FACULTY OF SCIENCE AND AGRICULTURE

VISION

The Faculty of Science and Agriculture is a vibrant, innovative centre of excellence, relevant to the scientific, technological and agricultural needs of society.

MISSION

To unlock the potential of our staff, students and communities, in an environment conducive to learning, through teaching and research, and the pursuit of strategic partnerships.
CONTACT DETAILS

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School of Agriculture and Agribusiness

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Secretary  
Vacant

School of Physical and Computational Science

Director  
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E-mail  ppiyo@ufh.ac.za

Secretary  
Ms T Bottoman  
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E-mail  tbottoman@ufh.ac.za

School of Biological and Environmental Science

Director  
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Manager  
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School of Health Science

Director
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Mrs A Okeyo
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 Secretary
Ms N Mbaba
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ALICE
5700

Webpage: http://www.ufh.ac.za

ARDRI 040 6022323
Fort Hare Research Farm 040 6022428
Honeydale Research Farm 040 6022426
Institute of Science and Technology 040 6022086
## CONTENTS

1) Vision and Mission of the Faculty .......................... 1
2) Contact Details ................................................. 2
3) Staff of the Faculty and associated Institutions ......... 6
4) Qualifications offered in the Faculty ...................... 15
5) Timetable .......................................................... 16
6) General Rules of the Faculty for Bachelor degrees .... 17
7) Admission and Registration Guidelines .................... 20
8) Vision and Mission of the School of Agriculture and Agribusiness 24
9) Background of the School of Agriculture and Agribusiness 25
10) Pathways Foundation Programme (PFP) .................. 27
11) Rules of the School of Agriculture and Agribusiness for undergraduate degrees 28
12) Undergraduate degrees
    a) Curriculums ................................................. 29
    b) Module descriptions ...................................... 44
13) Post-graduate studies in the School of Agriculture and Agribusiness 77
14) Post-graduate degrees
    a) Curriculums ................................................. 79
    b) Module descriptions ...................................... 86
15) Vision and Mission of the Schools of Science .......... 99
16) Science and Technology Foundation Programme (STFP) 106
17) Rules of the Schools of Science for undergraduate degrees 108
18) Undergraduate degrees
    a) Curriculums ................................................. 110
    b) Module descriptions ...................................... 129
19) Rules, Curriculums and module descriptions for Nursing Sciences degrees 191
20) Rules of the Schools of Science and module descriptions for Honours degrees 205
21) Rules of the Schools of Science and module descriptions for Masters degrees 240
22) Rules of the Schools of Science for Doctoral degrees 264

**Very important**

This is a legal document which serves as a contract between the student and the University for the duration of the student’s studies at the University of Fort Hare.

Students will only receive a prospectus with their first registration and not annually.
STAFF IN THE FACULTY

Administrative Staff

Executive Dean JG Raats MSc Agric (UOVS), PhD (Natal)
Personal Assistant F Maweza Nat Dip: HRM (PE Tech)
Faculty Manager MS Smith Nat Secr Cert (PenTech), B Soc Sc Hons (UFH), MA Social Dev (UEA)

SCHOOL OF AGRICULTURE AND AGRIBUSINESS

Director F Lategan B Inst Agrar (Hons), MSc (Agric Ext) (Pret),DTech (NMMU)
Manager CM Cuthbert BSc Agric (Hons) (Stell)
Secretary

Agricultural Economics and Extension

Head & Snr Lecturer N Monde PhD (UFH) (Agric Eco)
Professor BJ Bester PhD Agric (Stell) (Eco)
Associate Professor F Lategan B Inst Agrar (Hons), MSc (Agric Ext) (Pret),DTech (NMMU)
Snr Lecturer A Obi BSc Agric (Hons) (Agric Econ), MSc (Agric Eco) (Nigeria), MA (Econ Policy Mgt) (Mc Gill, Canada), Cert in Labour Law (UFS), PhD (UFS) (Agric Econ)
Lecturer IRF Trollip BSc Agric (Natal), MSc Agric (UFH) (Eco)

Agronomy

Head & Ass Prof P Muchaonyerwa BSc Agric (Hons), DPhil (Zim)
Professor (Crop Science) C Chiduza BSc Agric (Hons), MPhil, DPhil .(Zim)
(Soil Science) PNS Mnkeni BSc Agric (Hons) (Dar es Salaam), MSc (Soil Science) PhD (McGill)
(Snr Lecturer (Agric Eng) GJ Meikle Pr Eng, ANCAE (Silsoe)
(Crop Science) C Mutengwa PhD (Zim)
(Soil Science) IIC Wakindiki B Sc Agric (Hons), M Sc (Soil Science) (Nairobi), PhD (Egerton), Adv. Cert. Irr. & Soil Mgt (Volcani)
(Horticulture Science) Vacant
Lecturer (Horti Science) MF Maphaha BSc Hon (Hort Sc) (Bath), MSc. (Massey)
(Crop Science) OK Owusu-Aduomi BSc Agric (Hons) (Kumasi), Cert. Agric Bus Mgt (MAMC), MSc (Sustainable Agriculture) (London)
Snr Laboratory Technician T M Ngqangweni B Tech (Analytical Chemistry) (Border Tech)
Laboratory Assistant P Macingwane National Diploma (Analytical Chemistry) (Border Tech)
Technical Assistant(s) V Bomali
W Seti
Livestock and Pasture Science

Head & Ass Prof (Ani Sci) V Muchenje MSc (Zim), PhD (UFH)
Professor (Animal Sci) Vacant
Snr Lecturer (Pasture Sci) Vacant
Lecturer (Animal Science) T Nkukwana MSc Agric (KZN)
(Pasture Science) K Mopipi, MSc Agric (UFH)
Technical Assistants WM Sibanga
D Pepe
M Nyanga

Agricultural and Rural Development Research Institute (ARDRI)

Director PJ Masika BVM (Makerere), MSc (Edinburgh),
MSc Agric (Stell), PhD (UFH)

Research Farm

Operations Manager D Potgieter
Admin Officer P Skillian BA (Rhodes)
Foreman Livestock Section G Mene
Crop Section L Pepe
Workshop Foreman O Klackers

Traction Centre

Director GJ Meikle
Manager (Animal Traction Centre) ABD Joubert

Agri-park

Agri-park General Manager C Kapp
Agri-park Manager DF Alexander ND Industrial Psychology (Lyceum College); Master of Public Administration & Management (UPE)

Processing Unit Manager AP Mkeni BSc Agric (Dar es Salaam), MSc (Food Science) (McGill), PhD (Sokoine)
Nguni project manager V Somyo B Juris LLB
Community Liaison Officer K Sibanga
Animal Technician M Cibini Dip. Animal Health
Nguni project
Projects Secretary JM Alexander
SCHOOL OF BIOLOGICAL AND ENVIRONMENTAL SCIENCE

Director          G Bradley  PhD (UPE)
Manager           L Smit     BA Honours (UFH), Certificate in Office Admin
(Damelin)
Secretary         NP Matakane Nat Dip (MSC college)

Biochemistry and Microbiology
Head & Professor  Al Okoh PhD (OAU, Nigeria)
Professor         G Bradley PhD (UPE)
                  N Ndip PhD (ESU, Nigeria)
Snr Lecturer      LV Mabinya MSc (UFH)
                  NT Mkwetshana PhD (UPE)
Lecturer          EG Ngwenya BSc Hons (Rhodes), M Sc (Louisiana)
                  AM Clarke PhD (Rhodes)
                  NT Mazomba MSc (UFH)
Snr Laboratory Assistant E Green MSc (UNIVEN)
Laboratory Assistant  U Puta  BSc Hons (UFH)
                  SS Gusha  BSc Hons (UFH)
                  N Mazibuko  BSc Hons (UKZN)

Botany
Head & Professor  DS Grierson MSc (UPE), PhD (UFH)
Professor         AJ Afolayan MSc (Ibadan), PhD (Pretoria)
                  ML Magwa  BSc (Unisa), PhD (UFH)
Lecturer          B Mayekiso PhD (UFH)
                  L Buwa  PhD (Natal)
Lab Assistant     A Ludwane  BSc Hons (UFH)
                  B Bara  BSc Hons (UFH)
Full time tutor   ZM Mhinana MSc (UFH)

Geography & Environmental Science
Head & Associate Professor W Nel PhD (UP)
Professor          CEP Seethal BA UED BEd (UNISA), BA Hons (UDW),
                  MA (Newcastle-Upon-Tyne), MA PhD (Iowa)
Associate Professor L Wotshele BA (UFH), BA Hons, MA (Rhodes), D Phil
                  (Oxford)
Lecturer           HB Magagula MSc (UFH)
                  EW Harte PhD (QUT)
                  J Odindi PhD (NMMU)
Junior Lecturer    ZAF Mzitshi BA, HDE, BSc Hons (UFH)
Snr Laboratory Assistant K Okecha BA (UFH), BA Hons (UCT), MSc (UFH)

Geographic Information Systems
Head & Senior Lecturer  M du Plessis MSc (Rhodes), PGDHET (UFH)
Senior Lecturer            C Tyson MSc Remote Sensing (Dundee, Scotland)
Junior Lecturer              A Simon BSc Hons (Remote Sensing) (UFH)
                                B Dube  BSc Hons (Remote Sensing) (UFH)
**Zoology and Entomology**

**Head & Senior Lecturer**  
E Do Linh San  
M Sc ETH (Swiss Federal Institute of Technology), D Sc (Neuchâtel, Switzerland)

**Professor**  
JC Masters  
B Sc (Natal), B Sc Hons, PhD (Witwatersrand)

DO Okeyo  
B Sc (California State), M Sc (Humboldt), PhD (Northern Arizona)

**Senior Lecturer**  
FGS Génin  
Maitrise (Poitiers, France), M Sc, PhD (Paris, France)

L Vumazonke  
B Sc Hons(UFH), M Sc (Rhodes)

Z Madikiza  
B Sc Hons, M Sc (UFH)

**Lecturer**  
FGS Génin  
Maitrise (Poitiers, France), M Sc, PhD (Paris, France)

**Junior Lecturer**  
DO Okeyo  
B Sc (California State), M Sc (Humboldt), PhD (Northern Arizona)

**Snr Laboratory Assistant**  
EN Nkoane  
M Sc (UFH)

GM Mfuko  
M Sc (UFH)

**Central Analytical Laboratory (CAL)**

**Acting Director**  
AJ Afolayan  
MSc (Ibadan), PhD (Pretoria)

**Technical Officer**  
NC Matyumza  
BSc Hons (UFH), MSc (Stellenbosch)

**Science Workshop**

**Head & Chief Technician**  
A Bosrotsi  

**Technician**

---

**SCHOOL OF PHYSICAL AND COMPUTATIONAL SCIENCE**

**Director**  
MA Mdebuca  
MSc (UFH), MS (Wyoming), MBA (BSN), DSc (UFH)

**School Manager**  
PN Mandila-Piyo  
Office Admin Cert (Border Tech), B Soc Sci Hons (UFH)

**Secretary**  
T Bottoman

**Computer Science**

**Head & Assoc Professor**  
J Chadwick  
MSc (NUI), PhD (ANU), BSc Hons (Rhodes)

**Senior Lecturer**  
M Thinane,  
PhD (Rhodes)

OP Kogeda,  
DCP & SA ,BCom ,MCA (Dr.BAMU), PhD (UWC).

**Lecturer**  
K Sibanda,  
MScEd (EJV, Cuba), MSc (NUST, Zimbabwe),

S Ntuli  
BSc Hons (UFH)

**Snr Laboratory Assistant**  
S Kos  
BSc Hons (UFH)

**Geology**

**Head & Snr Lecturer**  
O Gwavava,  
BSc Hons and DPhil (University of Zimbabwe)

**Professor**  
B Zhao  
Dipl. (Auckland), BSc, MSc., (Chengdu), PhD.(Wits).

**Adjunct Professor**  
J M Barton, Jr.  
B Sc (Yale), M Sc, PhD (McGill)
WR Kelly  BSc (Duke), M Sc (Case Western Reserve), PhD (Virginia)

Senior Lecturer  CJ Gunter  BSc Hons, M Sc. (UOFS)
(Geophysics, Part-time)  E Weder  PhD (Pretoria)

Junior Lecturer  V Mazomba  BSc Hons (UFH)
S Rasmeni  BSc Hons (UFH)

Senior Lab Assistant  L Sigabi  BSc Hons (UFH)

Personal Assistant  W P Koll

Pure and Applied Mathematics
Head & Professor  BB Makamba  BSc Hons (UFH), PhD (Rhodes)
Professor  GE Okecha  BSc Hons (ABU), MSc (Brunel), PhD. (Bradford)

Senior Lecturer  Vacant
Lecturer  S Ngcibi  BSc Hons (UFH), PhD (Rhodes)
O Ndiweni  MSc (UFH)
Z Mahlasela  BSc Hons (UFH) MSc (Rhodes)

Full-time Tutor  C Kakuli  BSc Hons (UFH)

Pure and Applied Chemistry
Head & Lecturer  NC Manene  MSc (UFH)
Professor  A Sadimenko  PhD (Rostov)

Senior Lecturer  PA Ajibade  BSc Hons, M Sc (Ibadan), PhD (UZ), MRSC (UK)
L Tichagwa  MSc (Waterloo, Canada), PhD (Stellenbosch)

Lecturer  D Katwire  MSc (UFH)
V Maqanda  MSc (UFH)
P Gogwana  MSc (UFH)

Junior Lecturer  NH Zulu  BSc Hons (UFH)

Snr Laboratory Assistant  L Mkosi  BSc Hons (UFH)
MW Mneno  BSc Hons (UFH)

Chief Technician  M Nwamadi  BSc Hons (Medunsa), M Sc (UNISA)
Store Keeper  L Lubisi  Dip in Office Admin (Border Tech)

Technical Assistant  SW Nduluka
XH Nomangandi

Physics
Head & Snr Lecturer  V Xuza  MSc (UFH), MS (Binghamton), MS PhD (Le high)
Professor  MA Mdebuka  MSc (UFH), MS (Wyoming),MBA (BSN),DSc (UFH)

Snr Lecturer  G. Makaka  PhD (UFH)
Lecturer  MP Kwinana  MSc (UFH), M Sc Eng (Elec) (Stellenbosch)
MA Someketa  BSc Hons (UFH)

Visiting Lecturer  L McKinnell  PhD (Rhodes)
Laboratory Assistant  X Fadana  BSc Hons (UFH)
Tutor  S Ziuku  MSc (University of Zimbabwe)
Tutor  R Kaseke  MSc (UFH)
Statistics

Head & Ass Professor  
**JC Tyler**  BSc, UED (UCT), B c Hons (Wits), MSc (UFH). PhD (UFH)  
Professor  
**Y Qin**  PhD (China)  
Lecturer  
**J Ndege**  MSc (Nairobi)  
**AS Odeyemi**  MSc (UFH)  
**RT Chiruka**  MSc (UFH)  
Junior Lecturer  
**I Jubane**  BSc Hons (UFH)

Fort Hare Institute of Technology

Director & Ass Professor  
**EL Meyer**  PhD (UPE), CEM (AEE), CMVP (AEE)  
Senior Researcher  
**KG Chinyama**  PhD (Strathclyde, Scotland), MSc & BSc (Zambia), CPhys MInstP  
Energy Engineer  
**M Simon**  BSc (Zim), BSc Hons, MSc & PhD (UFH)  
Researcher  
**S Mamphweli**  MEnvSc (Univen), PhD (UFH)  
Administrator  
**S Singiswa**  BA (UFH), HDE (UFH)  
ICT Technician  
**AA Teru**  B Tech Hons (Federal University of Technology, Akure).  
M & V Technician  
**Vacant**

Telkom Centre of Excellence

Project Director and Acting Head  
Prof A Terzoli, Laureat Physics (Pravia, Italy)  
Research Coordinator  
**M Thinyane**  MSc, PhD (Rhodes)  
Research / Admin Assistant  
**S Gumbo**  BSc Hons (UFH), M Sc (UFH)

