		
2	Statistical Inference	SSTS 3632	SSTS 3532
2	Introduction to Statistical Computing	SSTS 3612	SSTS 3531

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Real Analysis I	SMAT 3731	[SMAT 3611 or SMAT 3612] and SMAT 3601
1	Linear Algebra I	SMAT 3711	SMAT 3601 and SMAT 3652
1	Numerical Analysis I	SMAT 3701	[SMAT 3611 and SMAT 3621] or [SMAT 3612 and SMAT 3621]
1	Set Theory	SMAT 3721	SMAT 3601
1	Partial Differential Equations	SMAT 3741	[SMAT 3611 or SMAT 3612], SMAT 3621 and SMAT 3642
	Statistic Minor:		
1	Sampling Techniques	SSTS 3731	SSTS 3531
1	Distribution Theory	SSTS 3721	SSTS 3611, SMAT 3611 and SMAT 3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Real Analysis II	SMAT 3732	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Linear Algebra II	SMAT 3712	SMAT 3601 and SMAT 3652
2	Vector Analysis	SMAT 3622	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Number Theory	SMAT 3722	SMAT 3601
	Statistics Minor:		
2	Nonparametric and Categorical Data Analysis	SSTS 3712	SSTS 3632

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	SMAT 3810	All Mathematics modules up to third year
1	General Topology	SMAT 3811	SMAT 3731 or SMAT 3732
1	Algebra	SMAT 3831	SMAT 3711 or SMAT 3712
1	Complex Analysis I	SMAT 3851	SMAT 3731 or SMAT 3732

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Research Project	SMAT 3810	All Mathematics modules up to third year
2	Normed Vector Spaces	SMAT 3822	[SMAT 3731 or SMAT 3712] and [SMAT 3711 or SMAT 3712]
2	Category Theory	SMAT 3802	All Mathematics modules up to third year
2	Numerical Analysis II	SMAT 3832	SMAT 3611, SMAT 3612 and SMAT 3701
	Complex Analysis II	SMAT 3852	SMAT 3731 or SMAT 3732

QUALIFICATION: B.Sc.Mathematics Major and Computer Science Minor Minor (11BMAC)

Students opting for a major in Mathematics and Computer Science must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC 3509	University entry requirements
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	Faculty Entry Requirements
	Computer Science Minor:		
1	Programming Fundamentals I	SCMP 3511	Departmental Entry Test
1	Fundamentals of Digital Electronics	SCMP 3531	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Precalculus	SMAT 3512	Faculty Entry Requirements
2	Introduction to Probability	SSTS3532	Faculty entry requirements
	Computer Science Minor:		
2	Programming Fundamentals II	SCMP 3512	SCMP3511 Programming Fundamentals I
2	Computer Organization	SCMP 3532	Departmental Entry Test

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Calculus I	SMAT 3611	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
1	Sets and Numbers	SMAT 3601	Any two following modules: SMAT3511, SMAT3531, SMAT3512
1	Numerical Methods	SMAT 3621	Any two following modules: SMAT3511 , SMAT3531, SMAT3512
	Computer Science Minor:		
1	Introduction to Database Systems	SCMP 3611	SCMP3532 and SCMP 3511
1	Object Oriented Programming	SCMP 3631	SCMP 3511
1	Software Engineering I	SCMP 3641	SCMP 3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Calculus II	SMAT 3622	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Ordinary Differential Equations	SMAT 3642	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Elementary Linear Algebra	SMAT 3652	Any two following modules: SMAT3511, SMAT3531, SMAT3512
	Computer Science Minor:		
2	Data Structure and Algorithms	SCMP 3612	SCMP3631
2	Foundations of Data Communications	SCMP 3632	SCMP 3532 Computer Organization

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Real Analysis I	SMAT 3731	[SMAT 3611 or SMAT 3612] and SMAT 3601
1	Linear Algebra I	SMAT 3711	SMAT 3601 and SMAT 3652
1	Numerical Analysis I	SMAT 3701	[SMAT 3611 and SMAT 3621] or [SMAT 3612 and SMAT 3621]
1	Set Theory	SMAT 3721	SMAT 3601
1	Partial Differential Equations	SMAT 3741	[SMAT 3611 or SMAT 3612], SMAT 3621 and SMAT 3642
	Computer Science Minor:		
1	Artificial Intelligence	SCMP 3771	SCMP 3511 Programming Fundamentals I

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Real Analysis II	SMAT 3732	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Linear Algebra II	SMAT 3712	SMAT 3601 and SMAT 3652
2	Vector Analysis	SMAT 3622	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Number Theory	SMAT 3722	SMAT 3601
	Computer Science Minor:		
2	Operating Systems	SCMP 3712	SCMP 3532 or SCMP 3612

2	Advanced Databases	SCMP 3622	SCMP3611

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	SMAT 3810	All Mathematics modules up to third year
1	General Topology	SMAT 3811	SMAT 3731 or SMAT 3732
1	Algebra	SMAT 3831	SMAT 3711 or SMAT 3712
1	Complex Analysis I	SMAT 3851	SMAT 3731 or SMAT 3732

QUALIFICATION: B.Sc.Mathematics Major and Physics Minor (11BMAP)

Students opting for a major in Mathematics and minor in Physics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Computer Literacy	UCLC 3509	University entry requirements
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	Faculty Entry Requirements
1	Descriptive Statistics	SSTS 3531	Faculty Entry Requirements
	Physics Minor:		
1	Physics for Physical Sciences I	SPHY3511	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Precalculus	SMAT 3512	Faculty Entry Requirements
2	Introduction to Probability	SSTS3532	Faculty entry requirements
	Physics Minor:		
2	Physics for Physical Science II	SPHY3512	Departmental Entry Test

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Calculus I	SMAT 3611	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
1	Sets and Numbers	SMAT 3601	Any two following modules: SMAT3511, SMAT3531, SMAT3512
1	Numerical Methods	SMAT 3621	Any two following modules: SMAT3511 , SMAT3531, SMAT3512
1	Probability Theory	SSTS 3611	SSTS3532 and SMAT 3512
	Physics Minor:		
1	Waves and Optics	SPHY3631	SPHY3511 and SPHY3512
1	Classical Mechanics	SPHY 3611	SMAT3512, SPHY3511 and SMAT 3511

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Calculus II	SMAT 3622	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Ordinary Differential Equations	SMAT 3642	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Elementary Linear Algebra	SMAT 3652	Any two following modules: SMAT3511, SMAT3531, SMAT3512
	Physics Minor:		
2	Electromagnetism	SPHY3612	SMAT3511, SMAT3512 and SPHY3512
2	Modern Physics I	SPHY3602	SMAT3511, SMAT3512, SPHY3511 and SPHY3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Real Analysis I	SMAT 3731	[SMAT 3611 or SMAT 3612] and SMAT 3601
1	Linear Algebra I	SMAT 3711	SMAT 3601 and SMAT 3652
1	Numerical Analysis I	SMAT 3701	[SMAT 3611 and SMAT 3621] or [SMAT 3612 and SMAT 3621]
1	Set Theory	SMAT 3721	SMAT 3601
1	Partial Differential Equations	SMAT 3741	[SMAT 3611 or SMAT 3612], SMAT 3621 and SMAT 3642
	Physics Minor:		
1	Electrodynamics	SPHY 3711	SMAT 3612 and SPHY 3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Real Analysis II	SMAT 3732	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Linear Algebra II	SMAT 3712	SMAT 3601 and SMAT 3652
2	Vector Analysis	SMAT 3622	[SMAT 3611 or SMAT 3612] and SMAT 3601
2	Number Theory	SMAT 3722	SMAT 3601
	Physics Minor:		
2	Theoretical Mechanics	SPHY 3712	SPHY 3611, SMAT 3621, SMAT 3642 and SMAT 3652
2	Electronics I	SPHY 3702	SPHY 3512

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Research Project	SMAT 3810	All Mathematics modules up to third year
1	General Topology	SMAT 3811	SMAT 3731 or SMAT 3732
1	Algebra	SMAT 3831	SMAT 3711 or SMAT 3712
1	Complex Analysis I	SMAT 3851	SMAT 3731 or SMAT 3732

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Research Project	SMAT 3810	All Mathematics modules up to third year
2	Normed Vector Spaces	SMAT 3822	[SMAT 3731 or SMAT 3712] and [SMAT 3711 or SMAT 3712]
2	Category Theory	SMAT 3802	All Mathematics modules up to third year
2	Numerical Analysis II	SMAT 3832	SMAT 3611, SMAT 3612 and SMAT 3701
2	Complex Analysis II	SMAT 3852	SMAT 3731 or SMAT 3732

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Research Project	SMAT 3810	All Mathematics modules up to third year
2	Normed Vector Spaces	SMAT 3822	[SMAT 3731 or SMAT 3712] and [SMAT 3711 or SMAT 3712]
2	Category Theory	SMAT 3802	All Mathematics modules up to third year
2	Numerical Analysis II	SMAT 3832	SMAT 3611, SMAT 3612 and SMAT 3701
2	Complex Analysis II	SMAT 3852	SMAT 3731 or SMAT 3732

H.1.2. B.SC.MATHEMATICS CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES:

SMAT 3511: BASIC MATHEMATICS

Module name: **BASIC MATHEMATICS**
Code: **SMAT 3511**
NQF level: 5
Contact hours: 4 lectures per week for 14 weeks
2 tutorials per week for 14 weeks
Credits: 16
Assessment: Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite: Faculty Entry Requirements
Module description: Sets: notations and diagrams to represent sets, subset, empty set, equality of sets, intersection, union, complement. Algebraic expressions simplification, expansion, polynomials, remainder and factor theorem, partial fractions. Trigonometry: trigonometric functions, basic trigonometric identities. The absolute value, linear equations, linear inequalities, quadratic equations, quadratic inequalities. Functions: domain, codomain, image, preimage, even function, odd function. Sequences: the geometric sequence, the arithmetic sequence. The Binomial Theorem.

SMAT 3531: ANALYTIC GEOMETRY, COMPLEX NUMBERS AND MATRICES

Module name: **ANALYTIC GEOMETRY, COMPLEX NUMBERS AND MATRICES**
Code: **SMAT 3531**
NQF level: 5
Contact hours: 4 lectures per week for 14 weeks
2 tutorials per week for 14 weeks
Credits: 16
Assessment: Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite: Faculty Entry Requirements
Module description: Points and lines in a plane: the distance formula, the triangle inequality, parallel and perpendicular lines, circles and tangent lines. Conic sections: ellipse, parabola, hyperbola. Vectors in two and three dimensions: addition of vectors, multiplication by a scalar, magnitude, dot product, cross product. Matrices: addition, multiplication, scalar multiplication and transpose (for up to 3×3 dimension), determinant and inverse (with emphasis on 2 × 2), solutions of systems of linear equations by Cramer's rule (for 2 × 2), and by Gaussian elimination method (for up to 3 × 3

matrices). Complex numbers: operations on complex numbers, the complex conjugate, Argand diagram, modulus-argument form, de Moivre's formula, fundamental theorem of algebra.

SMAT 3512: PRECALCULUS

Module name:	**PRECALCULUS**
Code:	**SMAT 3512**
NQF level:	5
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Faculty Entry Requirements

Module description: Functions: one-to-one and onto functions, horizontal line test, composition of functions, inverse of a function. Introduction to exponential and logarithmic functions. Limit of a function: definition, left and right limits, improper limits, continuity in terms of limits. Differentiation: rate of change, derivative of a function, rules of differentiation, increasing and decreasing functions and graph sketching. Integration: antiderivatives, the definite integral, area under a graph. Trigonometry: area of a sector and segment of a circle, further trigonometric identities, trigonometric equations, derivatives and integrals of trigonometric functions.

SECOND YEAR MODULES

SMAT 3601: SETS AND NUMBERS

Module name:	**SETS AND NUMBERS**
Code:	**SMAT 3601**
NQF level:	6
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	Any two of the following three modules: Basic Mathematics (**SMAT3511**), Analytic Geometry, Complex Numbers and Matrices (**SMAT 3531**), Precalculus (**SMAT 3512**).

Module description: Basic logic: propositions and predicates conjunction, disjunction, negation, implication, contrapositive, equivalence. Methods of proof: direct, contrapositive, contradiction, induction. Sets: symmetric difference of two sets, de Morgan's laws, power set, partition, cartesian product, definition of a binary relation, functions as binary relations, preorder. Real numbers: natural numbers, integers, positional number systems, induction.

SMAT 3611: CALCULUS I

Module name:	**CALCULUS I**
Code:	**SMAT 3611**
NQF level:	6
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	[**SMAT 3511**(Basic Mathematics) and **SMAT 3512** (Precalculus)] OR [**SMAT 3531**(Analytic Geometry, Complex Numbers and Matrices)

Module description: Limits and continuity of functions: limit at a point, improper limit, continuity. Derivatives: definition, rules of differentiation, chain rule, derivatives of higher order, derivative of the inverse function, Arc functions (inverse trigonometric functions), hyperbolic functions, area functions (inverse hyperbolic functions). Exponential and logarithmic functions. Some applications of the exponential functions: growth and decay, Rolle's Theorem, Mean Value theorem. Applications of the derivative: l'Hˆospital's rule, related rates, concavity. Integration: antiderivatives, integration by substitution, the fundamental theorem of calculus, area of a region bounded by graphs.

SMAT 3652: ELEMENTARY LINEAR ALGEBRA

Module name:	**ELEMENTARY LINEAR ALGEBRA**
Code:	**SMAT 3652**
NQF level:	6
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Any two of the following three modules: Basic Mathematics (**SMAT3511**), Analytic Geometry, Complex Numbers and Matrices **(SMAT 3531),** Precalculus (**SMAT 3512).**

Module description: Matrices: determinant, inverse and Cramer's rule (for up to 3 × 3 dimension), eigenvalues and eigenvectors, adjoint, symmetric and skew-symmetric matrices, orthogonal matrices. Linear algebra in R^2, R^3 and R^n: subspace, linear combination, linearly independent and linearly dependent vectors, span, basis, dimension. Points, lines, planes and hyperplanes in R^2, R^3 and R^n. orthogonality, angle.

SMAT 3612 CALCULUS II

Module name:	**CALCULUS II**
Code:	**SMAT 3612**
NQF level:	6
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	**[SMAT3511**(Basic Mathematics) and **SMAT3512** (Precalculus)] or **[SMAT3531**(Analytic Geometry, Complex Numbers and Matrices) and **SMAT 3512** (Precalculus)]

Module description: Integration: Riemann sums, approximations of the Riemann integral using the trapezoidal rule and Simpson's rule. Integration techniques: integration by parts, integration of rational functions. Improper integrals, Applications of the Riemann integral: volume of a solid of revolution, arc length, surface of revolution. Partial differentiation, chain rule, directional derivative. Classification of critical points for two-variable functions, Sequences and series of numbers: the limit of a sequence, absolutely convergent series, tests of convergence. Power series: radius of convergence, interval of convergence, Taylor series, binomial theorem. Double integration, iteration, use of polar coordinates, application of double integration to finding area and volume.

SMAT 3621 NUMERICAL METHODS

Module name:	**NUMERICAL METHODS**
Code:	**SMAT 3621**
NQF level:	6
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	Any two of the following three modules: **SMAT3511** (Basic Mathematics), **SMAT 3531**(Analytic Geometry, Complex Numbers and Matrices), **SMAT3512** (Precalculus)

Module description: Basics Of MATLAB: arithmetic, decision, functions, graphs (2-3) dimension. Vector (Array) and Matrix Operations: arithmetic, inverse, determinant, Leslie. Limit of Function: limit, sequence, recurrence relation. Processes: discrete, continuous, and stochastic. Differentiation: Euler, difference methods (linear first and second order). Integration: trapezium, midpoint and Simpson.

SMAT 3642 ORDINARY DIFFERENTIAL EQUATIONS

Module name:	**ORDINARY DIFFERENTIAL EQUATIONS**
Code:	**SMAT 3642**
NQF level:	6
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	**[SMAT3511** (Basic Mathematics) and **SMAT3512** (Precalculus)] OR **[SMAT3531** (Analytic Geometry, Complex Numbers and Matrices) and **SMAT3512** (Precalculus)]

Module 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 undetermined 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, homogeneous linear system with constant coefficients, nonhomogeneous linear systems.

THIRD YEAR MODULES

SMAT 3741 PARTIAL DIFFERENTIAL EQUATIONS

Module name:	**PARTIAL DIFFERENTIAL EQUATIONS**
Code:	**SMAT 3741**
NQF level:	7
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	SMAT 3621 (Numerical Methods), SMAT 3642 (Ordinary Differential Equations) and at least one of the following modules [SMAT 3611 (Calculus I) or SMAT 3612 (Calculus II)]

Module description: First order equations: basic properties of the linear equations, solutions of linear equations, the general first order nonlinear equation, applications. Linear second order equations in two independent variables: classification of linear second order equations into parabolic, hyperbolic and elliptic equations. Separation of variables. Examples: the one–dimensional wave equation, the vibrating string, boundary conditions associated with the wave equation.

SMAT 3731: REAL ANALYSIS I

Module name:	**REAL ANALYSIS I**
Code:	**SMAT 3731**
NQF level:	7
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Calculus I (**SMAT 3611**) and Sets and numbers (**SMAT 3601**)] or [Calculus II (**SMAT 3612**), and Sets and numbers (**SMAT 3601)]**

Module description: The real numbers: upper and lower bounds of a set, supremum and infimum, completeness property of R, Archimedean property of R, intervals. Sequences and series of real numbers: bounded sequences, monotonic sequences, the limit of a sequence, limit rules, subsequences, theorem of Bolzano–Weierstrass, Cauchy sequences, completeness of R, convergent and absolutely convergent series, convergence tests. The limit of a function at a point, limit rules, continuous functions, intermediate value theorem, maximum–minimum theorem, uniform continuity. Differentiation: definition of differentiability, rules of differentiation, mean value theorem, theorem of Taylor.

SMAT 3701 NUMERICAL ANALYSIS I

Module name:	**NUMERICAL ANALYSIS I**
Code:	**SMAT 3701**
NQF level:	7
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	[**SMAT 3611** (Calculus I) and **SMAT 3621** (Numerical Methods)] or [**SMAT 3612** (Calculus II) and SMAT 3621 (Numerical Methods)]

Module description: Computer arithmetic: binary numbers, floating–point arithmetic, the various kinds of errors, propagation of errors. Solving of non- linear equations. Systems of linear equations: Gauss and Gauss–Jordan algorithm, LU decomposition, the condition of a matrix and error estimation. Iterative methods for non - linear systems: Jacobi iteration, Convergence Near Fixed Points, Seidel iteration, error analysis. Interpolation and curve fitting.

SMAT 3721: SET THEORY

Module name:	**SET THEORY**
Code:	**SMAT 3721**
NQF level:	7
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601)

Module description: Ordered pairs and the product of two sets. Functions: definition of a function as a set of ordered pairs, images and preimages, injective, surjective and bijective functions, families of sets, Axiom of Choice. Binary relations: equivalence relations, equivalence classes, transversals, order relations, upper and lower bounds, greatest and least elements, maximal and minimal elements, Zorn's Lemma. Equipotent sets: countable sets, product of two countable sets, countability of Q, uncountability of R.

SMAT 3711: LINEAR ALGEBRA I

Module name:	**LINEAR ALGEBRA I**
Code:	**SMAT 3711**
NQF level:	7
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601), Elementary Linear Algebra (SMAT 3652)

Module description: Vector spaces: definition and examples, subspaces, operations on subspaces, span of a set of vectors, complement of a subspace, Dedekind's law, linearly independent set of vectors, basis and dimension, dimension formula for subspaces. Linear mappings: image and preimage of a subspace, kernel, image, rank and defect, isomorphism, coset, factor space, homomorphism theorem, dimension formula for linear mappings, linear form, the dual.

SMAT 3732: REAL ANALYSIS II

Module name:	**REAL ANALYSIS II**
Code:	**SMAT 3732**
NQF level:	7
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601) and at least one of the modules Calculus I (SMAT 3611) and Calculus II (SMAT 3612)

Module description: The Riemann integral: upper and lower Darbaux sums, Riemann integrability, rules of integration, the fundamental theorem of calculus, Lebesque's theorem on Riemann integrability. The Euclidean metric of R^n. neighborhoods, open and closed subsets, limit of a sequence, theorem of Bolzano–Weierstrass, completeness of R^n.The limit of a function at a point, limit rules, continuous functions. Partial differentiation: gradient, divergence, curl, partial derivatives of higher order. Differentiability of vector-valued functions of several variables: Jacobi matrix, C^1 – functions, chain rule.

SMAT 3622: VECTOR ANALYSIS

Module name:	**VECTOR ANALYSIS**
Code:	**SMAT 3622**
NQF level:	6
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601) and at least one of the modules Calculus I (SMAT 3611) and Calculus II (SMAT 3612)

Module description: Vector fields, Line, surface and volume integrals, parametric representation of surfaces, Green's theorem, Stokes theorem, Divergence theorem, applications.

SMAT 3722: NUMBER THEORY

Module name:	**NUMBER THEORY**
Code:	**SMAT 3722**
NQF level:	7
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601)

Module description: Divisibility of integers, Euclidean division, greatest common divisor and least common multiple of a set of integers, Euclid's algorithm, primes numbers, p–exponents, the Fundamental Theorem of Arithmetic.

SMAT 3712: LINEAR ALGEBRA II

Module name:	**LINEAR ALGEBRA II**
Code:	**SMAT 3712**
NQF level:	7
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Sets and Numbers (SMAT 3601), Elementary Linear Algebra (SMAT 3652)

Module description: Endomorphisms: involution, projection, eigenvalue, eigenvector, eigenspace. Matrix theory: representation of a linear mapping by a matrix, change of basis, similar matrices. Euclidean vector spaces: scalar product, norm of a vector, Cauchy–Schwarz inequality, orthogonal basis, orthonormal basis, orthogonal mappings. Determinatal forms, determinant of an endomorphism, characteristic polynomial.

FOURTH YEAR MODULES

SMAT 3811: GENERAL TOPOLOGY

Module name:	**GENERAL TOPOLOGY**
Code:	**SMAT 3811**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Real Analysis I (SMAT 3731) or Real Analysis II (SMAT 3732)

Module description: Topological spaces: topologies on a set, topological space, open set, closed set, boundary, neighbourhood, neighbourhood filter, accumulation point, derived set, dense set, nowhere dense set, cluster points and limits of a sequence, separation axioms, continuous function, connected subset, connected subsets of the real line, quasicompact space, compact space, theorem of Heine–Borel. Metric spaces: metric on a set, metric space, topology induced by a metric, distance between a point and a subset, Cauchy sequence, completeness.

SMAT 3831: ALGEBRA

Module name:	**ALGEBRA**
Code:	**SMAT 3831**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	Linear Algebra I (SMAT 3711) or Linear Algebra II (SMAT 3712)

Module description: Binary operations: properties of binary operations, powers, semigroup, monoid. Groups: definition and examples, subgroup, subgroup generated by a subset, cyclic group, finitely generated group, homomorphism, normal subgroup, factor group, isomorphism, automorphism, homomorphism theorem, conjugacy classes of an element, conjugacy class of a subgroup. Rings: definition and examples, endomorphism ring of an abelian group, characteristic, subring, homomorphism, ideal, isomomorphism, homomorphism theorem, principal ideal domain, polynomial ring.

SMAT 3851: COMPLEX ANALYSIS I

Module name:	**COMPLEX ANALYSIS I**
Code:	**SMAT 3851**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	SMAT 3731 or SMAT 3732

Module description: The field C of the complex numbers: construction of C, absolute value, modulus–argument form, roots of unity, non–orderability of C, complex number plane. Sequences and series: bounded sequence, convergent sequence, theorem of Bolzano–Weierstrass, completeness of C, convergent series, absolutely convergent series, rearrangement of a series, product of two series, Cauchy product.

SMAT 3822: NORMED VECTOR SPACES

Module name:	**NORMED VECTOR SPACES**
Code:	**SMAT 3822**
NQF level:	8
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	(SMAT 3731 or SMAT 3732) and (SMAT3711 or SMAT 3712)

Module description: Definition of a normed vector space and examples, closed subspaces, continuity of linear mappings, Banach spaces, Hilbert spaces, the dual of a normed vector space, theorem of Hahn–Banach.

SMAT 3832: NUMERICAL ANALYSIS II

Module name:	**NUMERICAL ANALYSIS II**
Code:	**SMAT 3832**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	SMAT 3611(Calculus I), SMAT 3612 (Calculus II) and SMAT 3701 (Numerical Analysis I)

Module description: Approximation: linear and nonlinear approximations, uniform approximation, Legendre and Chebychev polynomials, splines, discrete least-squares and the QR−factorizations, Norms and the analysis of errors. Optimization: first and second order Taylor approximations, the steepest descent method, zeroing the gradient and the conjugate gradient method. Numerical integration: Newton–Cotes formulae, Romberg

method, Gaussian quadrature. Ordinary Differential Equations: Euler method, Runge–Kutta method, Numerical Methods for Boundary Value Problems: shooting method and finite difference method.

SMAT 3852: COMPLEX ANALYSIS II

Module name:	**COMPLEX ANALYSIS II**
Code:	**SMAT 3852**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	16
Assessment:	Continuous assessment 50% (at least 3 tests), examination 50% (3 hours examination paper).
Prerequisite:	SMAT 3731 or SMAT 3732

Module description: Differentiation: definition, rules of differentiation, Cauchy–Riemann equations. Holomorphic functions: definition, mean value inequality. Power series: set of convergence, radius of convergence, Abel's Lemma, differentiability of the sum of a power series, exponential function, circular functions, Euler's formula. Integral of a continuous complex–valued function, rules of integration, standard estimate, fundamental theorem, path, operation on paths, rectifiable path, piecewise C1–path, path integral, Goursat's Lemma, star–shaped region, Cauchy's integral theorem, Cauchy's integral formula, Taylor series, analyticity of holomorphic functions, Liouville's theorem, fundamental theorem of algebra, isolated singularities, Laurent series, residue, residue theorem.

SMAT 3802: CATEGORY THEORY

Module name:	**CATEGORY THEORY**
Code:	**SMAT 3802**
NQF level:	8
Contact hours:	2 lectures per week for 14 weeks 1 tutorial per week for 14 weeks
Credits:	8
Assessment:	Continuous assessment 50% (at least 2 tests), examination 50% (2 hours examination paper).
Prerequisite:	All mathematics modules up to third year.

Module description: Definition and examples of categories, sections, retractions, monic and epic morphisms, functors, natural transformations, products and coproducts, representable functors, Yoneda's lemma.

SMAT 3810: RESEARCH PROJECT

Module name:	**RESEARCH PROJECT**
Code:	**SMAT 3810**
NQF level:	8
Contact hours:	4 lectures per week for 14 weeks 2 tutorials per week for 14 weeks
Credits:	32
Assessment:	Continuous assessment 30% (Assignments) Examination 70% (oral presentation of written project 20%, written project 80%)
Prerequisite:	All modules of mathematics up to third year level.

Module description: The student will be requested to study a specific problem in mathematics. Although, depending on the magnitude of the problem, the student might not be able to solve the problem, he is expected to find out how much is known about that problem. In the process the student will learn some mathematics required to understand and to solve the problem.

DEPARTMENT OF MATHEMATICS: COURSE EQUIVALENTS

OLD MODULES	NEW MODULES (STARTED 2008)
MTS3101: Mathematics 1A	SMAT3511: Basic Mathematics
MTS3121: Analytic Geometry & Complex Numbers	SMAT3531: Analytic Geometry, Complex numbers and Matrices
MTS3132: Foundation Mathematics	SMAT3512: Precalculus
MTS3112: Mathematics 1B	*None*
MTS3211: Calculus I	SMAT3611: Calculus I
MTS3232: Calculus II	SMAT3612: Calculus II
MTS3201: Sets and Numbers	SMAT3601: Sets and Numbers
MTS3222: Elementary Linear Algebra	SMAT3652: Elementary Linear Algebra
None	SMAT3621: Numerical Methods
MTS3321: Linear Algebra I	SMAT3711: Linear Algebra I
MTS3312: Linear algebra II	SMAT3712: Linear algebra II
MTS3311: Real Analysis I	SMAT3731: Real Analysis I
MTS3322: Real Analysis II	SMAT3732: Real Analysis II
MTS3381: Ordinary Differential Equations	SMAT3642: Ordinary Differential Equations
MTS3362: Numerical Analysis I	SMAT3701: Numerical Analysis I
None	SMAT3622: Vector Analysis
None	SMAT3722: Number Theory
None	**SMAT3721 Set Theory**
MTS3411: Algebra	SMAT3831: Algebra
MTS3431: General Topology	SMAT3811: General Topology
MTS3432: Complex Analysis	SMAT3851: Complex Analysis I
None	SMAT3852: Complex Analysis II
MTS3412: Numerical Analysis II	SMAT3832: Numerical Analysis II
MTS3422: Partial Differential Equations	SMAT3741: Partial Differential Equations
None	SMAT3822: Normed Vector Spaces
None	SMAT3802: Category Theory
None	SMAT3810: Research Project

I. DEPARTMENT OF PHYSICS

I.1 PHYSICS MAJOR

I.1.1. B.SC. PHYSICS: MAJORS AND MINORS, CURRICULUM AND PREREQUISITES

Four subject combinations are recommended. These are Physics and Mathematics, Physics and Chemistry, Physics and Computer Science, and Physics and Geology.