SCHOOL OF HEALTH SCIENCES

Director  
Manager  
**Vacant**  
Administrator  
**N Mbana**  ND Management (Border Tech)  
Acting Manager & Administrator  
**AP Okeyo**  BSc Home Economics (Foods & Nutrition) (Northern Arizona) MA Vocational Education (Northern Arizona), MSc Nutrition (UFS)

Nursing Sciences

Head and senior Lecturer  
**E Seekoe**  RN, RM, RCHN, RPN, HNE, B A Cur (UNISA), MSOC SC, (UFS), MBA (UFS), D Cur (UJ)  
Lecturer  
**PM Chitnis**  MBBS (BJ Medical College, Pune India)  
**NIN Magadla**  RN, RM, RPN, B Cur (Nursing Administration/Community Health), MA Social Science (Psychiatry) (UKZN)  
**AN Mbatha**  RN, RM, DNE (UKZN), BA Cur, BA Cur Hons (UNISA), M Cur (UKZN)
NM Maketa  B Cur (UFH), RN, RCHN, RPN, RM, RADM, RNE, M Cur (Maternal and Child Health) (UKZN),
FB Mayeye  RN, RM, RCHN, B Cur (UFH), B Cur Hons (UNISA) MPH (Medunsa)
TM Shabalala  RN, RM, RCNH, RNE, RNA, B A Cur (Education & Administration) (UNISA), M Cur (Critical Care & Trauma) (UKZN)
Junior Lecturer
ZP Peter  RN, RM, RCN, RNE, BA Cur Hons (UNISA), M Cur (Stellenbosch)
MC Zatu  B Sc, B Sc Hons (Zoology) (UFH), BSc Hons, MSc (Physiology) (NWU Potchefstroom)
NM Velem  BA (UFH), BCR (UFH), RN, TM, RCN, RPN, HDE (UFH), DNE (North West University), M Cur (Midwifery) (UFH)
Part-time Lecturer
AP Okeyo  BSc Home Economics (Foods & Nutrition) (Northern Arizona) MA Vocational Education (Northern Arizona), MSc Nutrition (UFS)
R Harry  BSc Agric (Natal), MSc Agric (Soil Science) (Stellenbosch)
Part-time Researcher
Prof. C T Rautenbach  MCur, DCur (UPE)
Clinical Facilitator
NNV Hlaula  RN, RM, Diploma in Psychiatry (Natal), Diploma in Community Nursing (Natal), B Tech Community (Tech Natal)
NJ. Jora  RN, RM, Dip in Managerial Skills & Computing (Accord), Sign Language (Theodore Blumberg School for the Deaf), BA Cur I et A (UFH), M Cur (UFH)
NT Nkutu  RN, RM Psychiatry, BCur (I et A) (UZ), M Cur (Stellenbosch)
NF Melitafa  RN, RM, RPN, RNH, RNM, RCN, BA Nursing (Potchefstroom)
NB Qomfo  RN, RM, RNE, RCN, BA Nursing (UNISA), Advanced Diploma in Health Service Management (UNISA) M Cur (UFH)
Laboratory Assistant
N Hoyana  BSc (UFH) (Anatomy & Physiology)
Chief Admin Officer
Vacant
Part Time Clinical Facilitator
OVN Pule, RN, RM, Diploma in Psychiatric Nursing (UNISA), BA Nursing (UNISA), BA Hons (Psychiatric Nursing) (UPE)
MN Mahlangeni, NPH, RN, Diploma in Orthopaedics (Walton College in PE)
PP Myoli, RN, RM, BA Nursing (UNISA), Advanced Diploma in Health Science Management (UNISA)
D Marry  RN, RM, BA Cur in Nursing Admin & Community Health Nursing Science (UNISA), Dip in Nursing Education (UNISA), Dip in Labour law (Global Solution)
Data Capturer
SCM Swartbooi  Grade 12 Certificate (Dr Blok Senior Secondary School)
UNEDSA PROJECT STAFF

Project Director  EM Yako  RN, RM, RCHN, RNE, RNA, BA Cur (UNISA), MSc (Michigan), PhD Nursing (Case Western Reserve)

Project Co-ordinator  N Tshotsho  Diploma: General Nursing, Midwifery, Psychiatry; UDNE, (Natal); B Cur (UFH)  B Cur Hons (UNISA); M Cur (UPE); D Cur (RAU); Advance Cert in Health Management (UP).

Admin officer: F Sizani  National Dip in office Admin (ECTech), B Tech degree in PM&A (WSU)

Financial manager  S Mentz

ICAP PROJECT STAFF


Admin Asst.  NB Tutu  Grade 12 certificate (Nyameko High school), Certificate in Prac Office skills (Buffalo City College), Certificate in customer communication (Buffalo City College), Certificate in Intro to Computers (Buffalo City College)

Curriculum developer/ HIV/AIDS Prog Coordinator  JE Bereda-Thakhatha, Dip General Nursing; Diploma in Midwifery (Limpopo Nursing College); Adv. Dip Community Nursing Sciences, Clinical Diagnosis, Treatment and Care (PHC) UNIVEN; BA (Cur) UNISA: BA(Cur) Hons UNISA; MA (Cur) UNISA; Registered Assessor EDTP-Seta(MENTONET), Qualified Moderator (GRAY).

Deputy admin Officer  JM Yako  BA (Andrews University Michigan, USA), MA Ed (Eastern Michigan University) MBE (Eastern Michigan University)

Computer Technician  LR Matina  National Dip in Information Technology (WSU), CCNA (WSU)

Drivers  W Khuza Code 14  NC Mtsatse Code 14

Human Movement Studies

Head & Snr Lecturer  P Lyoka  PhD (Sport Science) (Stell)

Senior Lecturer  M van Gent  PhD (Sport Science) (NWU, Potchefstroom)

Junior Lecturer  TD Xoxo  STD (Tshiya College), BA HMS (UFH), BA Hons HMS (UFH)
SCIENCE & AGRICULTURE FOUNDATION PROGRAMME

Manager       MP Kwinana  M Sc (UFH), M Sc Eng (Elec) (Stellenbosch)
Administrator  N Mnqumevu  B Admin (PM) (UFH)
Secretary      N Mtise      Nat diploma in Public Mgt (NMMU)
Facilitator: Computer Sci A Chifura  B Sc Hons (UFH)
Physics       L Maweza     B Sc Hons (UFH)
Chemistry     T Hasheni     B Sc Hons (UFH)
Mathematics   N Somniso    B Sc Hons (UFH)
Communication & C Formson    M A (Linguistics)
Life Skills    R Scott      M A (English studies) (Durban Westville)
Intro to Sci Concepts Ngubelanga, N  BSc Hons (UFH)
Biology      B Mayekiso    PhD (UFH)
QUALIFICATIONS IN THE FACULTY

Degrees in the School of Agriculture and Agribusiness

The Degree of Bachelor of Agriculture……………….. B Agric
70001 Agricultural Economics
70002 Agricultural Extension / Production

The Degree of Bachelor of Science in Agriculture………. BSc Agric
71501 Agricultural Economics / Economics
71507 Crop Science / Horticultural Science
71509 Crop Science / Soil Science
71506 Soil Science
71503 Animal Production Science
71508 Livestock / Pasture Science

Post-Graduate studies in Agriculture

The Degree of Bachelor of Agriculture (Honours) ……. B Agric (Hons)
70501 Agricultural Economics
70502 Agricultural Extension

The Degree of Bachelor of Science in Agriculture (Honours) BSc Agric (Hons)
72001 Agricultural Economics (Honours)
72002 Economics (Honours)
72003 Crop Science (Honours)
72004 Animal Science (Honours)
72007 Pasture Science (Honours)
72005 Soil Science (Honours)
72006 Horticultural Science (Honours)

The Degree of Master of Agriculture…………………… M Agric
The Degree of Master of Science in Agriculture……….. MSc Agric
The Degree of Doctor of Philosophy in Agriculture…. PhD

Degrees in the School of Physical & Computational Science and the School of Biological & Environmental Science:

The Degree of Bachelor of Science………………….. BSc

Post-Graduate studies in Science:

The Degree of Bachelor of Science (Honours)…………….. B Sc (Hons)
The Degree of Master of Science……………………….. MSc
The Degree Master of Philosophy………………………. M Phil
The Degree of Doctor of Philosophy…………………….. PhD
Degrees in the School of Health Science

The Degree of Bachelor of Nursing.................................................. BCur

Post-Graduate studies in Health Science

Advanced Certificate in the Clinical Management of HIV & AIDS
Degree of Master of Nursing.......................................................... MCur

Lecture Timetable

<table>
<thead>
<tr>
<th>Time</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
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<tbody>
<tr>
<td>08:00 - 08:45</td>
<td>B</td>
<td>F</td>
<td>D</td>
<td>A</td>
<td>E</td>
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<td>08:55 - 09:40</td>
<td>A</td>
<td>B</td>
<td>G</td>
<td>D</td>
<td>C</td>
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<td>09:50 - 10:35</td>
<td>A</td>
<td>B</td>
<td>E</td>
<td>D</td>
<td>C</td>
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<td>10:45 - 11:30</td>
<td>C</td>
<td>D</td>
<td>A</td>
<td>G</td>
<td>F</td>
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<td>11:40 - 12:25</td>
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<td>F</td>
<td>C</td>
<td>H</td>
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<td>12:35 - 13:20</td>
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<td>G</td>
<td>F</td>
<td>B</td>
<td>H</td>
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<td>14:00 - 17:00</td>
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<td></td>
<td></td>
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<td>PRACTICALS</td>
</tr>
</tbody>
</table>

Lecture Groups

In the table below the subjects are listed according to the lecture groups.

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
<th>Group F</th>
<th>Group G</th>
<th>Group H</th>
</tr>
</thead>
</table>
| BIO 111 | ECO 111 | CSC 100 | AGF 112 | AGC 111 | AGE 121 | AGE 111 | AGE 121  
| BIO 121 | ECO 121 | CLT 121 | AGF 122 | AGC 121 | BEC 111 | BEC 121 |-prac |
| CLT 111 | PAC 101 |     | MAT 011 | GEG 100 | AGP 211 | AGP 221 | AGP 221 |
| GLG 100 | PAC 110 |     | MAT 100 | PHY 100 | AGP 221 | AGW 211 | AGW 211 |
| MNU 100 | PAC 121 |     | STA 100 | PHY 110 | AGP 221 | AGG 221 | AGG 221 |
| ZOO 100 |     |     | STA 101 | PHY 113 | AGP 221 | AGX 221 | AGX 221 |

| AGP 211 | AGS 211 | AGE 211 | AGA 211 | AGC 221 | AGA 221 | AGC 211 | AGC 211 |
| AGP 222 | AGS 221 | AGE 222 | AGE 221 | PAC 200 | AGG 221 | AGG 221 | AGG 221 |
| ECO 222 | AGV 221 | ECO 222 | AGE 221 | PAC 200 | BCH 223 | BCH 214 | BCH 214 |
| GIS 200 | CSC 200 | ECO 222 | BCH 223 | PHY 200 | GLG 200 | EDE 211 | EDE 211 |
| MAT 200 | ENT 200 | ECO 222 | GLG 200 | PHY 200 | MAP 200 | EDE 221 | EDE 221 |
| MIC 200 |     | ECO 222 |      | STM 200 |        |        |        |
|         |     |      |      | ZOO 200 |        |        |        |
The following rules and regulations of the Faculty must be read in conjunction with the provisions of the Higher Education Act, the University Statute and the general rules and regulations of the University. Where a learner includes a module or modules from another faculty, the rules and regulations of that faculty apply to the module(s) in question.

SA 1 Registration
SA1.1 At Registration learners have to register as though any outstanding special and/or supplementary examinations were failed. Should the learner’s promotion status (year level) change as a result of a module or modules passed during the special and/or supplementary examinations, s/he can change his/her registration at Late Registration.

SA1.2 Any learner who desires to be credited for modules, courses or qualifications obtained at another tertiary institution, is personally responsible for supplying the Faculty Manager with all the necessary documentary proof of such credits no later than the end of January during the first year of registration at the University of Fort Hare. The documentary proof required includes a statement by the issuing institution as to modules passed, the credit value (as a percentage also of the total annual requirement), and a full description of the module(s). In the case of credits obtained outside South Africa, a SAQA evaluation of the module(s) must also be attached. Failure to abide by this rule may result in the cancellation of the learner’s registration, but the learner will still be liable for all the fees which would normally apply for the modules/courses the learner registered for.

SA1.3 A learner who interrupts his/her studies for a period of six years or more shall forfeit such credits as determined by the Faculty Planning and Management Committee.

SA1.4 If the rules of a degree are amended, a student who elects to continue under the old rules shall be permitted to do so for a maximum period corresponding to the minimum duration of the degree, unless the Faculty Planning and
Management Committee, in special circumstances, recommends otherwise. If s/he fails to obtain sufficient credits in any semester, or interrupts his/her studies at any time, s/he shall be obliged to continue under the new rules.

SA 2 **Pre-requisites and Co-requisites**
The pre- and co-requisites for each module, where applicable, are listed with the syllabus descriptions of modules and are also included in the structured curricula. These pre- and co-requisites should be read as an integral part of the Faculty’s rules and regulations.

SA2.1 No credit shall be obtained for a module which requires a pre-requisite or co-requisite module until credit is obtained for the pre-requisite or co-requisite module.

SA2.2 When a learner contravenes this rule and registers for modules illegally, any credits obtained for such modules will be struck *permanently* from the learner’s academic record, but the learner will still be liable for all the fees payable for such modules.

SA2.3 The Dean may permit a student to take modules normally prescribed for a semester or semesters in advance of that for which s/he is registered provided that:
   (a) preference is given to modules prescribed for earlier semesters, but not yet completed;
   (b) credit has been obtained for the pre-requisites; and
   (c) there are no time-table clashes

SA 3 **Number of credits per semester**
A student shall not be permitted to register for more than 88 credits in any one semester, provided that the Board of Faculty, on the recommendation of the Heads of Departments, only in exceptional cases, permit a student in his/her final year of study, to register for additional 16 credits per semester.

SA 4 **Examinations**
SA4.1 Unless specified otherwise in the module description, practical tests and/or practical assessments (both formative and summative) will be taken during the semester, and *not* during the examination period.

SA4.2 The semester mark and the examination mark shall each count 50% towards the final mark, except where the module description specifies a different composition or alternative method(s) of assessment.

SA4.3 No candidate shall be admitted to the summative assessment in a module unless at least 85% of the prescribed practicals, tutorials and/or assignments have been satisfactorily and timeously completed. Where a candidate has passed the practical component of a module with at least 60% at a previous attempt, and is currently repeating the theoretical component, the Head of Department may exempt such a candidate from attending practicals. Candidates must apply in writing to the relevant Head of Department for such exemption and will be informed in writing if his/her request has been approved or not approved.

SA4.4 A student may be admitted to a supplementary examination in a module in which s/he has failed provided s/he has obtained a final mark of at least 45%.
SA4.5  The above requirements (SA 4.4) may be waived should any modules failed in the final year be deemed to constitute the last requirements for a degree.

(a) A first semester supplementary examination may only be attempted in the scheduled examination period and may not be repeated or reconsidered at the end of the second semester.

(b) The total load for the last outstanding modules in both the first and second semesters may not exceed 16 credits per semester and the student must have presented himself for the relevant examinations. Total of 32 credits per year.

SA4.6  Heads of Departments may grant a candidate an oral examination in a module where the candidate is (1) either close to qualifying for a supplementary examination, (2) close to passing the module, or (3) close to obtaining a distinction in the module/subject.

SA4.7  In order to complete a module in a subject offered by a Faculty other than Science and Agriculture, a student shall comply with the rules of the faculty concerned;
# ADMISSION AND REGISTRATION GUIDELINES

## SCHOOL OF AGRICULTURE
- Bachelor of Agriculture: BAgric
- Bachelor of Science in Agriculture: BSSc Agric

## SCHOOLS OF SCIENCE
- Bachelor of Science: BSsc

## STANDARD PROCEDURE FOR ADMISSION
TO THE BAgric, BSsc Agric AND BSsc DEGREES

New National Senior Certificate (NSC) Entrance Requirements: The 4 NSC subjects required at level 4 must satisfy the following Faculty-specific requirements

<table>
<thead>
<tr>
<th>QUALIFICATION</th>
<th>OPTIONS</th>
<th>SUBJECT REQUIREMENTS</th>
<th>LEVEL OF ACHIEVEMENT</th>
<th>TOTAL POINTS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Sc and B Sc Agric and B Cur B Agric</td>
<td>All</td>
<td>English</td>
<td>3 (40-49%)</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mathematics</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical Sciences</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Life Sciences or Geog or Agric or Info Technology</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Life Orientation</td>
<td>3 (40-49%)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any other 2 subjects from the designated list</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>English</td>
<td>3 (40-49%)</td>
<td>25/26</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mathematical Literacy or Mathematics</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Life Orientation</td>
<td>3 (40-49%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any other 4 subjects from the designated list</td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 (50-59%)</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Minimum entrance requirements (Matric written prior to 2008) for programmes under the Faculty are as follows:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Minimum Rating</th>
<th>Selection</th>
<th>Additional mathematics requirement</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Agric</td>
<td>Plain 22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Sc Agric</td>
<td>Science 32</td>
<td>E (SG)</td>
<td></td>
<td>Double points value for Maths and one of Biology or Physical Science</td>
</tr>
<tr>
<td>B Sc</td>
<td>Science 32</td>
<td>E (SG)</td>
<td></td>
<td>Double points value for Maths and one of Biology, Physical Science or Stats</td>
</tr>
</tbody>
</table>
Determination of Selection Rating

Use the following table to determine the Selection (Swedish) Rating:

<table>
<thead>
<tr>
<th>Matriculation symbol</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points rating</td>
<td>HG</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SG</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Plain rating (B Agric)
Add the points rating for each subject symbol.

Science rating (B Sc & B Sc Agric)

- Determine the points rating for each subject symbol.
- The points rating for Mathematics is doubled.
- For B Sc Agric (except Economics option) check the points rating for Physical Science and Biology and double the higher of the two.
- For B Sc Agric (Agric Economics) check the points rating for Physical Science, Biology and Geography and double the highest one.
- For B Sc check the points rating for Physical Science, Biology and Statistics and double the highest one.
- The science rating is obtained by adding the ratings so obtained for each subject symbol.

To be admitted to either Physics or Chemistry (as a major) a student must have offered Physical Science at matriculation level.

Only students with a Mathematics symbol of at least an E on Standard Grade (SG) at Grade 12 will be accepted into any B Sc programme. B Agric students who obtained an F on Standard Grade (SG) at Grade 12 in Mathematics and would like to convert to BSc Agric will be required to register and successfully pass MAT011.

PROCEDURE FOR SPECIAL ADMISSION INTO THE BAGRIC, BSc AGRIC AND BSc DEGREES

If an applicant does not meet the requirements for Standard Admissions, s/he may be considered for special admission under the following options:

Students who have a Matriculation Exemption, but who do not meet the ratings required for standard admission
Students who have obtained a matriculation certificate or qualify for a conditional exemption from the Matriculation Board of South Africa, and who do not meet the Selection Rating requirements for normal registration may apply to register under the Pathways Foundation Programme (PFP) (reduced curriculum) for first year agriculture students or the Science Foundation Programme (STFP) for B Sc students. On these programmes students are required to register for a reduced number of first year courses and the value addition courses CLS111F and CLS121F (Communications and Life Skills)
## Foundation Programme: NSC Entrance Requirements

<table>
<thead>
<tr>
<th>QUALIFICATION</th>
<th>PROGRAMME</th>
<th>OPTIONS</th>
<th>SUBJECT REQUIREMENTS</th>
<th>LEVEL OF ACHIEVEMENT</th>
<th>TOTAL POINTS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Sc</td>
<td>Science and Technology Foundation Programme (STFP)</td>
<td>All</td>
<td>English 2nd Language</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mathematics</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical Sciences</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Life Science or Geography or Agriculture or Info Technology</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Sc Agric</td>
<td>Pathways Foundation Programme (PFP)</td>
<td></td>
<td>Life Orientation</td>
<td>3 (40-49%)</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Any other two subjects from the designated list</td>
<td>3 (40-49%)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 (40-49%)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>B Agric</td>
<td>Pathways Foundation Programme (PFP)</td>
<td>All</td>
<td>English 2nd Language</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mathematical Literacy or Mathematics</td>
<td>3 (40-49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Life Orientation</td>
<td>3 (40-49%)</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Any other four (4) subjects from the designated list</td>
<td>3 (40-49%)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 (40-49%)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 (40-49%)</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

### Students who qualify for Mature Age Exemption (MAE)

Mature Age Exemption students (23 yrs and above) may be admitted for the B Agric degree programmes if they have a Senior Certificate with a pass in four subjects (E (SG) and above), namely 2 languages and 2 content subjects. Admission into the B Sc or B Sc Agric degree programmes is on condition that a student has Matriculation Mathematics as required under Standard Admissions. The number of modules that a MAE student may register for is determined by their Swedish rating.

### Students who qualify on the basis of “Recognition of Prior Learning”

Students with a Fort Cox Diploma in Agriculture:

A B Agric student may apply for credit for the first year of study if s/he has obtained the three year agriculture diploma from Fort Cox College of Agriculture and had, prior
to first registration for the three year Fort Cox Agriculture Diploma, obtained a matriculation exemption from the Matriculation Board of South Africa. A B Sc Agric student may also apply for credit (under the same conditions), but s/he will be required to do all the B Sc modules in the first year.

A B Agric student with an agriculture diploma from an educational institution in South Africa other than Fort Cox College of Agriculture, may apply for credit for some modules. The application must include a certified copy of the diploma obtained, a certified copy of the highest school qualification/certificate obtained and any other documents, which may be required by the School’s Admissions Committee to have the application evaluated. Applications must be received before the end of January. Matriculation Board exemption requirements apply.

Note: If the Diploma was used to gain entry into the University, such Diploma cannot be used to gain credits.

Students who do not have a Matriculation Exemption (Prior to 2008) or who do not meet the NSC entrance requirements.

These students may apply to register under the relevant Foundation Programme. On these programmes students are required to register for a reduced number of first year courses and the value addition courses CLS111F and CLS121F (Communications and Life Skills). Upon registration these students are required to obtain a Conditional Exemption Certificate. Once s/he has obtained 120 credits of regular modules AND passed the value-added modules, s/he will be assisted to apply for a complete exemption certificate. These programmes have a limited capacity due to lecture space and staffing.

Foreign Qualifications
Applicants are responsible for the evaluation of their qualifications by the South African Qualifications Authority (SAQA). Certified copies of qualifications and the relevant Certificate of Evaluation from SAQA must be submitted to the School’s Admissions Committee.
SCHOOL OF AGRICULTURE AND AGRIBUSINESS

VISION
To be a significant key player in the development of a sustainable agricultural industry in the Eastern Cape, South Africa and the greater African continent through effective and efficient teaching, research and community partnering activities.

MISSION
The School of Agriculture and Agribusiness is committed to:

- Providing quality and balanced undergraduate and postgraduate education designed to equip students with skills and competencies to contribute significantly to agriculture development in the Eastern Cape, nationally and globally.

- Conducting research and development grounded in the Southern African experience in smallholder, emerging and commercial agriculture.

- Establishing appropriate partnering programmes pertinent to the requirements of all the agricultural and rural sectors in the Eastern Cape, nationally and internationally.
A SHORT HISTORY OF THE FACULTY OF AGRICULTURE PRIOR TO THE FORMATION OF THE NEW FACULTY OF SCIENCE AND AGRICULTURE IN 2005

The School of Agriculture and Agribusiness in the Faculty of Science and Agriculture at the University of Fort Hare is the only institution of its kind in the Eastern Cape Province. Together with one Agricultural College (Fort Cox), a section of the Nelson Mandela Metropole University (Port Elizabeth) and five Research Institutes, this School is responsible for the majority of agriculture related training and research in this province.

The former Faculty of Agriculture has a long and productive history. Diplomas in Agriculture and Business Proficiency were first offered in 1916. From its humble beginnings this department obtained full Faculty status in 1967. As the only Faculty of Agriculture, catering for Black students in South Africa during the 60's and 70's, students were drawn from all the provinces and many neighbouring countries. During this period, the special B Agric degree was also introduced. More than 1000 students graduated from this Faculty and contributed significantly to the development of Agriculture and provided leadership in research and training in the Eastern Cape and Southern Africa. In addition, a significant number of graduates also successfully entered the private sector. Research aimed at understanding the complex issues of development has always been a high priority in this Faculty. As early as 1972, the “Agricultural and Rural Development Research Institute” (ARDRI) was established. During the 30 years of it’s existence more than 750 research papers and reports have been published. In 2001 the Department of Geography joined Agriculture to become the new Faculty of Agricultural and Environmental Sciences. In 2005 the two Faculties of Agriculture and Science merged to form the Faculty of Science and Agriculture.

AGRICULTURAL AND RURAL DEVELOPMENT RESEARCH INSTITUTE (ARDRI)

The Faculty of Agriculture founded ARDRI in 1977, with the aim of researching the needs of rural people and communities in South Africa. Its mission is to enhance the quality of life of rural and peri-urban people by generating social, economic and technical information relating to livelihood systems and support services with a focus on agriculture; by disseminating this information, and by facilitating change based on this information.

ARDRI is managed by a director and has a secretary/administrator supporting the Institute. A permanent staff member and a variable number of contract and temporary staff handle research and outreach activities.

The immovable infrastructure is funded by the University of Fort Hare. The research/outreach component, moveable assets and running costs are funded by means of entering into research contracts with a variety of governmental and non-governmental institutions. The Eastern Cape Department of Agriculture and Land Affairs provide core funding.
ARDRI researchers have proven to be efficient in collecting information and implementing projects in the rural areas of South Africa in general, and the Eastern Cape in particular. They are specialists in their respective subject areas and most are able to communicate in Xhosa and other African languages. They have an intimate understanding of local people and conditions, which is based on ARDRI’s extensive field experience gained over more than 20 years.

ARDRI is recognised as the most important generator of information on small-scale agriculture in the Eastern Cape. As a result, ARDRI is considered a valuable partner by agents active in agriculture and rural development, and gets regular requests to participate in related projects. For example, over the last three years, ARDRI has collaborated with provincial institutions such as Rhodes University, and national institutions such as the Agricultural Research Council, AGRELEK and the Water Research Commission in research and development projects. It has received funding from a variety of international linkages and contracts, including DFID, SANPAD and NRF.

In cooperation with the Faculty of Agriculture, ARDRI aspires to be a major generator and provider of practical information on agriculture mainly for rural and peri-urban target groups, and to be recognised as an important source of information by policy makers.

THE TRACTION CENTRE

- The School of Agriculture and Agri-business, in the Faculty of Science and Agriculture, is the home of Agricultural Traction Studies in South Africa.

- The Traction Centre (TC) as well as the South African Network of Animal Traction (SANAT) are both based at the University.

- The TC is a training and a research centre, offering undergraduate, postgraduate, extension officer and farmer training in all aspects of Agricultural Traction. It also provides a centre with trained personnel and draught animals, where both on-station as well as on-farm research can be conducted.

SANAT is a ‘Networking Organization’ linking all those working with or interested in draught animal power with government officials, academics, researchers, farmers and NGO’s. In particular, it represents the interests of small farmers who use draught animal power in South Africa.

AGRIPARK

The aim of the AGRIPARK is to assist the communities surrounding Fort Hare to become active partners in agribusiness by forming themselves into Cooperatives. Examples are the Nursery, vegetable production, vegetable processing, the Nguni Project, the multi million rand Dairy Project, fish farming, bee farming etc.

The name "Agripark" may be interpreted as an agribusiness village where thriving partnerships are developed, e.g. the Nursery producing seedlings and selling them to the vegetable growers who, in their turn, then sell to the processing cooperative.
PATHWAYS FOUNDATION PROGRAMME (PFP)

1. Background and Entry Requirements

The Pathways Foundation Programme (PFP) is an entrance programme intended to provide a strong science foundation to students who do not meet Faculty of Science and Agriculture entry requirements. The PFP follows main stream modules, but involves a reduced curriculum and “extra time” is used for support. PFP students take an extra year to complete their degree. All students who do not have a matric exemption (matric written prior to 2008) must apply for conditional exemption. Communication & Life Skills are followed as value-added modules to enable a student to apply for full exemption.

2. Course Structure

First year curriculum for B Agric students following PFP

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 111F / CLS 121F Communication &amp; Life Skills</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PAC 111F / PAC 121F Basic Chemistry</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>BIO 111F / BIO 121F Biology</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>AGF 112F Introduction to Scientific Concepts</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGC 111F Elements of Agro Meteorology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGF 122F Introduction to Scientific Concepts</td>
<td></td>
<td>(16)*</td>
</tr>
<tr>
<td>AGC 121F Introduction to Crop Science</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>CLT 121F Intro to Computers and Computing Theory</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>16 + 52</td>
<td>16 + 48</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>32 + 100</td>
<td></td>
</tr>
</tbody>
</table>

- *AGF 122F is offered in the second semester for students who have failed AGF112F
These students will follow AGE111 and AGE121 in their second year.

First year curriculum for BSc Agric students following PFP

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 111F / CLS 121F Communication &amp; Life Skills</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PAC 111F / PAC 121F Basic Chemistry</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>PHY 115F,114F / 125F,124F Physics</td>
<td>8 + 8</td>
<td>8 + 8</td>
</tr>
<tr>
<td>BIO 111F / 121F Biology</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>16 + 40</td>
<td>16 + 40</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>32 + 80</td>
<td></td>
</tr>
</tbody>
</table>

These students will follow PAC113F and PAC 123F in their second year of study, together with STA111 and STA121/122.
RULES OF THE SCHOOL OF AGRICULTURE AND AGRIBUSINESS

The following rules and regulations of the School must be read in conjunction with the provisions of the Higher Education Act, the University Statute and the general rules and regulations of the University. Where a learner includes a module or modules from another faculty in his/her programme, the rules and regulations of that faculty apply to the module(s) in question.

RULES OF THE SCHOOL FOR BACHELOR DEGREES

These rules apply to Agricultural modules and qualifications.

Ag1.1 In order to obtain a degree of bachelor in the School of Agriculture and Agribusiness a student must be credited with the modules which are prescribed for the curriculum concerned.

Ag1.2 On completion of a module a student shall be credited with the number of credits assigned thereto.

Ag2 The relevant School Board shall advise the Faculty Board and Senate in respect of the curriculum for each study direction.

Ag3.1 Under special circumstances, departures from a curriculum may be permitted, subject to the approval of the Senate on the recommendation of the School of Agriculture and Agribusiness and the Faculty Board.

Ag3.2 The Senate may, on the recommendation of the School of Agriculture and Agribusiness and the Faculty Board, give credit towards the degree for a module not included in a particular curriculum.

Ag3.3 Registration for elective modules is subject to approval by the Dean, on the recommendation of the Head of Department concerned.

Ag 3.4 The Dean may permit a student to take modules normally prescribed for a semester or semesters in advance of that for which s/he is registered provided that:

(a) preference is given to modules prescribed for earlier semesters, but not yet completed;

(b) credit has been obtained for the pre-requisites; and

(c) there are no time-table clashes.

Ag3.5 Credit will not be given for both AGF 112 and AGF 122

Ag 4 Determination of Year of Study

Ag4.1 (a) A student shall, at first attempt, be promoted to the second year of study, if s/he has obtained credit for 70% of the credits prescribed in the curriculum for the first year of study.

(b) A student obtaining less than 70% of the credits prescribed for the first year of study shall be promoted to the second year of study if, thereafter, she obtains credits for all the first year modules.