QUALIFICATION: B.Sc. Physics Major and Mathematics Minor (11BPHM)

Students opting for a major in Physics and minor in Mathematics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	Physics for Physical Sciences I	SPHY3511	NSSC/IGCSE Physical Science **and** Mathematics (**C-symbols**)
SEMESTER	**MINOR MODULES**		
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Analytic Geometry, Matrices & Complex Numbers	SMAT3531	Faculty entry requirements
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Physics for Physical Sciences II	SPHY3512	NSSC/IGCSE Physical Science **and** Mathematics (**C-symbols**)
	MINOR MODULES		
2	Precalculus	SMAT3512	NSSC/IGCSE Mathematics
2	Programming Fundamentals II	SCMP3512	SCMP3511 Programming Fundamentals I

YEAR 2

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Classical Mechanics	SPHY3611	SPHY3511, SMAT3511, SMAT3512
1	Waves & Optics	SPHY3631	SPHY3511, SPHY3512
	Minor modules		
1	Sets & Numbers	SMAT3601	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
1	Calculus I	SMAT3611	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
1	Numerical Methods	SMAT3621	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
1	Object Oriented Programming	SCMP3631	SCMP3511

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	Electromagnetism	SPHY3612	SPHY3512, SMAT3511, SMAT3512
2	Modern Physics I	SPHY3602	SPHY3511, SPHY3512, SMAT3511, SMAT3512
	Minor modules		
2	Calculus II	SMAT3612	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
2	Ordinary Differential Equations	SMAT3642	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
2	Elementary Linear Algebra	SMAT3652	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
2	Data Structures & Algorithms	SCMP3612	SCMP3631

YEAR 3

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Electrodynamics	SPHY3711	SPHY3612, SMAT3612
1	Thermodynamics & Kinetic Theory	SPHY3701	SPHY3611, SMAT3612
1	Computational Physics with C++	SPHY3721	SMAT3612
	Minor modules		
1	Real Analysis I	SMAT3731	[SMAT3611 **or** SMAT3612] **and** SMAT3601
1	Linear Algebra I	SMAT3711	SMAT3601, SMAT3652

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	Theoretical Mechanics	SPHY3712	SPHY3611, SMAT3612, SMAT3642, SMAT3652
2	Modern Physics II	SPHY3732	SPHY3602
2	Electronics I	SPHY3702	SPHY3512
2	Research Methodology	SPHY3722	SPHY3612
	Minor modules		
2	Real Analysis II	SMAT3732	[SMAT3611 **or** SMAT3612] **and** SMAT3601

A student may replace the full module SMAT3732 (Real Analysis II) with the combination of **two** half modules (SMAT3622) Vector Analysis **and** SMAT3722 (Number Theory).

YEAR 4

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Quantum Mechanics	SPHY3811	SPHY3712, SPHY3732
1	Statistical Mechanics	SPHY3831	SPHY3611, SPHY3701
1	Research Project	SPHY3810	SPHY3711, SPHY3712
1	Advanced Electrodynamics	SPHY3809	SPHY3711
1	Plasma Physics	SPHY3821	SPHY3711
1	*Energy Physics	*SPHY3861	*SPHY3701 (This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.)

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Solid State Physics	SPHY3812	SPHY3701, SPHY3732
2	Research Project	SPHY3810	SPHY3711, SPHY3712
2	Nuclear Physics	SPHY3802	SPHY3732
2	Optics and Laser Physics	SPHY3822	SPHY3631, SPHY3711
2	Astrophysics	SPHY3842	SPHY3732
2	Advanced Potential Field Methods	SPHY3862	SPHY3711
2	*Electronics II	*SPHY3829	SPHY3702

***(This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.)**

QUALIFICATION: B.Sc. Physics Major and Geology Minor (11BPHG)

Students opting for a major in Physics and a minor in Geology must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT 3511	NSSC/IGCSE Mathematics
1	Computer Literacy	UCLC 3509	University entry requirements
1	Physics for Physical Science I	SPHY 3511	NSSC/IGCSE Physical Science **and** Mathematics **(C-symbols)**
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	NSSC/IGCSE Mathematics
	Geology Minor:		
1	Introduction to Physical Geology and surface processes	SGLY 3521	NSSC/IGCSE Maths **(C-symbol)**

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Pre-calculus	SMAT 3512	NSSC/IGCSE Mathematics
2	Physics for Physical Science II	SPHY3512	NSSC/IGCSE Physical Science **and** Mathematics (**C-symbols)**
2	Introduction to Probability	SSTS3532	NSSC/IGCSE Maths **(C-symbol)**
	Geology Minor:		
2	Introduction to Earth systems	SGLY 3502	NSSC/IGCSE Maths **(C-symbol)**

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Classical Mechanics	SPHY 3611	SPHY 3511; SMAT 3511; SMAT 3512
1	Waves and Optics	SPHY 3631	SPHY 3211; SPHY 3512
1	Calculus I	SMAT 3611	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
1	Sets and Numbers	SMAT 3601	any two of the following modules: SMAT3511; SMAT3531; SMAT3512
1	Numerical Methods	SMAT3621	Any two of the following modules: SMAT3511; SMAT3531; SMAT3512
	Geology Minor:		
1	Introduction to hydrology	SGLY 3621	SMAT 3512
1	Earth Resources	SGLY 3641	SGLY 3521

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Electromagnetism	SPHY 3612	SPHY 3512; SMAT 3511; SMAT 3512
2	Modern Physics I	SPHY 3602	SPHY 3511; SPHY 3512; SMAT 3511; SMAT 3512
2	Calculus II	SMAT 3612	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
2	Elementary Linear Algebra	SMAT 3652	Any two of the following modules: SMAT3511; SMAT3531; SMAT3512
2	Ordinary Differential Equations	SMAT3642	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
	Geology Minor:		
2	Geological Mapping and Stratigraphy	SGLY 3612	SMAT 3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Electrodynamics	SPHY 3711	SPHY 3612; SMAT 3612
1	Thermodynamics and Kinetic Theory	SPHY 3701	SPHY 3611; SMAT 3612
1	Computational Physics with C++	SPHY 3721	SMAT 3612
1	Real Analysis I	SMAT 3731	SMAT 3611 **or** SMAT 3612 SMAT 3601
	Geology Minor:		
1	Coal, Petroleum and Gas	SGLY3701	SGLY3521 & SGLY3600
1	Plate Tectonics	SGLY 3721	SGLY3612 & SGLY3600

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Theoretical Mechanics	SPHY 3712	SPHY 3611; SMAT 3612; SMAT 3642; SMAT 3652
2	Modern Physics II	SPHY 3732	SPHY 3602
2	Electronics I	SPHY 3702	SPHY 3512
2	Research Methodology	SPHY 3722	SPHY 3722
	Geology Minor:		
2	Structural Geology I	*SGLY 3712*	SGLY 3612; SGLY 3600

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Quantum Mechanics	SPHY 3811	SPHY 3712; SPHY 3732
1	Statistical Mechanics	SPHY 3831	SPHY 3611; SPHY 3701
1	Research Project	SPHY 3810	SPHY 3711; SPHY 3712
1	Advanced Electrodynamics	SPHY 3809	SPHY 3711
	Electives: Choose Any One Modules (Subject to Dept Approval)		
1	Plasma Physics	SPHY 3821	SPHY 3711
1	*Energy Physics	*SPHY 3861	SPHY 3701

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Solid State Physics	SPHY 3812	SPHY 3701; SPHY 3732
2	Research Project	SPHY 3810	SPHY 3711; SPHY 3712
2	Advanced Potential Field Methods	SPHY 3862	SPHY 3711
	Electives: Choose Any Three Modules (Subject to Dept Approval)		
2	Nuclear Physics	SPHY 3802	SPHY 3732
2	Optics and Laser Physics	SPHY 3822	SPHY 3631; SPHY 3711
2	Astrophysics	SPHY 3842	SPHY 3732
2	*Electronics II	*SPHY 3829	SPHY 3702

*This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.

QUALIFICATION: B.Sc. Physics Major and Computer Science Minor (11BPHC)

Students opting for a major in Physics and a minor in Computer Science must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Computer Literacy	UCLC3509	University entry requirements
1	Physics for Physical Sciences I	SPHY3511	NSSC/IGCSE Physical Science **and** Mathematics (**C-symbols**)
1	Basic Mathematics	SMAT3511	Faculty entry requirements
1	Analytic Geometry, Matrices & Complex Numbers	SMAT3531	Faculty entry requirements
	Minor modules		
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Physics for Physical Sciences II	SPHY3512	NSSC/IGCSE Physical Science **and** Mathematics (**C-symbols**)
2	Precalculus	SMAT3512	NSSC/IGCSE Mathematics
	Minor modules		
2	Programming Fundamentals II	SCMP3512	SCMP3511 Programming Fundamentals I

YEAR 2

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Classical Mechanics	SPHY3611	SPHY3511, SMAT3511, SMAT3512
1	Waves & Optics	SPHY3631	SPHY3511, SPHY3512
1	Sets & Numbers	SMAT3601	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
1	Calculus I	SMAT3611	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
1	Numerical Methods	SMAT3621	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
	Minor modules		
1	Object Oriented Programming	SCMP3631	SCMP3511

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	Electromagnetism	SPHY3612	SPHY3512, SMAT3511, SMAT3512
2	Modern Physics I	SPHY3602	SPHY3511, SPHY3512, SMAT3511, SMAT3512
2	Calculus II	SMAT3612	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
2	Ordinary Differential Equations	SMAT3642	Either [SMAT3511 & SMAT3512] **or** [SMAT3512 & SMAT3531]
2	Elementary Linear Algebra	SMAT3652	Any **two** from following: SMAT3511, SMAT3512, SMAT3531
	Minor modules		
2	Data Structures & Algorithms	SCMP3612	SCMP3631

YEAR 3

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Electrodynamics	SPHY3711	SPHY3612, SMAT3612
1	Thermodynamics & Kinetic Theory	SPHY3701	SPHY3611, SMAT3612
1	Computational Physics with C++	SPHY3721	SMAT3612
1	Real Analysis I	SMAT3731	[SMAT3611 **or** SMAT3612] **and** SMAT3601
	Minor modules		
1	Artificial Intelligence	SCMP3771	SCMP3511

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
2	Theoretical Mechanics	SPHY3712	SPHY3611, SMAT3612, SMAT3642, SMAT3652
2	Modern Physics II	SPHY3732	SPHY3602
2	Electronics I	SPHY3702	SPHY3512
2	Research Methodology	SPHY3722	SPHY3612
	Minor modules		
2	Operating Systems	SCMP3722	SCMP3532 **or** SCMP3612
2	Computer Graphics	SCMP3762	SCMP3612

A student may replace the full module SMAT3732 (Real Analysis II) with the combination of **two** half modules (SMAT3622) Vector Analysis **and** SMAT3722 (Number Theory).

YEAR 4

SEMESTER	MODULE	CODE	PRE-/CO-REQUISITES
1	Quantum Mechanics	SPHY3811	SPHY3712, SPHY3732
1	Statistical Mechanics	SPHY3831	SPHY3611, SPHY3701
1	Research Project	SPHY3810	SPHY3711, SPHY3712
1	Advanced Electrodynamics	SPHY3809	SPHY3711
1	Plasma Physics	SPHY3821	SPHY3711
1	*Energy Physics	*SPHY3861	*SPHY3701 (This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.)

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Solid State Physics	SPHY3812	SPHY3701, SPHY3732
2	Research Project	SPHY3810	SPHY3711, SPHY3712
2	Nuclear Physics	SPHY3802	SPHY3732
2	Optics and Laser Physics	SPHY3822	SPHY3631, SPHY3711
2	Astrophysics	SPHY3842	SPHY3732
2	Advanced Potential Field Methods	SPHY3862	SPHY3711
2	*Electronics II	*SPHY3829	SPHY3702 (This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.)

QUALIFICATION: B.Sc. Physics Major and Chemistry Minor (11BPHH)

Students opting for a major in Physics and a minor in Chemistry must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Basic Mathematics	SMAT 3511	NSSC/IGCSE Mathematics
1	Computer Literacy	UCLC 3509	University entry requirements
1	Physics for Physical Science I	SPHY 3511	NSSC/IGCSE Physical Science **and** Mathematics **(C-symbols)**
1	Analytic Geometry, Complex Numbers and Matrices	SMAT 3531	NSSC/IGCSE Mathematics
	Chemistry Minor:		
1	Chemistry 1A	SCHM3511	Faculty Entry Requirements

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for Academic Purposes	ULEA3519	Co-requisite: ULCE3419
2	Contemporary Social Issues	UCSI3529	University Entry Requirements
2	Pre-calculus	SMAT 3512	NSSC/IGCSE Mathematics
2	Physics for Physical Science II	SPHY3512	NSSC/IGCSE Physical Science **and** Mathematics **(C-symbols)**
	Chemistry Minor:		
2	Chemistry 1B	SCHM3512	Faculty Entry Requirements

YEAR 2

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Classical Mechanics	SPHY 3611	SPHY 3511; SMAT 3511; SMAT 3512
1	Waves and Optics	SPHY 3631	SPHY 3211; SPHY 3512
1	Calculus I	SMAT 3611	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
1	Sets and Numbers	SMAT 3601	any two of following modules: SMAT3511; SMAT3531; SMAT3512
1	Numerical Methods	SMAT3621	Any two of the following modules: SMAT3511; SMAT3531; SMAT3512
	Chemistry Minor:		
1	Physical Chemistry I	SCHM3631	SCHM 3511, SCHM3512,, SMAT3511 and SMAT3512

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Electromagnetism	SPHY 3612	SPHY 3512; SMAT 3511; SMAT 3512
2	Modern Physics I	SPHY 3602	SPHY 3511; SPHY 3512; SMAT 3511; SMAT 3512
2	Calculus II	SMAT 3612	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
2	Elementary Linear Algebra	SMAT 3652	Any two of the following modules: SMAT3511; SMAT3531; SMAT3512
2	Ordinary Differential Equations	SMAT3642	[SMAT3511 & SMAT 3512] **or** [SMAT3531 & SMAT3512]
	Chemistry Minor:		

2	Organic Chemistry I	SCHM3612	SCHM3511 and SCHM3512

YEAR 3

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Electrodynamics	SPHY 3711	SPHY 3612; SMAT 3612
1	Thermodynamics and Kinetic Theory	SPHY 3701	SPHY 3611; SMAT 3612
1	Computational Physics with C++	SPHY 3721	SMAT 3612
1	Real Analysis I	SMAT 3731	**1.** SMAT 3611 **or** SMAT 3612 **2.** SMAT3601
	Chemistry *Minor:*		
1	Organic Chemistry II	SCHM3711	SCHM3612

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Theoretical Mechanics	SPHY 3712	SPHY 3611; SMAT 3612; SMAT 3642; SMAT 3652
2	Modern Physics II	SPHY 3732	SPHY 3602
2	Electronics I	SPHY 3702	SPHY 3512
2	Research Methodology	SPHY 3722	SPHY 3722
	Chemistry *Minor:*		
2	Physical Chemistry II	SCHM3712	SCHM 3631,SMAT3611 and SMAT3612

YEAR 4

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	Quantum Mechanics	SPHY 3811	SPHY 3712; SPHY 3732
1	Statistical Mechanics	SPHY 3831	SPHY 3611; SPHY 3701
1	Research Project	SPHY 3810	SPHY 3711; SPHY 3712
1	Advanced Electrodynamics	SPHY 3809	SPHY 3711
	Electives: Choose Any One Modules (Subject to Dept Approval)		
1	Plasma Physics	SPHY 3821	SPHY 3711
1	*Energy Physics	*SPHY 3861	SPHY 3701

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	Solid State Physics	SPHY 3812	SPHY 3701; SPHY 3732
2	Research Project	SPHY 3810	SPHY 3711; SPHY 3712
	Electives: Choose Any Four Modules (Subject to Dept Approval)		
2	Nuclear Physics	SPHY 3802	SPHY 3732
2	Optics and Laser Physics	SPHY 3822	SPHY 3631; SPHY 3711
2	Astrophysics	SPHY 3842	SPHY 3732
2	Advanced Potential Field Methods	SPHY 3862	SPHY 3711
2	*Electronics II	*SPHY 3829	SPHY 3702

*This elective will be offered when there is expertise within the department and could be taken instead of any other half-module course in the semester.

PHYSICS SERVICE COURSES

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
I	Physics for Life Sciences I	SPHY3501	NSSC Physical Science
II	Physics for Radiographers	SPHY3402	-
II	Physics for Life Sciences II	SPHY3532	NSSC Physical Science, SPHY3501
II	Electricity and Magnetism	SPHE3642	SPHY3512, SMAT3511, SMAT3512
I	Modern Physics for Educators	SPHE3751	SPHY3511, SPHY3512, SMAT3511, SMAT3512

I.1.2 B.SC.PHYSICS CURRICULUM MODULE DESCRIPTIONS

FIRST YEAR MODULES

SPHY3511: PHYSICS FOR PHYSICAL SCIENCES I

Module title:	**PHYSICS FOR PHYSICAL SCIENCES I**
Code:	**SPHY3511**
NQF level:	5
Contact hours:	56 Lectures and 14 Practical Sessions/Tutorials
Credits:	16
Module assessment:	Continuous Assessment (50%) and 1 x 3-hour Exam Paper (50%) Continuous Assessment will consist of class tests, tutorial tests/assignments and practical reports.
Pre-requisites:	NSSC Physical Science and Mathematics (C-symbols)

Module description (content): Units, significant figures & scientific notation; vectors: properties, components, unit vectors, products; average & instantaneous speed, velocity and acceleration; one dimensional motion with constant acceleration; falling bodies; two dimensional motion with constant acceleration; projectile motion; uniform circular motion; circular motion; relative velocity and acceleration; Newton's laws; inertial frames; weight; friction; applications; work and kinetic energy; power; conservative and non-conservative forces; gravitational potential energy; conservation theorem; work-energy theorem; linear momentum & impulse; conservation of linear momentum - 2 particle system; collisions; equilibrium; centre of gravity; applications; Newtonian gravitation; gravitational constant; weight & gravitational force; Kepler's laws; pressure; Archimedes' principle; laminar flow; Bernoulli's equation; temperature & temperature scales; thermal expansion; ideal gas; heat; heat capacity; latent heat; heat transfer.

SPHY3501: PHYSICS FOR LIFE SCIENCES I

Module title:	**PHYSICS FOR LIFE SCIENCES I**
Code:	**SPHY3501**
NQF level:	5
Contact hours:	28 Lectures and 14 Practical Sessions/Tutorials
Credits:	8
Module assessment:	Continuous Assessment (50%) and 1 x 3-hour Exam Paper (50%) Continuous Assessment will consist of class tests, tutorial tests/assignments and practical reports.
Pre-requisites:	IGCSE Physical Science

Module description (content): This module is to introduce Life science students to physics concepts and applications that will be useful to them in their undergraduate studies and carrier. The module is not for physical science students as it is not equivalent to SPHY3511. The course will cover the following topics: Units and significant figures; Motion in one dimension, average velocity, acceleration, freely falling bodies; Vectors and scalars, addition and subtraction of vectors in one and two dimensions, multiplication of vectors, component method of vector addition; Projectiles; Force and weight, Newton's laws and applications, free-body diagrams, friction, motion on inclined planes; Uniform circular motion, period and frequency of motion, centripetal force, banking of curves; Newton's law of Universal gravitation, gravity near the Earth's surface, satellites; Kepler's laws; Work done by a constant force, kinetic energy, work-energy theorem, potential energy, conservation of Mechanical energy, power; Momentum, impulse, conservation of energy and momentum in collisions, elastic and inelastic collisions in one dimension.

SPHY 3512: PHYSICS FOR PHYSICAL SCIENCES II

Module Title:	**PHYSICS FOR PHYSICAL SCIENCES II**
Code:	**SPHY 3512**
NQF Level:	5
Contact Hours:	4 Lectures per week for 14 weeks, Practical Time: 14 sessions (42 hours)
Credits:	16
Module assessment:	Continuous assessment (50%, Minimum 2 tests, 4 assignments and practical reports) Examination (50%, 1 x 3- hour paper)
Pre-requisites:	IGCSE Physical Science and Mathematics (C-symbols)

Module description (contents): This module introduces the phenomena associated with electrostatics (charges at rest) and magnetostatics (the magnetic effects associated with steady currents). It also introduces and develops the use of the electric and magnetic field vectors and relates them by considering electromagnetic induction at a classical level. The connection between these fields and conventional circuit parameters R, C and L is developed, together with the techniques to deal with elementary transient phenomena. Sound, basic geometrical optics and radioactivity and its detection are also covered. The contents of this course include: Electric charge; insulators and conductors; Electric force and coulomb's law, Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Basic geometrical optics; Radioactivity and its detection; Sound.

SPHY 3532: PHYSICS FOR LIFE SCIENCES II

Module Title:	**PHYSICS FOR LIFE SCIENCES II**
Code:	**SPHY 3532**
NQF Level:	5
Contact Hours:	4 Lectures per week for 14 weeks, Practical Time: 14 sessions (42 hours)
Credits:	16
Module assessment:	Continuous assessment (50%, Minimum 2 tests, 4 assignments and practical reports) and Examination (50%,1 x 3-hour paper)
Pre-requisites:	IGCSE Physical Science
Co-requisites:	Physics for Life Sciences I

Module description (contents): This module introduces life science students to concepts of physics and their application to real life situations, new topics that were not dealt with in SPHY 3501 are introduced (i.e., on electricity, magnetism and radioactivity). The module is not for physical science students as it is not equivalent to SPHY3512. The content of this course is good enough to help the life science students throughout their undergraduate work and careers. The following topics will also be covered: Electric charge; insulators and conductors; Electric force and coulomb's law , Electric field and Gauss's law; Electric potential; Capacitance and capacitors; Direct current; Ohm's law and simple circuits; Magnetic field; Alternating current; Transformers; Phenomenological approach to RL and RC circuits; Temperature, gas and thermal expansion; Basic geometrical optics; Radioactivity and its detection.

SPHY3402: PHYSICS FOR RADIOGRAPHERS

Module Title: **PHYSICS FOR RADIOGRAPHERS**
Code: **SPHY3402**
NQF Level: 4
Contact Hours: 28
Credits: 8
Module assessment: Continuous assessment 50%, one 2 hour exam 50%. Continuous assessment is based on class tests, assignments and minimum 7 practical sessions
Pre-requisites: none

Module Description: Electromagnetic radiation; elementary quantum theory ; atomic structure; atomic nucleus; radioactive decay - half-life, law of radioactive decay, activity of a radioactive sample; detectors of radioactive particles; X- and Gamma-rays and their interactions with matter – photo-absorption, Compton scattering, pair-production; homogeneous and heterogeneous beams, x-ray spectra; intensity of x- and gamma-radiation as a function of distance to the source and as a function of the thickness of the absorber; attenuation coefficients; half-value layer; filters; effects of the different absorption modes on the clarity and quality of a radiographic image; dosimetry - absorbed dose; exposure; dosimetric devices; maximum permissible doses.

SECOND YEAR MODULES

SPHY3611: CLASSICAL MECHANICS

Module title: **CLASSICAL MECHANICS**
Code: **SPHY3611**
NQF level: 6
Contact hours: 56 Lectures and 14 Practical Sessions/Tutorials
Credits: 16
Module assessment: Continuous Assessment (50%) and one 3-hour Exam Paper (50%).
Continuous assessment will consist of class tests, assignments and practical reports.
Pre-requisites: SPHY3511: Physics for Physical Sciences I, SMAT3511:Basic Mathematics and
SMAT3512: Precalculus
Module description (content): Vectors, vector operations & the calculus of vectors; straight line and general motion particles; polar co-ordinates; rigid bodies: rotating about a fixed axis & planar motion; reference frames; inertial frames and the law of inertia; Laws of: mutual interaction, multiple interactions, universal gravitation; mass distributions; principle of equivalence; rectilinear motion in a force field; constrained rectilinear motion; resisting media; projectiles; circular motion; classical SHM: damped & forced; coupled oscillations and normal modes; energy principle; rectilinear motion; conservative fields; orbits in a central field: orbital motion, path equation, Homann transfer orbits, attractive & repulsive inverse square fields; Rutherford scattering; non-linear oscillations and phase space; phase plane in dynamics; limit cycles; driven non-linear oscillations; degrees of freedom; rigid bodies; linear momentum; rocket motion; collision theory; zero-momentum frame; 2-body problem; scattering; integrable mechanical systems; moment of a force; angular momentum; planar rigid body motion; Rigid body statics;

SPHY 3631: WAVES AND OPTICS

Module Title: **WAVES AND OPTICS**
Code: **SPHY 3631**
NQF Level: 6
Contact Hours: 4 Lectures per week for 14 weeks, Practical Time: 14 sessions (42 hours)
Credits: 16
Module Assessment: Continuous [50%], Minimum 2 tests and 2 assignments. Exam [50%], 1 x 3-hour paper
Pre-requisites: SPHY3511: Physics for physical sciences I and SPHY3512: Physics for physical sciences II

Module description (contents): This course will provide opportunity to students to understand how waves behave in nature. They will know various phenomenons involving rectilinear propagation of light and wave nature of light.
The course contents are as follows: Mathematical description of wave motion; Fourier analysis of wave motion; Differential equation of wave motion; Elastic waves in solid rod; Waves in string and liquid; Electromagnetic wave and interaction with matter. Huygen's principle; Malu's theorem; Fermat's principle; Reflection and refraction of plane waves; Wave geometry; Reflection and refraction at spherical surfaces; Lens, prisms, dispersion and chromatic aberrations; Interference, diffraction and polarization.

SPHY3612: ELECTROMAGNETISM

Module Title: **ELECTROMAGNETISM**
Code: **SPHY3612**
NQF Level: 6
Credits: 16
Contact Time: 56 hours. Practical Time: 14 sessions (42 hours)
Assessment: Continuous [50%] Minimum 2 tests and 2 assignments
Exam [50%] 1 x 3-hour paper
Pre-requisites: SPHY3512: Physics for Physical sciences II, SMAT3511: Basic Mathematics and SMAT3512: Precalculus,
Model description (contents): This module will provide students how the charges at rest and at motion behave. This course will be calculus based and students will develop the skill to obtain different equations and solve related problems. The contents of the course are: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohms law; Resistance, Joule effect and emf; Magnetic interaction; Lorentz force; Electromagnetic field of a moving charge; Electric flux of a moving charge; Magnetic field and electric current; Magnetostatics; Ampere's law; Time dependent electric field; Maxwell's equations.

SPHY3602: MODERN PHYSICS I

Module title: **MODERN PHYSICS I**
Code: **SPHY3602**
NQF Level: 6
Contact hours: 28 Lectures and 7 Practical Sessions
Credits: 8
Module assessment: Continuous assessment (class tests, assignments and practical reports) 50%, two-hour exam 50%
Pre-requisites: SPHY3511: Physics for Physical sciences I, SPHY3512: Physics for Physical sciences II,
SMAT3511: Basic Mathematics and SMAT3512: Precalculus

Module description (content): Particles and waves in classical physics; introduction to special relativity; blackbody radiation; Planck's quantization; Photoelectric effect; Compton effect; atomic structure; spectral lines of Hydrogen; the nuclear atom; Bohr's theory; correspondence principle; Franck-Hertz experiment; Characteristic x-rays; de Broglie wavelengths; particle-wave duality; Heisenberg uncertainty relation; Schrödinger equation for a free particle; the potential Step.

SPHE3642: ELECTRICITY AND MAGNETISM

Module title:	**ELECTRICITY AND MAGNETISM**
Code:	**SPHE3642**
NQF Level:	**6**
Contact Time:	28 Lectures and 7 Practical sessions (21 hours)
Credits:	8
Module Assessment:	Continuous assessment (class tests, assignments and practical reports) 50%, two-hour exam 50%
Pre-requisites:	SPHY3512: Physics for Physical sciences II, SMAT3511: Basic Mathematics and SMAT3512: Precalculus.

Module description (content): The content of the module will cover the following: Electric interaction; Static electric charge and Gauss's Law; Electric potential; Capacitors; Electric current; Ohms law; DC circuits; Magnetic field and flux, Lorentz force; Ampere's law; Electromagnetic induction and ac circuits.

THIRD YEAR MODULES

SPHY3711: ELECTRODYNAMICS

Module title:	**ELECTRODYNAMICS**
Code:	**SPHY3711**
NQF Level:	7
Contact hours:	4 lectures per week for 14 weeks, supplemented by 14 practical/tutorial sessions (minimum 3 hour per session) and extra classes
Credits:	16 NQF credits
Module assessment:	Continuous assessment (minimum of 4 class tests, 4 assignments and practical reports) 50%, three hour written exam 50%
Pre-requisites:	SPHY3612: Electromagnetism and SMAT3612: Calculus II

Module description (content): The following topics are covered in Electrodynamics: Vector analysis, with emphasis on the 'del' operator , integral calculus, curvilinear coordinate systems; The electrostatic field E and its divergence and curl, Gauss's law; The electric potential, Poisson's equation and Laplace's equation; Work and energy in electrostatics, induced charges on conductors and capacitors; Uniqueness theorems and method of images as special techniques for solving some problems; The electric field of a dipole; Electric field in matter – polarization, linear dielectrics, electric displacement; Magnetostatics field B – Lorentz force law, Biot-Savart law, divergence and curl of B, Ampère's law, magnetic vector potential; Magnetic fields in matter – magnetization and the auxiliary field H; Electrodynamics – Ohm's law, Faraday's law, Maxwell's equations in vacuum and in matter, conservation laws, Poynting's theorem.