Ag4.2 A student shall be promoted to the third year of study when s/he has completed all the modules of the first year of study and has not more than 24 credits outstanding from the second year of study.
Ag4.3 A student shall be promoted to the fourth year of study when s/he has completed the requirements above and has not more than 32 credits outstanding.

Ag4.4 Registration for modules which have a time-table clash will not be permitted.

Ag 5 Practical Vacation Training
In their final two years of study, students will be required by the School of Agriculture and Agribusiness and the Faculty Board to remain for specified periods to do practical work under the guidance of an approved person or at an approved institution during vacations.

Ag 6 Conversion from B Agric to B Sc Agric
The procedure involves one of 2 pathways as follows:

Ag 6.1 Start with the B Agric degree and switch over to the B Sc Agric degree, before completing B Agric (eg from year II of B Agric, once Matriculation Mathematics has been passed)

Ag 6.2 Complete the B Agric degree and obtain B Sc Agric status for a higher degree

Matric Mathematics: Module offered by Department of Mathematics (MAT011)
Additional requirements: PAC 110 and PAC 121.

Note: Every student wishing to convert must submit a written request to the Department offering the option they would like to major in. The Department will then prepare a case for each request for consideration by the Faculty Board.

UNDERGRADUATE DEGREE OPTIONS

BACHELOR OF AGRICULTURE

Common First Year (NQF 5) for both B Agric options

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC 101 Basic Chemistry</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>BIO 111 / BIO 121 Biology</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>AGF 112 Introduction to Scientific Concepts</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 111 Introduction to Agric Economics</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGC 111 Elements of Agro Meteorology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGF 122 Introduction to Scientific Concepts</td>
<td></td>
<td>(16)*</td>
</tr>
<tr>
<td>AGC 121 Introduction to Crop Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 121 Marketing of Agricultural Products</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>CLT 121 Intro to Computers and Computing</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Theory</td>
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<tr>
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</tr>
<tr>
<td>Total per Year</td>
<td>128</td>
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</table>

- *AGF 122 is offered in the second semester for students who have failed AGF112
## Agricultural Economics Option (70001)

### Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
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</thead>
<tbody>
<tr>
<td>AGA 211 Introduction to Animal Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 211 Agric Production Economics</td>
<td>12</td>
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<tr>
<td>AGP 211 Introduction to Pasture Ecology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGC 211 Elements of Crop Production</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGS 211 Introduction to Soil Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGW211 Introduction to Seminar Writing</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>AGC 221 Elementary Irrigation</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>AGE 221 Farm Management</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>AGE 222 Farm Accounting</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>AGP 222 Veld &amp; Cultivated Pasture Management</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>AGS 221 Pedology</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>AGX 221 Introduction to Agricultural Extension</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>80</td>
<td>64</td>
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<td><strong>Total per Year</strong></td>
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### Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
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<tbody>
<tr>
<td>A minimum of 36 credits approved by the</td>
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<td>24</td>
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<tr>
<td>Programme Coordinator of Agric Economics</td>
<td></td>
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<tr>
<td>and Extension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE 311 Adv Farm Bus Management</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGE 312 Agric Market Analysis</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGH 312 Elements of Fruit and Vegetable</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALP 313 Land Use Planning</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>AGF 401 Practical Vacation Training</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>AGE 321 Agric Development Planning</td>
<td></td>
<td>12</td>
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<tr>
<td>AGE 322 Seminar in Agric Economics</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>ALP 322 Project in Land Use Planning</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>128</td>
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<td><strong>Total for Qualification</strong></td>
<td>400</td>
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# Agricultural Extension / Production Option (70002)

## Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
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</thead>
<tbody>
<tr>
<td>AGA 211 Introduction to Animal Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGP 211 Introduction to Pasture Ecology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGS 211 Introduction to Soil Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGC 211 Elements of Crop Production</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGW 211 Introduction to Seminar Writing</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGC 221 Elementary Irrigation</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGG 221 Introduction to Agric Engineering</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGS 221 Pedology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGE 221 Farm Management</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGX 221 Introduction to Agricultural Extension</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGP 222 Veld &amp; Cultivated Pasture Management</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGA 221 Principles of Animal Nutrition</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>68</td>
<td>88</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>156</td>
<td></td>
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</table>

## Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC 313 Plant Pest Control</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGH 311 Elements of Horticultural Science</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGH 312 Elements of Fruit and Vegetable Production</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>ALP 313 Land Use Planning</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGQ 311 Smallstock Production</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGF 401 Practical Vacation Training</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AGV 321 Elementary Animal Health</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGX 321 Agricultural Extension &amp; Human Dev</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGX 322 Applied Extension &amp; Rural Development</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGX 323 Seminar in Agricultural Extension</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>ALP 322 Project in Land Use Planning</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>68</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>140</td>
<td></td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td>424</td>
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</table>
BACHELOR OF SCIENCE IN AGRICULTURE

Offering of these options is subject to student enrolment and the staffing situation.

Common First Year (NQF 5) for all BSc Agric options

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC 110 / 121 Basic Chemistry</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PHY 113,114 / 123,124 Physics</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>BIO 111 / 121 Biology</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>STA 111 / 121 / 122* Statistics</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td><strong>64</strong></td>
<td><strong>64</strong></td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td><strong>128</strong></td>
<td></td>
</tr>
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</table>

* Only students majoring in Agric. Economics follow STA 122

Agricultural Economics / Economics Option (71501)

Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECO 111 / 121 Economics</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>AGE 211 Agric Production Economics</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGA 211 Introduction to Animal Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGC 111 Elements of Ag Meteorology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGW 211 Introduction to Seminar Writing</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGC 121 Introduction to Crop Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 221 Farm Management</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGE 222 Farm Accounting</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGE 121 Marketing of Agric Products</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td><strong>64</strong></td>
<td><strong>64</strong></td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td><strong>128</strong></td>
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</table>

Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECO 211, 212 / 221, 222 Economics</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>AGE 311 Adv Farm Bus Management</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGE 312 Agric Market Analysis</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGS 211 Introduction to Soil Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 321 Agric Development Planning</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGE 322 Seminar in Agric Economics</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGX 221 Introduction to Agric Extension</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td><strong>68</strong></td>
<td><strong>64</strong></td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td><strong>132</strong></td>
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</tbody>
</table>

Fourth Year (NQF 7)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Sem 1</th>
<th>Sem 2</th>
</tr>
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<tbody>
<tr>
<td>ECO 311&amp;313 plus any 2 other 3rd yr Economics modules</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>AGE 411</td>
<td>Analytical Techniques in Agric Economics</td>
<td>16</td>
</tr>
<tr>
<td>AGE 422</td>
<td>Agric Policy</td>
<td>16</td>
</tr>
<tr>
<td>AGE 401</td>
<td>Project in Agric Economics</td>
<td>16</td>
</tr>
<tr>
<td>AGE 421</td>
<td>Seminar in Agric Economics</td>
<td>12</td>
</tr>
<tr>
<td>AGF 401</td>
<td>Practical Vacation Training</td>
<td>0</td>
</tr>
<tr>
<td>A minimum of 24 credits approved by the Programme Coordinator of Agricultural Economics and Extension</td>
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</tbody>
</table>

| Total per Semester | 56      | 72      |
| Total per Year     | 128     |         |
| Total for Qualification | 516     |         |

**Crop Science / Horticultural Science Option (71507)**

**Second Year (NQF 5)**

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC 111 Elements of Agro-meteorology</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGE 111 Introduction to Agricultural Economics</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGS 211 Introduction to Soil Science</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>BCH 214 Introductory Biochemistry</td>
<td>24</td>
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</tr>
<tr>
<td>MIC 211 Introduction to Microbiology</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGC 121 Introduction to Crop Science</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>AGE 221 Farm Management</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>AGG 221 Introduction to Agricultural Engineering</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>AGS 221 Pedology</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>AGE 121 Marketing of Agricultural Products</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>88</td>
<td>68</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>156</td>
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**Third Year (NQF 6)**

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC 211 Elements of Crop Production</td>
<td>16</td>
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<tr>
<td>AGC 311 Water Relations</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGC 312 Introduction to Genetics</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGH 311 Elements of Horticultural Science</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGH 313 Post-harvest Physiology &amp; Technology</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGW 211 Introduction to Seminar Writing</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGC 321 Principles of Irrigation</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>AGC 422 Plant Breeding</td>
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<td>12</td>
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<tr>
<td>AGH 321 Vegetable Crops</td>
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<td>12</td>
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<tr>
<td>AGH 403 Seminar in Horticultural Science</td>
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<td>12</td>
</tr>
<tr>
<td>AGS 321 Plant Nutrition and Soil Fertility</td>
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<td>12</td>
</tr>
<tr>
<td>AGW 221 Introductory Seminar</td>
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<td><strong>Total per Semester</strong></td>
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<td>72</td>
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<td><strong>Total per Year</strong></td>
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</table>
Fourth Year (NQF 7)

<table>
<thead>
<tr>
<th>Modules</th>
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<th>Semester 2</th>
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<tbody>
<tr>
<td>AGB 311 Agricultural Biometry</td>
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<tr>
<td>AGC 313 Plant Pest Control</td>
<td>12</td>
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</tr>
<tr>
<td>AGC 411 Advanced Crop Science</td>
<td>12</td>
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</tr>
<tr>
<td>AGC 402 Seminar in Crop Science</td>
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<td>12</td>
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<tr>
<td>AGF 401 Farm Vacation Training</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AGH 411 Citrus Fruit</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>AGB 321 Applied Agricultural Biometry</td>
<td></td>
<td>16</td>
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<tr>
<td>AGC 421 Special Topics in Crop Science</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGH 423 Special Topics in Horti Science</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>AGC 401 Project or AGH 401 Project</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>AGH 421 Temperate Fruits</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>or AGH 422 Sub-tropical Fruit</td>
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<td></td>
</tr>
<tr>
<td>AGS423 Chemical Analysis of Soils, Plants &amp; Waters</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td><strong>68</strong></td>
<td><strong>64</strong></td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td><strong>132</strong></td>
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<tr>
<td><strong>Total for Qualification</strong></td>
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*Crop Science / Soil Science Option (71509)*

Second Year (NQF 5)

<table>
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<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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</thead>
<tbody>
<tr>
<td>AGC 111 Elements of Agro-meteorology</td>
<td>16</td>
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Third Year (NQF 6)

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**Fourth Year (NQF 7)**

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**Soil Science Option (71506)**

**Second Year (NQF 5)**

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### Fourth Year (NQF 7)

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### Animal Production Science Option (71503)

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<td>AGC 111 Elements of Agro-Meteorology</td>
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**Total for Qualification**: 538
**Livestock / Pasture Science Option (71508)**

**Second Year (NQF 5)**
*Same curriculum as second year of Animal Production Science Option (71503)*

**Third Year (NQF 6)**
*Same curriculum as third year of Animal Production Science Option (71503)*

**Fourth Year (NQF 7)**

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**LIST OF MODULES OFFERED IN THE FACULTY**

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**LIST OF MODULES OFFERED IN OTHER FACULTIES**

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**DESCRIPTION OF UNDERGRADUATE MODULES**

**AGRICULTURAL ECONOMICS**

**AGE 111: Introduction to Agricultural Economics**

**Purpose:** To facilitate the learning process for the learners to: understand the basic economic problem of relative scarcity; understand the process of production, specialisation and exchange; understand the principles of demand, supply and price determination; distinguish the effect on demand and supply of changes in various factors; and understand the basics of production economics.

**Content:** Introduction to economic concepts. Production factors. The functions of the economy. The role of prices and money in the economy. Structure of the economy. Agriculture in the economy. Introduction to agricultural production economic theory. The production function, cost functions, input and output optimization.

**Instruction:** Lectures (3 hours/week); Practical Work (Every 2nd week) - Exercises in determining agriculture’s contribution to the economy. Total, average and marginal product curves. Determining maximum profit input and output levels.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 16

**Pre-requisite:** None

**AGE 121: Marketing of Agricultural Products**

**Purpose:** To facilitate the learning process for the learners to: understand the importance of agricultural marketing; identify the characteristics of
agricultural products and production; understand the consumer environment; understand the functions and institutions involved in the marketing process; and to understand the structure of agricultural marketing in South Africa.


Instruction: Lectures (3 hours/week); Practical Work (Every 2nd week) - Demand and supply curves. Price information with changes in demand and supply. Case studies in marketing agricultural products.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: None

AGE 211: Agricultural Production Economics

Purpose: To facilitate the learning process for the learners to understand the basic principles of agricultural production and to provide them with theories of the various types of relationship between inputs and output.

Content: The farm and agricultural production in the economy. The agricultural production function. Costs of production in agriculture. Factor relationships in agriculture and optimum input combinations. Production of several products. Linear production theory and its application in agriculture. Derivation of demand and supply functions for agricultural products; derivation of market prices; applications to policy situations.

Instruction: Lectures (3 hours/week); Practical Work (1 per week) - Graphical analysis of production functions. Maximum profit determination. Least-cost input and optimum product combinations. Linear optimization problems.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: For B Agric: AGE 111
Co-requisite: For B Sc Agric: AGE 111 or ECO 111

AGE 221: Farm Management

Purpose: To facilitate the learning process for the learners to understand the basic principles of farm business management with special emphasis on planning and control of the farm business; to distinguish between relevant and irrelevant data to facilitate the above process; to undertake (with guidance from and participation in a multi-disciplinary team) the farm business management aspects of a land use plan; and to understand the operation of a simple farm accounting system.

Content: The decision making process. Record keeping for farm management information. Gross margin budgets for individual crop and livestock enterprises and their analysis. Partial
budgeting. Techniques for analyzing the whole farm. Planning the farm using budgeting and programme planning. Estimating fixed costs. Uncertainty and farm planning. Control of the farm business.

Instruction: Lectures (3 hours/week); Practical Work (1 per week) - Exercises in designing farm records: calculation of cost and Income budgets; partial budgeting: whole farm planning.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGE 111 or AGE 211

AGE 222: Farm Accounting

Purpose: To facilitate the learning process for the learners to understand the basic principles of farm business management with special emphasis on planning and control of the farm business; to distinguish between relevant and irrelevant data to facilitate the above process; to undertake (with guidance from and participation in a multi-disciplinary team) the farm business management aspects of a land use plan; and to understand the operation of a simple farm accounting system.


Instruction: Lectures (3 hours/week); Practical Work (1 per week) - Exercises in drawing up the Cash Analysis Book and completing the Trading Account and Balance Sheet Financial analysis of the Balance Sheet Computer applications. Exercises in financial control.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 8
Pre-requisite: AGE 111 or AGE 211

AGE 311: Advanced Farm Business Management

Purpose: To facilitate the learning process for the learners to apply the basics learned in 'Introduction to Farm Business Management' at a more advanced level; to understand the complexities of farm business decision making in an uncertain environment; and to assess the viability of investments which may enhance the profitability of the farm business.

Content: Deriving an economic optimum farm plan using programme planning. Linear programming applied to farm decision-making. Applications of micro-computers to farm business management. Farm resource management. Agricultural work study.