SPHY3701: THERMODYNAMICS AND KINETIC THEORY

Module title:	**THERMODYNAMICS AND KINETIC THEORY**
Code:	**SPHY3701**
NQF Level:	7
Contact hours:	28
Credits:	8
Module assessment:	Continuous assessment (50% weight), one 2 hour exam (50% weight) Continuous assessment is based on class tests, assignments and minimum 7 practical sessions
Pre-requisites:	SPHY3611: Classical Mechanics and SMAT3612: Calculus II
Module Description:	Fundamental concepts - zeroth law, temperature, equilibrium; equations of state - ideal gases, real gases; First Law of Thermodynamics - internal energy, heat, reversible quasi-static processes, work, heat capacity, heat engines; Second Law of Thermodynamics - Caratheodory theorem, absolute temperature, entropy, entropy changes, Clapeyron inequality; Carnot theorem, heat engines; thermodynamic potentials and Maxwell relations - internal energy, enthalpy, Helmholz and Gibbs functions; phase transitions; kinetic theory - Maxwell's velocity distribution, Boltzmann distribution; applications

SPHY3721: COMPUTATIONAL PHYSICS WITH C++

Module title:	**COMPUTATIONAL PHYSICS WITH C++**
Code:	**SPHY3721**
NQF level:	7
Contact hours:	28 Lectures and 7 Practical Sessions
Credits:	8
Module assessment:	Continuous Assessment (50%) and one 3-hour Exam Paper. Continuous assessment will consist of class tests and computational assignments.
Pre-requisites:	SMAT3612: Calculus II

Module description (content): Introduction to C++; statements; expressions; variables: local and global; constants: literal and symbolic; data-types; basic stream I/O: iostream; operators; program flow: for, while, if, switch, etc.; functions; arrays; pointers & references; stream I/O: iosteam, fstream and strstream; C/C++ standard libraries; OOP basics: C++ classes; constructors & destructors; operator overloading; simple inheritance; Computational Physics techniques: iteration, recursion, dynamic creation of arrays; coding the : Thomas Algorithm, Euler and Runge-Kutta methods, Crank-Nicolson, ADI and LOD finite difference methods; random numbers and pseudo-random number generators; random-walk methods and Monte-Carlo basics applied to diffusion problems; analysis and visualisation of data.

SPHE3751: MODERN PHYSICS FOR EDUCATORS

Module title:	MODERN PHYSICS FOR EDUCATORS
Code:	SPHE3751
NQF Level:	7
Contact hours:	4 Lectures per week and 1 (3h) Practical Sessions per week
Credits:	16
Module assessment:	Continuous assessment (class tests, assignments and practical reports) 50%, Three-hour exam 50%
Pre-requisites:	SPHY3511: Physics for Physical sciences I, SPHY3512: Physics for Physical sciences II, SPHY3611: Classical Mechanics, SMAT3511: Basic Mathematics and SMAT3512: Precalculus.

Module description (content) : Blackbody radiation; Planck's quantization; Photoelectric effect; Compton effect; atomic structure; spectral lines of Hydrogen; the nuclear atom; Bohr's theory; correspondence principle; Franck-Hertz experiment; x-rays; de Broglie wavelengths; particle-wave duality; Heisenberg uncertainty relation; Special relativity; departure from Newtonian dynamics; Einstein and Lorentz transformations; Lorentz contraction and time dilation; wave mechanics, Schrödinger equation for a free particle; the potential Step. particles in a box ; particle in a finite potential well; Electrons in metals, Nearly free electron model, energy bands; Semiconductors, band gaps, intrinsic carrier concentration, impurity conductivity, donor and acceptor states.

SPHY3712: THEORETICAL MECHANICS

Module title:	**THEORETICAL MECHANICS**
Code:	**SPHY3712**
NQF level:	7
Contact hours:	56 Lectures and 14 Practical Sessions/Tutorials
Credits:	16
Module assessment:	Continuous Assessment (50%) and one 3-hour Exam Paper (50%). Continuous assessment will consist of class tests, assignments and practical reports.
Pre-requisites:	SPHY3611: Classical Mechanics, SMAT3612 Calculus II: Numerical Methods, SMAT3642: Ordinary Differential Equations and SMAT3652: Elementary Linear Algebra.

Module description (content): Lagrangian methods; constraints; generalised coordinates; D'Alembert's principle; Lagrange's equations; moving constraints; Lagrangian; generalised momenta; symmetry and conservation principles; The calculus of variations; minimisation problems; Euler-Lagrange equation; variational & Hamilton's principles; Hamilton's equations; phase space; systems of first order ODEs; Legendre transforms; Hamilton's equations; Hamiltonian phase space; Liouville's theorem and recurrence; general theory of small oscillations; Stable equilibrium and small oscillations; general theory of normal modes; existence; normal mode problems; orthogonality; general small oscillations; normal coordinates; Rigid body kinematics; rotation about a fixed axis & general rigid body kinematics; rotating reference frames; single & multi-particle system in a non-inertial frame; Tensor algebra and the inertia tensor: orthogonal transformations; coordinate transformations; tensors & tensor algebra; inertia tensor; symmetric tensor; rigid body dynamics; bodies with axial symmetry; Lagrangian dynamics of rigid bodies; Euler's equation; unsymmetrical rigid bodies.

SPHY3732 MODERN PHYSICS II

Module title:	**MODERN PHYSICS II**
Code:	**SPHY3732**
NQF Level:	7
Contact hours:	56 Lectures and 14 Practical Sessions
Credits:	16
Module assessment:	Continuous assessment (class tests, assignments) 50%, three hours written exam 50%
Pre-requisites:	SPHY3602: Modern Physics I

Module description (content): Special relativity; departure from Newtonian dynamics; Einstein and Lorentz transformations; Minkowski diagram; Lorentz contraction and time dilation; relativistic kinematics and relativistic dynamics; four vectors; wave mechanics, particles and potential; particles in a box ; Schrödinger equation; particle in a finite potential well; barrier penetration; spin and Pauli exclusion principle; L-S coupling; Zeeman effect; stimulated emission.

SPHY3702: ELECTRONICS I

Module Title:	**ELECTRONICS I**
Code:	**SPHY3702**
NQF Level:	7
Contact hours:	28 hours theory: 2 Lectures/Week 1x3 hours Practical session per week
Credits:	8
Module Assessment:	Continuous: 50%, Examination: 50% (1 x 2 hour exam)
Pre-requisites:	SPHY3512: Physics for Physical Sciences II

Module description: This module introduces the basic concepts of analogue electronics and illustrates its applications through examples using such as diodes, BJT's and FET and operational amplifiers. Introduction to semi-conductor theory, intrinsic, p & n type doping, extrinsic semiconductors, conduction processes; Semiconductors 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, analogy 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 table; Boolean algebra and simplification of basic logic networks circuits; Basic combinational logic circuits, flip-flops and their applications.

SPHY3722: RESEARCH METHODOLOGY

Module title:	**RESEARCH METHODOLOGY**
Code:	**SPHY3722**
NQF Level:	7
NPSC:	Not applicable
Contact hours:	2 lectures per week for 14 weeks
Credits:	8 NQF credits
Module assessment:	100% modulework (assignments & a typed report on literature review on some physic topic)
Pre-requisites:	SPHY3612: Electromagnetism

Module description (content): Although the actual topics will be adapted to the students research area the following topics will be "generally" covered in this module: various philosophies of Science; Research Proposals (Guidance to writing good project proposals); Basic research skills (e.g. library research, literature review, article analysis etc.); Research Strategy: Planning, Designing and Implementing; Data collection and interpretation methods; Data Reduction, Error analysis (error propagation); Data analysis; Report writing; Communication, skills required to communicate research findings to a broader audience, presentations (oral & written), peer reviewing, refereed journals; Ethics and Legal Issues (e.g. plagiarism); Basics of Quantitative Research (concerned with the tabulation or numeric relevance of various kinds of behaviour (¨measuring¨); Basics of Qualitative Research (concerned with understanding the processes, which underlie various behavioural patterns (Answering the question ¨why? ¨).

FOURTH YEAR MODULES

SPHY3811: QUANTUM MECHANICS

Module title:	**QUANTUM MECHANICS**
Code:	**SPHY3811**
NQF Level:	8
Contact hours:	4 lecture periods per week for 14 weeks and 14 Practical/Tutorial sessions
Credits:	16
Module assessment:	Continuous assessment (50%) and one 3-hour Examination (50%). Continuous assessment consists of a minimum of 4 assignments, 2 tests and practical reports.
Pre-requisites:	SPHY3712: Thoretical Mechanics and SPHY3732: Modern Physics II.

Module description: This course is to have students learn the fundamentals of quantum mechanics. Students will be introduced to many new concepts and techniques in the course. The course will cover the following topics: Mathematical primer; Historical review; The postulates of quantum mechanics, state functions and expectation values, time development of state functions; Dirac notation, eigenvalues and eigenfunctions; Hermitian operators and applications; Commutator relations and compatible observables; Time development of expectation values, Ehrenfest's principle and applications, constants of motion, conservation of energy, momentum and parity; The harmonic oscillator, creation and annihilation operators; Angular momentum, commutation properties of the components of angular momentum, simultaneous eigenfunctions; Total angular momentum, commutation relations for the components of total angular momentum, ladder operators; Elements of matrix mechanics, Pauli spin matrices, spin wave functions; The Slater determinant; Time-independent Perturbation theory, degenerate perturbation theory, the Stark effect; Variational method; Scattering.

SPHY3831: STATISTICAL MECHANICS

Module title:	**STATISTICAL MECHANICS**
Code:	**SPHY3831**
NQF Level:	8
Contact hours:	56 Lectures and 14 Practical Sessions
Credits:	16
Module assessment:	Continuous assessment (class tests, assignments) 50%, three hours written exam 50%
Pre-requisites:	SPHY3611: Classical Mechanics and SPHY3701: Thermodynamics and Kinetic Theory

Module description (content): 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.

SPHY3810: RESEARCH PROJECT

Module title:	**RESEARCH PROJECT**
Code:	**SPHY3810**
NQF Level:	8
Contact hours:	Frequent meetings (as determined by the Department) with supervisor(s) amounting to a minimum of 112 hours.
Credits:	32
Module assessment	A written (typed) report of the research in the form of a dissertation or thesis must be submitted by the student. This will be evaluated by qualified staff within the field. During the course of the project, the student will also be expected to present the progress of his work in the form of two seminars (colloquiums).
Pre-requisites :	SPHY3711: Electrodynamics and SPHY3712 : Theoretical Mechanics

Module description (content): This one-year module constitutes the research and report writing for an available project within the various fields of physics. The actual content of the module will depend on the topic of research selected by the student, from the available specialized fields within the department. The student will submit a written dissertation (or thesis) of the project upon completion of the research activities.

SPHY3809: ADVANCED ELECTRODYNAMICS

Module title:	**ADVANCED ELECTRODYNAMICS**
Code:	**SPHY3809**
NQF Level:	8
Contact hours:	2 lectures per week for 14 weeks, and 7 practical sessions of 3 hours each.
Credits:	8 NQF credits
Module assessment:	Continuous assessment (minimum of 2 tests, 2 assignments and practical reports) 50%, written examination 50%
Pre-requisites:	SPHY3711: Electrodynamics

Module description (content): This module is a follow-up on the module Electrodynamics and constitute the following topics: Conservation laws in electrodynamics; Vector and scalar potential formulation; Coulomb and Lorentz transformations; Retarded potentials and Jefimenko's equations; Lièнard-Wiechert potentials; Electric and magnetic dipole radiation, power radiated; Linear Antennas; Electrodynamics and relativity – relativistic magnetism, field transformation, field tensor.

SPHY3821: PLASMA PHYSICS

Module title:	**PLASMA PHYSICS**
Code:	**SPHY3821**
NQF level:	8
Contact hours:	28 Lectures and 7 Practical Sessions
Credits:	8
Module assessment:	Continuous Assessment (50%) and 1 2-hour Exam Paper (50%) Continuous Assessment will consist of class tests, assignments and practical reports.
Pre-requisites:	SPHY3711: Electrodynamics

Module description (content): Plasmas: definitions, Debye shielding, plasma parameter, criteria; Single-particle motion: uniform, non-uniform and time-varying **E**- and **B**-fields; guiding-centre drifts; adiabatic invariants; plasmas as fluids; fluid equation of motion; fluid drifts perpendicular and parallel to B; plasma approximation; Waves in plasmas: plasma oscillations; electron plasma waves; sound waves; ion waves; comparisons; electrostatic electron and ion oscillations perpendicular to B; lower hybrid frequency; cut-offs and resonances; hydromagnetic waves; magnetosonic waves; CMA diagram; Diffusion in weakly ionised gases and fully ionised plasmas; decay of a plasma by diffusion; steady state solutions; recombination; Collisions in fully ionised plasmas; single-fluid MHD equations; Böhm- & neoclassical

diffusion; hydromagnetic equilibrium; diffusion of magnetic field into a plasma; Classification of instabilities; Kinetic theory and its equations: Boltzmann-, Vlasov-, & Fokker-Planck equations.

SPHY3861: ENERGY PHYSICS

Module title:	**ENERGY PHYSICS**
Code:	**SPHY3861**
NQF Level:	8
Contact hours:	2 lecture periods per week for 14 weeks and 7 Practical/Tutorial sessions
Credits:	8
Module assessment:	Continuous assessment (50%) and one 2-hour Examination (50%). Continuous assessment consists of a minimum of 3 assignments, 2 tests and practical reports.
Pre-requisites:	SPHY3701: Thermodynamics and Kinetic Theory

Module description: This course is to make students learn about different energy sources. The topics to be covered in the course are:
Solar Energy: Radiation laws, the Sun, attenuation of solar radiation by the atmosphere; direct, diffuse and global radiation; solar radiation horizontal and inclined surfaces, measurement of solar radiation; fundamentals of heat transfer, optics of collectors, reflection and refraction at dielectric interfaces, transmittance and reflectance of glazings, selective absorber coatings, concentrators, solar heating panels and conversion of solar energy to electricity.
Wind power: Wind resources, measurement of wind speed, types of turbine, momentum theory and dynamic matching.
Hydro power: Types of turbines, the Pelton wheel, calculation of efficiency, shape factor and generation of electricity.
Geothermal energy: Thermal and hyperthermal fields, heat flow in the earth, harnessing geothermal energy.
Biofuels: biomass production, wood, combustion and stoves, secondary fuels such as charcoals, ethanol, biogas, producer gas and vegetable oils.Ocean Power Systems: Wave energy, tidal power, ocean thermal energy conversion
Nuclear Power: Fission and fusion, introduction to reactor physics, nuclear power plants, radioactive waste and radiation protection.

SPHY3812: SOLID STATE PHYSICS

Module title:	**SOLID STATE PHYSICS**
Code:	**SPHY3812**
NQF Level:	8
Contact hours:	4 lecture periods per week for 14 weeks and 14 Practical/Tutorial sessions
Credits:	16
Module assessment:	Continuous assessment (50%) and one 3-hour Examination (50%). Continuous assessment consists of a minimum of 4 assignments, 2 tests and practical reports.
Pre-requisites:	SPHY3701: Thermodynamics and Kinetic Theory and SPHY3732: Modern Physics II.

Module description: This course is to have students learn about the properties of solids such as simple crystals, semiconductors and superconductors. The course will cover the following topics: Crystal structure; Fundamental types of lattices, crystal planes; Diffraction of waves by crystals, Bragg law, reciprocal lattice vectors, diffraction conditions, Laue equations, structure factor; 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, Bloch functions, Kronig-penney model; Semiconductors, band gaps, Intrinsic carrier concentration, impurity conductivity, donor and acceptor states; Superconductivity, destruction of superconductivity, Meissner effect, type I and type II superconductors, London equation, the BCS theory.

SPHY3802: NUCLEAR PHYSICS

Module title:	**NUCLEAR PHYSICS**
Code:	**SPHY3802**
NQF Level:	8
Contact hours:	2 lecture periods per week for 14 weeks and 7 Practical/Tutorial sessions
Credits:	8
Module assessment:	Continuous assessment (50%) and one 2-hour Examination (50%). Continuous assessment consists of a minimum of 3assignments, 2 tests and practical reports.
Pre-requisites:	SPHY3732: Modern Physics II

Module description : 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.

SPHY3822: OPTICS AND LASER PHYSICS

Module Title: **OPTICS AND LASER PHYSICS**
Code: **SPHY 3822**
NQF Level: 8
Contact Hours: 2 Lectures per week for 14 weeks, Practical Time: 7 sessions (21 hours)
Credits: 8
Module Assessment: Continuous [50%], Minimum 1 test and 1 assignment
Exam [50%], 1 x 2-hour paper
Pre-requisites: SPHY3631: Waves and Optics and SPHY3711: Electrodynamics
Module Description (contents): This module will give opportunity to students to have mastery on various phenomenon based on the wave nature of light and that light is a transverse wave. The main contents of this course will be: Interference: Division of amplitude, Division of wavefronts, Thin films, Interferometers, Multiple reflections and Refractions; Diffraction: Fresnel's diffraction, Fraunhoffer diffraction, Kirchhoff's diffraction theory, Single slit, Double slit and gratings, and Monochromatic aberrations; Polarization: Plane polarized light, Circularly polarized light, Elliptically polarized light, Double refraction, Quarter wave plate, Babinet compensator, Polarimeters, Specific rotation; Introduction to lasers: Basics of lasers, He-Ne laser, N_2 laser and CO_2 laser; Applications.

SPHY3842: ASTROPHYSICS

Module title: **ASTROPHYSICS**
Code: **SPHY3842**
NQF level: 8
Contact hours: 28 Lectures and 7 Practical Sessions
Credits: 8
Module assessment: Continuous Assessment (50%) and 1 2-hour Exam Paper (50%)
Continuous Assessment will consist of class tests, assignments and practical reports.
Pre-requisites: SPHY3732: Modern Physics II
Module description (content): Origins; parallax, magnitudes & luminosity; stellar spectra; classification and the H-R (Herzsprung-Russel) diagram; stellar equilibrium: equations of state, hydrostatic equilibrium, radiation pressure; virial theorem; stellar timescales; Energy production mechanisms and Radiative Transport: P-P chain, CNO-cycle, triple-□ process, other processes; shell burning; nucleosynthesis; Radiative transport; convective envelopes and cnvective cores; Stellar and planetary formation; Stellar Evolution: mass-luminosity relations; main sequence; stellar clusters; low mass, solar/intermediate mass and high mass stars; Stellar "graveyards": degenerate matter; white dwarfs; type Ia & II supernovae; neutron stars; pulsars and pulsar nebulae; SNRs; Stellar black holes; Pulsars, accreting binaries and AGNs; Practical astronomy: time; calendars; conversions; spherical geometry; coordinates & coordinate transformations; angular separation; rising & setting; compensations: precession, nutation, aberration, atmospheric refraction, barycentric motion;

SPHY3862: ADVANCED POTENTIAL FIELDS

Module Title: **ADVANCED POTENTIAL FIELDS**
Code: **SPHY 3862**
NQF Level: 8
National Professional: None
Contact Hours: 2 Lectures per week for 14 weeks, Practical Time: 7 sessions (21 hours)
Credits: 8
Module assessment: Continuous assessment (50%, Minimum 2 tests and 2 or more practical assignments) Examination (50%1 x 3-hour paper)
Pre-requisites: SPHY3711: Electrodynamics
Module description: The following topics will be covered; Potential field theory: 2D and 3D gravitational and magnetic potentials, equipotential surfaces, forces of attraction – gravity and magnetic, improper integrals, Gauss's (divergence) theorem, Laplace's equation, Poisson's equation, Harmonic functions, Gauss's integral formula, excess mass, transformations of potential fields (derivatives, Poisson's relation, pseudo-gravity, reduction-to-pole, continuation, frequency filtering), ambiguity. Gravity: Measurement of G and gravitational acceleration, units, figure of the earth, rock and mineral densities, reduction to gravity observations, gravity anomalies (Bouguer, Free air, Isostatic), isostasy, interpretation of anomalies (regional/residual separation, forward and inverse modelling). Geomagnetism: Analysis of the earth's internal and external fields, units, basic physics, magnetic properties of rocks and minerals (paramagnetism, diamagnetism, ferromagnetism, anti-ferromagnetism, susceptibility, coercivity, magnetic mineralogy, effect of grain size, curie temperature, induced and remanent magnetization), time variations of the earth's field, palaeomagnetism, magnetometers (Fluxgate, proton precession, optically pumped, Overhauser), interpretation (rules of thumb, forward and inverse modelling, magnetic fields of simple geometry, depth inversion), design of ground and airborne magnetic surveys, image processing (applicable also to gravity data).

SPHY3829: ELECTRONICS II

Module Title: **ELECTRONICS II**
Code: **SPHY3829**
NQF Level: 8
Contact hours: 2 Lectures/Week for 14 weeks: 7 Practical /Tutorial ssessions (21 hours)
Credits: 8
Module Assessment: Continuous: 50%, Examination: 50% (1 x 2 hour exam)
Pre-requisites: SPHY3702: Electronics I
Module description: This course is to give students an insight into the analysis and design of electronic circuits. The detailed course content is as follows: Diodes and diode applications, diode testing, zener diodes and applications; Design of single stage CE amplifier, feedback, multistage amplifiers; Special electronic devices, optoelectronic devices, photoconductive cells, photodiodes, phototransistors, solar cells, light emitting diodes (LED), optocouplers, liquid-crystal displays (LCDs); BJT & FET differential pair, Ideal op-amp, inverting op-amp, non-inverting op-amp, frequency response, stability, gain-bandwidth, slew rate, offset currents and voltages, specifications, op-amp applications; Power BJT, power dissipation, power rating, thermal calculations, derating factor, heat sink, amplifiers classes and efficiency (class A, B, C), push-pull amplifier principle, push-pull drivers, harmonic distortion and feedback, distortions in push-pull amplifiers, class AB operation, biasing CAD design of analogue circuits.

PHYSICS DEPARTMENT: COURSE EQUIVALENTS

CURRENT COURSE	EQUIVALENT NEW COURSE
PHC3101	*SPHY3401 or SPHY3511
PHC3112	*SPHY3412 or SPHY3512
PHC3192	(To be offered again)
PHC2102	SPHY3402
PHC3211	SPHY3511
PHC3201	SPHY3631
PHC3291	(To be offered again)
PHC3212	SPHY3512
PHC3202	SPHY3602
PHC3292	(To be offered again)
PHC3311	SPHY3611
PHC3331	SPHY3702
PHC3391	(To be offered again)
PHC3312	SPHY3712
PHC3332	SPHY3711
PHC3392	(To be offered again)
PHC3411	SPHY3811
PHC3431	SPHY3831
PHC3491	(To be offered again)
PHC3412	SPHY3812
PHC3492	(To be offered again)
PHC3402	SPHY3802 and SPHY3822
PHC3422	SPHY3842 and SPHY3862

- For Life Sciences students only.

J. DEPARTMENT OF STATISTICS

J.1 DIPLOMA PROGRAMMES

J.1.1. REGULATION PERTAINING TO DIPLOMA STUDIES IN THE FACULTY

QUALIFICATION: DIPLOMA IN APPLIED STATISTICS (11DSST)

INTRODUCTION

J.1.2. ADMISSION REQUIREMENTS

To qualify for admission to the Diploma in Applied Statistics, an applicant shall satisfy any one of the following minimum requirements:

a) A Namibian Senior Secondary Certificate (NSSC) or equivalent, obtained in not more than two examination sittings with a minimum of 22 points in five subjects on the UNAM Evaluation Scale. English is a compulsory subject and should have been obtained on a First or second Language Ordinary Level with symbol D or higher. A symbol D or higher in Mathematics is also required.

b) Mature age entry (based on the results from the entry test)

J.1.3. DURATION OF STUDY

The Diploma in Applied Statistics is to be offered on both full time and part-time basis. It cannot be completed in less than two (2) years for full-time students and cannot be completed in less than 3 years for part-time students. The maximum period of study for full-time and part-time students is 3 and 4 years, respectively.

J.1.4. MODE OF DELIVERY

The Diploma in Applied Statistics will be offered in the evening. This is to allow full-time working candidates to attend lectures in the evening. The programme comprises of a total credit of 256 and it is at Namibian Qualification Framework (NQF) level 5. The year 1 modules are at NQF level 4 whereas the year 2 modules are at NQF level 5.

J.1.5. EXAMINATION REGULATIONS

For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees. A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of 40%. Examination will be administered at the end of each semester.

J.1.6. MINIMUM REQUIREMENTS FOR RE-ADMISSION

To be readmitted to the Diploma programme, a student must have passed the minimum number of modules required as indicated below:

- 4 modules (equivalent to 64 credits) by the end of the first year; 2 of these modules (equivalent to 32 credits) must be non-core.
- 12 modules (equivalent of 192 credits) by the end of the second year

J.1.7. ADVANCEMENT AND PROGRESSION RULES

A student advances to the second academic year of study when at least 6 modules (96 credits) of the curriculum for a first year have been passed.

J.1.8. MAXIMUM NUMBER OF MODULES PER YEAR

A part-time student can only register for 75% of the prescribed modules in any given academic year. Full-time students can register for all first year modules and thereafter, no more than 10 modules in any academic year.

J.1.9. ARTICULATION ROUTE

After successful completion of the Diploma, students may be exempted from first year Statistics/and or Population Studies modules.

QUALIFICATION: DIPLOMA IN APPLIED STATISTICS

YEAR 1

Semester	Module Title	Code	Pre-requisite
1	English for General Communication	ULEG2410	Entry requirements
1	Computer Literacy	UCLC3509	Entry requirements
1	Basics of Statistics	SSTD2431	Entry requirements
1	The Statistical System	SSTD2411	Entry requirements
1	Contemporary Social Issues	UCSI3529	Entry requirements

Semester	Module Title	Code	Pre-requisite
2	English for General Communication	ULEG2410	Entry requirements
2	Index Numbers and Time series	SSTD2412	
2	Introduction to Mathematics	SSTD2432	Entry requirements
2	Sampling concepts in Survey work	SSTD2452	Entry requirements

YEAR 2

Semester	Module Title	Code	Pre-requisite
1	Basic Data Processing	SSTD2551	SSTD2452
1	Probability	SSTD2531	SSTD2432
1	Statistical Methods and Techniques	SSTD2511	SSTD2431
1	Basic Micro Economics	CEMI2571	

Semester	Module Title	Code	Pre-requisite
2	English for Academic Purposes	ULCE3519	
2	Statistical Modeling	SSTD2532	SSTD2432
2	Basic Demography and Epidemiology	SSTD2512	SSTD2411
2	Basic Macro Economics	CEMA2572	

J.2. DIPLOMA IN APPLIED STATISTICS: MODULE AND CURRICULUM DESCRIPTION

FIRST YEAR MODULES

ULEG2410 ENGLISH FOR GENERAL COMMUNICATION **4L/Week**

Module title: **English for General Communication**
Code: **ULEG2410**
NQF Level: 4
Contact hours: 4 hours per week for 28 weeks
Credits: 32
Module Assessment: Continuous assessment (60%): 4 reading tests, 4 writing tests, 2 oral presentations and 1 literature worksheet. 1x3 hour examination paper (40%):
Pre-requisites: None
Module description: This module attempts to assist students to improve their general English proficiency. The main goal of this module is to develop the reading, writing, listening, speaking and study skills of students in order for them to perform tasks in an academic environment and beyond.

UCLC3409 COMPUTER LITERACY **2L/Week**

Module title: **Computer Literacy**
Code: **UCLC 3509**
NQF level: 5
Contact hours: **1 lecture theory and 1 lecture practical per week for 14 weeks**
Credits: 8
Module assessment: Continuous Assessment 2 Practical Tests 50% and 2 Theory Tests 50%
Prerequisites: None
Module description: The aim of this module is to equip the students through hands-on experience with the necessary skills to use application software: word processing, spreadsheets, databases, presentations and communications. The objective is to increase student's productivity in both the education and later, the work environment. The module covers the following topics. Introduction to Computers: hardware and software, types and categories of computers, usage of Computer devices and peripherals. Working with the windows operating system: File Management, working with multiple programs, using the recycle bin. Using a word processor: formatting a text and documents, spelling check, grammar and thesaurus tools, inserting tables, auto-shapes, clip arts, charts, and mail merge. Spreadsheet: worksheets and workbooks, ranges, formulas and functions, creating graphs, charts, and printing the workbook. Databases: creating tables, relationships, queries, forms and reports. Presentation software: slide layout and master, animations, auto-content wizard and templates. Communication tools: introduction to the Internet, web browsers, search engines, downloading and uploading files, creating and sending messages, email etiquette, internet security, and digital signatures.

SSTD241 THE STATISTICAL SYSTEM **4L/Week**

Module Title: **The Statistical System**
Code: **SSTD2411**
NQF Level: **4**
Contact Hours: **4 lectures per week/14 weeks**

Credits: **16**

Module Assessment**:** **Continuous assessment (at least two tests and one assignments) 40%; 1 x 3 hours Examination 60%**

Pre- requisite: **None**

Module description: Purpose and scope of official statistics, structure and work of the National Statistical System, Organization, methods and practices of data collection and dissemination. Explain the role of statistics in evidence-based policy-making; 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.