Instruction: Lectures (2 hours/week); Practical Work (1 per week) - Exercises in estimating economic optimum production levels with actual data. Solving linear programming problems using the simplex method. Case studies in resource management.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGE 221

AGE 312: Agricultural Market Analysis
Purpose: To facilitate the learning process for the learners to understand the influences on the demand for agricultural products; to understand the influences on the supply of agricultural products; and to understand the causes of price differences and variability of agricultural prices over time, space and quality.
Instruction: Lectures (2 hours/week); Practical Work (1 per week) - Analysis of prices of agricultural products. Case studies of marketing boards and agricultural cooperatives. Visits to local cooperatives. Group discussion on co-operative concepts.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGE 211 or BEC 211 + BEC 221

AGE 321: Agricultural Development Planning
Purpose: To facilitate the learning process for the learners to understand the concept of development; to understand the importance of agriculture in the economic development; to understand the various types of models of agricultural development; to understand the various steps and procedures in the preparation of a sound agricultural development plan; and for them to understand the link between agricultural projects and agricultural development.
Content: Agriculture in developing countries; the role of agriculture in the development process; the objectives of development policy. A survey of development theories; approaches to agricultural development; instruments of agricultural development; case studies. Projects in agricultural development; project cycle; analysis of agricultural projects; project selection and evaluation.
Instruction: Lectures (2 hours/week); Practical Work (Every 2nd week).
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: ECO 211 + ECO 212 + ECO 221 + ECO 222 or AGE 211

AGE 322: Seminar in Agricultural Economics
Purpose: To facilitate the learning process for the learners to develop the necessary skills involved in the reviewing of literature, the writing of a scientific article, and the delivery of an oral presentation.
Content: Each student shall prepare and present a written paper on a selected subject under supervision of academic staff.

Assessment: Typed seminar and oral presentation

Credits: 12

Pre-requisite: AGW 211

Co-requisite: AGE 321

**AGE 411: Analytical Techniques in Agricultural Economics**

**Purpose:** To facilitate the learning process for the learners to understand the theory, philosophy and practice of research and their application to agriculture, and to understand the various analytical techniques applied in agricultural economics research.

**Content:** *Agricultural sampling and survey:* sampling techniques; questionnaire design and testing; conducting interviews; data analysis; report writing. *Linear programming:* matrix construction for intermediate farm products; variable resource restrictions; variable prices; time problems. *Application of economic techniques:* demand and supply of food; demand for farm labour; cross-section and time-series analysis of agricultural statistics. *System analysis and simulation:* a brief survey of applications in agricultural and resource economics.

**Instruction:** Lectures (3 hours/week); Practical (1/week) - Design and testing of questionnaire. Curve fitting to production data. Exercise in setting up a farm optimization linear programming problem for computer solution. Examples of cross-section or time-series analysis applications.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 16

**Pre-requisite:** AGE 311

**AGE 421: Seminars in Agricultural Economics**

**Purpose:** To facilitate the learning process for the learners to develop the necessary skills involved in the reviewing of literature, the writing of a scientific article, and the delivery of an oral presentation.

**Content:** Each student shall prepare and present two written papers on selected subjects under the supervision of academic staff.

**Assessment:** Typed seminars and oral presentations

**Credits:** 24

**Pre-requisite:** AGE 322

**AGE 422: Agricultural Policy** *(Previously AGE 432)*

**Purpose:** To facilitate the learning process for the learners to understand what agricultural policy is; to understand the nature of agricultural policy process; to understand the analysis of policy issues relating to agriculture in the macro-economy; and to understand the South African agricultural policy-making process and its institutions.

**Content:** Background to the economics of agricultural policy. Problems of the agricultural industry. Historical price movements. The nature and characteristics of food demand and supply functions. Problems of agricultural policy. Economic welfare and policy. Social cost-benefit analysis. Agricultural trade policy, price policies, structural policies,
marketing policies. Food supplies and world population. Agricultural Policy in developing countries. Strategies of agricultural development. The instruments of agricultural modernization.

Instruction: Lectures (2 hours/week); Practicals (Every 2nd week) - Examines case studies in Agricultural Policy. Discussion of current issues in Agricultural Policy and application principles.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: AGE 321 or ECO 211 + ECO 212 + ECO 221 + ECO 222 or EDE 211 + EDE 221

AGE 401: Project in Agricultural Economic (Previously AGE 433)

Purpose: The module provides learners with the necessary knowledge base and insight to design a research plan and conduct a small research project using sound scientific principles.

Content: A project of limited scope to give the student experience in the handling and presentation of data.

Assessment: Continuous evaluation (proposal, planning, etc) culminating in a typed project report.

Credits: 16

Pre-requisite: AGE 411

AGRICULTURAL EXTENSION

AGX 221: Introduction to Agricultural Extension

Purpose: To facilitate the learning process for the learners to equip students with a knowledge of the basic concepts of agricultural extension and communication.

Content: Part (a) Communication: Communication, its objectives and an analysis of the process. The theory and use of mass media, group media, interpersonal communication, production and use of audio visual aids, public speaking, conducting meetings, demonstrations and farmer’s days. Choice of topic and level of audience, prepared and unprepared speech, introduction to language, writing, meaning and scope of technical writing and reporting, style and presentation. The adoption and diffusion process – communication for change. (One lecture per week)

Part (b) Principles of Extension: The objectives, principles and philosophy of extension and rural development. Agricultural Extension services – operation, functions and role in agriculture and rural development, with particular reference to the developing areas of Southern Africa. Historical background of the development of extension services and present organizational structure, scope of work, long and short term objectives and problems in relation to the basic principles and philosophy of extension education, the role, duties and responsibilities of extension educators.

Instruction: Lectures (2 hours/ wk), assignments

Assessment: Assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 8
AGX 321: Agricultural Extension and Human Development

Purpose: To equip learners with an insight into the human problems experienced in extension and rural development including aspects of rural sociology, group dynamics, leadership development and adult education.

Content: Part (a) Rural Sociology and Cultural Anthropology. Analysis of human society and the individual as a member of the family, the community and other social systems. Rural Sociology and cultural anthropology and its importance. The farmer in his social environment; cultural patterns as a basis for social behaviour and change, group relations; kinds of groups and their importance; social structure and its implications for social change; kinship structures; power and community decision making process; migration and urbanisation and its effect on rural communities; local and world religions; characteristics of peasant societies; attitudes and attitude change. (One lecture per week);

Part (b) Adult Education and Extension Teaching Methods. The meaning, scope and importance of adult education in Southern Africa. Planning adult education; the adult learner and learning; some principles of promoting effective learning; methods and techniques of teaching adults effectively. Evaluation of extension teaching methods. (One lecture per week and 1 practical every 2nd week).

Part (c) Group Dynamics and Leadership. Analysis of human groups processes as part of society and as a social process. Group formation and function in society and cultural change. Leadership development and role in agricultural and rural development; identification of leaders; role of groups and group leadership in formal and non-formal educational development. Practical work: Study of group dynamics – functioning and evaluation of groups. (One lecture per week and 1 practical every 2nd week).

Instruction: Lectures (3 hours/wk), Practical (1/week)

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: AGX221

Co-requisites: AGX 322 + AGX 323

AGX 322: Applied Extension and Rural Development

Purpose: To equip learners with an insight into the extension programming and evaluation procedures; to acquire a working knowledge of research methodology in extension, evaluation of extension projects and programmes and evaluation of development projects; and to acquire a working knowledge and some skills of how to apply accepted management practices and skills in agricultural extension.

Content: Part (a) Extension and Rural Development Programming and Evaluation. The need for extension and rural development plans; objectives and philosophy, planning and procedures in extension and rural development planning at National, Regional, and District and area level. Practical Work: Planning of an agricultural extension and rural
development programme. (One lecture per week and 1 practical every 2nd week).

Part (b) Extension Research and Evaluation. A general study of types of extension and education research. Principles of research design. Methods of data collection in agricultural extension, rural development and related fields. A detailed study of the research and evaluation process; evaluation and monitoring of development projects. (One lecture per week).

Part (c) Management of Agricultural Extension and Rural Development. The management of agricultural extension and rural development organisations; setting organisational objectives; criteria for efficiency, organisational structures; job specifications; motivational theories; training. (One lecture per week).

Instruction: Lectures (3 hours/week), Practicals (Every 2nd week)
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGX221
Co-requisites: AGX 321 + AGX 323

AGX 323: Seminars in Agricultural Extension
Purpose: To facilitate the learning process for the learners to help them understand the human problems experienced in extension and rural development including aspects of rural sociology, group dynamics, leadership development and adult education, and to get equipped with skills to apply this knowledge in practice.
Content: Students will be required to submit seminars on selected topics to be prepared in their own time.
Assessment: Typed seminars and oral presentation
Credits: 12
Pre-requisite: AGX221
Co-requisites: AGX 321 + AGX 322

LAND USE PLANNING

Land Use Planning ALP 313 (BAgric students)
Purpose: A student credited with this module should be able to execute, interpret basic surveys of soil, climate and vegetation and other aspects of land and competently develop a sustainable agricultural land use plan for any piece of agricultural land.
Instruction: Lectures (4 / week), Practical (1 per week) - Assessment of climate. Use of aerial photographs for vegetation survey. Use of 1:50000 topographical maps, scales, slope measurement. Soil survey with the objective of assessing potential. Collection of data regarding present land use, and social economic conditions. Assessing water resources.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16
Pre-requisite: AGC 211 + AGP 222 + AGE 221 + AGS 221

**ALP 322: Project in Applied Land Use Planning (B Agric students)**

Purpose: A student credited with this module should be able to competently develop a sustainable agricultural land use plan for any piece of agricultural land.

Content: The determination and description of the agricultural land and the present system of land use. The formulation of a proposed system of land use covering all aspects of agriculture pertaining to the particular land unit. The compilation of maps showing the present and proposed systems of land use. No year mark required.

Instruction: Field work.

Assessment: Preparation and presentation of a land use plan (Typed project report and oral presentation)

Credits: 16
Pre-requisite: ALP 313

**ANIMAL SCIENCE**

**AGA 211: Introduction to Animal Science**

Purpose: To provide learners with an understanding of the general principles and concepts of animal science which are important in basic animal production.

Content: Introduction to animal husbandry and livestock industry in Southern Africa; types and breeds of farm livestock; evolution, origin, characteristics and usefulness. Regionalisation of livestock production, nutritional aspect, maintenance, production energy and other requirements, roughage, sweet- and sourveld; fresh milk; beef, sheep, pig and poultry regionalisation. Terminology definitions used in describing animals. Environment and adaptability. Basic principles of animal production; reproduction, bone growth, development and growth, compensatory growth and milk secretion. Production and management practice of dairying, beef, pigs, horses, sheep and goats.

Instruction: Lectures (3 hours/ week), Practical (1 per week) - Cattle, pig and horse judging. Farm visits

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16
Pre-requisite: BIO 111 + BIO 121
AGA 221: Principles of Animal Nutrition
Purpose: To provide learners with an understanding of the general principles and concepts of animal nutrition.
Content: Introductory fundamentals of animal nutrition; the necessary nutrients and their general metabolism; an understanding of nutritive requirements for metabolic processes and productive functions, and of the nutritive values of relevant Southern African feedstuffs. Theoretical aspects and computation of balanced rations for farm livestock.
Instruction: Lectures (3 hours/week), Practical (1 per week) - Feed identification and usage; computation of balanced rations for individual animals; simple nutritional practices on the farm.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGA 211

AGA 321: Animal Nutrition
Purpose: To provide learners with an understanding of the nutrition of ruminant and monogastric animals.
Content: Fundamentals of animal nutrition; nutrients and their metabolism; the measurement of body requirements and feed values; nutritive requirements for body processes and productive functions; nutritional properties of miscellaneous Southern African feedstuffs.
Instruction: Lectures (3 hours/week), Practical (1 per week) - Feed orientation and evaluation; nutritional practice on the farm; organized visits to farms and institutions.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGA 211 + AGV 221 + BCH 214

AGA 322 Animal Breeding
Purpose: To provide learners with the necessary knowledge base and insight on how to design a breeding plan.
Instruction: Lectures (2 hours/week), Practical (1 per week) - Calculations of breeding parameters and their application in practice.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGC 312

AGA 414: Seminar in Animal Science
Purpose: To develop the necessary skills involved in the reviewing of literature, the writing of a scientific article and the delivery of an oral presentation.
Content: The student is required to prepare and present orally a seminar on a topic under the supervision of academic staff.
AGA 415: Pig & Poultry Production
Purpose: To provide learners with an understanding of non-ruminant (pigs & poultry) production and management practices. Learners should have a holistic approach towards pig and poultry production and be capable of identifying and solving production problems.
Instruction: Lectures (3 hours/week), Practical (1 per week) - In laboratory and on farm; organized tours.
Assessment: Practical reports, assignments, 2 major tests, one seminar and examination (1 x 3hr paper).
Credits: 16
Pre-requisite: AGA 321

AGA 416: Dairy Science and Technology
Purpose: To provide learners with an understanding of dairy science, production and technology. Learners should have a holistic approach towards dairy technology and be capable of identifying and solving production problems.
Instruction: Lectures (2 hours/week), Practical (1 per week) - In laboratory and on farm; organised tours.
Assessment: Practical reports, assignments, 2 major tests, one seminar and examination (1 x 3hr paper).
Credits: 12
Pre-requisite: AGA 321 & MIC 211

AGA 421: Meat Science
Purpose: To provide learners with an understanding of the quality requirements of meat.
Instruction: Lectures (3 hours/week), Practical (Every 2nd week) - Carcass cutting of cattle, sheep and pigs; dissection, deboning and visits to abattoir.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGA 211 + AGV 221

**AGA 422: Project in Animal Science**

Purpose: To provide learners with the necessary knowledge base and insight on how to design a research plan and conduct a small research project.

Content: The student is required to participate actively in a selected project involving animal production, the results of which are to be presented in the form of a scientific dissertation.

Assessment: Continuous evaluation (proposal, planning, etc) culminating in a typed project report.

Credits: 16
Pre-requisite: AGA 415 + AGA 416
Co-requisite: AGA 425

**AGA 423: Special Topics in Animal Science**

Purpose: To provide learners with an insight into livestock science through the reviewing of selected research papers.

Content: A study of research papers on selected topics of Animal Science.

Instruction: Discussion groups (2 hours/week)
Assessment: Examination (1 x 3hr paper)
Credits: 8
Pre-requisite: AGA 415 + AGA 416
Co-requisite: AGA 425

**AGA 424: Seminar in Animal Science**

Purpose: To help the learner develop the necessary skills involved in the reviewing of literature, the writing of a scientific article and the delivery of an oral presentation.

Content: The student is required to prepare and present orally a seminar on a topic under the supervision of academic staff. Must be preceded by AGA 414.

Assessment: Typed seminar and oral presentation
Credits: 12
Pre-requisite: AGA 414

**AGA 425: Beef Production, Animal Traction and Game Farming**

Purpose: To provide learners with an understanding of beef production, animal traction and game farming.