SSTD 2431 BASICS OF STATISTICS **4L/Week**

Module Title: **BASICS OF STATISTICS**
Code: **SSTD 2431**
NQF Level: 4
Contact Hours: 4 Lectures per week for 14 weeks
Number of Credits: 16
Module Assessment: **Continuous assessment (at least two tests and one assignments) 40%; 1 x 3 hours Examination 60%**
Prerequisites: None

Module Description: Definition: Statistics; descriptive, inferential. Variables: qualitative versus quantitative. Data types: primary versus secondary, categorical versus discrete, continuous. Sources of data: Population versus sample. Reasons for sampling. Sampling techniques: probability versus non- probability sampling- advantages and disadvantages of each. Simple Random Sampling, Stratified Random Sampling, Systematic Sampling, cluster Sampling, Uses of random numbers. Convenience Sampling Purposive Sampling, Judgemental Sampling, Snowball Sampling. Types of measurements: nominal, ordinal, interval, ratio scales. Presentation of data: tabular forms; frequency tables, cross-tabulations (two- variable), graphical methods; histograms, pie charts, bar charts, frequency polygons, stem- and- leaf plots, box- and- whiskers plot, ogives. Measures of Central Tendency: Σ notation, Π notation, mean, median, mode, quartiles, percentiles. Measures of Dispersion: variance, standard deviation, range, inter- quartile range, skewness, Kurtosis. Identifying outliers. Uses of scientific calculators for statistical manipulation limited to calculation of mean, standard deviation, random number generation.

UCSI 3429 CONTEMPORARY SOCIAL ISSUES **4L/Week**

Module Title: **Contemporary Social Issues**
Code: **UCSI 3529**
NQF: 5
Contact Hours: 2 periods per week for 14 weeks
Credits: 8
Module Assessment: Continuous assessment (50%): test or assignment
1x2 hours examination paper (50%):
Prerequisite: None

Module Description: The module raises awareness on the need for a personal, national and global ethics. The main objectives of the course is to help students reflect on the social moral issues; to discover themselves in a learner-centered, contextual, religious and life related setting. It also stimulates students for critical thinking and help them to appreciate their values, standards and attitudes. Furthermore it orientates students with regards to the epidemiology of HIV/AIDS; the prevalence of the disease on Namibia, Africa and Internationally. It also informs students on the psycho social and environmental factors that contribute to the spread of the disease, the impact of HIV/AIDS on their individual lives, family and communities at large. The unit further seeks to enhance HIV/AIDS preventive skills among students by means of paradigm shift and behavior change and also to impart general introductory knowledge on gender, to make students aware, as well as sensitize them towards gender issues and how they affect our society, Sub-Region and continent at large.

SSTD2432 INTRODUCTION TO MATHEMATICS **4L/Week**

Module Title: **INTRODUCTION TO MATHEMATICS**
Code: **SSTD2432**
NQF Level: 4
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1x3 hours Examination 60%
Pre- requisite: Grade 12 Mathematics

Module description: Sets: notations and diagrams to represent sets, subset, empty set, equality of sets, intersection, union, complement; Matrices: addition, multiplication, scalar multiplication and transpose (for up to 3x3 dimension), determinant and inverse (with emphasis on 2x2), Derivatives: definition, rules of differentiation; the definite integral**.** Understand the difference between sequences and series and between finite and infinite series, and appreciate the idea of a limit. Solve basic problems involving Arithmetic and Geometric Progressions. Compute both simple and compound interests, apply the concept to discounting in studying Economics. Use the Binomial Series Expansion to any power. Indices and logarithms.

SSTD2452 SAMPLING CONCEPTS IN SURVEY WORK **4L/Week**

Module Title: **SAMPLING CONCEPTS IN SURVEY WORK**
Code: **SSTD2452**
NQF Level: 4
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1 x 3 hours Examination 60%
Pre- requisite: None
Module description: Identifying data needs. Importance of examining the literature to determine existing data sources, their appropriateness and their reliability. Using knowledge concerning the target population. Samples, target population, study population, sampling frames, sampling units. Developing objectives; Designing a sampling scheme; Designing and testing a questionnaire; Data entry and data cleaning; Producing statistical summaries that relate to the objectives of the study; Presenting results What is meant by "representativeness"? The importance of getting results that are generalisable. What is meant by simple random sampling and stratified random sampling. How to draw such samples. Benefits and limitations. Probability versus non-probability sampling methods. A brief overview of quota sampling, purposive sampling, systematic sampling, cluster sampling and multi-stage sampling. Developing a sampling strategy for a given problem. Identifying information needs. Discussing alternative sampling schemes as presented by different groups. Estimating a population mean, a population proportion. Distinguishing between "with" and "without" replacement sampling. Computing measures of precision. How to take a stratified random sample. Advantages of stratification. Sample sizes using proportional allocation or Neyman's allocation. Deriving estimates for a population mean, total and proportion. Formulae for determining the sample size based on simple random sampling for estimating a population mean or population proportion. Difficulties associated with use of formulae. Recognizing broad issues that enter into sample size determinations. Key considerations needed to make decisions about sample sizes. Cluster and multi-stage sampling. Probability proportional to size (PPS) sampling. Self-weighting designs. Brief introduction to the role of design effects. Brief overview of different types of non-sampling errors. Discussion of how non-sampling errors can be minimized. Role of sampling weights in estimation. Calculation of weights for simple scenarios.

SSTD2412 INDEX NUMBERS AND TIME SERIES **4L/Week**

Module Title: **INDEX NUMBERS AND TIME SERIES**
Code: **SSTD2412**
NQF Level: 4
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1x3 hour Examination 60%
Pre- requisite: Grade 12 Mathematics
Module description: Introduction to index numbers; Basic theory of index number, consumer price indices, errors in index numbers, rebasing techniques, introduction to National Accounts, GDP statistics by activity, GDP by expenditure, National Income and the balance of payment, measuring GDP. Introduction to time series; Trends in time series; decomposing a time series; forecasting and review.

SECOND YEAR MODULES

SSTD2531 PROBABILITY **4L/Week**

Module Title: **PROBABILITY**
Code: **SSTD2531**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1x3 hour Examination 60%
Pre- requisite: SSTD2432
Module description: Introduction to probability and life tables ideas; Laws of probability; Conditional probability and independence; probability distributions: the binomial distribution, the Poisson distribution, the normal distribution; using probability ideas in life tables; basic life table computations.

SSTD2511 STATISTICAL METHODS AND TECHNIQUES **4L/Week**

Module Title: **STATISTICAL METHODS AND TECHNIQUES**

Code: **SSTD2511**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks,
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1X3 hour Examination 60%
Pre- requisite: SSTD2431
Module description: Analysis of Variance: One way and two-ways; Linear models and estimation by least squares: an introduction; measures of association between variables; Hypothesis testing: Test of significance for means; proportions and variance: in small and large samples (dependent and independent samples); Chi-square tests; Calculating Type II Error probabilities and finding the sample size for the Z test; relationships between hypothesis testing procedure and confidence intervals; Significance levels and p-values as ways of reporting results of a statistical test;

CEMI2571 BASIC MICROECONOMICS **4L/Week**

Module Title: **BASIC MICROECONOMICS**
Code: **CEMI2571**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1x3 hour Examination 60%
Pre- requisite: None
Module description: This module is aimed at introducing students to key concepts used in microeconomics and facilitates a basic understanding of the economic phenomena. The module is designed to help students understand that society's economic choices often involve tradeoffs between efficiency and equity and serves as preparation for students for further study of the discipline with the economics field. The module content includes: an introduction to microeconomics, demand and supply, market structures, factor markets and introduction to international trade.

ULEA3519 ENGLISH FOR ACADEMIC PURPOSES **4L/Week**

Module title: **ENGLISH FOR ACADEMIC PURPOSES**
Code: **ULEA 3519**
NQF level: 5
Contact hours: 4 periods per week for 14 weeks
Credits: 16
Module assessment: Continuous assessment (60%): 2 tests (reading and writing), 1 academic written essay, 1oralpresentation
Examination (40%) : 1x3 hour examination paper
Prerequisites: None
Module description: This module develops a student's understanding, and competencies regarding academic conventions such as academic reading, writing, listening and oral presentation skills for academic purposes. Students are required to produce a referenced and researched essay written in formal academic style within the context of their university studies. Students are also required to do oral presentations based on their essays. The reading component of the course deals with academic level texts. This involves students in a detailed critical analysis of such texts. The main aim is therefore, to develop academic literacy in English.

SSTD2552 BASIC DATA PROCESSING **4L/Week**

Module Title: **BASIC DATA PROCESSING**
Code: **SSTD 2552**
NQF Level: 5
Contact Hours: 2 theoretical lectures and 2 practical lectures per week
Number of Credits: 16
Module Assessment: Continuous Assessment (at least two tests and two assignments) 40%, Examination 60%. 1x3 hour practical and theoretical Examination
Prerequisites: SSTD2452
Module Description: Designing a questionnaire, coding, variable definition; transferring data from paper form to electronic files, uses and limitations of a spreadsheet for data entry; organising data in a spreadsheet; Exploratory data analysis for single variables; analysing numeric variables, producing and presenting good tables and graphs, Analysing categorical variables; managing the dataset; organising multiple response

data; international standards and guidelines; efficient storage and management of electronic files; cross tabulation and testing for relationships and associations.

SSTD2512 BASIC DEMOGRAPHY AND EPIDEMIOLOGY **4L/Week**

Module Title: **BASIC DEMOGRAPHY AND EPIDEMIOLOGY**
Code: **SSTD2512**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1 x 3 hours Examination 60%
Pre- requisite: SSTD2411

Module description: Meaning of demography. Data sources: census, vital registration and surveys. Nature of demographic data and usual need for very large samples. Data collection problems: frame, non-response and measurement errors. Uses and importance of demographic data. Difficult concepts for data collection and analysis e.g. household and family. Difficult data to elicit e.g. complete fertility histories. Meaning of epidemiology. Data sources, examples and discussion: routine data, cross-sectional surveys, longitudinal and sentinel site studies, research approaches. Introduction to "demographic shorthand" use of algebraic symbols. Absolute vs. relative numbers. Ratio, proportion and rate. Death rates introduced as being conceptually some of the simplest demographic rates. Age-specific death rates. Data sources. Mortality rates. Mention of some other types of rates. Attribute data & its importance in epidemiology. Point and period prevalence. Incidence and relationship to prevalence. Risk, risk factors, comparison of risks. Brief introduction to cohort and case-control studies and basic perceptions of risk therein. Confounding. Direct and indirect standardisation introduced and discussed in context of death rates. Brief mention of other, more general applications of this idea. Age-grouping conventions. Age-misreporting. Disaggregation and its data demands. Reporting detailed data. Introduction to age-period-cohort issues. Construction of a simple life table

SSTD2532 STATISTICAL MODELLING **4L/Week**

Module Title: **STATISTICAL MODELLING**
Code: **SSTD 2532**
NQF Level: 5
Contact Hours: 2 theoretical lectures and 2 practical lectures per week
Number of Credits: 16
Module Assessment: Continuous Assessment (at least two tests and two assignments) 40%,1x3 hour Examination 60%.
Prerequisites: SSTD2432

Module Description: Simple Linear Regression; Inferences about the regression line; Correlation and the Coefficient of determination; Assumptions underlying regression analysis; Multiple linear regression; Choosing the best model; Predictions from the regression model; analysis of variance for comparing means; analysis of variance with two categorical factors; comparing regressions

CEMA2572 BASIC MACROECONOMICS **4L/Week**

Module Title: **BASIC MACROECONOMICS**
Code: **CEMA2572**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks,
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; 1x3 hour Examination 60%
Pre- requisite: None

Module description: This module introduces basic concepts and tools used in macroeconomic analysis: the theory, measurement, and determination of national income; business cycles; the multiplier; fiscal policy; budget deficits; and the national debt; aggregate supply and aggregate demand; money, banking, and monetary policy, exchange rates and balance of payments accounts; and stabilization policy for unemployment and inflation.

J.3 B.Sc.STATISTICS: MAJORS AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc.Statistics Major and Computer Science Minor (11BSTC)

Students opting for a major in Statistics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Descriptive Statistics	SSTS3531	C in Gr. 12 Mathematics
1	Computer Literacy	UCLC3509	None
1	Basic Mathematics	SMAT3511	C in Gr. 12 Mathematics
1	Analytic Geometry, Complex Numbers and	SMAT3531	C in Gr. 12 Mathematics

	Matrices		
	Computer Science Minor		
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test

SEMESTER	MODULE	CODE	PRE-/COREQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	
2	Precalculus	SMAT3512	C in Gr. 12 Mathematics
2	Introduction to Probability	SSTS3532	C in Gr. 12 Mathematics
	Computer Science Minor		
3	Programming Fundamentals II	SCMP3512	SCMP3511Programming Fundamentals I

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Probability Theory	SSTS3611	SSTS3532, SMAT3512
1	Statistical Estimation	SSTS3631	SSTS3532
1	Calculus I	SMAT3611	None
1	Sets and Numbers	SMAT3601	None
	Computer Science Minor		
1	Introduction to Database Systems	SCMP3611	SCMP3511 Programming Fundamentals I

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Calculus II	SMAT3612	SMAT3512
2	Statistical Inference	SSTS3632	SSTS3532
	Computer Science Minor		
2	Advanced Databases	SCMP3622	SCMP3611 Introduction to Database Systems

YEAR 3

SEMETER	MODULE	CODES	PRE/CO-REQUISITES
1	Linear Models	SSTS3711	SSTS3611, SSTS3632
1	Distribution Theory	SSTS3721	SMAT3611, SMAT3632, SSTS3611
1	Sampling Techniques	SSTS3731	SSTS3531
1	Research and Survey Methods	SSTS3701	None
	Computer Science Minor		
1	Artificial Intelligence	SCMP3771	SCMP3511 Programming Fundamentals I

SEMETER	MODULE	CODES	PRE/CO-REQUISITES
2	Data processing	SSTS3732	SSTS3632, SSTS3612
2	Experimental Design and Analysis of Variance	SSTS3752	SSTS3636
2	Non-parametric and Categorical Statistics	SSTS3712	SSTS3632
	Computer Science Minor		
2	Database Programming	SCMP3852	SCMP3511 Programming Fundamentals I; SCMP3622 Advanced Databases

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Time Series Analysis	SSTS3801	SSTS3711
1	Statistical Computer Programming	SSTS3811	SSTS3732
1	Research Project	SSTS3810	
1	Decision Analysis	SSTS3821	SSTS3711
1	Stochastic Processes	SSTS3841	SSTS3721

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Multivariate Distribution Theory	SSTS3812	SSTS3721
2	Research Project	SSTS3810	
2	Forecasting Methods and Application	SSTS3852	
2	Statistical Quality Control	SSTS3832	SSTS3721

QUALIFICATION: B.Sc.Statistics Major and Population Studies Minor (11BSTP)

Students opting for a major in Statistics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES

1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Descriptive Statistics	SSTS3531	C in Gr. 12 Mathematics
1	Computer Literacy	UCLC 3509	None
1	Basic Mathematics	SMAT3511	C in Gr. 12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr. 12 Mathematics
	Population Studies Minor:		
1	Foundation of Sociology	HSOG3511	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	
2	Precalculus	SMAT3512	C in Gr. 12 Mathematics
2	Introduction to Probability	SSTS3532	C in Gr. 12 Mathematics
	Population Studies Minor:		
2	Basics of Sociology	HSOG3532	

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Probability Theory	SSTS3611	SSTS3532, SMAT3512
1	Statistical Estimation	SSTS3631	SSTS3532
1	Calculus I	SMAT3611	None
1	Sets and Numbers	SMAT3601	None
	Population Studies Minor		
1	Official statistics and National Statistical systems	SPOP3631	None

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Calculus II	SMAT3612	SMAT3512
2	Statistical Inference	SSTS3632	SSTS3532
	Population Studies Minor		
2	Social Demography	HSOG3652	

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Linear Models	SSTS3711	SSTS3611, SSTS3632
1	Distribution Theory	SSTS3721	SMAT3611, SMAT3632, SSTS3611
1	Sampling Techniques	SSTS3731	SSTS3531
1	Research and Survey Methods	SSTS3701	None
	Population Studies Minor		
1	Demographic Methods I	SPOP3711	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Data processing	SSTS3732	SSTS3632, SSTS3612
2	Experimental Design and Analysis of Variance	SSTS3752	SSTS3636
2	Non-parametric and Categorical Statistics	SSTS3712	SSTS3632
	Population Studies Minor		
2	Demographic Methods II	SPOP3732	SPOP3711, SPOP3611

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Time Series Analysis	SSTS3801	SSTS3711
1	Statistical Computer Programming	SSTS3811	SSTS3732
1	Research Project	SSTS3810	
1	Decision Analysis	SSTS3821	SSTS3711
1	Stochastic Processes	SSTS3841	SSTS3721

SEMESTER	MODULE		
2	Multivariate Distribution Theory	SSTS3812	SSTS3721
2	Research Project	SSTS3810	
2	Forecasting Methods and Application	SSTS3852	
2	Statistical Quality Control	SSTS3832	SSTS3721

QUALIFICATION: B.Sc.Statistics Major and Mathematics Minor (11BSTM)

Students opting for a major in Statistics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Descriptive Statistics	SSTS3531	C in Gr. 12 Mathematics
1	Computer Literacy	UCLC 3509	None
1	Basic Mathematics	SMAT3511	C in Gr. 12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr. 12 Mathematics
	Mathematics Minor		
1	Programming Fundamentals I	SCMP3511	Departmental Entry Test

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	
2	Precalculus	SMAT3512	C in Gr. 12 Mathematics
2	Introduction to Probability	SSTS3532	C in Gr. 12 Mathematics
	Mathematics Minor		
2	Programming Fundamentals II	SCMP3512	SCMP3511 Programming Fundamentals I

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Probability Theory	SSTS3611	SSTS3532, SMAT3512
1	Statistical Estimation	SSTS3631	SSTS3532
1	Calculus I	SMAT3611	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
1	Sets and Numbers	SMAT3601	any two following modules: SMAT3511 SMAT3531,SMAT3512
	Mathematics Minor		
1	Numerical Methods	SMAT3621	
	MODULE	**CODES**	**PRE/CO-REQUISITES**
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Calculus II	SMAT3612	[SMAT3511 and SMAT 3512] or [SMAT3531 and SMAT3512]
2	Statistical Inference	SSTS3632	SSTS3532
	Mathematics Minor		
2	Elementary Linear Algebra	SMAT3652	Any two following modules: SMAT3511 SMAT3531,SMAT3512

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Linear Models	SSTS3711	SSTS3611, SSTS3632
1	Distribution Theory	SSTS3721	SMAT3611, SMAT3632, SSTS3611
1	Sampling Techniques	SSTS3731	SSTS3531
1	Research and Survey Methods	SSTS3701	None
	Mathematics Minor		
1	Linear Algebra I	SMAT3711	SMAT3601 SMAT3652

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Data processing	SSTS3732	SSTS3632, SSTS3612
2	Experimental Design and Analysis of Variance	SSTS3752	SSTS3636
2	Non-parametric and Categorical Statistics	SSTS3712	SSTS3632
	Mathematics Minor		
2	Linear Algebra II	SMAT3712	SMAT3601 SMAT3652

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Time Series Analysis	SSTS3801	SSTS3711
1	Statistical Computer Programming	SSTS3811	SSTS3732
1	Research Project	SSTS3810	
1	Decision Analysis	SSTS3821	SSTS3711
1	Stochastic Processes	SSTS3841	SSTS3721

SEMESTER	MODULE		
2	Multivariate Distribution Theory	SSTS3812	SSTS3721
2	Research Project	SSTS3810	
2	Forecasting Methods and Application	SSTS3852	
2	Statistical Quality Control	SSTS3832	SSTS3721

QUALIFICATION: B.Sc.Statistics Major and Economics Minor (11BSTE)

Students opting for a major in Statistics must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	English Communication & Study Skills	ULCE3419	University entry requirements
1	Descriptive Statistics	SSTS3531	C in Gr. 12 Mathematics
1	Computer Literacy	UCLC3509	
1	Basic Mathematics	SMAT3511	C in Gr. 12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr. 12 Mathematics
	Economics Minor		
1	Basic Microeconomics	CEMI3571	
SEMESTER	**MODULE**	**CODES**	**PRE/CO-REQUISITES**
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	
2	Precalculus	SMAT3512	C in Gr. 12 Mathematics
2	Introduction to Probability	SSTS3532	C in Gr. 12 Mathematics
	Economics Minor		
2	Basic Macroeconomics	CEMA3572	

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Probability Theory	SSTS3611	SSTS3532, SMAT3512
1	Statistical Estimation	SSTS3631	SSTS3532
1	Calculus I	SMAT3611	None
1	Sets and Numbers	SMAT3601	None
	Economics Minor		
1	Intermediate Microeconomics I	CEMI3671	
SEMESTER	**MODULE**	**CODES**	**PRE/CO-REQUISITES**
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Calculus II	SMAT3612	SMAT3512
2	Statistical Inference	SSTS3632	SSTS3532
	Economics Minor		
2	Intermediate Microeconomics II	CEMI3672	

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Linear Models	SSTS3711	SSTS3611, SSTS3632
1	Distribution Theory	SSTS3721	SMAT3611, SMAT3632, SSTS3611
1	Sampling Techniques	SSTS3731	SSTS3531
1	Research and Survey Methods	SSTS3701	None
	Economics Minor		
1	Econometrics I	CETM3771	
SEMESTER	**MODULE**	**CODES**	**PRE/CO-REQUISITES**
2	Data processing	SSTS3732	SSTS3632, SSTS3612
2	Experimental Design and Analysis of Variance	SSTS3752	SSTS3636
2	Non-parametric and Categorical Statistics	SSTS3712	SSTS3632
	Economics Minor		
2	Econometrics II	CETM3772	

YEAR 4 (In 2010, the fourth year curriculum will be as follows)

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Time Series Analysis	SSTS3801	SSTS3711
1	Statistical Computer Programming	SSTS3811	SSTS3732
1	Research Project	SSTS3810	
1	Decision Analysis	SSTS3821	SSTS3711
1	Stochastic Processes	SSTS3841	SSTS3721

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Multivariate Distribution Theory	SSTS3812	SSTS3721
2	Research Project	SSTS3810	
2	Forecasting Methods and Application	SSTS3852	
2	Statistical Quality Control	SSTS3832	SSTS3721

**NB: For students to be considered as having fulfilled requirements for a minor in Statistics, they are required to take the following courses:

SSTS 3531: Descriptive Statistics,
SSTS 3532: Introduction to Probability,
SMTS3512: Precalculus
SSTS 3611: Probability Theory,
SSTS3632: Statistical Inference
SSTS 3731: Sampling Techniques,
SSTS 3712: Non- parametric and Categorical Data Analysis

J.3.1. B.SC.STATISTICS: MODULE AND CURRICULUM DESCRIPTIONS

FIRST YEAR MODULES

SSTS 3531 DESCRIPTIVE STATISTICS **4L/ Week**

Module Title: **DESCRIPTIVE STATISTICS**
Code: **SSTS3531**
NQF Level: 5
Contact Hours: 4 lectures per week/14 weeks, 1 hour tutorial per week/14 weeks
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignment) 40%; examination 60% (1x3 hour examination paper).
Pre- requisite: C Grade 12 Mathematics
Module description: Collection and Presentation of Data; Data Sources: primary versus secondary. Data types: categorical versus discrete and continuous numerical data. Types of measurements: nominal, ordinal, interval, ratio scales. Measures of Central Tendency: mean, mode, median. Measures of dispersion: Skewness and Kurtosis, quartiles, standard deviation, variance, range, inter- quartile range. Presentation of data: tabular forms, frequency tables, cross – tabulations (two variable), graphical methods, histograms, pie charts, bar charts, frequency polygons, stem and leaf plots, box and whiskers plot, identifying outliers; ogives.

SSTS 3532 **INTRODUCTION TO PROBABILITY** **4L/ Week**

Module Title: **INTRODUCTION TO PROBABILITY**
Code: **SSTS 3532**
NQF Level: 5
Contact hours: 4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits: 16
Module Assessment: Continuous assessment (at least two tests and two assignments) 40%; examination 60% (1x3 hour examination paper).
Pre-requisite: C Grade 12 Mathematics
Module description: Counting techniques: permutation and combination, Set theory; relative frequency and probability, properties, Identification of events, Addition rule, mutually exclusive events, conditional probability, calculation of total probability, Bayes Theorem and independence; Random experiments and Sample space; The axioms of probability; random variables, expectations, random vectors, functions of random variables; and probability density in discrete and continuous case; Bernoulli trials, Binomial; Poisson, Geometric; Uniform and Normal; Binomial and Normal tables

SECOND YEAR MODULES

SSTS 3611 PROBABILITY THEORY

Module Title:	**PROBABILITY THEORY**
Code:	**SSTS3611**
NQF Level:	6
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week/14 weeks
Credits:	16
Module Assessment:	Continuous assessment (at least two tests and two assignments) 40%; examination 60% (1x3 hour examination paper).
Pre-requisite:	SSTS3532: Introduction to Probability; SMAT3512: Precalculus

Module description: Convergence in probability, Law of large number, Sums and Products, convergence of distribution, Central Limit Theorem, Negative Binomial, Hypergeometric, Exponential ; Normal Approximation to Binomial and Poisson. Bivariate and multivariate probability distributions; Marginal and Conditional probability distributions; Independent random variables; Expected value of a function of random variables; Covariance of two random variables; the expected value and variance of linear functions of random variables. Mathematical expectations.

SSTS 3631 STATISTICAL ESTIMATION

Module Title:	**STATISTICAL ESTIMATION**
Code:	**SSTS 3631**
NQF Level:	6
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week/14 weeks
Credits:	16
Module Assessment:	Continuous assessment (at least two tests and two assignments) 40%; examination 60% (1x3 hour examination paper).
Pre-requisite:	SSTS3532: Introduction to Probability

Module description: Sample statistics and sampling distributions: Sampling distributions related to the Normal distribution; the Central Limit Theorem. Estimation of parameters: the bias and mean square error of point estimators; Some common unbiased point estimator; Confidence intervals; Properties of point estimators and Methods of Estimation: relative efficiency; consistency; sufficiency; the Rao-Blackwell theorem and Minimum Variance Unbiased Estimators; the Method of Moments; the Method of maximum Likelihood.

SSTS3612 INTRODUCTION TO STATISTICAL COMPUTING

Module Title:	**INTRODUCTION TO STATISTICAL COMPUTING**
Code:	**SSTS 3612**
NQF Level:	6
Contact hours:	4 lab- based lectures per week / 14 weeks, 1 hour tutorial per week/14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% - 3 hour Laboratory based
Pre-requisite:	SSTS3531: Descriptive Statistics

Module description: Introduction to a statistical package (SPSS, Excel for analysis; Minitab, Statistica); Data acquisition and management; Create datasets, variable definition, variable labels, data entry, data cleaning, selecting cases, split files, Descriptive statistics; Graphical representation-editing, cross tabulation, Import/copying files, tables from excel, SPSS to word, estimation and hypothesis testing using a statistical package.

SSTS3632 STATISTICAL INFERENCE

Module Title:	**STATISTICAL INFERENCE**
Code:	**SSTS 3632**
NQF Level:	6
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour examination paper)
Pre-requisite:	SSTS3532: Introduction to Probability

Module description: Hypothesis testing: Test of significance for means; proportions and variance: in small and large samples (dependent and independent samples); Chi-square tests; Calculating Type II Error probabilities and finding the sample size for the Z test; relationships between hypothesis testing procedure and confidence intervals; Significance levels and p-values as ways of reporting results of a statistical test; Testing hypotheses concerning variances; power of tests and the Neyman-Pearson Lemma; Likelihood Ratio Tests. Linear models and estimation by least squares: an introduction; measures of association between variables

THIRD YEAR MODULES

SSTS3711 LINEAR MODELS

Module Title:	**LINEAR MODELS**
Code:	**SSTS 3711**
NQF Level:	7
Contact hours:	4 lectures per week / 14 weeks, 3 hour practical per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60%
Pre-requisite:	SSTS3611: Probability Theory; SSTS3632 Statistical Inference

Module description: This module is expected to introduce students to linear models, and their application in predicting future occurrences based on models built from available information.Linear models and estimation; fitting a simple linear model; multiple regression; statistical inference of linear models; polynomial and nonlinear regression; residual analysis; multicollinearity and its effects; Diagnostics and remedial measures; model building – stepwise procedure

SSTS3721 DISTRIBUTION THEORY

Module Title:	**DISTRIBUTION THEORY**
Code:	**SSTS 3721**
NQF Level:	7
Contact hours:	2 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	8
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60%
Pre-requisite:	SMATS3611 Calculus I; SMATS3632 Calculus II; SSTS3611: Probability Theory

Module description: Moments of Binomial, Poisson, Uniform, Normal, Geometric, Hypergeometric and Exponential distributions; Bivariate Normal, Gamma, Beta, Chi- square, F and t distributions. moment generating functions; Finding the Probability distribution of a Function of random variables: sums, products and quotients: The Method of Distribution functions, the method of Transformation, the Method of moment generating functions; Order Statistics and their functions

SSTS3731 SAMPLING TECHNIQUES

Module Title:	**SAMPLING TECHNIQUES**
Code:	**SSTS 3731**
NQF Level:	7
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1 hour examination paper)
Pre-requisite:	SSTS3531: Descriptive Statistics

Module description: The overall aim of this module is to equip the student with the planning of data collection process, estimation of required sample size and estimation of population mean, total, proportion as well as variance. Data collection methods: probability and non-probability methods. Response and non-response errors. Estimation of population mean, population total, population proportion and population variance. Sample size allocation in: simple random sampling (with and without replacement), stratified random sampling, systematic sampling, cluster sampling (two-stage), quota sampling, judgemental sampling, and snowball sampling. Calculation of sampling and Non-sampling errors. Confidence interval. Weighting.

SSTS3701 RESEARCH AND SURVEY METHODS

Module Title:	**RESEARCH AND SURVEY METHODS**
Code:	**SSTS 3701**
NQF Level:	7
Contact hours:	2 lectures per week / 14 weeks, 1 hour tutorial per week/14 weeks
Credits:	8
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x2 hour examination paper).
Pre-requisite:	None

Module description: Design and use of questionnaires (formulating research problem, research questions, research hypotheses), methods of collecting data, errors in surveys, ethical issues, pilot studies and revising questionnaire, types of research (desk studies, types of surveys): advantages and disadvantages, report writing, dealing with non-response, coding, scientific language, sampling frame.

SSTS3732 DATA PROCESSING

Module Title:	**DATA PROCESSING**
Code:	**SSTS 3732**
NQF Level:	7
Contact hours:	4 Lab- based lectures per week / 14 weeks; 3 hour practical per week/14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour Laboratory Based – examination).
Pre-requisite:	SSTS3632 Statistical Inference; SSTS3612: Introduction to Statistical Computing

Module description: Applications of inferences concerning means and proportions to data – Parametric tests: t- test, Chi-Square 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 Simple Linear Regression (modelling) to data. Mini project.

SSTS3712 NON-PARAMETRIC AND CATEGORICAL DATA ANALYSIS

Module Title:	**NON-PARAMETRIC AND CATEGORICAL DATA ANALYSIS**
Code:	**SSTS 3712**
NQF Level:	7
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour examination paper)
Pre-requisite:	SSTS 3632: Statistical Inference

Module 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, Friedma's test, spearman Rank Correlation test. Contingency tables; inferences for two way contingency tables; Chi- square test of Independence. Dummy variables, models for binary response variable: logistic regression and log linear models.

SSTS3752 EXPERIMENTAL DESIGN AND ANALYSIS OF VARIANCE

Module Title:	**EXPERIMENTAL DESIGN AND ANALYSIS OF VARIANCE**
Code:	**SSTS 3752**
NQF Level:	7
Contact hours:	4 lectures per week / 14 weeks, 3 hour practical per week/14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour examination paper).
Pre-requisite:	SSTS3632: Statistical Inference; Co- requisite – SSTS3711 Linear Models

Module description: Students who do this module will be equipped sufficiently with the basic understanding of how to design researches and analyse the data collected. Experiments; Experimental design; one-way ANOVA; Two-way ANOVA; Latin and Greco-Latin squares design; Multiple comparison; Factorial design. Analysis involving incomplete tables and missing values; estimation of missing values; multiple comparison methods.

FOURTH YEAR MODULES

SSTS3852 FORECASTING METHODS AND APPLICATIONS

Module Title:	**FORECASTING METHODS AND APPLICATIONS**
Code:	**SSTS 3852**
NQF Level:	8
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week/14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour examination paper).
Co- requisite:	SSTS3801: Time Series Analysis

Module description: 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

SSTS3812 MULTIVARIATE DISTRIBUTION THEORY

Module Title:	**MULTIVARIATE DISTRIBUTION THEORY**
Code:	**SSTS 3812**
NQF Level:	8
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x2 hour examination paper)
Pre-requisite:	SSTS3721: Distribution Theory

Module description: The multivariate normal distribution: definition, moment generating function, conditional distributions. Estimation of the mean vector; covariance matrix and distribution of the estimates. The Hotellings T2 Distribution; Chi-square distribution. Inference about the mean vectors: one or two sample cases. Test of independence.

SSTS3832 STATISTICAL QUALITY CONTROL

Module Title:	**STATISTICAL QUALITY CONTROL**
Code:	**SSTS 3832**
NQF Level:	8
Contact hours:	4 lectures per week / 14 weeks, 3 hour practical per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour examination paper).
Pre-requisite:	SSTS3732: Data Processing

Module description: Sampling inspection: OC curve average run length, process curve and method of choosing sample plans. Mood's theorem. Control charts: simple control charts for variables, properties of charts, economic designs of charts, charts for variables and qualitative data. CUSUM charts: economic design control charts and use of monogram to design interval schemes.

SSTS3811 STATISTICAL COMPUTER PROGRAMMING AND SIMULATION

Module Title:	**STATISTICAL COMPUTER PROGRAMMING AND SIMULATION**
Code:	**SSTS 3811**
NQF Level:	**8**
Contact hours:	4 laboratory- based lectures per week / 14 weeks, 3 hour practical per wek/14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x3 hour lab- based examination).
Pre-requisite:	SSTS3732: Data Processing

Module description: Introduction to programming (in C/C++/etc.): Algorithms, simple data types, assignment, conditionals, iteration, functions and procedures, complex data types, array processing. Statistics: Introduction to statistical package programmes; SPSS syntax/MS Excel scripts/etc., generation of random numbers, simulations of probability distributions; normal, binomial, etc. Data analysis; elementary distribution theory: binomial and normal distributions; random sampling; population parameters and sample statistics; estimation, confidence intervals and hypothesis testing based on the binomial and normal distributions.

SSTS3801 TIME SERIES ANALYSIS

Module Title:	**TIME SERIES ANALYSIS**
Code:	**SSTS 3801**
NQF Level:	8
Contact hours:	2 Lectures per week/14 weeks, 3 hour practical every other week
Credits:	8
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x2 hour examination paper)
Pre-requisite:	SSTS 3711: Linear Models

Module description: Components of a Time Series; Smoothing techniques; Trend Analysis; Time Series Analysis: Multiplicative Models and Additive Models; Measuring the Cyclical Effect; Measuring the Seasonal Effect.

SSTS 3821 DECISION ANALYSIS

Module Title:	**DECISION ANALYSIS**
Code:	**SSTS 3821**
NQF Level:	8
Contact hours:	2 Lectures per week/14 weeks, 1 hour tutorial per week
Credits:	8
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x2 hour examination paper)
Pre-requisite:	SSTS3711: Linear Models

Module description: 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: Bayes' rule. Solving decision problems using posterior probabilities.

SSTS 3841 STOCHASTIC PROCESSES

Module Title:	**STOCHASTIC PROCESSES**
Code:	**SSTS 3841**
NQF Level:	8
Contact hours:	2 Lectures per week/14 weeks, 1 hour tutorial per week
Credits:	8
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60% (1x2 hour examination paper)
Pre-requisite:	SSTS3721: Distribution Theory

Module description: Elements of Stochastic Processes. Markov Chains. The basic limit theorem of Markov chains and applications. Branching processes. Compounding stochastic processes. Queuing processes.

STS3810

Module title:	**RESEARCH PROJECT**
Code:	**SSTS3810**
NQA level:	8
Contact hours:	2 contact hours per week
Credits:	**32**

Module assessment: Project report 70% Oral presentation 30%

Pre-requisite: At least 75% of third year modules must have been passed

Module description: A piece of work on a selected topic showing the applications of relevant statistical tools and embodied in a project report. The project is expected to run throughout the two semesters. Students are expected to work under the supervision of a member of academic staff. The internal and external examiners will examine the student's project report at the end of the second semester. A student may be expected to do an oral on the project.

SERVICE MODULES OFFERED

SSTS 3422 INTRODUCTION TO STATISTICS

Module Title:	**INTRODUCTION TO STATISTICS**
Code:	**SSTS 3522**
NQF Level:	5
Contact Hours:	2 Lectures per Week + 1 hour tutorial per week for 14 weeks
Credits:	8
Module Assessment:	Continuous assessment (at least two tests and two assignments) 40%, Examination 60% (1x2 Hour examination paper)
Prerequisites:	C in NSSC Mathematics

Module Description: Definition: Statistics; descriptive, inferential. Variables: qualitative versus quantitative. Data types: primary versus secondary, categorical versus discrete, continuous. Sources of data. Population versus sample. Types of measurements: nominal, ordinal, interval, ratio scales. Presentation of data: tabular forms and graphical methods: histograms, pie charts, bar charts, frequency polygons, ogives, stem- and- leaf plots, box- and-whiskers plots. Measures of Central Tendency: Σ notation, mean, median, mode, quartiles, percentiles. Measures of Dispersion: variance, standard deviation, range, inters- quartile range, skewness and kurtosis. Identification of outliers. Uses of scientific calculators for statistical manipulation limited to calculation of mean, standard deviation.

SSTS 3621 STATISTICS FOR LIFE SCIENCES I

Module Title:	**STATISTICS FOR LIFE SCIENCES I**
Code:	**SSTS 3621**
NQF Level:	6
Contact Hours:	2 Lectures per Week + 1 hour tutorial per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%, Examination 60%. (1x2 hour Examination paper).
Prerequisites:	SSTS 3422: Introduction to Statistics

Module Description: Tests of Hypotheses: one sample and two sample cases for dependent and independent samples; Confidence Intervals. Linear regression and correlation. Test of Significance of regression and Correlation coefficients; Predictions using regression models.

SSTS 3622 STATISTICS FOR LIFE SCIENCES II

Module Title:	**STATISTICS FOR LIFE SCIENCES II**
Code:	**SSTS 3622**
NQF Level:	6
Contact Hours:	2 lectures per week/14 weeks, 1 hour tutorial per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%, Examination 60%. (1x2 hour Examination paper)
Prerequisites:	SSTS3422: Introduction to Statistics

Module Description: Design of Biological Experiments: Choice of factors, sampling units, Analysis of variance: One- and two-way. Selecting samples, replications. Nonparametric tests: Sign test, Mann- Whitney U- test, Wilcoxon- Signed Ranks test, Spearman rank correlation test, Kruskal – Wallis H – test, Friedman's test; Use of Chi- square test for independence and goodness of fit. Tests for normality should be included Shannon-Wiener index?

SSTS 3691 STATISTICS FOR ENGINEERS

Module Title:	**STATISTICS FOR ENGINEERS**
Code:	**SSTS3691**
NQF Level:	6
Contact Hours:	4 Lectures per week/14 weeks, 2 hours practical per week for 14 weeks
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%, Examination 60% (1x3 hour examination paper).
Prerequisite:	SSTS 3422: Introduction to Statistics

Module Description: Probability: Theory (Random experiments, Random events), Conditional Probability, Mathematical Expectation and Decision making; Probability Distributions and Densities: Binomial, Geometric, Hypergeometric, Poisson, Normal, Uniform, Gamma, Beta, Weibull; Sampling Distributions: Mean, Variance; Inferences concerning Mean, Variance and Proportions: Point and Interval Estimations, Parametric tests, Nonparametric tests; Linear Regression and Correlation: Simple and Multiple Linear Regression, Correlation; Analysis of Variance: Completely Randomized and Randomized Block Designs, Multiple Comparisons; Applications to Quality Assurance: Control Charts for Measurements and for Attributes, Tolerance Limits, OC Curves, Acceptance Sampling; Applications to Reliability and Life Testing: Reliability, Failure-time distributions, Exponential Model in Reliability and in Life Testing, Weibull Model in Life Testing.

J.4 B.Sc.POPULATION STUDIES MAJORS AND MINORS, CURRICULUM AND PREREQUISITES

QUALIFICATION: B.Sc. Population Studies Major and Geography Minor (11BPGE)

Students opting for a major in Population Studies must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	English Communication and Study Skills	ULCE3419	C in Gr.12 English
1	Computer Literacy	UCLC 3509	None
1	Basic Mathematics	SMAT3511	C in Gr.12 Mathematics
1	Fundamentals of Physical Geography	HGHE3511	
1	Descriptive statistics	SSTS3531	C in Gr.12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr. 12 Mathematics

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	None
2	Precalculus	SMAT3512	C in Gr.12 Mathematics
2	Fundamentals of Human Geography	HGHE3532	
2	Introduction to Probability	SSTS3532	C in Gr.12 Mathematics

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Settlement Geography	HGHE3641	
1	Climatology	HGHE3621	
1	Economic Geography	HGHE3661	
1	Geomorphology	HGHE3601	
1	Community Health	NCH3630	None
1	Sets and Numbers	SMAT3601	any two following modules: SMAT3511 SMAT3531,SMAT3512
1	Introduction to Demography	SPOP3611	None
1	Official Statistics and National Statistical Systems	SPOP3631	None

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Social Demography	HSOG3652	
2	Community Health	NCH3630	
2	Statistical Inference	SSTS3632	SSTS3532
2	Biogeography	HGHE3642	

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Health Service Planning	NHM3711	
1	Fundamentals of Data processing	SPOP3731	SSTS3612
1	Sampling Techniques	SSTS3731	SSTS3531
1	Demographic Methods I	SPOP3711	
1	Geographic Analysis and Techniques	HGIS3711	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Health service Management	NHM3712	
2	Geographic Information Systems	HGIS3732	
2	Demographic Methods II	SPOP3732	Co-SPOP3711, POP3611
2	Regional Geography	HGHE3752	

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Epidemiological Methods	SPOP3811	
1	Health Communication	HISA3862	
1	Research Project	SPOP3810	
1	Environmental Management and Governance	HGSP3800	
1	Spatial Planning	HGSP3820	

1	Remote Sensing	HGHR3801	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Population Migration	SPOP3832	
2	Population Projections	SPOP3822	
2	Research Project	SPOP3810	
2	Environmental Management and Governance	HGSP3800	
2	Spatial Planning	HGSP3820	
2	Applied Spatial Analysis	HGHR3822	

QUALIFICATION: B.Sc. Population Studies Major and Statistics Minor (11BPST)

Students opting for a major in Population Studies must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	English Communication & Study Skills	ULCE 3419	University entry requirements
1	Descriptive Statistics	SSTS3531	C in Gr. 12 Mathematics
1	Computer Literacy	UCLC 3509	None
1	Basic Mathematics	SMAT3511	C in Gr. 12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr. 12 Mathematics
1	Foundation of Sociology	HSOG3511	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	
2	Precalculus	SMAT3512	C in Gr. 12 Mathematics
2	Introduction to Probability	SSTS3532	C in Gr. 12 Mathematics
2	Basics of Sociology	HSOG3532	

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Probability Theory	SSTS3611	SSTS3532, SMAT3512
1	Statistical Estimation	SSTS3631	SSTS3532
1	Community Health	NCH3630	None
1	Introduction to Demography	SPOP3611	None
1	Sets and Numbers	SMAT3601	
1	Official Statistics and National Statistical Systems	SPOP3631	None

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Social Demography	HSOG3652	
2	Community Health	NCH3630	
2	Statistical Inference	SSTS3632	SSTS3532

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Health Service Planning	NHM3711	
1	Fundamentals of Data processing	SPOP3731	SSTS3612
1	Sampling Techniques	SSTS3731	SSTS3531
1	Demographic Methods I	SPOP3711	
1	Research and Survey Methods	SSTS3701	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Health service Management	NHM3712	
2	Social Research Methods	HSOG3732	
2	Demographic Methods II	SPOP3732	Co- SPOP3711, SPOP3611
2	Non-parametric and Categorical Statistics	SSTS3712	SSTS3632

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Epidemiological Methods	SPOP3811	
1	Health Communication	HISA3862	
1	Research Project	SPOP3810	
1	Advanced Sociology of Namibian Society	HSOS3840	
1	Sociology of Gender and Sexuality	HSOS3860	
1	Sociology of Health	HSOZ3820	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Population Migration	SPOP3832	
2	Population Projections	SPOP3822	
2	Research Project	SPOP3810	
2	Advanced Sociology of Namibian Society	HSOS3840	
2	Sociology of Gender and Sexuality	HSOS3860	
2	Sociology of Health	HSOG3880	

QUALIFICATION: B.Sc. Population Studies Major and Sociology Minor (11BPSO)

Students opting for a major in Population Studies must take all of the following modules:

YEAR 1

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	English Communication and Study Skills	ULCE3419	C in Gr.12 English
1	Computer Literacy	UCLC 3509	None
1	Basic Mathematics	SMAT3511	C in Gr.12 Mathematics
1	Foundation of Sociology	HSOG3511	
1	Descriptive statistics	SSTS3531	C in Gr.12 Mathematics
1	Analytic Geometry, Complex Numbers and Matrices	SMAT3531	C in Gr.12 Mathematics

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	English for academic Purpose	ULEA3519	
2	Contemporary Social Issues	UCSI 3529	None
2	Precalculus	SMAT3512	C in Gr.12 Mathematics
2	Basics of Sociology	HSOG3532	
2	Introduction to Probability	SSTS3532	C in Gr.12 Mathematics

YEAR 2

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Social problems: learning to conceptualize and implement social research	HSOG3671	
1	Community Health	NCH3630	None
1	Sets and Numbers	SMAT3601	any two following modules: SMAT3511 SMAT3531,SMAT3512
1	Introduction to Demography	SPOP3611	None
1	Official Statistics and National Statistical Systems	SPOP3631	None

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Introduction to Statistical Computing	SSTS3612	SSTS3531
2	Social Demography	HSOG3652	
2	Community Health	NCH3630	
2	Statistical Inference	SSTS3632	SSTS3532
2	Classical sociological Theory	HSOG3612	

YEAR 3

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Health Service Planning	NHM3711	
1	Fundamentals of Data processing	SPOP3731	SSTS3612
1	Sampling Techniques	SSTS3731	SSTS3531
1	Demographic Methods I	SPOP3711	
1	Research and Survey Methods	SSTS3701	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Health service Management	NHM3712	
2	Social Research Methods	HSOG3732	
2	Demographic Methods II	SPOP3732	Co- SPOP3711, SPOP3611
2	Sociology of Namibian society	HSOG3772	

YEAR 4

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
1	Epidemiological Methods	SPOP3811	
1	Health Communication	HISA3832	
1	Research Project	SPOP3810	
1	Advanced Sociology of Namibian Society	HSOS3840	
1	Sociology of Gender and Sexuality	HSOS3860	
1	Sociology of Health	HSOZ3820	

SEMESTER	MODULE	CODES	PRE/CO-REQUISITES
2	Population Migration	SPOP3832	
2	Population Projections	SPOP3822	
2	Research Project	SPOP3810	
2	Advanced Sociology of Namibian Society	HSOS3840	
2	Sociology of Gender and Sexuality	HSOS3860	
2	Sociology of Health	HSOZ3820	

J.4.1. B.Sc. POPULATION STUDIES MODULE AND CURRICULUM DESCRIPTIONS

FIRST YEAR MODULES

HSOG 3511: FOUNDATIONS OF SOCIOLOGY

Module Title: **FOUNDATIONS OF SOCIOLOGY**
Code: **HSOG 3511**
NQF level: 5
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 60%, consisting of 1 written assignment, minimum of two tests, examination 40%.
Prerequisites: None
Module description: The course serves as a guide to the foundations of the discipline. While introducing the student to the basic concepts, theories, fields and applications of international sociology, it focuses on Namibian society. Sociology is shown with its different faces – its history of origins, the classical and contemporary interpretations of social action, social structure and social change. As well, the course reflects on the principal social institutions, such as family, state, economy, education and religion. It emphasizes the analysis and the impact of social inequality, such as class, race, and gender.

HSOG 3532: BASICS OF SOCIOLOGY: PARADIGMS AND METHODS (4L/Week)

Module title: **BASICS OF SOCIOLOGY: PARADIGMS AND METHODS**
Code: **HSOG 3532**
NQF level: 5
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 60%, consisting of 1written assignment, minimum of two tests, examination 40%
Module description: The introductory course emphasizes the link between the theoretical body of sociology and its methodological implementation. It acquaints the student with the basic paradigms of the discipline. At the same time, it familiarizes the student with the basic knowledge and instruments of social research. With this first out of four methodological courses, the new sociology curriculum intends to strengthen the student's research abilities. Such faculties are increasingly on request on the Namibian labour market, reflecting the broad developmental efforts of post-independence Namibian society. Themes covered: sociological sub-disciplines; main paradigms: functionalism, interactionism, marxism; post-structuralism; race, class, gender and ethnicity; social institutions: family, education and media. Social research: sources of knowledge; criteria for judging good research; purpose of social research, research goals; types of social research; key concepts; research ethics; instruments: measurement, sampling; sources of data; the research process; research proposal.

HGHE 3511: FUNDAMENTALS OF PHYSICAL GEOGRAPHY

Module title: **FUNDAMENTALS OF PHYSICAL GEOGRAPHY**
Code: **HGHE 3511**
NQF Level: 5
Contact hours: 4 lectures / week for 14 weeks
Credits: 16
Module assessment: Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 03 hours paper)
Prerequisite: University, Faculty and Department Rules and Regulations apply
Module description (content): Students acquaint themselves with the essential foundations of Physical Geography, including common links to auxiliary disciplines and fields of study. The module presents structures, functions, processes and distributional patterns inherent in phenomena of 'natural' environments, relating to climate, geomorphology, hydrology, soils and vegetation. The content focuses on the interrelationship of geo-ecosystems, including the human factor. With particular reference to Namibian conditions, the module offers fundamental applications of concepts inherent in the functioning of the atmo-, litho-, sphere, hydro- and biosphere.

HGHE 3532 FUNDAMENTALS OF HUMAN GEOGRAPHY

Module title: **FUNDAMENTALS OF HUMAN GEOGRAPHY**
Code: **HGHE 3532**
NQF Level: 5
Contact hours: 4 periods / week for 14 weeks
Credits: 16
Module assessment: Continuous assessment 60 % (minimum 03 assessments, practical work). Examination 40 % (01 x 03 hours paper)
Prerequisite: University, Faculty and Department Rules and Regulations apply
Module description (content): Students acquaint themselves with foundations and concepts of Human Geography, including the subject's links to auxiliary disciplines. The module presents structures, functions, processes and distributional patterns inherent in phenomena of human environments. The content focuses on demographic features of population, rural and urban settlements and economic activities including tourism, land-use and infrastructure, regional diversity / similarity as well as politico-geographical perspectives relating to spatial development. Local to international references cover Namibia, the African continent and selected regions of the world. The module structure implies practical exercises / assignments, aiming at fostering application of knowledge, reflective thinking and practical skills.

SECOND YEAR MODULES

SPOP 3611 INTRODUCTION TO DEMOGRAPHY

Module Title: **INTRODUCTION TO DEMOGRAPHY**
Code: **SPOP 3611**
NQA level: 6
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module Assessment: Continuous assessment 40% (at least two tests and two assignments); Examination 60%
Pre-requisite: none
Module description: Nature and scope of Demography; The development of population theories: Malthusian and Neo-Malthusian theories, Socialist and Marxist views, Neo- Marxian views, demographic transition theory. Population size and composition, Population change; Components of population change; Key concepts in fertility; Sources of data for fertility analysis; Levels, trends and differentials of fertility; Major macro level fertility theories and models; Transition; responses; Micro level perspectives of fertility; economic, psychological; socio-cultural. Recent changes in fertility patterns in developing countries; Fertility policies and programmes. Key concepts in mortality; Sources of data for mortality analysis; Levels and trends of mortality; Differentials and Determinants; Recent changes in mortality levels and patterns in developing countries; Mortality policies and programmes in developing countries; Emerging and re-emerging diseases and their effects on mortality patterns. Population trends (Namibian context); Population Conferences; Impact of HIV.

SPOP3631 OFFICIAL STATISTICS AND NATIONAL STATISTICAL SYSTEMS

Module Title: **OFFICIAL STATISTICS AND NATIONAL STATISTICAL SYSTEMS**
Code: **SPOP3631**
NQA level: 6
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 40% (at least two tests and two assignments); Examination 60%
Pre-requisite: None
Module description: Purpose and scope of official statistics, structure and work of the National Statistical System, Organization, methods and practices of data collection and dissemination. Social Statistics: Define educational levels, purpose, principles and procedures with respect to education statistical data collection, Understand and appreciate data requirement for educational development purposes, Understand and appreciate various rate and ratios required for analysis of statistics on teacher and pupils, Understand 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: Explain how the following statistics are defined and calculated: labour force, economically active and inactive population, employment rates etc.; Understand the importance of statistics on wages, labour income, social security, underemployment etc. System of national accounts (SNA): Explain the importance of compiling national accounts; Explain the uses of national accounts in socio-economic planning. Trade statistics; migration statistics; (understand statistics from various line ministries), civil registration statistics, economic statistics.

HSOG3671 SOCIAL PROBLEMS- LEARNING TO CONCEPTUALIZE AND IMPLEMENT

Module title:	**SOCIAL PROBLEMS- LEARNING TO CONCEPTUALIZE AND IMPLEMENT**
Code:	**HSOG3671**
NQF Level:	6
Contanct Hours:	4 Lectures per week/14 weeks
Credits:	16
Module Assessment:	Continuous assessment 60%, consisting of 2 written assignments, 1 presentation and a minimum of 2 tests. Examination 40%.
Prerequisites:	None

Module Description: The course mostly utilizes lecture and tutorial format. It resumes the methodological training introduced into the sociology curriculum with the 1st year module "Basics of Sociology". It familiarizes the student with the use of social problems (class, poverty and inequality, gender inequality, crime and violence, alcohol and substance abuse; HIV/AIDS and other health issues; environmental problems etc.). At lower intermediate level, the course is the second in a sequence of three modules aimed at imparting theoretical knowledge, conceptual capabilities and practical skills in social research that are needed for adequate professional preparation. Practical acquaintance with the field, however, will be reserved for a further course at upper intermediate level, in the following years of studies.

HSOG 3612 CLASSICAL SOCIOLOGICAL THEORY

Module title:	**CLASSICAL SOCIOLOGICAL THEORY**
Code:	**HSOG 3612**
NQF level:	6
Contact hours:	4 lectures per week / 14 weeks
Credits:	16
Module assessment:	Continuous assessment 60%, consisting of 2 written assignments, minimum 1 test; examination 40%
Prerequisites:	None

Module description: This module will survey and analyse the main classical sociological theories and their philosophical predecessors (1750-1950) that are central to the emergence and development of the sociological tradition. Enlightenment philosophy will be examined (Rousseau, Adam Smith); also German idealism (Hegel and Kant) and British socialist thought and utilitarianism (Owen, Bentham). The influence of these on the emergence of classical sociology will be explained. Extensive analysis of the major founders of sociology such as Comte, Marx, Durkheim and Weber will be at the heart of this module discussing themes such as religion, rise of modern society, class and social division, methods of social analysis. In addition students will study: Spencer, Morgan and Darwinian social evolution; Mauss on social order and social construction of the person; Toennies on community; Simmel and Lukacs on industrial culture; Schuetz and Husserl on the life-world; Mead's symbolic interactionism; Adorno and the Frankfurt School; Parsons and structural functionalism.

HSOG 3652 SOCIAL DEMOGRAPHY

Module title:	**SOCIAL DEMOGRAPHY**
Code:	**HSOG 3652**
NQF Level:	6
Contact hours:	4 lectures per week / 14 weeks
Total credits:	16
Module assessment:	Students' work will be assessed through continuous assessment (60%) and an examination paper of three hours duration (40%). Continuous assessment grades is based on a minimum of two (2) in-class tests and one (1) individual assignment of approximately 5 pages (plus a reference list). Test and assignment dates will be discussed and agreed upon in class. Periodically, class will be divided into groups for the purpose of discussing questions provided by the lecturer. Students are graded upon their participation & presentation in groups. The final examination will evaluate factual information and understanding.
Prerequisites:	None

Module description: Demography, the science of human population, deals with changes and differences in the size and structure of human populations. Demography is concerned with virtually everything that influences, or can be influenced by, population size, distribution, processes, structure or characteristics. This module pays particular attention to population concepts, population dynamics (processes), theories, causes and demographic data and their usage. The emphasis of the module is on substantive rather than technical issues.

SSTS 3632 STATISTICAL INFERENCE

Module Title:	**STATISTICAL INFERENCE**
Code:	**SSTS 3632**
NQF Level:	6
Contact hours:	4 lectures per week / 14 weeks, 1 hour tutorial per week
Credits:	16
Module Assessment:	Continuous Assessment (at least two tests and two assignments) 40%; Examination 60%
Pre-requisite:	SSTS3532: Introduction to Probability

Module description: Hypothesis testing: Test of significance for means; proportions and variance: in small and large samples (dependent and independent samples); Chi-square tests; Calculating Type II Error probabilities and finding the sample size for the Z test; relationships between hypothesis testing procedure and confidence intervals; Significance levels and p-values as ways of reporting results of a statistical test; Testing hypotheses concerning variances; power of tests and the Neyman-Pearson Lemma; Likelihood Ratio Tests. Linear models and estimation by least squares: an introduction; measures of association between variables

HGHE 3611 CLIMATOLOGY

Module title:	**CLIMATOLOGY**
Code:	**HGHE 3621**
NQF Level:	6
Contact hours:	2 lectures / week for 14 weeks
Credits:	8
Module assessment:	Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 03 hours paper)
Prerequisite:	University, Faculty and Department Rules and Regulations apply

Module description (content): The module investigates components, patterns, processes and functioning relating to phenomena of climatology such as air temperature; atmospheric moisture and precipitation; and on atmospheric pressure, motion and circulation.

HGHE 3601GEOMORPHOLOGY

Module title:	**GEOMORPHOLOGY**
Code:	**HGHE 3601**
NQF Level:	6
Contact hours:	2 lectures / week for 14 weeks
Credits:	8
Module assessment:	Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 03 hours paper)
Prerequisite:	University, Faculty and Department Rules and Regulations apply

Module description (content): The content focuses on processes such as weathering and mass wasting; and the creation of structural terrestrial, marine and aeolic landforms. Landscapes from Namibia and southern Africa exemplify the relevant types of landforms.