Assessment: Practical reports, assignments, 2 major tests, one seminar and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGA 321

ANIMAL HEALTH

AGV 221: Anatomy and Physiology
Purpose: To provide learners with an understanding of the anatomy and physiology of farm animals.
Content: The anatomy and physiology of farm animals, histology and embryology. Emphasis placed on normal development and function to provide a background for the Animal Health and Animal Science courses.
Instruction: Lectures (3 hours/week), Practical (1 per week) - Anatomy, physiology and histology of healthy organ systems.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: PAC 110 + PAC 121

AGV 321: Elementary Animal Health
Purpose: To provide learners with an understanding of applied animal health practices.
Content: Practical calculations and services in connection with dips, worm drugs and vaccines, an understanding of applied animal health practices e.g. dosing, injecting, castrating, blood sampling, etc. The recognition and treatment of important livestock diseases and plant poisoning; understanding the meaning and importance of hygiene.
Instruction: Lectures (2 hours/week), Practical (1 per week) Farm visits
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGA 211

AGV 322: Animal Health: Non-Infectious Diseases
Purpose: To provide learners with the necessary knowledge base and insight into the pathology of diseases caused by non-infectious means that affect farm animals.
Content: Clinical and pathological examination of farm animals. Some examples of the most important medical, surgical and gynaecological conditions of farm animals, giving aetiology, course, treatment and prophylaxis.
Instruction: Lectures (3 hours/week), Practical (1per week) - Demonstration of clinical cases and elementary therapeutic principles.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGV 221
AGV 411: Animal Health: Infectious Diseases
Purpose: To provide learners with the necessary knowledge base and insight to be able to diagnose specific diseases in a livestock enterprise. The most important diseases of farm animals caused by specific agents, dealing with the biology of these agents, occurrence, symptoms produced in life and after death, treatment of animals suffering from these diseases, preventative measures and Government Regulations concerning diseases.
Instruction: Lectures (3 hours/week), Practical (1 per week) - Demonstration of animals suffering from diseases caused by specific agents; diagnostic, therapeutic and preventative procedures
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGV 322

PASTURE SCIENCE

AGP 211: Introduction to Pasture Ecology
Purpose: To introduce the learner to grass taxonomy and morphology and to the dynamics of plant ecological systems as they relate to the utilization of vegetation as feed for domestic and wild animals.
Instruction: Lectures (2 hours/week), Practical (1 per week) - Identification of grasses, shrubs and trees. Field exercises demonstrating autogenic and allogenic plant succession. Conducting vegetation surveys.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: BIO 111 + BIO 121

AGP 221: Pasture Ecology
Purpose: To acquaint the learner with the dynamics of plant ecological systems, which enhances the understanding of manipulation of vegetation for utilization as feed for domestic and wild ungulates.
Content: Introduction to plant ecology involving a study and analysis of plant succession. Classical examples of plant succession and a consideration of the productivity of ecological systems. The effects, role and use of fire in the management of vegetation for agricultural purposes. The vegetation of Southern Africa with special reference to the origins of the three main vegetation types and recent changes that have occurred on a national scale. A comparison of the utilization of vegetation by wild and domestic ungulates.
Instruction: Lectures (3 hours/week), Practical (1 per week) – Practical demonstrations of plant ecology, veld burning and the vegetation of South Africa. Illustrated discussion on the utilization of vegetation by wild and domestic ungulates.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
AGP 222: **Veld and Cultivated Pasture Management**

**Purpose:** Develop an understanding of the principles and application of veld and cultivated pasture management.

**Content:** Pasture terminology. Practical principles of pasture management. Grazing practices and systems. Formulation of veld management systems. Veld rehabilitation. Establishment and management of cultivated pastures. Formulation of a cultivated pasture system.

**Instruction:** Lectures (3 hours/week), Practical (1 per week) - Planning veld and cultivated pasture systems.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 16

**Pre-requisite:** AGP 211

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AGP 311: **Pasture Management**

**Purpose:** Develop a scientific understanding of the principles and application of veld management practices, systems and layouts.

**Content:** The objectives and principles of pasture management. The ontogeny of the grass plant and the physiological and ecological approaches to pasture utilization, critical growth periods and the objectives of resting veld. Plant/animal relationships with special reference to animal preference, acceptability and selective grazing. Pasture terminology encompassing terms and definitions of the properties of vegetation, types of management and land/animal relationships. Discussion and evaluation of continuous grazing, rotational grazing, rotational resting, rotational grazing and resting. Description and appraisal of different veld management systems.

**Instruction:** Lectures (3 hours/week), Practical (1 per week) - Practical demonstrations of the different growth stages in the grass plant. Small plot studies of the effect of frequency and intensity of defoliation on the yield; quality and vigour of pasture plants. Field excursions to study the practical application of the different grazing practices and veld management.

**Credits:** 16

**Pre-requisite:** AGP 221 + AGC 111

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AGP 321: **Fodder Production and Conservation**

**Purpose:** Training in the selection, establishment, management and utilisation of cultivated pastures.

**Content:** The classification, establishment, maintenance and utilization of cultivated pasture and fodder crop species. Fodder conservation through silage and hay making. Drought resistant fodder crops and fodder trees, their role and purpose in the farming system. Description, establishment and management of selected drought resistant fodder crop species.

**Instruction:** Lectures (2 hours/week), Practical (Every 2nd week) - The identification of cultivated pasture and fodder crop species. Practical demonstrations
on the establishment and management of cultivated pastures. Discussion and demonstrations of silage and hay-making.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGP 311

**AGP 411: Advanced Pasture Management**

**Purpose:** Study latest developments in veld and cultivated pasture management.

**Content:** Prescribed reading and discussions on pasture ecology, applied pasture management, Physiology of pasture plants, radical veld improvement, cultivated pastures, veld and pasture plants as feed for livestock, soil conservation and game farming.

**Instruction:** Contact (3 hours/week) Practical (1 per week) - Demonstrations, field and laboratory studies and visits to field experiments and agricultural research stations.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16
Pre-requisite: AGP 311

**AGP 421: Veld Rehabilitation**

**Purpose:** Training in the rehabilitation of degraded veld.

**Content:** Introduction to the encroachment and eradication of undesirable plants in the veld. Different types of encroachment, the extent of the problem in Southern Africa and the causes of the encroachment. Methods for the eradication and control of undesirable plants. The re-seeding of veld with emphasis on objectives, factors determining the success of re-seeding, choice of plant species, establishment, fertilization and management of reseeded areas. Insect pest control in veld. Methods for the control of the harvester termites, antheap termites and other insect pests.

**Instruction:** Contact (2 hours/week), Practical (Every 2nd week) - Illustrated and field demonstrations of encroachment and eradication of undesirable plants in the veld. Field studies of the re-seeding of veld and the control of insect pests.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 8
Pre-requisite: AGP 311

**AGP 422: Special Topics in Pasture Science**

**Purpose:** To provide learners with an insight into livestock science through the reviewing of selected research papers.

**Content:** Pasture research techniques for the quantitative assessment of vegetation. Sampling and small plot techniques in pasture research. Criteria for botanical analysis: The measurement of grazing capacity and utilization of herbage. The assessment of veld condition and trend.
AGP 423: Seminar in Pasture Science (Previously AGP 431)
Purpose: Training in reviewing and preparing scientific papers in Pasture Science.
Content: Students will be required to submit seminars on selected topics to be prepared in their own time.
Assessment: Typed seminars and oral presentation
Credits: 12
Pre-requisite: AGW 211

AGP 424: Project in Pasture Science
Purpose: To provide learners with the necessary knowledge base and insight on how to design a research plan and conduct a small research project.
Content: The student is required to participate actively in a selected project involving pasture science, the results of which are to be presented in the form of a scientific dissertation.
Assessment: Continuous evaluation (proposal, planning, etc) culminating in a typed project report.
Credits: 16
Pre-requisite: AGP 411

SMALLSTOCK SCIENCE

AGQ 311: Smallstock Science
Purpose: To provide learners with an understanding of the scientific principles involved in small stock production.
Content: Regionalization of various important sheep and goat breeds - their adaptability, production, reproduction and growth. Histological development of wool and mohair fibres; main physical characteristics, handling and marketing of wool and mohair.
Instruction: Lectures (3 hours/week), Practical (1 per week) - Judging of smallstock; handling, classification and typing of wool and mohair. Visits to farms and institutions.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGA 211

AGQ 421: Smallstock management
Purpose: To enable the learners to identify and solve production problems associated with small stock production systems.
Content: General management and organization of the smallstock industry; smallstock grazing habits, reproduction, (induced multi-ovulation,
synchronization, flushing, etc) nutrition (milk replacer, drought and creep feeding, protein stabilization), production systems (intensive and extensive) and their application in developing areas.

Instruction: Contact (2 hours/week), Practical (Every 2nd week) - Study of the managerial aspects of smallstock production with visits to farms, shearing and handling centres, practical aspects of smallstock infrastructure. Supplementation and ration formulation for smallstock

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: AGQ 311

CROP SCIENCE

AGC 111: Elements of Agro-Meteorology

Purpose: To introduce all agriculture learners to agro-meteorology, as an understanding of the principles of agro-meteorology is basic to all forms of agriculture, and forms the foundation for most crop production courses.

Content: Climatic surveys and their application in Land Use Planning. Management practices for alleviating specific climatic limitations. The installation, operation and interpretation of data from the following meteorological equipment: rain gauge; max. and min. thermometer; wet and dry bulb psychrometer; class A pan; thermo-hygrograph. The compilation and interpretation of an elementary water budget for maize, given Class A pan data, crop factors, water holding capacity of the soil, and depth of root penetration with time.

Instruction: Contact (2 hours/week); Practical (1 per week) - Operation and maintenance of meteorological equipment. Water budgeting. Elementary analysis of weather data.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: None

AGC 111F: Refer to AGC 111 for information

AGC 121: Introduction to Crop Science

Purpose: To introduce all agriculture learners to the basic principles of crop science, as an understanding of these forms the foundation for crop production practices, and are also basic to other forms of agriculture.

Content: Origin, classification and nomenclature of economic crops: evolutionary trends – natural and artificial selections, domesticated crops and their origin, classification of plant species – criteria (agronomic use, life cycle, growth habits ecological zones, botany); Structure and morphology: Plant cell, tissues and meristems, organs (the seed, the root, the shoot, the leaf, the flower and the fruit); Plant Physiology: Germination and seed quality, photosynthesis and crop yield, photosynthetic pathways (C3; C4; CAM), source-sink relationships. Assimilate partitioning and transport, biological and economic yield, harvest index. Metabolism (respiration) – carbohydrates, lipids and


Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: GEG 111 + GEG 121 or AGC 111

AGC 121F: Refer to AGC 121 for information

AGC 211: Elements of Crop Production

Purpose: To introduce the learner to the major food crops (cereals, pulses and potato) and to agronomy as an integrating science and to lay the foundation for the more advanced courses in Crop Science.

Content: Agronomy as an integrating science. The morphology, physiology and management practices of maize, sorghum, wheat, potatoes, and pulses. Lecy-cropping: The principles and practices of crop rotation.

Instruction: Contact (3 hours/week); Practical (1 per week) - A study of the anatomy and ontogeny of crop plants; assessment of potential and target yield; heat budgeting; farm machinery in field crop production; elements of grain grading.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: AGC 121

AGC 221: Elementary Irrigation

Purpose: To introduce learners studying for the B. Agric. degree to irrigation. The module forms the foundation for the advanced irrigation module AGC 321 for students in the Integrating Science programme.

Instruction: Contact (2 hours/week). Practical (Every 2nd week) - Practical methods of estimating plant water requirement and the irrigation potential of soils; planning and implementing systems of irrigation.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 8

Pre-requisite: AGC 121 + AGS 211

AGC 311: Water Relations

Purpose: To introduce concepts in water relations and their application in Crop production to all B.Sc. Agric. learners as a sound foundation for studying the Principles of Irrigation (AGC 321) and Crop Physiology.


Instruction: Contact (2 hours/week), Practical (1 per week) - Measurements of transpiration, water use efficiency and growth effects of moisture deficits in plants.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: AGC 121

AGC 312: Introduction to Genetics

Purpose: To introduce the subject of genetics to agricultural learners doing programmes with a biological bias, as the science of genetics is a basic biological science of central importance.


Instruction: Contact (3 hours/week), Practical (1 per week) - Examination of prepared slides. Controlled crosses in Drosophila melanogaster.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: BIO 111 + BIO 121

AGC 313: Plant Pest Control

Purpose: To introduce the learner to principles and practices of the post-harvest physiology and technology of fruit and vegetable crops, since most are highly perishable.

Content: Vegetative and reproductive cycles of crops and the types of pest/disease affecting the various stages. Effect of famines on mankind.

Instruction: Contact (3 hours/week); Practical (1 per week) - Survey of pests and diseases of various crops. Commonly used insecticides and fungicides and mode of application. Calibration of mechanical sprayers. Weed-killers and their uses. Techniques for recovery of nematodes from soil.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGC 121

AGC 321: Principles of Irrigation
Purpose: To provide a strong background in the principles and practices of irrigation for B.Sc. Agric. learners. The module enables the learner to operate irrigation systems for field and horticultural crops.

Content: Introduction - Irrigated areas of the world; the productivity and value of irrigated land; importance and scope of irrigation in Southern Africa. The Soil-Plant-Atmosphere system: the dynamic nature of the system; inter-action between climate, plant and soil factors; evapotranspiration and energy balance concepts; crop and soil factors; concepts related to the maintenance of long-term productivity; soil water availability; leaching requirements; brack formation; irrigation water quality. Planning: Social, economic and physical aspects involved in the selection of irrigable land; the assessment of physical factors. Prediction of irrigation needs. Application of energy balance, empirical and physical methods; practical considerations in scheduling irrigation. Field application of water: Efficiency of irrigation; the design, implementation and efficiency assessment of surface and overhead systems. Drainage: The salt balance concept; designing a relief draining system.

Instruction: Contact (3 hours/week), Practical (1 per week) – Practical methods of estimating plant water requirement; measurement of water flow; water budgeting; field evaluation of efficiency of surface and overhead systems; assessment of infiltration capacity, irrigation potential of soils, water quality; planning an irrigation scheme.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGC 311

AGC 411: Advanced Crop Science
Purpose: To offer advanced topics in Crop Science, including the production of specialized industrial and fibre crops to Crop Science majors.

Content: The production of specialized crops: Morphology, physiology, quality and yield criteria in relation to the production of tobacco and fibre crops including a study of specialized cultural practices and processing. Growth analysis. Crop Physiology: Crop physiological and ecological
principles as a basis for the management of field crops.

Instruction: Contact (3 hours/week), Practical (1 per week) – A study of the morphology of tobacco and cotton plants; elements of tobacco curing; elements of vegetable fibre technology. Exercises in comparative physiology and morphology of selected crops relative to crop production practices. Exercises in growth analysis.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: AGC 211

**AGC 421: Special Topics in Crop Science**

**Purpose:** To offer advanced training in crop experimental techniques, including analysis of experimental data, and problems in agronomic research.

**Content:** Experimental techniques: The field plot experiment with reference to selection of site, experimental material, plot size, sample number, the problem of what to measure, measurement of the living plant; division of the plant; harvesting; experimentation in controlled environments; pot experiments; biometry in agronomic research. Research topics. A study of selected investigations into current agronomic problems with the object of acquiring a scientific approach and gaining insight into the pitfalls of agronomic research.

Instruction: Contact (2 hours/week), Practical (Every 2nd week) – A study of current research on the University experimental farm; analysis of the factorial and split-plot experiments; the field laboratory concept and techniques employed in environmental research; biometrical evaluation of data on growth analysis and intercropping experiments.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 8

Pre-requisite: AGC 411

**AGC 422: Plant Breeding**

**Purpose:** To provide a strong background in the principles and practices of plant breeding for B.Sc. Agric. learners. It also introduces the learner to the current science and debate around genetic engineering and genetically modified organisms.


Instruction: Contact (3 hours/week), Practical (1 per week) - Practical experience with techniques employed in the breeding of self-pollinated field crop plants. Experimental crosses with tomatoes, maize, beans.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGC 312

**AGC 401: Project in Crop Science** (Previously AGC 431)

**Purpose:** To use a small research project to prepare the learner for further research in the work situation or for postgraduate studies in the crop sciences.

**Content:** Field work, in the form of a minor research project, aimed at giving the student practical experience in the production and scientific study of field crops. A report to be submitted. No year mark required.

**Assessment:** Continuous evaluation (proposal, planning, etc) culminating in a typed project report.

**Credits:** 16

Pre-requisite: AGC 211

**AGC 402: Seminar in Crop Science** (Previously AGC 432)

**Purpose:** To prepare the learner for research and for the presentation of scientific information to a scientific audience by doing a comprehensive literature search on a scientific topic, write it up according to an accepted format, present it orally and answer questions posed by peers and lecturers.

**Content:** The student is required to prepare and present orally a seminar on a topic which must be preceded by a 200 level course in the subject concerned.

**Assessment:** Typed seminar and oral presentation

**Credits:** 12

Pre-requisite: AGW 221

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**HORTICULTURAL SCIENCE**

**AGH 311: Elements of Horticultural Science**

**Purpose:** To introduce the learners to basic principles and aspects of horticultural science as a foundation for other modules in Horticultural Science.

**Content:** A brief survey of the horticultural industry in Southern Africa. Plant nomenclature, horticultural terminology and classification of horticultural crops. Climate as a factor in horticultural crop production; hail and frost protection, windbreaks for fruit orchards. Principles of horticultural crop management, including soil and site selection; orchard layout, spacing, irrigation, fertilization, cover cropping, mulching and weed control. Plant propagation with special reference to the principles and practices of asexual propagation. Introduction to plant growth and development; natural and synthetic growth substances; juvenility and senescence; flowering and flower physiology; fruit set and fruit development. Introduction to floriculture.