HGHE 3641 SETTLEMENT GEOGRAPHY

Module title:	**SETTLEMENT GEOGRAPHY**
Code:	**HGHE 3641**
NQF Level:	6
Contact hours:	2 lectures / week for 14 weeks
Credits:	8
Module assessment:	Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 03 hours paper)
Prerequisite:	University, Faculty and Department Rules and Regulations apply

Module description (content): The module builds students' in depth comprehension and skills in fields of Settlement Geography including tourism settlemt(s). The content familiarises students with structures, patterns, processes, trends and developments relating to urbanisation, settlement development and planning. Regional examples collected from Namibia and internationally present varying spatial scales and timeframes. The content demonstrates the application of recognised models and theories in the analysis of settlements. Case studies strengthen the reflective comprehension of distinct phenomena and problem formations emerging from human settlement over time.

Practicals:
Closely related to the content taught in Settlement Geography, exercises in Practical 2 aim at nurturing the reflective ability of students through knowledge and application skills.

HGHE 3661 ECONOMIC GEOGRAPHY

Module title:	**ECONOMIC GEOGRAPHY**
Code:	**HGHE 3661**
NQF Level:	6
Contact hours:	2 lectures / week for 14 weeks
Credits:	8
Module assessment:	Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 03 hours paper)
Prerequisite:	University, Faculty and Department Rules and Regulations apply

Module description (content): The content builds students' in depth comprehension and skills in fields of Economic Geography, including economic aspects of tourism. The content familiarises students with structures, patterns, processes, trends and developments relating to economic growth and development. Regional examples collected from Namibia and internationally, present varying spatial scales and timeframes. The content demonstrates the application of recognised models and theories in the analysis of geographic economic development in main sectors of the Namibian economy. Case studies strengthen the reflective comprehension of distinct phenomena and problem formations emerging from economic endeavour.

Practicals:
Closely related to the content taught in Climatology, exercises in Practical 2 aim to develop the reflective ability of students through knowledge and application skills.

HGHE 3642 BIOGEOGRAPHY

Module title: **BIOGEOGRAPHY**
Code: **HGHE 3642**
NQF Level: 6
Contact hours: 2 lectures / week for 14 weeks
Credits: 8
Module assessment: Continuous assessment 60% (minimum 03 assessments, practical work). Examination 40% (01 x 02 hours paper)
Prerequisite: University, Faculty and Department Rules and Regulations apply
Module description (content): This module introduces students to the components, functions, processes, patterns and phenomena of Biogeography. Biogeography includes a broad range of topics including evolution, ecology, history of biogeography, biogeographical system, population ecology, distribution of single species and communities, dispersal and extinction, continental biogeography, conservation biogeography and biodiversity.

NNCH3630 COMMUNITY HEALTH NURSING SCIENCE I

Module title: **COMMUNITY HEALTH NURSING SCIENCE**
Code: **NNCH3630**
NQF Level: 6
Contact hours: 2 periods per week x 28 weeks
Credits: 32
Prerequisite: None
Module assessment: Continuous assessment 50%: A minimum of four tests/assignments Examination 50%: 1 x 2hr paper
Module Description: This module aims and introduce knowledge and appropriate skills to students to improve the quality of health status of the individual, family and community in Namibia. Module Requirement and Expectations Compulsory attendance - 80%: active class participation : make appointments with lecturer for tutorials.

THIRD YEAR MODULES

SPOP 3711 DEMOGRAPHIC METHODS I

Module title: **DEMOGRAPHIC METHODS I**
Code: **SPOP 3711**
NQA level: 7
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 40% (at least two tests and two assignments); Examination 60%
Pre-requisite: None
Module description: Sources and types of demographic data. Uses and limitations of demographic data: Population census, sample surveys, vital registration, population register, non-traditional sources (parish register, administrative records), international sources, availability of population data in sub-Saharan Africa. Evaluation of demographic data; Errors in demographic data and techniques of detecting these errors; Data adjustment techniques. Techniques of estimating population size and composition, some basic demographic methods: the balancing equation, rates and ratios: dependency ratio: age and economic dependency ratios and their implications. Population composition: analysis of sex structure, analysis of age structure, age-sex pyramid. Estimation and measurements of basic demographic parameters: fertility, mortality and migration.

SPOP 3732 DEMOGRAPHIC METHODS II

Module title: **DEMOGRAPHIC METHODS II**
Code: **SPOP 3732**
NQA level: 7
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 40% (at least two tests and two assignments); Examination 60%
Pre-requisite: none
Module description: Direct and indirect methods of estimation of fertility and mortality. Measurements of Mortality: CDR, ASDR, (q-type and m-type mortality rates), the Lexis chart; Standardization (standardized death rate, standardized mortality ratio), Infant mortality rate. Frameworks and models for mortality analysis, Measurements of fertility: CBR, ASFR, standardization applied to fertility rates, TFR, Period and Cohort analysis of fertility; Parity progression, The determinants of fertility, Frameworks and models for fertility analysis, The Life table: the theory of the life table, abridged life tables, multiple decrement life tables, Population growth: fertility and population growth, Geometric and exponential growth, the annual rate of growth and the net reproductive rate.

SPOP 3731 FUNDAMENTALS OF DATA PROCESSING

Module title: **FUNDAMENTALS OF DATA PROCESSING**
Code: **SPOP 3731**
NQA level: 7
Contact hours: 4 lectures per week / 14 weeks; 3 hours practical per week
Credits: 16
Module assessment: Continuous assessment 40%; Examination 60%
Pre-requisite: SSTS 3612 Introduction to Statistical Computing
Module description: Introduce students to parametric and non-parametric tests. Introduction to regression analysis: Linear regression and Correlation; Explaining the relationship between variables using a Scatter plot; Fitting a simple linear regression model and test of hypothesis for regression coefficient; Testing the association between variables using the correlation analysis. Introducing multiple linear regression analysis: model selection techniques: forward, backward, stepwise; categorical variables in regression; Generalized Linear models: parameter estimation,

interpretation; Logistic regression analysis: parameter estimation; interpretation of odds ratio; estimated probabilities.

MNHM 3711 HEALTH SERVICE PLANNING

Module title: **HEALTH SERVICE PLANNING**
Code: **MNHM 3711**
NQF level: 7
Contact hours: 4 periods per week × 14 weeks
Credits: 16
Module assessment: Continuous assessment 50% (minimum 2 tests; 1 assignment). Examination 50% (1 × 2 hour examination paper)
Module description: This module aims at introducing students to aspects of health service planning which will enable them to develop health service programmes for the socio-economic development of communities

MNHM 3712 HEALTH SERVICE MANAGEMENT

Module title: **HEALTH SERVICE MANAGEMENT**
Code: **MNHM 3712**
NQF level: 7
Contact hours: 4 periods per week × 14 weeks
Credits: 16
Prerequisites: None
Module assessment: Continuous assessment 50% (minimum 2 tests; 1 assignment). Examination 50% (1 × 2 hour examination paper)
Module description: This module aims at introducing students to aspects of health service management that will enable them to plan, implement and evaluate health service programmes, as well as human resources management.

HSOG 3732 SOCIAL RESEARCH METHODS

Module Title: **SOCIAL RESEARCH METHODS**
Code: **HSOG 3732**
NQF level: 7
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 60%, consisting of 2 written assignments, 1 presentation, and a minimum of 2 tests. Examination equals 40%.
Prerequisites: None
Module description: The course mostly utilizes lecture and tutorial format. It examines the different methodological and theoretical debates that underpin different research traditions. Topics include measurement, reliability and validity, index and scale construction, sampling, methods of data collection, data analysis.At upper intermediate level, the course is the third in a sequence of modules aimed at imparting theoretical knowledge, conceptual capabilities and practical skills in social research that are needed for adequate professional preparation.

SSTS 3701 RESEARCH AND SURVEY METHODS

Module Title: **RESEARCH AND SURVEY METHODS**
Code: **SSTS 3701**
NQF Level: 7
Contact hours: 2 lectures per week / 14 weeks
Credits: 8
Module Assessment: Continuous Assessment (at least two tests and two assignments) 40%; Examination 60%
Pre-requisite: None
Module description: Design and use of questionnaires(formulating research problem, research questions, research hypotheses), methods of collecting data, errors in surveys, ethical issues, pilot studies and revising questionnaire, types of research (desk studies, types of surveys): advantages and disadvantages, report writing, dealing with non-response, coding, scientific language, sampling frame.

HSOG 3772 SOCIOLOGY OF NAMIBIAN SOCIETY

Module title: **SOCIOLOGY OF NAMIBIAN SOCIETY**
Code: **HSOG 3772**
NQF level: 7
Contact hours: 4 lectures per week / 14 weeks
Credits: 16
Module assessment: Continuous assessment 60%, consisting of 2 assignments and minimum 1 test, examination 40%
Prerequisites: None
Module description: Modern Namibian society will be examined using a cultural sociology approach. This will distinguish the course from the 4th year double module 'Advanced sociology of Namibian society'. It explores how Namibia and its socio-cultural structures and processes were historically shaped: prior to colonialism; during German and South African colonialism; currently in independent Namibia. Discourse and identity theory (Foucault, Giddens, Hall etc.) will structure the historical and modern analysis in the following topics: ethnic and national identity past and present; colonial and capitalist work culture (with emphasis on contract labour and migration); identity imposition and the state of the San peoples; sexual cultures in Namibia & HIV; the impact of the new mass media; youth cultures; tourism and culture; poverty and deprivation; consumption, class and the new materialism in modern Namibia; religious culture and Namibian society.

HGIS 3711 GEOGRAPHICAL ANALYSIS AND TECHNIQUES

Module title:	**GEOGRAPHICAL ANALYSIS AND TECHNIQUES**
Code:	**HGIS 3711**
NQF Level:	7
Contact hours:	4 periods /week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 60 % (minimum 02 tests, 03 assignments; practical work). Examination 40 % (01 x 03 hours paper)
Prerequisite:	University, Faculty and Department Rules and Regulations apply

Module description (content): The module offers application-orientated insights into scientific methods and techniques, comprising the formulation of hypotheses and assumptions; collection and compilation of data; research design and management; field survey and reconnaissance; as well as the formulation of findings. Exposure to map production; fundamental geodesy; map and aerial photography analysis and interpretation complements this module, enhancing essential skills in geographic analysis techniques. The content familiarises students with the nature of statistical methods applied to quantitative geographic problem analysis, together with the employ of techniques in collecting and analysing qualitative data. Relevant computer-assisted GIS software supports practical components of the module work, seeking to ensure that all participants share a working knowledge of spreadsheet capabilities.

HGIS 3732 GEOGRAPHICAL INFORMATION SYSTEMS

Module title:	**GEOGRAPHICAL INFORMATION SYSTEMS**
Code:	**HGIS 3732**
NQF Level:	7
Contact hours:	4 periods / week for 14 weeks
Credits:	16
Module assessment:	Continuous assessment 60 % (minimum 02 tests, 03 assignments, practical work). Examination 40 % (01 x 03 hours paper)
Prerequisites:	University, Faculty and Department Rules and Regulations apply

Module description (content): The module introduces students to computer-assisted spatial data processing; development, implementation and functions of geographic information systems; data models and structures; as well as analytical procedures. The content focuses on foundations of mapping, database management and information science, including concepts that are essential to any GIS package. Project work based on the application of GIS to a variety of environmental problem formations complement skill-orientated exercises, offered in the Laboratory for Spatial Analysis, DGHES. Hands-on experiences provide students with advanced skills. They should enable students to master software packages such as ArcView 3.x, ArcInfo 8.x. and IDRISI/ILWIS in order to facilitate the creating of maps of geographical locations and their attributes; the performing of spatial analyses using spatial and attributed data; and the display of results in the form of maps and tables.

HGHE 3752 REGIONAL GEOGRAPHY

Module Title: **Regional Geography**
Code : **HGHE 3752**
NQF Level: **7**
Contact hours: 4 Lectures per week/14 weeks
Credits: 16
Module Assessment : Continuous assessment 60% : Examination 40% (1 x 3 hour examination paper)
Prerequisite: None
Content: The module familiarises students with concepts of and approaches to Regional Geography and furthers students' comprehension of the complexity of the system "region", comprising regional structures and functions (politico-economic, socio-cultural). It reflects data in distinct regions, emphasising the interaction of local and external factors, forces and processes over distance and time in Namibia, Africa and other continents. The module incorporates aspects of regional disparity and explains regional development against the background of different paradigms and concepts of regional development.

HSOG 3732 SOCIAL RESEARCH METHODS

Module Title:	**SOCIAL RESEARCH METHODS**
Code:	**HSOG 3732**
NQF level:	7
Contact hours:	4 lectures per week / 14 weeks
Credits:	16
Module assessment:	Continuous assessment 60%, consisting of 2 written assignments, 1 presentation, and a minimum of 2 tests. Examination equals 40%.
Prerequisites:	None

Module description: The course mostly utilizes lecture and tutorial format. It examines the different methodological and theoretical debates that underpin different research traditions. Topics include measurement, reliability and validity, index and scale construction, sampling, methods of data collection, data analysis.At upper intermediate level, the course is the third in a sequence of modules aimed at imparting theoretical knowledge, conceptual capabilities and practical skills in social research that are needed for adequate professional preparation.

FOURTH YEAR MODULES

SPOP 3811 EPIDEMIOLOGICAL METHODS

Module title:	**EPIDEMIOLOGICAL METHODS**
Code:	**SPOP 3811**
NQA level:	8
Contact hours:	4 lectures per week / 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40% (at least two tests and two assignments); Examination 60%
Pre-requisite:	None

Module description: Epidemiological study design; Clinical trials; Case control: Incidence and Prevalence; Design and analysis of Cohort (prospective) studies: advantages and disadvantages. Advantages and disadvantages of cross-sectional studies Matched Case control design and analyses using McNemar's test, reasons for matching: advantages and disadvantages relative to unmatched studies; Measures of Association and impact: Relative risk and odds ratio: estimation of Odds ratio from 2 X 2 tables; Bias: Selection and information bias; effects of the various forms of bias on estimation. Confounding and effect modification: its determination and control.

SPOP 3822 POPULATION PROJECTIONS

Module title:	**POPULATION PROJECTIONS**
Code:	**SPOP 3822**
NQA level:	8
Contact hours:	2 lectures per week / 14 weeks;
Credits:	8
Module assessment:	Continuous assessment 40% (at least two tests and one assignment); Examination 60%
Pre-requisite:	None

Module description: Introducing population projection; the need for population forecast; Basic methods of population projection and applications; the mathematical method; the limitations of the mathematical method. The component method of population projection: the principles of the method, the details of the method; the use of broader age groups, data requirements. Population projections in the Namibian context.

SPOP 3832 POPULATION MIGRATION

Module title:	**POPULATION MIGRATION**
Code:	**SPOP 3832**
NQA level:	8
Contact hours:	4 lectures per week / 14 weeks
Credits:	16
Module assessment:	Continuous assessment 40%; Examination 60%
Pre-requisite:	None

Module description: Definition and terminologies in migration studies. International migration. Sources of data, quality of statistics. Evaluation and estimation of international migration. Intercensal component method. Intercensal cohort – component method. Net migration, gross migration (migration turnover) and migration ratios. Migration rates: crude immigration rate. Crude emigration rate. Crude net migration rate. Crude gross migration rate. Contribution of migration to population change. Graphic techniques of analysis (population turnover). Life-time migration. Migration streams and counter streams. Return migration. Longitudinal migration. Bases of migration rates. Sources of migration statistics. Measurement of mobility. National grouth rate method. Residual methods; vital statistics method. Residual method: survival rate method. Place of birth vs place of enumeration statistics. Residence at a fixed past date. Migration selectivity; by sex, by age, by educational level etc. Causes of migration. Ravenstein's push and pull theory. Lee's Intervening Obstacles theory. Other theories. Contribution of migration to urbanization. Other consequences of migration at the place of origin and at the place of destination. Internal migration (Namibian context)

HISA 3862 HEALTH COMMUNICATION

Module title:	**HEALTH COMMUNICATION**
Code:	**HISA 3862**
NQA level:	8
Contact hours:	2 lectures per week / 14 weeks
Credits:	8
Module assessment:	Continuous assessment 60%; Examination (minimum of 1 test and 2 assignments). Examination 40% (1x3 hour paper)
Pre-requisite:	None

Module description (content): Health communication is one of the most effective methods of preventing the further spread of the HIV/AIDS pandemic in society, in the absence of a cure or vaccination. Health communication uses a variety of strategic communication approaches and tools to achieve behaviour change among groups which are at risk of contracting HIV/AIDS. The course familiarizes students with health communication concepts and theories, the steps of planning a health communication project, methods of identifying risk factors in the health behaviour of communities, target audience analysis. The course also focuses on research methods to collect data from a target audience for communication programmes, behaviour and attitude change, planning communication projects, health message design, liaison with media and selecting communication channels and evaluating health communication interventions.

HSOS 3840 ADVANCED SOCIOLOGY OF NAMIBIAN SOCIETY

Module Title:	**ADVANCED SOCIOLOGY OF NAMIBIAN SOCIETY**
Code:	**HSOS 3840**
NQF level:	8
Contact hours:	2 lectures per week / 28 weeks
Credits:	16
Module assessment:	Continuous assessment 60%, consisting of 2 written assignments, 2 oral presentations, and a minimum of two tests; examination 40%.
Prerequisites:	None

Module description: The course is presented in seminar format. It embarks on the analysis of contemporary Namibian society in its varied cultural, economic, political, historical, social, and social structural aspects. The analysis is based on the comprehensive sighting of current research, thus emphasizing the research orientation of the curriculum at final year level. The course applies sociological perspectives learned in the previous course of the curriculum. Main topical areas of the debate: land issue; labour migration; labour market and unemployment; industrial relations; societal development and Vision 2030; globalization and neo-liberalism; youth; poverty; family; gender; sexual cultures; education; media; religion; traditionalism; social structural change and post-colonial class structure; pre-colonial social formations in Namibia; colonialism, apartheid and liberation.

HSOS 3860 SOCIOLOGY OF GENDER AND SEXUALITY

Module title:	**SOCIOLOGY OF GENDER AND SEXUALITY**
Code:	**HSOS 3860**
NQF level:	8
Contact hours:	2 lectures per week / 28 weeks
Total credits:	16
Module assessment:	Students' work will be assessed through continuous assessment (60%) and one written final examination (40%).For continuous assessment; students are required to submit a minimum of two (2) individual essays. Essays should reflect the critical analysis of the gender system based on theoretical knowledge acquired in the course, literature reviewed and analysis of own life experiences. Students are also expected to do three (3) group presentations of published articles. Additionally, students will be required to participate in monthly seminars. Seminars materials will be assigned on a monthly basis and students are expected to have read the materials in advance of the seminar. The final examination will evaluate the student's understanding of the proceedings in class and her / his theoretical ability.
Prerequisites:	None

Module description: To detect that the social world is largely organised around the gender divide is perhaps one of the most difficult tasks in our current social and political climate. The fact that no two individuals experience the gender system in exactly the same way does not diminish its powerful impact on most individuals. Gender definitely structures shared experiences among categories of people (race, ethnicity, social class) and also their sexual cultures. That is the reason why gender issues have been mainstreamed into the syllabi of the first three years of the B.A. sociology curriculum. This final year course aims at an in-depth analysis of the way in which femininity and masculinity are constructed by both industrialized and developing societies. Testing sociological theories of structuralist orientation and of agency, the course will exemplify both approaches: the ways in which societies socialize individuals into gendered identities and roles, and the ways in which individuals appropriate and re-construct them. The second main focus of the course will be to put to the test gender theories within the social and cultural distinctiveness of Namibian society. Topics include: sociological schools in the conceptualization of gender, i.e. origins of biological sex, origins and strands of feminism; feminist analysis of Namibian society, women's movement in Namibia; sexuality, i.e. components of sexual identity, sexual identities, sexual cultures, sexual rights, friendship and intimate relationship; reproductive health, i.e. gender and HIV/AIDS, safe motherhood, contraception, abortion; men and masculinity, i.e. concepts of masculinity, construction of masculinities in Namibian society, masculinity and gender-based violence; gender policies and developmental organizations in Namibia, i.e. Women in Development (WID), Women and development (WAD), Gender and Development (GAD), policy approaches of state and civil society; gender and economy, i.e. poverty, empowerment, labour market and work place, gender division of labour, job and salary discrimination; gender and culture, i.e. education, media, cultural traditions and commodified culture; gender and social structure, i.e. gender stratification, gender and class; gender and politics, i.e. women and power, women in politics, the legal framework for the promotion of gender equity.

HSOZ 3880 SOCIOLOGY OF HEALTH

Module title:	**SOCIOLOGY OF HEALTH**
Code:	**HSOZ 3880**
NQF Level:	8
Contact hours:	2 lectures per week / 28 weeks
Credits:	16
Module assessment:	Students' work will be assessed through continuous assessment (60%) and one written final examination (40%). For continuous assessment, students are required to submit a minimum of two (2) individual essays. Essays should reflect the critical analysis of health and illness behaviour.
Prerequisites:	None

Module description: This module examines the social contexts of physical and mental health and illness. The module gives prominence to the debates, contrasting models and perspectives that characterise the field of sociology of health. Topics include concepts and theoretical frameworks for sociological understandings of health and illness; the individual (self), society and illness; social organisation and political economy of the health care system; the development of health professions, health professionals and the health work force; stratification, inequality and power in health care delivery organisations; health care and bureaucracy; health care and social change; comparative analyses of alternatives to the dominant paradigms of health, illness and healing; ethical issues in health care and contemporary issues in the study of health and illness.

HGSP 3800 CONCEPTS OF ENVIRONMENTAL MANAGEMENT

Module title:	**CONCEPTS OF ENVIRONMENTAL MANAGEMENT**
Code:	**HGSP 3800**
NQF Level:	8
Contact hours:	2 lectures / week for 28 weeks
Credits:	16
Module assessment:	Continuous assessment: 60% (minimum 04 assessments; research assignments).Examination: 40% (01 x 03 hours paper)
Prerequisites:	Successful completion of all minor modules of the 1st, 2nd and 3rd year level

Module description (content): This module advances students' comprehension of the interdependent functioning whole of the geo-system, biological and human system (geo-ecosystem) through a strong focus on environmental resources and selected environmental problem formations. The content demonstrates the need for conservation and environmental management. Discussions examine academic perspectives and build intellectual skills required in evaluation procedures such as Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA). Practice-orientated assignments apply principles of Integrated Environmental Management (IEM). The module fosters the internalisation of environmental obligations, environmental auditing and environmental ethics needed for sustainable societies.

HGSP 3820 SPATIAL PLANNING

Module title:	**SPATIAL PLANNING**
Code:	**HGSP 3820**
NQF Level:	8
Contact hours:	2 lectures / week for 28 weeks
Credits:	16
Module assessment:	Continuous assessment: 60% (minimum 04 assessments; research assignments). Examination: 40% (01 x 03 hours paper)
Prerequisite:	Successful completion of all modules of the 1st, 2nd and 3rd year level

Module description (content): This module explores the relationship between social structures and their distribution within the territory of state. It is assumed that the triangular relationship between society, economy and territory reflected in the consumption of land reflects a rather created than incidental allocation in space. Governments, through their public services, usually regulate the triangular, interdependent and interlocked system of society, economy and land consumption at local, regional and national level. The content exposes students to the application of their geographical knowledge and understanding to structured and scaled processes of territorial planning. The module focuses institutional agents of public sector planning and assesses their contribution to the allocation of local and regional resources such as land in order to organising the sector and spatial development of state territory.

HGHR 3801 REMOTE SENSING

Module Title:	**REMOTE SENSING**
Code:	**HGHR 3801**
NQF Level:	8
Contact Hours:	2 periods / week for 14 weeks
Credits:	8
Module Assessment:	Continuous Assessment 60% (Minimum 02 tests, 07 Lab assignments). Examination 40 % (1 x 3 hours Examination paper)
Prerequisite:	Successful completion of all minor modules of the 1st, 2nd and third year level

Module Description (Content): This module focuses on the physical principles of remote sensing data acquisition and handling, optical and digital image processing techniques, and environmental and scientific applications of remote sensing data from local to global scales. Specifically, the module deals with the following topics: Physical principles of the visible, infrared and microwave section of the electromagnetic spectrum; Remote sensing platforms and sensors; Data acquisition, storage and processing; Image processing and analysis; Remote sensing applications in geosciences. The module is delivered through a mixture of lectures, tutorials and practicals using remotely sensed data, and practice in digital image processing techniques to provide relevant information for addressing geoscientific issues at a range of temporal and spatial scales.

HGHR 3822 APPLIED SPATIAL ANALYSIS

Module Title:	**APPLIED SPATIAL ANALYSIS**
Code:	**HGHR 3822**
NQF Level:	8
Contact Hours:	2 periods / week for 14 weeks
Credits:	8
Module Assessment:	Research report 100%
Prerequisite:	HGHR 3811

Module Description (Content): This module allows students to deepen their previously acquired skills in geostatistic (HGIS 3711), GIS (HGIS 3732) and / or Remote Sensing (HGHR 3411) by applying them in a wide range of areas such as environmental impact assessment, water resources management, environmental modelling, and terrain analysis. It is designed to develop students' applied vocational and professional skills relevant to work or research. The content is essentially pegged to the module HGHE 3410: Research Project, in which geostatistic, GIS and or Remote Sensing could be employed as a major tool.

SPOP3810

Module title: **RESEARCH PROJECT**
Code: **SPOP3810**
NQA level: 8
Contact hours: 2 contact hours per week
Credits: **32**
Module assessment: Project report 70% Oral presentation 30%
Pre-requisite: At least 75% of third year modules must have been passed
Module description: In this course students will undertake independent and practical research on a selected demographic topic which will be presented as a research report. Students will be expected to apply demographic and statistical methods and follow all phases of research process. The project is expected to run throughout the two semesters. Students are expected to work under the supervision of a member of academic staff. The internal and external examiners will examine the student's project report at the end of the second semester. A student may be expected to do an oral on the project.

STATISTICS DEPARTMENT: COURSE EQUIVALENTS

OLD		**NEW (STARTED 2008)**	
STS3101	Statistics 1A	SSTS3522	Introduction to Statistics
STS3101	Statistics 1A	SSTS3531	Descriptive Statistics
none		SSTS3532	Introduction to Probability
STS3211	Probability	SSTS3611	Probability Theory
STS3201	Inference I	SSTS3631	Statistical Estimation
none		SSTS3612	Introduction to Statistical Computing
STS3212	Inference II	SSTS3632	Statistical Inference
STS3402	Regression Analysis	SSTS3711	Linear Models
STS3312	Distribution Theory	SSTS3721	Distribution Theory
STS3331	Sampling Theory and Survey Methods	SSTS3731	Sampling Techniques
STS3331	Sampling Theory and Survey Methods	SSTS3701	Research and Survey Methods
STS3311	Data Processing	SSTS3732	Data Processing
STS3411	Design and Analysis of Experiments	SSTS3752	Experimental Design and Analysis of Variance
none		SSTS3712	Non- parametric and Categorical Statistics
none		SSTS3801	Time Series Analysis
none		SSTS3811	Statistical Computer Programming
STS3400	Projects	SSTS3810	Research Project
none		SSTS3821	Decision Analysis
none		SSTS3841	Stochastic Processes
STS3401	Multivariate Analysis	SSTS3812	Multivariate Distribution Theory
none		SSTS3852	Forecasting Methods and Applications
STS3412	Statistical Quality Control	SSTS3832	Statistical Quality Control
none		SPOP3611	Introduction to Demography
none		SPOP3631	Official Statistics and National Statistical Systems
STS3391	Fundamentals of Data Processing	SPOP3731	Fundamentals of Data Processing
STS3332	Demography	SPOP3711	Demographic Methods I
none		SPOP3732	Demographic Methods II
none		SPOP3811	Epidemiological Methods
STS3400	Research Projects	SPOP3810	Research Projects
STS3432	Population Migration	SPOP3832	Population Migration
none		SPOP3822	Population Projections

K. POSTGRADUATES PROGRAMMES

(11MSCB Master of Science (Biodiversity Management & Research)
(11MSCI) Master of Science (Information Technology)
(11MSCC) Master of Science (Chemistry)
(11MASC) Master of Science (by Thesis only)
(11DPSC) Doctor of Philosophy (by Thesis only)

The Faculty may award the degree Master of Science (MSC.) by thesis in all the disciplines.
Currently all masters programme are offered by research except M.Sc. in IT and M.Sc, Biodiversity Management & Research, but students may be required to undertake specific courses that will enhance their capability in the field of research. Refer to Regulations for Postgraduate Course in the General Regulations Prospectus: Information, Regulation & fees. Candidates who intend to pursue MSC studies should approach the head of the department in which they would like to undertake their studies before 31 October of the year preceding intended registration.

K.1 MSC BIODIVERSITY MANAGEMENT & RESEARCH (11MSCB) (IN COLLABORATION WITH HUMBOLDT UNIVERSITY, GERMANY)

K.1.1 DEPARTMENTAL REGULATIONS

K.1.2 ADMISSION REQUIREMENTS

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

K.1.3 DURATION OF STUDY

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

K.1.4. CURRICULUM COMPILATION

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

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE_REQUISITE	Compulsory/Elective
1	Biostatistics, Scientific Presentation & Publication	SEBM 5911	Admission requirements	Compulsory
1	Academic Writing for Post Graduate Students	UAE5819	Must be a registered postgraduate student	Compulsory
1	Assessing Biodiversity	SEBM5931	Admission requirements	Compulsory
1	Evolution of Biodiversity	SEBB 5911	Admission requirements	Compulsory
1	Applied Biogeography	SEBB 5931	Admission requirements	Compulsory
1	Integrated Land use and Water Resources Management	SEBL5911	Admission requirements	Compulsory
2	Natural Resource Economics and Management	SEBL5912	Provide a list of requirements or courses that should first be completed before this one.	Compulsory
2	Environmental law	SEBL 5932	Admission requirements	Compulsory
2	GIS and Remote sensing	SEBL5952	Admission requirements	Elective
2	Management of Natural History Collections	SEBM 5912	Admission requirements	Elective
2	Functional Biodiversity of Arid and Semiarid ecosystems	SEBF 5912	Admission requirements	Elective
2	Functional Biodiversity of woodland and forest Ecosystem	SEBF5932	Admission requirements	Elective
2	Functional Biodiversity of Marine Ecosystems	SEBF5952	Admission requirements	Elective
2	Functional Biodiversity of Freshwater Ecosystems	SEBF 5972	Admission requirements	Elective

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE_REQUISITES	Compulsory/Elective
1	Internship	SEBL 5902	Student must pass all year modules and register for thesis	Compulsory
1 & 2	Thesis	SEBL5900	Student must pass all year 1 modules	Compulsory

K.1.5 EXAMINATION REGULATIONS

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

K.1.6. FORMAT AND EVALUATION OF THESIS WORK

Before a candidate can proceed to the thesis, he/she must first successfully complete the coursework examinations. Each student will submit a Master Thesis/Dissertation during the second year. The thesis must be drafted in English language. The thesis must be in a format given by the Coordinators. The thesis will be evaluated by the supervisor and another examiner within one month after submission. The UNAM grading system will be used for the evaluation. Each student will defend the thesis in a viva voce examination.

K.1.7. PRACTICALS

Attendance of practical classes, field trips and internship is compulsory.

K.1.8. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

FIRST YEAR MODULES

ACADEMIC WRITING FOR POST GRADUATE STUDENTS

Module Title: **ACADEMIC WRITING FOR POST GRADUATE STUDENTS**
Code: UAE 5819
NQF Level: 9
Contact hours: 42
Credits: 18
Module Assessment: CA: Students will submit written assignments and at least 1 test during the semester that will form part of continuous assessment.
Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites: Must be a registered postgraduate student
Content: This module is a post-graduate course designed to empower students with skills and knowledge to access and critique academic sources and to synthesize information from these sources to assist them in the substantiation and development of their own claims when writing an academic paper in their respective fields of specialization. Additionally, this course will empower students with the capacity to undertake the challenges of academic writing by exposing them to the different rhetorical and stylistic elements typical of academic texts. Finally, students will be introduced to the American Psychological Association (APA) writing style and will be equipped with the necessary skills to format an academic paper in APA style.

ASSESSING BIODIVERSITY

Module Title: ASSESSING BIODIVERSITY
Code: SEBM5931
NQF Level: 9
Contact hours: 42
Credits: 18
Module Assessment: CA: Students will submit written practical assignments and at least 1 test during the semester that will form part for continuous assessment mark.
Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites: Admission requirements
Content:A general overview about the history of biodiversity research; important definitions for biodiversity research; introduction to the significance and vulnerability of biodiversity; rational for biodiversity assessment, levels at which biodiversity may be assessed; genetic, species, ecosystem, biome and global scale; latitudinal diversity gradients, global versus regional diversity, ecological processes and habitat heterogeneity, biodiversity indices, introduction into various methodological approaches for assessment of biodiversity (biodiversity assessment methods; Gap analysis, conservation biodiversity workshops, National Conservation review, All Taxa Biodiversity Inventory [ATBI], Rapid Biodiversity Assessment, Rapid Assessment Programme, rapid biodiversity appraisal versus long-term ecological monitoring, line transects versus plot design, spatial and temporal organisation of organisms, species, populations); the concept of bioindicators; functional zoodiversity; scaling, tracking and monitoring procedures; the role of habitat (diversity, abundance and habitat use); ecological niches and inter-specific occurrence (contractors versus empires); radio-telemetry; delineation of research; selected examples of data collection and description; spatial orientation and time (seasonality); behavioural studies for biodiversity research; formulation of hypotheses; testing of hypothesis; designing and need for adaptation of monitoring programs, communities, ecosystems and biomes; humans and the biosphere (human population dynamics, shrinking of resources); scientific nature

conservation; IUCN Red List; bioprospecting; buffer zones and migration corridors; working with landowners and local communities; making results available for conservation authorities.

BIOSTATISTICS, SCIENTIFIC PRESENTATION AND PUBLICATION

Module Title:	BIOSTATISTICS, SCIENTIFIC PRESENTATION AND PUBLICATION
Code:	SEBM 5911
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and 2 tests during the semester that will form a mark for continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: Revision of Descriptive Statistics (measures of location and spread as well as graphical presentation of data). Statistical Inference: Parametric as well as Nonparametric methods. Agricultural Experimentation: Principles of experimental design for on-station and adaptive field research trails, Repeated measurements; Analysis of data from balanced designs. Some basic designs: Latin squares, Randomized Complete Block Designs, Completely randomised designs, Split-plot designs – applications to field experiments and trails. Methods of analysing multiple experiments, data management. Multivariate analysis – additive main effects and multiplicative interaction models; Spatial Statistics: Basic concepts of time series; exponential smoothing forecasting, ARIMA models. Definition of and reasons for communication and presentation. Modes of communication and presentation. Is there difference between communication and presentation? Why scientific communication and presentation? The Scientific method, communication and presentation. What is research? Ethics of scientific research, Overview of the scientific method. Graphical presentation of research data, Distinction between data analysis and presentation; Graphs, pie charts, tables, figures, photographs, cartoons etc. Oral scientific presentation; Oral presentation, Use of power point. Written scientific communication: Generic components of scientific writing; Title, abstract, introduction, literature review, aims and objectives, hypotheses (null, alternative, research), key questions, materials and methods, results (graphical presentation of research data, citing statistical test outcomes, description of trends of research data), discussion of research results, drawing conclusions based on research results, summary of results, recommendations, references, appendices / annexes; Practical (research) report; Review articles (literature review);, Writing the thesis. How to prepare scientific poster? Posting Information on the Web

EVOLUTION OF BIODIVERSITY

Module Title:	EVOLUTION OF BIODIVERSITY
Code:	SEBB 5911
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: Historical background of the theory of evolution, milestones; evidence of past evolution; comparative anatomy and paleontology; homologous and analogous structures; evolutionary biogeography; Mendelian inheritance; molecular and Mendelian genetics; phylogeny and classification of mammals (synapomorphic characteristics, ontogeny of mammals, the mammalian head, olfactory communication, placentation, the status of newborn in Therian mammals); dissection and preparation of selected animals and analyses of diagnostic characters; apomorphic and plesiomorphic traits; co-evolution and inter-specific competition; natural and artificial selection; sexual selection (directional, disruptive, stabilising selection, secondary sexual characteristics, Zahavi's Handicap Principle versus Fisherian runaway principle, sexual dimorphism); life-history strategies (fundamental aspects of life history, K- and r- selected species); synthetic theory of evolution; evolutionary scenarios, human evolution

Origin of Agriculture: Origin, Domestication and Introduction of Crops and Animals, Evidence for Origins and Spread of Agriculture. Patterns of Evolution of Crop Plants and Domestic Animals: Evolutionary processes and their role, Genetic Erosion and Genetic Vulnerability: Meaning and causes, Conservation of Biodiversity. Centres of diversity and their significance. *In situ* and *ex situ* conservation. International Plant Genetic Centres and their mandates. Biodiversity International. Important Biodiversity Conventions. A brief background to aquaculture: Definition of aquaculture, types of organisms cultured, summary of world aquaculture production, culture technologies. The history and evolution of aquaculture: History of aquaculture from prehistoric to modern times, development of aquaculture from extensive to highly intensive water reuse technologies. The use of evolutionary tools in aquaculture: Selective breeding, hybridization, polyploidy, sex manipulation & cloning, molecular genetics. Importance of plant systematic, morphological, typological and Cladistic (Phylogenetic) species concepts. Major problems that plant pose to the Linnean Hierarchical system; intergeneric hybridization, asexual reproduction, apomictic plants, (microspecies), forms of polyploidy (including allopolyploidy and autopolyploidy), polyploidy in crop plants, polyploid swarms and horizontal gene transfer. Review of the International Code of Botanical Nomenclature and rules for naming plants. Interpretation of phylogenetic trees. The meaning of gene trees *vs*. species trees. Reticulate evolution and its effect on phylogenies. Shortcomings to the Phylogenetic Species Concept. Plant identification resources in Namibia and Southern Africa; local experts, herbaria, and identification materials (books, unpublished keys). Plant pressing and preservation. *Acacia* species shall be collected in the veld, and pressed and identified with NBRI dichotomous keys, with emphasis on learning important plant identification terminology.

APPLIED BIOGEOGRAPHY

Module Title:	APPLIED BIOGEOGRAPHY
Code:	SEBB5931
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

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

INTEGRATED LAND USE AND WATER RESOURCES MANAGEMENT

Module Title:	INTEGRATED LAND USE AND WATER RESOURCES MANAGEMENT
Code:	SEBL 5911
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

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

NATURAL RESOURCE ECONOMICS AND MANAGEMENT

Module Title:	NATURAL RESOURCE ECONOMICS AND MANAGEMENT
Code:	SEBL5912
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Provide a list of requirements or courses that should first be completed before this one.

Content: Content will include the following:- Spatial development and management on the local and regional level. Factors and principles of population and economic growth: population development (natural, migration), population pyramid, Malthusian hypothesis, environmental constraints, demographic transition. Economic change in the development process: sectors of the economy, three sector hypothesis, reasons for sectoral change, sector-specific differences between industrial and developing countries. Land use forms: Thünen's land use theory, bid-price curves, modifications to the theory, role of transportation costs. Economic activities in space and their spatial patterns: locational decision-making, footloose industries, central place theory, ranges of goods, locational patterns of services. Locational systems in time: Vance's model, rank size rule, neoclassical models, polarisation models, polarisation-reversal hypothesis, long wave theory, product life cycle theory. Regional multiplier effects: forward, backward and service linkages, external and internal agglomeration effects, spread and backwash effects, agglomeration advantages and disadvantages. Instruments and strategies of regional economic development: targets, basic decisions, instruments, spatial strategies. Spatial development and management on the global level. Global disparities: GDP/GNP, per capita income, economic and social indicators, Human Development Index, ecological indicators. Spatial effects of globalization: globalisation and regionalisation, supranational integration spaces, import substitution and export diversification, institutional framework of globalisation, trade (reasons, global patterns),

comparative cost advantages, term of trade, foreign direct investments (positive and negative effects, global patterns). Commodity chains: producer-driven commodity chains, consumer-driven commodity chains, governance and spatial consequences. Agricultural Value Chains and the proliferation of global standards. Rural Development in the context of globalisation with a special focus on African small scale farmers. Globalisation and the environment: global diversity, environmental hazards, fresh water, pollution shares, economics of biodiversit

ENVIRONMENTAL LAW

Module Title:	ENVIRONMENTAL LAW
Code:	SEBL 5932
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: This module will provide an Introduction to International Law: History, sources, relation to national law, relevance in international relations. Discussing international environmental law it highlights history and concepts of international environmental law focusing on the Stockholm, Rio and Johannesburg Conferences, key principles, common goods and the role of developing countries. The module emphasizes environmental treaties, their drafting, negotiations, conclusion and regimes. Principles and problems of Biodiversity Protection through law will be discussed critically in the light of conservation of land resources, conservation treaties (land), species protection and the Convention on International Trade in Endangered Species (CITES). Matters relating to the implementation, human rights and trade related problems will be highlighted. The Biodiversity Convention (CBD), Desertification and Wetlands will be equally important as conservation of marine resources, fishing, oil pollution, UNCLOS, regional treaties, liability approach. Biodiversity and intellectual property are to be viewed in the light of genetic resources and traditional knowledge, the WIPO and WTO regimes. TRIPS, GMOs, the Cartagena Protocol on Biosafety, the developments of climate change and its effects on biodiversity will be legally discussed within the relevant national legal framework and international conventions and protocols. A comparison of environmental law and policy in Namibia, SADC, the EU and Germany will be undertaken. Concept and Scope of the Environment and its law, Foundations and Functions of International Environmental Law, Sources of international and national Environmental Law, International institutions, Principles of International Environmental Law, Compliance and dispute settlement, Criminal aspects of Environmental Law, Sectoral and trans-sectoral regulation (national, regional and international).

GIS AND REMOTE SENSING

Module Title:	GIS AND REMOTE SENSING
Code:	SEBL 5952
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: Content will include the following:- Application and benefits of GIS, Elements of GIS, Basic Geographic Concepts, Cartographic concept of the real world, Scale of Measurement, Spatial location and reference, Projections and coordinate systems. GIS Data Models, Relational database management system, Graphic representation of entities, Vector GIS, Raster GIS. Data Input, Storage and Editing, Primary and Secondary data input devices, GPS, Digitizing, Scanning, Data conversions, Remote Sensing data. Data Analysis, Data Query, Classification, Buffers, Neighborhood functions, Comparison of variables among maps. Data Output and Presentation, The designing process, Map design controls, Non-cartographic output. What is meant by remote sensing? Electromagnetic radiation; Platforms and sensors – Remote Sensed data sources, Image processing and analysis, Thematic applications. Display and manipulation of image files; image pre-processing: radiometric and spectral enhancement; geometric corrections; remote sensing for land use/land cover identification; remote sensing for vegetation monitoring. Remote Sensing for hydrosphere. Map composition and GIS integration (raster/vector).

MANAGEMENT OF NATURAL HISTORY COLLECTIONS

Module Title:	MANAGEMENT OF NATURAL HISTORY COLLECTIONS
Code:	SEBM 5912
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: The module will discuss several aspects of the management of natural history collections. Students will be trained in the principles of establishing, developing, maintaining, and information redistribution in biological reference and research collections. Topics will include:- purpose of collections (introduction, definition of collections, ethics, operational planning); specimen acquisition (field preservation, preservation fluids and fixatives, specimen labelling, microscope preparation, vertebrate preparation, botanical preparation, skeletal reconstruction, gene and tissue banks); collection management (infrastructure management, record keeping, specimen management, information extraction, information management, digital information capture, electronic information processing, collection development planning); information dissemination (exhibitions and education, practical display techniques, practical education techniques); specimen identification (character sets, paper based identification media, morphometric identification media, electronic identification media, building character sets for identification keys, constructing keys) Overview of herbaria and museums, their functions and importance: Definition, objectives and importance of herbaria and museums; use of collections in research, exhibits and educational programs, and how collections can be used to help educators meet science education goals; Types of herbaria: National, Private, University and combinations of these; Types of collections: Type specimens, Main collection, Carpological

collection, Bulky specimens, Xylarium, Bryophytes & Lichens, Macrofungi, Fossils, Spirit collection, Illustrations, Photographs & Copies of specimens, Microscope slides. Herbarium and museum curation: Collection management procedures and preservation techniques including acquisitions and accessions, specimen preparation, exchanges, loans, access and use, documentation, storage, conservation, pest control, profiling, cataloging, digitization, and administration. Database use and management: Types of databases used, practices and procedures of information capture, entry and retrieval; importance of back-ups; uses of the data on the system. Challenges faced by herbaria and museums, and opportunities to be explored to enhance their functions.

FUNCTIONAL BIODIVERSITY OF ARID AND SEMI-ARID ECOSYSTEMS

Module Title:	FUNCTIONAL BIODIVERSITY OF ARID AND SEMI-ARID ECOSYSTEMS
Code:	SEBF5912
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: This module will introduce and discuss the functional aspects of the biodiversity of arid and semi-arid ecosystems with emphasis on arid and semi-arid systems in Southern Africa and in particular Namibia. The module will introduce hot arid lands of the world and Namibia. Special attention will be given to understand ecophysiology in conditions of limitations of factors such as water, food etc. Students will learn how organisms adapt to desert conditions. The biodiversity in deserts shall be explored including factors that enhance and those that limit biodiversity in deserts. The module shall further discuss natural resources found in deserts and how they should be managed. Students shall also learn about desertification. The module shall have a large component of practical field work during which students will collect data and use this for their reports, oral presentations and a mini-research project. These will be undertaken during the compulsory Field Course for the module. Topics will include:- Introduction to Hot Arid Lands of the World and Namibia, geographic & climatological background, with emphasis on Namib. 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, biogeography (connect to other courses). Introduction to natural resources and their management in deserts. Desertification: causes, occurrence, criteria for indicators, possibilities of combating. Optional integration of a 2-days-seminar with emphasis on the specific problems of another arid region e.g. Land Degradation and Desertification in the Sahel – Examples from the Butana Region in the Rep. of the Sudan.

FUNCTIONAL BIODIVERSITY OF WOODLAND AND FOREST ECOSYSTEMS

Module Title:	FUNCTIONAL BIODIVERSITY OF WOODLAND AND FOREST ECOSYSTEMS
Code:	SEBF 5932
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: Definition of functional ecology and functional biodiversity; Definitions of woodland and forest ecosystems; Global and regional distribution of forest and woodland ecosystems; Classification of woodland and forest ecosystems; Overview of White's Phytochoria/Regional Centres of Endemism (with special emphasis on southern African Woodlands and Forests); Brief overview of the importance of woodland and forest biodiversity. Biodiversity and ecosystem function: Plant Functional Types; The intermediate disturbance hypothesis; Hypotheses on ecosystem function; Consequences of changing biodiversity on ecosystem functioning. Determinants of forest and woodland dynamics and functioning: Overview of determinants; Primary determinants (precipitation and temperature, soil moisture, soil nutrients, geology and soils); Secondary determinants (fire, herbivores (including invertebrates), other anthropogenic influences); Interactions among determinants; Savanna structure and functioning (in view of the above determinants). Threats to woodland and forest biodiversity: Impacts of Deforestation and Fragmentation on biodiversity of forests and woodlands; Impact of Climate and Variability on biodiversity of forests and woodlands; Unsustainable forest/woodland management practices (overgrazing, shifting cultivation, harvesting regimes, poor fire management, etc.); impacts of invasive alien species on biodiversity of forests and woodlands; impacts of Infrastructure development, mining and pollution on biodiversity of forests and woodlands. Management of woodland and forest ecosystems: Forest and woodland management approaches (management by the State; management by local communities; Co-management of forests and woodlands; Resource-sharing; multi-stakeholder management of forests and woodlands); Conservation of forest and woodland genetic resources (in situ; ex situ); Convention on Biological Diversity (CBD) as it relates to conservation of forest and woodland biodiversity. Modeling woodland and forest ecosystem structure and function: Introduction to Conceptual and Simulation modeling of forest and woodland dynamics (use case example(s) from moist forests; case example(s) from savanna ecosystems). Gradient analysis in vegetation ecology: Hierarchical classification methods; Indirect gradient (ordination) analysis methods; Direct gradient (ordination) analysis methods.

FUNCTIONAL BIODIVERSITY OF MARINE ECOSYSTEMS

Module Title:	FUNCTIONAL BIODIVERSITY OF MARINE ECOSYSTEMS
Code:	SEBF5972
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: This module will provide an insight into structural biodiversity (spatial levels) and functional biodiversity. properties, circulation (deep circulation and upwelling). Marine organisms: function and the environment – the effects of different abiotic factors (temperature, nutrients, light, pressure, salinity) on the distribution and abundance of marine organisms; life in a fluid medium (plankton and nekton). Organisms and processes in the open ocean. Marine aquatic food webs and key players: Distribution of species in the multidimensional niche-space. Primary producers: Patchy distribution of plankton; density dynamics of plankton and the role of upwelling; biological production in the ocean and its assessment; harmful algal blooms (HABs). Zooplankton: density dynamics; diurnal vertical migrations. Benthos: Organisms inhabiting soft substrates and hard substrates; the intertidal zone environment (sandy- and rocky shores, exposed- and sheltered shores); estuaries as dynamic environments; marshes; mangroves; coral reefs; the deep sea bed (hydrothermal fauna). The benthic communities in these various habitats are discussed with the focus on their feeding and reproductive ecology. Top predators: Their ecological role in marine food webs; effects of losing top predators in marine ecosystems – case studies. The microbial loop: ecological significance; the role of microorganisms in nitrogen, carbon, phosphorus and sulfur cycling in marine ecosystems, the microbial loop and climate change; significance of microorganisms in sulfidic events off the Namibian coast and the ecological significance of these sulfidic events.

FUNCTIONAL BIODIVERSITY OF FRESHWATER ECOSYSTEMS

Module Title:	FUNCTIONAL BIODIVERSITY OF FRESHWATER ECOSYSTEMS
Code:	SEBF 5972
NQF Level:	9
Contact hours:	42
Credits:	18
Module Assessment:	CA: Students will submit written practical assignments and at least 1 test during the semester that will form part of continuous assessment. Weighting: Continuous assessment 40%, Examination 60% (1 x 3 hour paper)
Prerequisites:	Admission requirements

Content: Definitions and examples of different freshwater ecosystems: global distribution, Namibian situation, impacts. Physical and chemical characteristics (temperature, dissolved gases, light intensity, transparency, nutrients concentration) of lentic and lotic freshwater ecosystems and how these factors create a multi-dimensional niche system, affecting the ecology of organisms. Definition and determination of functional biodiversity: Introduction to basic molecular-biological techniques used in biodiversity studies, functional richness (the number of functional groups derived from a combination of functional feeding groups and habit trait groups), Functional diversity – the number of functional groups and division of individuals among these groups, functional evenness - the division of individuals among functional groups, and functional structure - the composition and abundance of functional groups in a habitat. The importance of functional biodiversity. Effects of environmental gradients in lotic systems on functional richness and biodiversity. The river continuum concept - relationships of the functional biodiversity of stream macro-invertebrates to major environmental and spatial gradients in lotic ecosystems. Vertical stratification and gradients in lentic ecosystems and how it affects functional biodiversity. Major functional groups in freshwater ecosystems: 1. Producers – factors affecting productivity; primary producers in lentic systems and in lotic systems; interaction of producers and consumers. 2. Consumers – major consumers in lotic and lentic systems; factors affecting the functional role of consumers in freshwater ecosystems. 3. Decomposers – major biogeochemical cycles in freshwater ecosystems and the microorganisms playing a role in these cycles. Manifestation of various food webs, including microbial loop. Effects of invasive alien species on functional biodiversity - evaluation of changes in freshwater fauna in terms of composition, structure and function: Case studies.

INTERNSHIP

Module Title:	INTERNSHIP
Code:	SEBF 5972
NQF Level:	9
Contact hours:	None: 6 weeks attachment
Credits:	9
Module Assessment:	Assessment will be done through continuous assessment: 100%. Each student will submit a comprehensive report. Supervisor where student will be attached shall submit a report outlining skills that the student acquired and assessment of the student's performance at assigned tasks. The student will be awarded a pass for satisfactory report and recommendation from the supervisor.
Prerequisites:	Student must pass all year 1 modules and register for thesis

Content: The content of the module will be determined by the needs, requirements and interests of the respective students. This is a student-centered module. The place of attachment and nature of knowledge sought and skills acquired will be determined by the students and as advised by the lecturers.

THESIS

Module Title:	THESIS
Code:	SEBL5900
NQF Level:	9
Contact hours:	42
Credits:	120
Module Assessment:	The viva voce and written thesis are assessed and make up 25% and 75% of the final thesis mark respectively.
Prerequisites:	Student must pass all year 1 modules

Content: The content and nature of research for the thesis will depend on the topic of research selected by the student.

K.2. M.Sc. INFORMATION TECHNOLOGY (IT) PROGRAMME (11MSCI)

K.2.1. DEPARTMENTAL REGULATIONS

K.2.2. ADMISSION REQUIREMENTS

The applicants will be accepted on the basis of their undergraduate records. The Master of Science in Information Technology programme is open to all Bachelor's degree holders with Computer Science major or Computer related field and with a minimum average pass mark of 60%.

K.2.3. 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.

K.2.4. CURRICULUM COMPILATION

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

FIRST YEAR MODULES
Compulsory Modules:
ALL modules are compulsory

The following modules are offered in the first semester with a three hours examination paper written in June. The modules are not necessarily offered every academic year.

UAE5819 Academic Writing for Post Graduate Students
SCMP5931 Discrete Mathematics
SCMP5951 Computer Graphics
SCMP5971 Advanced Operating Systems

Second Semester
Compulsory module:
ALL modules are compulsory

The following modules are offered in the second semester with a three hours examination paper written in November. The modules are not necessarily offered every academic year.

SCMP5912 Cryptography and Network Security
SCMP5932 Research Methodology and Research Proposal
SCMP5952 Advanced Software Engineering
SCMP5972 Data Communication and Computer Networks

SECOND YEAR MODULE
SCMP5900 MSc Thesis

K.2.5. EXAMINATION REGULATIONS

Formal examination will take place at the end of each semester. Examinations will be subject to external assessment. The candidate should pass the formal examinations in the taught courses before registering for the Thesis Module. A candidate who fails any part of his/her Masters Degree Programme and who is allowed to repeat that part may be exempted by Senate, on the recommendations of the Departmental panel of examiners from those courses or components from that part s/he passed.

K.2.6. FORMAT AND EVALUATION OF THESIS WORK

A candidate shall be required to submit a complete report in loose bound form for verification and approval to the concerned supervisors in the following format: Paper size: A4 (International format, 210 x 297 mm) Line space:1.5 Top and Bottom margins: 20mm Left margin: 30mm Right margin: 10 mm Figures/flowchart/circuits/block diagrams: No restrictions. Font size: 12 After the dissertation has been approved by the panel the candidate shall submit at least four bounded copies with the chairman of the department in accordance with the following specifications: Color of the report: White Type of binding: Artvellum or cloth Front page should include: University Logo Title of the Project Title of the Degree Name of the candidate Month and Year The relevant department will retain one copy and two copies will be deposited in the university Library. Unless senate has agreed to the contrary the Library copies shall be open to public reference. One copy to the supervisor. The candidate should submit the completed project work in all respects before the end of the academic calendar as announced by the respective department. The candidates will be informed in advance the date, time and the venue of the viva-voce examination. Other regulations and guidelines are same shown in the section (9.4.7) page no. 28 of the general prospectus 2002 are holds good. Concept and Evaluation of Mini Project: Concept of mini project is introduced in each course in order to strengthen the programming skills and ideas to develop the real time project as the time goes. It not only gives the skills but also gives the confidence in the candidates to go ahead with the project developments and practical implementations with different types of tools. The evaluation will be done by a group of examiners constituted by the course co-ordinator. The candidate has to submit a complete project report according to the format given by the respective supervisors. Evaluation also involves the demonstration and viva-voce.

K.2.7. PRACTICALS

Attendance of practical classes is compulsory.

NB: STUDENT MUST PASS ALL MODULES/COURSES AND PRE/CO-REQUISITES AS LISTED FOR THE PARTICULAR MODULES. THIS SECTION LISTS ALLTHE COURSE CODES FOR MSC (IT), FOLLOWED THEREAFTER BY THE COURSE CONTENTS IN THE SAME ORDER.

QUALIFICATION: MSc. Information Technology (IT) Programme (11MSCI)

K.2.8. COURSES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
1	Academic Writing for Post Graduate Students	UAE5819	Must be a Postgraduate student
1	Discrete Mathematics	SCMP5931	None
1	Computer Graphics	SCMP5951	None
1	Advanced Operating Systems	SCMP5971	None

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
2	Cryptography and Network Security	SCMP5912	None
2	Research Methodology and Research Proposal	SCMP5932	None
2	Advanced Software Engineering	SCMP5952	None
2	Data Communication and Computer Networks	SCMP5972	None

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
1 & 2	Thesis	SCMP5900	Passed ALL first year modules

FIRST YEAR MODULES

FIRST SEMESTER

UAE5819 ACADEMIC WRITING FOR POST GRADUATE STUDENTS

Module title: **ACADEMIC WRITING FOR POST GRADUATE STUDENTS**
Code: **UAE5819**
NQF level: 9
Contact hours: 56 hours theory (4 hours per week for 14 weeks)
Credits: 16
Module Assessment Continuous Assessment: 50% (critical reading assignment, annotated bibliography, term paper). Examination: 50% (1 x 3 hour exam)
Prerequisites: Must be a Masters or PHD student

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

SCMP5931 DISCRETE MATHEMATICS

Module title: **DISCRETE MATHEMATICS**
Code: **SCMP5931**
NQF level: 9
Contact hours: 42 lecture hours and 36 hours of practical sessions
Credits: 16
Module Assessment Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites: None

Module Description: To extend student's mathematical ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems. The concepts and notations from discrete mathematics are useful to study or describe objects or problems in computer algorithms and programming languages.

Content: Discrete models, Concepts of sets and functions, foundations, finite series logic, propositional logic, predicate logic, principles of counting, permutations and combinations, induction and recursion, Concepts of AI

SCMP5951 COMPUTER GRAPHICS

Module title:	**COMPUTER GRAPHICS**
Code:	**SCMP5951**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites:	None

Module description: Computer graphics have revolutionalized movie and printing techniques, improved human-computer interfaces, and drive new applications such as computerized photography, art, games, simulations, and mechanical design.

Content: Overview of graphics systems, OpenGL, output primitives, attributes of output primitives, two dimensional geometric transformations and viewing, graphical user interfaces and Interactive input methods, three dimensional concepts, three dimensional object representations, computer animation, color models and color applications.