**Instruction:** Contact (2 hours/week), Practical (Every 2nd week) - Orchard layout and management practices. Asexual propagation techniques including mist propagation. Visits to commercial fruit orchards, nurseries and packhouses. The study of different fruit types. Identification of ornamental plants on campus.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 12
Pre-requisite: AGC 121

AGH 312:   **Elements of Fruit and Vegetable Production**
Purpose:  This module is intended for learners who will not be continuing with the study of Horticultural Science. It introduces them to the production of a representative range of fruit and vegetable crops and some of their distinctive features and requirements.
Content:  A classification of climates, with particular reference to Fruit Crop production. Introductory studies of the botany, ecology, cultivars, propagation and management of selected temperate citrus, tropical and sub-tropical fruit crops. A brief study of vegetable production.
Instruction:  Contact (3 hours/week), Practical (Every 2nd week) - Orchard layout and management practices. Pruning and fruit thinning of deciduous fruit trees. Pruning and trellising of grape vines. Propagation of selected fruit crops. The planting, management and harvesting of vegetable crops. Identification and evaluation of fruit and vegetable cultivars. Visits to producers, packhouses and to the Pineapple Research Station at Bathurst and Municipal Fresh Produce Market, East London or Port Elizabeth.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits:  12
Pre-requisite: AGC 121

NB: This module should be taken in preference to AGH 313 by those students who will not be taking more than two modules in Horticultural Science.

AGH 313:   **Post-harvest Technology and Physiology**
Purpose:  To introduce the learner to principles and practices of the post-harvest physiology and technology of fruit and vegetable crops, since most are highly perishable.
Content:  An introduction to the physiology and handling of fruit and vegetables. Fruit growth and development with special attention paid to ripening, maturity standards, and quality. The principles and practices of fruit harvesting; handling, grading, and storage. Physiology of stored fruits and vegetables. Cold stores and packhouse equipment. The effect of pre-harvest conditions on the post-harvest quality and storage life of fruits.
Instruction:  Contact (3 hours/week), Practical (Every 2nd week) - The determination of maturity of fruits. Fruit quality evaluation. Visits to packhouses, cold stores, fruit and vegetable processing factories.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits:  12
Pre-requisite: AGC 121
Co-requisite: AGH 311

NB:  This module is a pre-requisite for most advanced horticulture modules and should be selected in preference to AGH 312 by those who will be selecting Horticultural Science advanced modules as electives in their fourth academic year.
AGH 321: **Vegetable Crops**

**Purpose:** The module provides a general background to vegetable crops and their production. General principles and practices are studied, as also certain aspects of the production of selected crops.

**Content:** Brief survey of the vegetable industry in Southern Africa. Importance of, and food value of vegetable crops. Classification of vegetable crops. Types of vegetable growing. Climate and soil as factors in vegetable growing. Nutrient requirements of vegetable crops; application of fertilizers. Seeds, seed production, seed certification and testing. Seedbed preparation, sowing and transplanting, raising of seedlings in cavity trays. Management of vegetable crops. Marketing and storage, including the importance of quality. Vegetable processing. Economic importance, botany, nutritional value, production areas, climatic requirements and other selected aspects of the major vegetable crops.

**Instruction:** Contact (3 hours/week), Practical (1 per week) - Laboratory work, including seed quality and germination tests. Field work, including the raising of vegetable seedlings and management of the crop. Evaluation of cultivars and quality. Judging of vegetables. Visits to vegetable producers and to the Municipal Fresh Produce Market, East London.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 12

**Pre-requisite:** AGH 311 + AGH313

AGH 411: **Citrus Fruits**

**Purpose:** The module is intended to provide a comprehensive study of citrus and the citrus industry, with particular reference to Southern Africa. The scope and depth of the module prepare the learner for gainful employment in the industry.

**Content:** Studies of the economic importance, distribution, botany, growth, physiology, ecology, cultivars, propagation, management, marketing, and major pests and diseases of citrus fruits, (oranges, grapefruit, lemons, easy peelers). Particular attention to be paid to climatic requirements and distribution, cultivar characteristics, propagation and plant improvement, fruit quality and factors affecting quality, packhouse management, disease and pest control.

**Instruction:** Contact (3 hours/week), Practical (1 per week) - Visits to citrus orchards and packhouses; packhouse management. Propagation of citrus and visits to nurseries. Citrus quality tests. Identification and control of citrus pests and diseases.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 12

**Pre-requisite:** AGH 311 + AGH 313

AGH 421: **Temperate Fruits**

**Purpose:** The module introduces the learner to the deciduous fruit industry and certain aspects of selected crops. It concentrates on those aspects which are peculiar to deciduous fruits.
Content: Studies of the economic importance, distribution, botany, growth, physiology, ecology, cultivars, propagation, management, marketing, and major pests and diseases of the more important temperature fruits, e.g. stone and pome fruits and table grapes. Particular attention to be paid to climatic requirements, principles and practices of pruning/training systems; rootstocks.

Instruction: Contact (3 hours/week), Practical (1 per week) - Production practices including propagation, pruning, training, fruit thinning, harvesting, grading and packing. Identification and control of pests and diseases

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: AGH 311 + AGH 313

AGH 422: Sub-tropical Fruits

Purpose: The module introduces the learner to tropical and sub-tropical fruits grown under largely sub-tropical conditions in Southern Africa. It highlights the importance of climate in fruit production and also some distinctive features of selected major fruit crops, tea and coffee.

Content: Studies of the economic importance, distribution, botany, growth, physiology, ecology, cultivars, propagation, management, marketing, and major pests and diseases of the more important tropical and sub-tropical fruit and nut crops, tea and coffee.

Instruction: Contact (3 hours/week), Practical (1 per week) - Field trips including possible visits to a pineapple farm and cannery, the Pineapple Research Station, and to tea and coffee plantations. Laboratory studies of eelworm infection in pineapples, control measures. Fruit and nut studies. Study and interpretation of climatic data in relation to the climatic requirements of sub-tropical fruits.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12

Pre-requisite: AGH 311 + AGH 313

AGH 401: Horticulture Project (Previously AGH 431)

Purpose: This project introduces the learner to research in Horticultural Science by requiring him/her to identify a research problem, formulate a research proposal, conduct a relatively small research project, analyse the data and write it up as a report or scientific paper.

Content: Field work, in the form of a minor research project, aimed at giving the student practical experience in the production and scientific study of fruits or vegetables. A written report to be submitted.

Assessment: Continuous evaluation (proposal, planning, etc) culminating in a typed project report.

Credits: 16

Pre-requisite: AGH 311 + AGH 313

AGH 423: Special Topics in Horticultural Science (Previously AGH 432)

Purpose: The module provides the learner with information on special topics not covered in the other courses and teaches him/her to source the
information from the scientific literature (library and internet) and present it as assignments.

Content: Special topics, mainly on fruit crops, designed to supplement previous courses and to provide a small degree of specialization in a desired direction. Assignments.

Instruction: Contact (2 hours/week), Practical (Every 2nd week)

Assessment: No year mark required. Examination (1 x 3hr paper);

Credits: 8

Pre-requisite: AGH 321 + AGH 411

**AGH 403: Seminar in Horticultural Sciences** (Previously AGH 433)

Purpose: The module teaches the learner to prepare an objective but critical review of the literature on a given topic and to write it in an acceptable scientific format as a seminar. The seminar is presented orally in the form of a PowerPoint presentation, an exercise in addressing a critical audience and answering their questions.

Content: A student is required to write and present orally a seminar on a given topic.

Assessment: Typed seminar and oral presentation

Credits: 12

Pre-requisite: AGH 311 + AGH 313

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**AGRICULTURAL ENGINEERING**

**AGG 221: Introduction to Agricultural Engineering**

Purpose: To introduce agricultural students to the field of Agricultural Engineering and to provide them with elementary skills in the directions involved.

Content: Principles of mechanics; Farm machinery for crop production; Measuring and levelling techniques; Using tractors and animal traction; Elementary farm building construction; Map reading and land measurement; Farm water resources.

Instruction: Contact (3 hours/week), Practical (1 per week)

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: AGF 112 or AGF 122

**AGG 311: Farm Buildings**

Purpose: To provide, in particular, Animal Science students with a sound basis in building constructions on the farm as well as the knowledge and skills related to intensive animal housing.

Content: Building plans and specifications; Site selection and farmyard planning; Economic feasibility of farm buildings; Building materials and construction techniques; Electricity on the farm; Natural ventilation of farm buildings; Farm water and waste management; Large stock handling facilities; Pig housing facilities; Poultry housing facilities; Smallstock handling facilities; Dairy housing and engineering.

Instruction: Contact (3 hours/week), Practical (1 per week)

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
AGG 411: **Introduction to Farm machinery** (Previously AGG 431)

**Purpose:** To provide, in particular, Agronomy students with a sound basic understanding of the mechanical principles and the machinery used for crop production on the farm, including hands-on skills in hitching, setting up calibration and use of such machinery.

**Content:** (Essentially this is a course in crop production machinery). Mechanical principles; Agricultural tractor engine operating principles; Fundamentals and servicing; Fuels and the principles of combustion; Diesel fuel system and engine governing; Cooling and lubricating systems; Power transmission system; Hydraulic system; Power takeoff; Primary tillage and associated implements; Secondary tillage and associated implements; Planting equipment; Fertilizer application; Spraying equipment; Animal traction as an important power option; Animal traction related equipment and implements; Mechanization planning in relation to tractors and animal traction.

**Instruction:** Contact (3 hours/week); Practical (1 per week)

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 16

**Pre-requisite:** AGG 221

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**SOIL SCIENCE**

AGS 211: **Introduction to Soil Science**

**Purpose:** To introduce students to the subject of Soil Science by giving them a general background to the origins of soils, their formation and classification, their physical, chemical and biological properties, as well as soil fertility and its management.


**Instruction:** Contact (3 hours/week), Practical (1 per week) - Study of minerals and rocks. Field excursions: landforms, factors of soil formation, elementary soil classification. Laboratory and field determination of important primary physical and chemical properties of soils. Fertilizer identification.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
AGS 221: Pedology

Purpose: To enable students with a background in Soil Science to understand in some detail soil formation/genesis and classification and be capable of describing soils in the field as well as to map them.


Instruction: Contact (2 hours/week), Practical (1 per week) - Detailed description of soil profiles in the field followed in each case by classification. Exercises in simple series identification when provided only with profile description and analytical data. Exercise in soil mapping, aerial photographs, land capability/soil suitability assessment.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 16
Pre-requisite: PAC 110 or PAC101

AGS 321: Plant Nutrition and Soil Fertility

Purpose: To enable students to understand the fundamental principles controlling the supply of nutrients to plants, and management practices that are agronomically and environmentally sound.


Instruction: Contact (3 hours/week), Practical (Every 2nd week) - Pot experiment using nutrient solutions omitting selected nutrients. Soil fertility assessment using a biometrically designed pot experiment. Soil tests of P and K using different soils, including those used previously for pot experiment. Comparison of fertility assessment by pot experiment and soil test.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

Credits: 12
Pre-requisite: AGS 211

AGS 322: Soil Taxonomy

Purpose: To enable students with a background in Soil Science to build on the AGS 221: Pedology module but also study other international soil classification systems.

Content: An overview of the basic principles of “Soil Taxonomy” (the soil classification system of the USA) and the classification system of the FAO/UNESCO Legend.

Instruction: Contact (2 hours/ week), Practical (Every 2nd week)
AGS 411: **Soil Chemistry**

**Purpose:** To empower the learner majoring in Soil Science with knowledge on important chemical reactions that take place in soils and their practical implications to soil fertility and its management.


**Instruction:** Contact (3 hours/week), Practical (1 per week) - Determination of micronutrients in soil and plant material. Experiments on P and K fixation. Ion exchange equilibria studies. An investigation of the properties of an acid soil.

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 12

**Pre-requisite:** AGS 221

AGS 412: **Soil Mineralogy**

**Purpose:** To enable students with a background in Soil Science and Pedology to appreciate the value of soil mineral information in studies of soil genesis, soil classification, and soil fertility management and productivity.

**Content:** Primary and secondary clay minerals: their weathering formation and properties. Value of soil minerals information in studies on soil genesis, soil classification and land capability.

**Instruction:** Contact (2 hours/week), Practical (Every 2nd week)

**Assessment:** Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)

**Credits:** 12

**Pre-requisite:** AGS 221

AGS 413: **Seminar in Soil Science**

**Purpose:** To enable students to develop skills necessary for writing scientific reports as well as effective delivery of oral presentations.

**Content:** A student is required to write and present orally a seminar on a given topic.

**Assessment:** Typed seminar and oral presentation

**Credits:** 12

**Pre-requisite:** AGW 211 + AGS 221

AGS 422: **Soil Physics**

**Purpose:** The module gives a learner majoring in Soil Science an understanding of the theory and application of soil physics necessary for dealing with physical problems affecting soil productivity.

**Content:** Physico-chemical properties of water: a study of the properties themselves; energy states of water. Physical properties of soil water:
moisture retention curve, the importance of pore size distribution, total soil water potential, Richards Outflow Law. Measurement of water content. Movement of soil water: laws, hydraulic conductivity, application for moisture conservation, infiltration, soil water availability. The physical state of the soil: structure; its meaning, binding forces, stability and its measurement; soil strength and its measurement; models. Soil texture.

Instruction: Contact (2 hours/week), Practical (1 per week) - The following field and laboratory determinations: soil moisture availability; moisture retention curve, neutron probe, tensionmeters; hydraulic conductivity and its stability; infiltration; stability of structure. Soil texture.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGS 211

**AGS 423: Chemical Analysis of Soils, Plants and Waters**

Purpose: This module prepares a learner majoring in Soil Science for analytical work relating to soils, plants and water in relation to agricultural and environmental issues.

Content: Introduction: Analytical techniques – theory and examples: Titration, precipitation, colorimetry, flame spectrophotometry. The analysis of soils, plants and water: objectives, sampling and storage of samples, important parameters, extraction problems, interpretation of results.

Instruction: Contact (2 hours/week), Practical (1 per week) - The analysis of standard solutions for SO₄, P, NO₃, HCO₃, Cl, Ca, Mg, Na, K. The analysis of soils: saturation paste extract, P extraction, CEC and exchangeable Na, K, Ca, Mg. The analysis of plant material: N by Kjeldahl, ashing and determination of Ca, Mg, K, P on ash extract. The analysis of water EC, anions, cations, SAR.

Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 8
Pre-requisite: AGS 211

**AGS 424: Seminar in Soil Science**

Purpose: To enable students to develop skills necessary for writing scientific reports as well as effective delivery of oral presentations.

Content: A student is required to write and present orally a seminar on a given topic.

Assessment: Typed seminar and oral presentation
Credits: 12
Pre-requisite: AGW 211 + AGS 221

**AGS 401: Project in Soil Science** (Previously AGS 431)

Purpose: This module introduces the learner to research in Soil Science by requiring him/her to identify a research problem, formulate a research proposal, conduct the research project, analyze the data and write up a report.

Credits: 12
Pre-requisite: AGS 401
Content: Students are required to carry out a selected project in soil science, the results of which are to be presented in the form of a scientific dissertation.

Assessment: Continuous evaluation (proposal, planning, etc) culminating in a typed project report.