SCMP5971 ADVANCED OPERATING SYSTEMS

Module title:	**ADVANCED OPERATING SYSTEMS**
Code:	**SCMP5971**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites:	None

Module description: The module equips students with the knowledge of managing different operating systems
Content: Different types of OS, Operating System Structures, Process Management: Threads, CPU Scheduling, Process Synchronization, Deadlocks, Memory Management: Main Memory, Virtual Memory, Storage Management, Protection and Security, Distributed Systems.

SECOND SEMESTER

SCMP5912 CRYPTOGRAPHY AND NETWORK SECURITY

Module title:	**CRYPTOGRAPHY AND NETWORK SECURITY**
Code:	**SCMP5912**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites:	None

Module description: Deals with the main security threats to communications networks such as X-25, Internet, mobile communications, broadband, local area networks and wide area networks. The module establishes certain security mechanisms that avoid or diminish the threats. It introduces students to specific cryptographic techniques that guarantee security in certain applications: e-mail, e-commerce, and web access.
Content: Introduction: OSI security architecture, classical encryption techniques, cipher principles, evaluation criteria foe AES-AES cipher, triple DES. Public key cryptography: key management, Diffie-Hellman key exchange, number theory, confidentiality using symmetric encryption, and RSA. Message authentication and hash function: message authentication codes, security of hash functions and MACs, MD5 message digest algorithm, secure hash algorithm, authentication protocols, and digital signature standards. Network security: Kerberos, X.509 authentication service, electronic mail, security, PGP, S/MIME, IP security, and web security. System level security: intrusion detection, password management, viruses, worms, firewalls.

SCMP5932 RESEARCH METHODOLOGY AND RESEARCH PROPOSAL

Module title:	**RESEARCH METHODOLOGY AND RESEARCH PROPOSAL**
Code:	**SCMP5932**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	100% Continuous Assessment
Prerequisites:	None

Module description: This module introduces the student to Postgraduate research. It aims to ensure that candidates are able to design and formulate appropriate postgraduate research projects, as well as to present their work, in preparation for the module CMP5900, Thesis. The module focuses on topics that are crucial to writing research proposals, conducting research, and preparation of theses. Candidates will be expected to do a number of presentations, which will enable them to develop confidence in presenting research results and to think carefully about the research approaches and methodologies that they adopted.
Content: Research Skills – search skills, writing skills, presentation skills; Conducting literature review; Research methodology; Research techniques; Developing research instruments; Carrying out research; Analysis of research results; presentation of results; validity of conclusions.

SCMP5952 ADVANCED SOFTWARE ENGINEERING

Module title:	**ADVANCED SOFTWARE ENGINEERING**
Code:	**SCMP5952**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites:	None

Module description: The module equips students with the knowledge of designing and building workable software systems

Content: Software – the process and its management, project management: software metrics, estimation, planning, system and software requirement analysis; Computer System analysis, analysis fundamentals, structured analysis, object oriented analysis and data modeling, design and implementation of software, ensuring, verifying and maintaining software integrity; the role of automation.

SCMP5972 DATA COMMUNICATION AND COMPUTER NETWORKS

Module title:	**DATA COMMUNICATION AND COMPUTER NETWORKS**
Code:	**SCMP5972**
NQF level:	9
Contact hours:	42 lecture hours and 36 hours of practical sessions
Credits:	16
Module Assessment	Continuous Assessment 50% (Minimum of 2 tests and 2 assignments) and Final Examinations 50%
Prerequisites:	None

Module description: The module is designed to provide the computer candidates with a working knowledge of data communications, computer networks and open systems. The module includes basic terminology and concepts in data communications, telecommunication protocols, transmission techniques and computer network architecture alternatives.

Content: Introduction to data communications, fundamentals of communications, data transmission coding and framing, data switching, hardware media and network software, reference models, network standardization, complete study of OSI reference models, designing.

SECOND YEAR MODULES

FIRST AND SECOND SEMESTER(S)

SCMP5900 THESIS

Module title:	**THESIS**
Code:	**SCMP5900**
NQF level:	9
Contact hours:	Weekly meetings, the frequency of which may be agreed with supervisors
Credits:	120
Module Assessment	A comprehensive research proposal is to be submitted to senate through the Faculty. In addition, every candidate shall submit a thesis in accordance with the guidelines stipulated in the Postgraduate Student Guide, to be examined by at least two specialists approved by Senate. At least one of these specialists must be external to UNAM.
Prerequisites:	Successful completion of all the Modules in the first year of study

Module description/ Content: Each candidate shall undertake a research project during the year, supervised by an approved supervisor. The research topic may come from the current ICT/Telecommunication technological challenges, in view to provide solutions. Candidates must submit periodic written reports about the research findings to their supervisors, and hold regular discussions with their supervisors. Candidates are also required to participate in research seminars where they present any breakthroughs made in the research for the benefit and input from other scholars.

K.3. MSC CHEMISTRY (11MSCC)

K.3.1. DEPARTMENTAL REGULATIONS

K.3.2. ADMISSION REQUIREMENTS

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

K.3.3. 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.

K.3.4. 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.

FIRST YEAR MODULES
Compulsory Modules:
UAE5819 Academic Writing for Post Graduate Students

First Semester
Compulsory Modules:
SCHM5981 Professional Communication

The following modules are offered in the first semester with a three hours examination paper written in June. Student may choose any 4 of the modules below. The modules are not necessarily offered every academic year.

SCHM5911 Advanced Analytical and InstrumentalMethods
SCHM5931 Advanced Organic Chemistry
SCHM5951 Advanced Inorganic Chemistry
SCHM5971 Advanced Physical Chemistry
SCHB5911 Advanced Biochemistryand Biotechnology
SCHI5931 Advanced Industrial Chemistry

Second Semester
Compulsory module:

SCHM5982 Research Methodology and Project Proposal

The following modules are offered in the second semester. Student may choose any 3 of the modules below. The modules are not necessarily offered every academic year.

SCHM5912 Current Topics in Analytical Chemistry
SCHM5932 Current Topics in Organic Chemistry
SCHM5952 Current Topics in Inorganic Chemistry
SCHM5972 Current Topics in Physical Chemistry
SCHB5932 Current Topics in Biotechnology
SCHI5932 Current Topics in Industrial Chemistry

SECOND YEAR MODULES
SCHM5900 MSc Thesis

QUALIFICATION: MSc Chemistry (11MSCC)

YEAR 1

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
1	Academic Writing for Post Graduate Students	UAE5819	Must be a Postgraduate student
1	Professional Communication	SCHM5981	Department entry requirements
1	Advanced Analytical and InstrumentalMethods	SCHM5911	Department entry requirements
1	Advanced Organic Chemistry	SCHM5931	Department entry requirements
1	Advanced Inorganic Chemistry	SCHM5951	Department entry requirements
1	Advanced Physical Chemistry	SCHM5971	Department entry requirements
1	Advanced Biochemistryand Biotechnology	SCHB5911	Department entry requirements
1	Advanced Industrial Chemistry	SCHI5931	Department entry requirements

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
2	Research Methodology and Project Proposal	SCHM5982	Department entry requirements
2	Current Topics in Analytical Chemistry	SCHM5912	Department entry requirements
2	Current Topics in Organic Chemistry	SCHM5932	Department entry requirements
2	Current Topics in Inorganic Chemistry	SCHM5952	Department entry requirements
2	Current Topics in Physical Chemistry	SCHM5972	Department entry requirements
2	Current Topics in Biotechnology	SCHB5932	Department entry requirements
2	Current Topics in Industrial Chemistry	SCHI5932	Department entry requirements

YEAR 2

SEMESTER	MODULE NAME	CODE	PRE-REQUISITES
1 & 2	MSc Thesis	SCHM5900	Passed all first year modules

K.3.5. EXAMINATION REGULATIONS

If a student fails the first semester module he/she may proceed to the next semester. However he/she must repeat the module in the following year. A minimum of 50% is required to pass each module.

K.3.6. PRACTICALS

Four compulsory practical classes (mini Projects) in the chosen field of study are offered in the first semester. Each practical runs over three weeks. A well-written practical report in the form of a journal article should be submitted. All calculations must be submitted separately.

K.3.7. MODULES: CODES, RESTRICTIONS, EQUIVALENTS AND CONTENTS

FIRST YEAR MODULES

Compulsory Module

UAE5819 ACADEMIC WRITING FOR POST GRADUATE STUDENTS 16 Credits

Module Title: **ACADEMIC WRITING FOR POST GRADUATE STUDENTS**
Code: **UAE5819**
NQF Level: 9
Contact hours: 4 lecture periods per week and 1 practical session per week for 14 weeks
Credits: 16
Module Assessment: CA: (1 x 3 hour exam paper)
Prerequisites: Must be a postgraduate student.
Content:
This module is a post-graduate course designed to empower students with skills and knowledge to access and critique academic sources and to synthesize information from these sources to assist them in the substantiation and development of their own claims when writing an academic paper in their respective fields of specialization. Additionally, this course will empower students with the capacity to undertake the challenges of academic writing by exposing them to the different rhetorical and stylistic elements typical of academic texts. Finally, students will be introduced to the American Psychological Association (APA) writing style and will be equipped with the necessary skills to format an academic paper in APA style.

FIRST SEMESTER

SCHM5911 ADVANCED ANALYTICAL AND INSTRUMENTAL METHODS 16 Credits

Module Title: **ADVANCED ANALYTICAL AND INSTRUMENTAL METHODS**
Code: **SCHM5911**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Admission Requirements
Content: Electroanalytical chemistry: Ion selective electrodes, potentiometry, polarography, coulometry, conductometry and electrogravimetry. Advanced techniques in electroanalytical chemistry –fundametals in; solution electrode interface, Buttler-Volmer relationships, Cottrel equation, Tafel relationships, Levich equation and aspects of rotating disk electrodes, rotating ring disk electrodes. Chromatography. Chromatography - Theory of Chromatography, High Performance Liquid Chromatography (HPLC), Ion Chromatography, Supercritical Fluid Chromatography. Mass Spectrometry (GC-MS), and Liquid Chromatography – Mass Spectrometry (LC-MS). T Advanced mass spectrometry, - Basic instrumentation, ionization techniques, analyzers and detectors, vacuum technology, detailed ion fragmentation patterns and the practical application of electron impact, chemical ionization and other auxiliary mass spectrometry techniques, *e.g*. FABMS and electro spray MS, to the structure elucidation of both small and large organic molecules. *X-ray analysis methods:* Theory of X-ray Spectra. Conventional X-ray fluorescence analysis. Methods and instrumentation for excitation, dispersion detection and interpretation. Matrix effects and their avoidance. Energy dispersive X-ray analysis. Alternative X-ray analysers. Electron microprobe analyser. Single crystal X-ray analysis. *Crystallography* (theoretical principles, theory of crystals, X-rays, crystallographic techniques, structure determinations, powder diffraction and crystallographic data bases), 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 homonuclear NMR- COSY, NOESY, TOCSY; heteronuclear direct (1J)- HECTOR, HMQC,HSQC; heteronuclear long range HMBC, LR HECTOR and COLOC.; selective 1D experiments: SEL TOCSY and SEL NOESY. Application of Analytical techniques to food science**,** pesticide analysis, forensic analysis, bioanalytical chemistry as well as other topics that are of interest. Other instrumentations tools.

SCHM5931 ADVANCED ORGANIC CHEMISTRY 16 Credits

Module Title: **ADVANCED ORGANIC CHEMISTRY**
Code: **SCHM5931**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Admission Requirements
Content: Stereochemistry: chirality, prochiral relationships, enzyme mediated reactions, dynamic stereochemistry; asymmetric synthesis; A survey of current methodologies for the synthesis of chiral compounds. Pericyclic reactions: A survey of the mechanistic principles and applications of cycloadditions, electrocyclic reactions and sigmatropic shifts in organic synthesis. Retrosynthetic Analysis (principles, functional groups transformations, synthetic equivalent groups, umpolung; protective groups);Organometallic Compounds in Synthesis (organolithium compounds, direct ortho-metallation, synthetic applications); Stereoselective Synthesis (strategies, chiral pool, substrate controlled methods, sigmatropic rearrangements, chiral auxiliary methods, asymmetric reagents and catalysts, synthesis planning). Nanotechnology (Fullerenes, nanotubes, self-assembled monolayer, Langmuir-Blodgett films). Polymers (types of polymerization, reactions of polymers selected application, recycling); Selected natural products: Elucidation of biosynthetic pathways.

SCHM5951 ADVANCED INORGANIC CHEMISTRY 16 Credits

Module Title: **ADVANCED INORGANIC CHEMISTRY**
Code: **SCHM5951**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Admission Requirements
Content: The material includes the chemistry of both, the main group, and the transition metal elements, and can be divided into the following topics: *Classification Systems in Inorganic Chemistry*
Chemistry of selected Main Group Elements, Synthesis, structure and reactions of: hydrogen, elements of Groups 1(alkali metals), 2(alkaline earth metals), 12, 13, 14, 15(pnictides), 16(chalcogens), 17(halogens) and 18(rare gases). Lanthanides and Actinides. Solution Chemistry. Steric Effects in Inorganic Chemistry.Coordination Chemistry (requirements, stereochemistry and structures)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. Vibrational Spectra of Inorganic Molecules. Organometallic Chemistry: synthesis, characterization and application. Homogeneous catalysis: Reactions of unsaturated compounds, oxidation of olefins to carbonyl compounds. Reaction Kinetics and Mechanisms: Ligand substitution reactions: classification of mechanism, substitution in square planar complexes, substitution in octahedral complexes. Rate laws and their interpretation. Mechanisms of redox reactions; oxidative-addition and migration (insertion) reactionsCatalysis. Recent developments in homogeneous catalysisElectron-deficient compounds Isolobal analogies and relationshipsMetal-metal bonds. Cluster compounds. Bioinorganic Chemistry.

SCHM5971 ADVANCED PHYSICAL CHEMISTRY **16 Credits**

Module Title: **ADVANCED PHYSICAL CHEMISTRY**
Code: **SCHM5971**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Departmental Entry Requirements
Content: *Advanced kinetics* (rates of chemical reactions, reactions in the gas and solution phases, complex reactions, and solid state reactions), *Statistical Mechanics* (partition functions, thermodynamic functions, equilibria), *Symmetry* (symmetry elements and operations, point groups, applications to orbital theory and spectroscopy), and *Chemical Bonding* (sigma bonding, hybrid orbitals, pi-bonding and multi-centre bonding). *Quantum Chemistry*, Computational Chemistry: Electronic structure methods (DFT, Ab-initio etc), Molecular dynamics Biophysical Chemistry.

CHM5981 PROFESSIONAL COMMUNICATION **12 Credits**

Module Title: **PROFESSIONAL COMMUNICATION**
Code: **SCHM5981**
NQF Level: 9
Contact Hours: 28 hours
Credits: 12
Module Assessment: 100% CA
Prerequisites: Departmental Entry Requirements
Content: The main component of this course involves training in various *general skills* such as writing of research proposals, scientific research papers, spread-sheets, graphics presentation packages and oral communication.

SCHB5911 ADVANCED BIOCHEMISTRY AND BIOTECHNOLOGY **16 Credits**

Module Title: **ADVANCED BIOCHEMISTRY AND BIOTECHNOLOGY**
Code: **SCHB5911**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Departmental Entry Requirements
Content: Biochemistry- Cell dynamics; Heredity of gene action; kinetics and coordination chemistry; Chemistry of biological molecules; genes and bioinformatics, statistical methods in biochemistry, techniques for biochemists; metabolic pathways; transmission genetics; cell biology and developmental genetics; biochemistry of disease; forensic materials; DNA evidence in forensic Science, Microbes to multicells; membrane biochemistry; basic immunology; microbial physiology and growth; medical microbiology; membrane proteins; enzyme catalysis. Biotechnology, Advance topics in biotechnology (principles and roles of various disciplines in biotechnology; Molecular plant and environmental biotechnology; Biochemical engineering; Bioanalytical chemistry (the use of biomolecules for analytics); Biological waste treatment (principles of biological treatment processes).

SCHI5931 ADVANCED INDUSTRIAL CHEMISTRY **16 Credits**

Module Title: **ADVANCED INDUSTRIAL CHEMISTRY**
Code: **SCHI5931**
NQF Level: 9
Contact Hours: 42 hours; 36 hours Practical
Credits: 16
Module Assessment: CA: 40 % Final; Exam: 60 % (1 x 3 hour Examination paper)
Prerequisites: Departmental Entry Requirements
Content: Momentum transfer, Mass transfer, Heat transfer, Simultaneous heat and mass transfer, Gas-liquid operations, Liquid-liquid operations, Solid-fluid operations, Liquid mixing, Homogeneous chemical reaction, Heterogeneous chemical reaction and Industrial process equipment.

SECOND SEMESTER

SCHM5982 RESEARCH METHODOLOGY AND PROJECT PROPOSAL **12 Credits**

Module Title: **RESEARCH METHODOLOGY AND PROJECT PROPOSAL**
Code: **SCHM5982**
NQF Level: 9
Contact Hours: 28 hours
Credits: 12
Module Assessment: 50% CA (Supervisor's Evaluation); 50% Departmental Evaluation
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present some Chemostatistics topics i.e. Handling experimental data, processing and reporting, e.g significance tests. Analysis of Variance (ANOVA), regression analysis methods, validation experimental data (quality control) and experimental design and optimisation of parameters.

Students will write a comprehensive research proposal for his/her MSc research work in a particular field of his/her choice, under the supervision of an academic research. The proposal is submitted to the departmental postgraduate committee and to senate through the Faculty as well as the University postgraduate committee for approval. The evaluation will be done at the departmental level.

SCHM5912 CURRENT TOPICS IN ANALYTICAL CHEMISTRY **16 Credits**

Module Title: **CURRENT TOPICS IN ANALYTICAL CHEMISTRY**
CODE: **SCHM5912**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present current topics in Analytical chemistry which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry out literature survey exercise on a current topic in Analytical chemistry. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SCHM5932 CURRENT TOPICS IN ORGANIC CHEMISTRY **16 Credits**

Module Title: **CURRENT TOPICS IN ORGANIC CHEMISTRY**
Code: **SCHM5932**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present current topics in Organic Chemistry, which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry literature survey exercise on a current topic in Organic Chemistry. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SCHM5952 CURRENT TOPICS IN INORGANIC CHEMISTRY **16 Credits**

Module Title: **CURRENT TOPICS IN ORGANIC CHEMISTRY**
Code: **SCHM5952**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present current topics in Inorganic Chemistry which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry out literature survey exercise on a current topic in Inorganic Chemistry. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SCHM5972 CURRENT TOPICS IN PHYSICAL CHEMISTRY **16 Credits**

Module Title: **CURRENT TOPICS IN PHYSICAL CHEMISTRY**
Code: **SCHM59&2**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present current topics in Physical Chemistry, which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry out literature survey exercise on a current topic in analytical chemistry. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SCHB5932 CURRENT TOPICS IN BIOTECHNOLOGY **16 Credits**

Module Title: **CURRENT TOPICS IN BIOTECHNOLOGY**
Code: **SCHM5932**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements

Content: The lecturers will present current topics in Biotechnology, which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry out literature survey exercise on a selected current topic in Biotechnology. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SCHI5932 CURRENT TOPICS IN INDUSTRIAL CHEMISTRY 16 Credits

Module Title: **CURRENT TOPICS IN INDUSTRIAL CHEMISTRY**
Code: **SCHI5932**
NQF Level: 9
Contact Hours: 42 hours
Credits: 16
Module Assessment: 40% Continuous Assessment (2500 words literature Review) and 60% Examination
Final Exam: (1 x 3 hour exam paper)
Prerequisites: Departmental Entry Requirements
Content: The lecturers will present current topics in Industrial Chemistry which will be assessed in the final examination. Topics to be covered will be provided towards the end of the first semester. Students will be requested to carry out literature survey exercise on a current topic in Industrial Chemistry. The topic shall not be related to a candidate's research project but shall support the candidate's broad knowledge in the general area of study. Some contact hours may be consultations with the lecturer and not necessarily lectures.

SECOND YEAR MODULE

FIRST AND SECOND SEMESTER

SCHM5900 MSc THESIS 120 Credits

Module Title: **MSC THESIS**
Code: **SCHM5900**
NQF Level: 9
Contact Hours: Minimum one year
Credits: 120
Module Assessment: Rules and regulations of UNAM apply. The thesis will be examined by one external examiner and two internal examiners. Projects are assessed as a piece of original work and require an extensive literature survey and synthesis, appropriate practical or survey work, and an in-depth analysis and discussion of the findings.
Prerequisites: A pass in all modules is required before the students start with the research projects.
Content: Students will present their findings in the form of 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 do not only enable students to acquire in-depth practical training under the supervision of experienced research staff but they also help to develop their capacity for independent investigation and report writing. Most projects are laboratory-based although some data review, computer-based projects may be available. Individual research projects are undertaken during the year (February to September). This is carried out for a minimum period of 1 year for full time students or 2 years for part time students.
Depending on the research topic the Department will confer the following degrees:

- MSc Chemistry with special research topic in Analytical and Instrumental Methods
- MSc Chemistry with special research topic in Organic Chemistry
- MSc Chemistry with special research topic in Inorganic Chemistry
- MSc Chemistry with special research topic in Physical Chemistry
- MSc Chemistry with special research topic in Biochemistry and Biotechnology
- MSc Chemistry with special research topic in Industrial Chemistry

SECTION II: OLD CURRICULUM STUDENTS WILL REGISTER FOR EQUIVALENCE MODULES IN 2011.
THE DETAILS OF OLD CURRICULUM MODULES SEE 2009 PROSPECTUS

L. OLD CURRICULUM UNDER GRADUATE QUALIFICATIONS OFFERED BY THE FACULTY IN 2011

The Faculty may award the following Undergraduate and Postgraduate degrees to the students who registered under the old curriculum to complete their studies:

L.1. DEGREES OFFERED

Undergraduate

(11BSCI)	Bachelor of Science	4 years full-time
(11BSCP)	Bachelor of Science (Special in Population and Development)	4 years full-time

L.1.1. ADMISSION REQUIREMENTS FOR UNDERGRADUATE PROGRAMMES

To register in a B.Sc.course of study, a candidate must hold a valid IGCSE or HIGCSE Certificate (with passes in at least five subjects), which add up to 25 points, calculated using the specified UNAM scale. Equivalent qualifications are acceptable.

In addition to the above, admission to the B.Sc.course of study requires at least a symbol C on IGCSE or equivalent qualification in Mathematics and English.

Students can also gain admission to degree programmes in the Faculty through Mature Age entry as per UNAM's Mature Age Entry regulations contained in the "General Prospectus: Information, Regulations and Fees".

Meeting the minimum admission requirements does not necessarily ensure admission, this depends on places available.

L.1.2. DURATION OF STUDY

The Bachelor of Science degree programmes cannot be completed in less than four (4) years. The B.Sc.degree must be completed within six (6) years of full-time study.

L.1.3. EXEMPTIONS

UNAM will give exemptions for equivalent courses taken at other tertiary institutions but the exemptions shall not exceed 50% of the program in the **BACHELOR OF SCIENCE. FOR DETAILED EXEMPTION RULES SEE THE GENERAL PROSPECTUS, INFORMATION, REGULATIONS & FEES BOOK.**

L.1.4. EXAMINATION REGULATIONS

For detailed examination and promotion rules see the General Prospectus: Information, Regulations and Fees. A candidate will be eligible to write the examination if he/she has obtained the required continuous assessment mark of 40%. Examination will be administered at the end of each semester

L.1.5. RE-REGISTRATION RULES

L.1.5.1. MINIMUM NUMBER OF MODULES TO BE PASSED FOR RE-REGISTRATION IN THE FACULTY

Take Note:

4 (of 10) modules after 1st year of registration. 40% of the curriculum. At least 1 of these modules should be non-core

9 (of 18) modules after 2nd year of registration. 50% of the curriculum including all UNAM core modules (3)

16 (of 26) modules after 3rd year of registration. 62% of the curriculum including all 1st year

L.1.6. PASS REQUIREMENTS

L.1.6.1. ACADEMIC ADVANCEMENT RULES

1st → 2nd year
At least 3 of the modules of the prescribed 1st year curriculum (excluding the UNAM core modules)

- a student who has passed only 3 of 1st year content modules will be allowed to register for not more than ½ of the prescribed 2nd year level modules, but will still be regarded as a 2nd year student
- a student who has passed less than 3 of the 1st year content modules will not be allowed to register for modules on 2nd year level, and will remain a 1st year student

2nd → 3rd year
All ten 1st year modules (including the UNAM core modules) + at least 4 (i.e. ½) of the prescribed 2nd year curriculum

- a student who has passed only 4 of the 2nd year modules will be allowed to register for not more than ½ of the prescribed 3rd year level modules, but will still be regarded as a 3rd year student

- a student who has passed less than 4 of the 2nd year modules will not be allowed to register for modules on 3rd year level, and will remain a 2nd year student

3rd → final year
All eight 2nd year modules + 6 (i.e. ¾) of the prescribed 3rd year curriculum, provided that the outstanding 3rd year modules are not pre-requisites for any of the 4th year modules, i.e. a student can only be regarded as a final year student if such a student is able to complete all outstanding modules in one year

- a student who has passed only 5 of the 3rd year modules will be allowed to register for not more than ½ of the prescribed 4th year level modules, and will thus be regarded as a non-final year student
- a student who has passed less than 5 of the 3rd year modules will not be allowed to register for modules on 4th year level, and will remain a 3rd year student

L.1.7. MAXIMUM NUMBER OF MODULES PER YEAR

No student will be allowed to register for more than 10 modules per year

L.1.8 PRACTICALS

Attendance of practical classes is compulsory.

L.1.9. MODULE RESTRICTIONS

A student will be admitted to a specific module only if he/she meets the requirements for the particular module. The UNAM CORE, as well as STS3101 Statistics 1A, MTS3101 Mathematics 1A and either MTS3112 Mathematics 1B or MTS3132 Foundation Mathematics are compulsory for all first year B.Sc.Degree students, including all students from other Faculties who wish to major in a subject offered by the Faculty of Science.

L.1.10. CURRICULUM COMPILATION

YEAR I (phased out) Register for equivalent modules offer in the NEW CURRICULUM
YEAR II (phased out) Register for equivalent modules offer in the NEW CURRICULUM
YEAR III (phased out) Register for equivalent modules offer in theNEW CURRICULUM
YEAR IV Phased in 2009

The curriculum for the B.Sc.degree is compiled as follows:

Year 1: **UNAM CORE**
UCE 3119 English Communication & Study Skills
UCA 3119 English Academic Purposes
UCC 3109 Computer Literacy
UCI 3109 Contemporary Social Issues

FACULTY CORE
MTS3101 Mathematics 1A
MTS3112 Mathematics 1B or MTS3132 Foundation Mathematics
STS3101 Statistics 1A

Any three (3) half modules offered on 1st year level in the first semester (or equivalence)
Any three (3) full first year level modules offered on 1st year level in the second semester (or equivalence)

Year 2: Any eight (8) second year level modules (or equivalents)

Year 3: Any eight (8) third year **level modules (or equivalents)**

Year 4: Any six (6) to eight (8) fourth year **level modules (or equivalents)**

It is the responsibility of the student to ensure that his/her selection of modules from the first year is in accordance with the relevant departmental regulations to allow continuation of double major curriculum in the fourth year.

When choosing a curriculum, students must take their majors and all pre-requisites and co-requisites into account.

L.2. MAJORS

The Old Curriculum B.Sc.degree programme comprises of two majors (double majors), chosen from the list below:
Environmental Biology
Chemistry
Computer Science
* Economics
* Geography
Geology
Mathematics
Molecular and Physiological Biology
Physics
*Psychology
Statistics

***Economics**, **Psychology** and **Geography** majors are not offered by the Faculty of Science – therefore students must take at least one major offered in the Faculty of Science if choose one these majors .

M. POSTGRADUATES PROGRAMMES

(11MSCB) Master of Science (Biodiversity Management & Research)
(11MASC) Master of Science (by Thesis only)
(11DPSC) Doctor of Philosophy (by Thesis only)

M.1. MSC BIODIVERSITY MANAGEMENT & RESEARCH (11MSCB) (IN COLLABORATION WITH HUMBOLDT)

N. DOCTOR OF PHILOSOPHY (PHD)

The degree of Doctor of Philosophy (PhD) in approved disciplines will be offered in compliance with the general regulations and guidelines for postgraduate studies at the University. Refer to the Regulations for Postgraduate Courses of Study in the General Prospectus: Information, Regulations & Fees.

N.1. ADMISSION REQUIREMENTS

Possession of a good M.Sc. degree. Working experience is highly recommended. Admission will depend on availability of suitably qualified supervisors in the respective field of research.

NB: PLEASE REFER TO THE GENERAL INFORMATION AND REGULATIONS PROSPECTUS FOR GENERAL REGULATIONS AS FAR AS POSTGRADUATE COURSES OF STUDY ARE CONCERNED.

O. PART-TIME COURSE/DISTANCE EDUCATION

The Faculty of Science does not offer a part-time curriculum. Some courses may be offered in the evening due to the time - table division. Prospective students should contact the Faculty Officer/Head of Department for further information. Part-time studies see Faculty Prospectus: Centre for External studies.

P. GENERAL INFORMATION

All general information as well as the general examination dates and the dates for registration appear in the General Information and Regulations Prospectus.