Credits: 12

Pre-requisite: AGS 221

ADDITIONAL COURSES

AGB 311: Agricultural Biometry
See under Biometry

AGB 321: Applied Agricultural Biometry
See under Biometry

AGF 112: Introduction to Scientific Concepts
Purpose: To give students arithmetic background and skills necessary for calculations required in subsequent courses.
Instruction: Contact (3 hours/week), Practical (1 per week) - The use of the scientific pocket calculator in applying the above techniques.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: None

AGF 112 F: Refer to AGF 112 for information

AGF 122: Introduction to Scientific Concepts
Purpose: To give students arithmetic background and skills necessary for calculations required in subsequent courses.
Content: AGF 122 and AGF 112 have the same syllabus. The first semester module AGF 112 is repeated with module code AGF 122 in the second semester. Credit will not be given for both AGF 112 and AGF 122. Semester marks obtained for AGF 112 will not be carried forward for AGF 122, nor will students be permitted to register for AGF 122 under rule G7 in the second semester of the first year of study.
Instruction: Contact (3 hours/week), Practical (1 per week) - The use of the scientific pocket calculator in applying the above techniques.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
NB: Repetition of the module will enable first year students who have failed in the first semester to attempt the module again in the same year; it will also enable second or third year students to fit the module more easily into their lecture time table.

AGF 122F: Refer to AGF 122 for information

AGW 211: Introduction to Seminar Writing
Purpose: To facilitate the learning process for the learners to plan and execute an undergraduate study; and to enable them to write and present the study according to accepted academic standards.
Instruction: Contact (1 hour/week)
Assessment: Examination (1 x 2hr paper)
Credits: 8
Pre-requisite: None

AGW 221: Introductory Seminar
Purpose: To equip learners with a knowledge of the basic concepts of agricultural extension and communication.
Content: Writing and presentation of a seminar on a selected topic.
Assessment: Seminar Presentation
Credits: 8
Pre-requisite: AGW 211

AGF 401: Practical Vacation Training (Previously AGF 431)
Purpose: To provide all final year agricultural students with basic hands-on experience with typical on-farm activities which will enable them to apply their scientific knowledge practically. In their final two years of study, students will be required by the Board of School of Agriculture and Agribusiness to remain for specified periods to do practical work under the guidance of an approved person or at an approved institution during vacations.
1. All students are required to take part in General Practical Training Programmes.
2. Students will also attend practicals related to the degree options for which they are registered.
Instruction: Contact (During Academic Recess)
Assessment: Attendance - Research Farm hands-on training
Credits: 0
Pre-requisite: None

CLS 111F Communication & Life Skills
Purpose: As well as academic achievement and intellectual ability, the work place expects Science, Engineering, Agriculture and Technology (SEAT) graduates to be able to demonstrate a range of communication skills. This is essential for enabling them to market the products they will have
designed. The course is also intended to capacitate them with skills to understand and apply English in a scientific context.

Contents: Interpretation of confusing words in science, analytic thinking skills, reading with understanding, skills for concise and clear writing, public speaking, summarizing and outlining, as well as assertiveness skills.

Instruction: Lectures, tutorials, projects, debates, individual and group assignments.

Assessment: Assignments, class tests, assessment of projects, peer assessment (debates).

Credits: 16 (For application for full exemption)

CLS 121F Communication & Life Skills

Purpose: This module continues from CLS 111F and is an application of communication skills introduced earlier. This module will enable the learner to enhance communication skills and apply them in real-life situations.

Contents: Skills for concise and clear writing, public speaking, comprehension and interpretation of scientific data, basic project management skills, debating skills, leadership skills, and proposal writing skills.

Instruction: Lectures, tutorials, projects, debates, individual and group assignments.

Assessment: Assignments, class tests, assessment of projects, peer assessment (debates) and assessment of project.

Credits: 16 (For application for full exemption)

POST GRADUATE STUDIES IN THE SCHOOL OF AGRICULTURE AND AGRIBUSINESS

(a) Prospective post-graduate students must discuss their proposed studies with the relevant Head of Department before submitting their application to the Administration.

(b) Application forms must be accompanied by a written recommendation from the Head of Department.

Entrance requirements for Honours Degree

A candidate shall not be admitted to any module for the Honours degree unless s/he has obtained the permission of the Head of Department concerned. Normally candidates will not be admitted to the Honours programme unless they have obtained at least 60% in the final year in the subject in which they wish to register for Honours, and in the case of Agricultural Extension, which is generally not offered at undergraduate level, a 60% pass in another subject, regarded as relevant by the Head of Department, will be required.

THE DEGREE OF BACHELOR OF AGRICULTURE (HONOURS)

(Refer also to the General Rules for the Honours degree of Bachelor)

Ag 7 Study programme:
Ag7.1 A candidate shall attend and complete a programme of study in accordance with an approved syllabus. The programme can be done full time extending over not less than one academic year.
The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Board:

- 70501 Agricultural Economics
- 70502 Agricultural Extension

**Admission:**

A person shall not be registered as a candidate for the degree unless s/he holds the degree of Bachelor of Agriculture of the University or has been admitted to the status thereof. For admission to the Agricultural Economics option, a candidate must hold the B Agric (Ag Econ) degree of the University or have been admitted to the status thereof. By special permission of Senate, on recommendation of the Board, a holder of another Bachelor's degree may be admitted.

A student may be required to make up such deficiencies as deemed necessary by the Head of Department.

**Examinations:**

- In all subjects, except Agricultural Extension, the examination shall consist of not less than five papers, of which not less than three shall be written examinations.

- The examinations in Agricultural Extension shall consist of three written papers, a dissertation and seminars presented during the module.

- In order to pass the Honours examination a candidate must obtain an aggregate of at least 50% of the marks in all the papers.

- There shall be a sub-minimum of 40% for each paper.

- The degree shall be conferred with distinction on a candidate who obtains a final mark of not less than 75%.
AGRICULTURE ECONOMICS OPTION 70501

**Admission:** As for other Honours degrees. See Ag8

**Duration:** The programme can be done full time over the period of one year.

**Study Programme:** The examinations shall consist of three written papers, a project, and two seminars. Total credits for the programme is 128.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE 501 Project</td>
<td>36</td>
</tr>
<tr>
<td>AGE 502 Seminars</td>
<td>32</td>
</tr>
<tr>
<td>Any 3 of the following:</td>
<td></td>
</tr>
<tr>
<td>AGE 503 Adv Farm planning &amp; Decision making</td>
<td>20</td>
</tr>
<tr>
<td>AGE 504 Agricultural marketing</td>
<td>20</td>
</tr>
<tr>
<td>AGE 505 Agricultural Development</td>
<td>20</td>
</tr>
<tr>
<td>AGE 506 Methods of Agric Eco &amp; Farm Management</td>
<td>20</td>
</tr>
<tr>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>AGE 507 Special Topics In Agricultural Economics</td>
<td>20</td>
</tr>
</tbody>
</table>

**Total for Qualification** 128

All optional papers will not necessarily be offered in any particular year; intending students should consult the Head of Department.

AGRICULTURAL EXTENSION OPTION 70502

**Admission:** As for other Honours degrees. See Ag8

**Duration:** A candidate shall attend and complete a programme of study in accordance with the syllabus. The programme can be done full time over the period of one year.

**Study Programme:** The examinations shall consist of three written papers, a dissertation and seminars. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGX 501 Basis &amp; Philosophy of Agric Ext &amp; Rural Dev.</td>
<td>20</td>
</tr>
<tr>
<td>AGX 502 Communication, Leadership &amp; Management</td>
<td>20</td>
</tr>
<tr>
<td>AGX 503 Evaluation &amp; Research</td>
<td>20</td>
</tr>
<tr>
<td>AGX 504 Dissertation</td>
<td>36</td>
</tr>
<tr>
<td>AGX 506 Seminars</td>
<td>32</td>
</tr>
</tbody>
</table>

**Total for Qualification** 128
THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE (HONOURS)

(Refer also to the General Rules for honours degree of Bachelor)

Ag 10  Study programme
Ag10.1 The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Board:
   72001 Agricultural Economics  72005 Soil Science
   72002 Economics               72006 Horticultural Science
   72003 Crop Science            72007 Pasture Science
   72004 Animal Science

Ag10.2 The minimum period for full-time study shall be one academic year for students holding the degree of Bachelor of Science in Agriculture and two years for all other bachelor degrees. The minimum period for part-time study shall be two academic years for students holding the degree of Bachelor of Science in Agriculture.

Ag 11  Admission
Ag11.1 Except as provided for in Rules Ag11.2 and Ag11.3 below a person shall not be admitted as a candidate for the degree unless s/he holds the degree of Bachelor of Science in Agriculture of the University or has been admitted to the status thereof.

Ag11.2 The Senate, upon recommendation of the School of Agriculture and Agribusiness and the Board, may permit a candidate who is in possession of a three year bachelor’s degree with acceptable major subjects, to register for postgraduate study in Agriculture. Such a candidate must register as a special student for a minimum period of one academic year, during which time modules in the major study direction and certain other prescribed modules must be completed. After the completion of these prescribed modules to the satisfaction of the Senate upon the recommendation of the School of Agriculture and Agribusiness and the Board, the candidate will be permitted to register for the degree of Bachelor of Science in Agriculture (Honours). In special cases, the Senate, upon recommendation of the School of Agricultural and Environmental Sciences and the Board, may reduce or exclude this preliminary study period.

Ag11.3 On the recommendation of the School of Agriculture and Agribusiness and the Board, Senate may admit a candidate in possession of any other acceptable degree to register for the degree.

Ag11.4 The Senate upon recommendation of the School of Agriculture and Agribusiness and the Board, may admit a candidate in possession of a three year bachelor’s degree with acceptable major subjects to register directly for the degree of Bachelor of Science in Agriculture (Honours) or reduce the preliminary study period, provided that s/he both:
   (a) presents proof that s/he has had extensive experience in his/her intended field of study and
   (b) completes prescribed admission examinations to the satisfaction of the School of Agriculture and Agribusiness and the Board.
Ag 12 Examinations
Ag12.1 The examination shall comprise not less than four and not more than six papers including oral and practical papers. The number of oral papers shall not exceed that of the written papers. In order to pass the Honours examination a candidate must obtain an aggregate of at least 50% of the marks in all the papers.
Ag12.2 There shall be a sub-minimum of 40% for each paper.
Ag12.3 The degree shall be conferred cum laude on a candidate who obtains an average examination mark of not less than 75%

Ag 13 Commencement of Studies
Ag13.1 For certain options, students may be required to report for commencement of studies on the first Monday after 10 January. For all other options students are required to report to the Directorate concerned on the first day of first year registration. Students should consult the Head of Department.
Ag13.2 Students may be required to pursue their studies at the University during University holidays.
Ag13.3 In addition to the provisions of Rule Ag12.1 a candidate may be required to submit a dissertation and/or to present himself for such other examination/s as is determined by the Senate on the recommendation of the School of Agriculture and Agribusiness and the Board.

AGRICULTURAL ECONOMICS OPTION 72001

The examinations shall consist of three written papers, a project and two seminars. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE 601 Research Project</td>
<td>36</td>
</tr>
<tr>
<td>AGE 602 Seminars</td>
<td>32</td>
</tr>
<tr>
<td>Any 3 of the following:</td>
<td></td>
</tr>
<tr>
<td>AGE 604 Methods of Agric Econ Research</td>
<td>20</td>
</tr>
<tr>
<td>AGE 605 Agric Production Theory &amp; Farm Business Mgt</td>
<td>20</td>
</tr>
<tr>
<td>AGE 606 Agricultural Marketing, Prices and Policy</td>
<td>20</td>
</tr>
<tr>
<td>AGE 607 Economics of Agric Development &amp; Project Appraisal</td>
<td>20</td>
</tr>
<tr>
<td>AGE 608 Agricultural Resource Economics</td>
<td>20</td>
</tr>
<tr>
<td>AGE 609 Special Topics in Agricultural Economics</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

All optional papers will not necessarily be offered in any particular year; intending students should consult the Head of Department.
ANIMAL SCIENCE OPTION    72004

The examination shall consist of three written papers, one oral, one seminar, a series of mini-seminars and a project. Duration of the programme is at least one year for full-time and at least two years for part-time students. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGA 601 Seminar in Animal Science</td>
<td>16</td>
</tr>
<tr>
<td>AGA 602 Project</td>
<td>32</td>
</tr>
<tr>
<td>AGA 603 Mini-seminars in Animal Science</td>
<td>16</td>
</tr>
<tr>
<td>AGA 604 Oral exam on Research Project</td>
<td>4</td>
</tr>
<tr>
<td>AGA 605 Physiology of Digestion &amp; Rumenology &amp; Energy &amp; Protein Metabolism</td>
<td>20</td>
</tr>
<tr>
<td>AGA 606 Vitamins, Minerals, Non-ruminant Nutrition &amp; Research Techniques</td>
<td>20</td>
</tr>
<tr>
<td>AGA 607 Feeding Practices in Animal Production</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

CROP SCIENCE OPTION    72003

The examination shall consist of three out of four written papers, one oral, two seminars and one project. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC 605 Project</td>
<td>32</td>
</tr>
<tr>
<td>AGC 606 Oral exam on Project</td>
<td>4</td>
</tr>
<tr>
<td>AGC 607 Seminar</td>
<td>16</td>
</tr>
<tr>
<td>AGC 608 Seminar</td>
<td>16</td>
</tr>
<tr>
<td>Any 3 of the following papers:</td>
<td></td>
</tr>
<tr>
<td>AGC 601 AGS 622 or any approved Botany Honours paper (for students with Botany major)</td>
<td>20</td>
</tr>
<tr>
<td>AGC 602 Advanced Topics in Selected Fields of Crop Physiology</td>
<td>20</td>
</tr>
<tr>
<td>AGC 603 Advanced Topics in Crop Experimentation or Biometry *</td>
<td>20</td>
</tr>
<tr>
<td>AGC 624 Advanced Topics in Selected Fields of Crop Ecology</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

* Students without training in Biometry equivalent to AGB311 and AGB321 will be required to take the latter modules.

ECONOMICS OPTION    72002

In consultation with the Head of Department, the Degree Bachelor of Science in Agriculture Honours in Economics (B Sc Agric Hons in Economics) may be obtained, as offered by the Directorate of Economics in the Faculty of Commerce and Management.

82
Please consult the prospectus of the Faculty of Commerce and Management for additional information.

**HORTICULTURAL SCIENCE OPTION 72006**

The examination shall consist of three out of four written papers, two seminars and one project. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGH 601 Project</td>
<td>36</td>
</tr>
<tr>
<td>AGH 602 Seminars</td>
<td>32</td>
</tr>
<tr>
<td>Any 3 of the following</td>
<td></td>
</tr>
<tr>
<td>AGH 603 An approved Honours module in Crop Science</td>
<td>20</td>
</tr>
<tr>
<td>AGH 604 Advanced studies in Field of Student’s Project</td>
<td>20</td>
</tr>
<tr>
<td>AGH 615 Advanced Topics in Selected Fields of Horticulture</td>
<td>20</td>
</tr>
<tr>
<td>AGH 616 Selected Topics in Plant Tissue Culture / plant propagation</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

Notes:
1. The Head of Department may require a student to do certain ancillary undergraduate modules (including AGB 311 and AGB 321 and/or selected modules in Computer Science) if deemed necessary.
2. In exceptional cases the Head of Department may prescribe or allow additional approved Honours modules or papers to be taken in lieu of the project (AGH 601).
3. All options will not necessarily be offered in any particular year; prospective students should consult the Head of Department.

**PASTURE SCIENCE OPTION 72007**

The examinations shall comprise two written papers, one oral, one project and three seminars. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGP 601 Selected Topics in Advanced Pasture Science</td>
<td>20</td>
</tr>
<tr>
<td>AGP 602 Research Techniques in Pasture Management</td>
<td>20</td>
</tr>
<tr>
<td>AGP 603 Project</td>
<td>36</td>
</tr>
<tr>
<td>AGP 604 Oral Examination</td>
<td>4</td>
</tr>
<tr>
<td>AGP 605 Seminar in Advanced Pasture Science</td>
<td>16</td>
</tr>
<tr>
<td>AGP 606 Seminar in Advanced Pasture Science</td>
<td>16</td>
</tr>
<tr>
<td>AGP 607 Seminar in Advanced Pasture Science</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>
The examination shall consist of three out of four written papers, two seminars and one project. Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGS 611 Soil Chemistry Honours</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>AGS 612 Soil Physics Honours</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>AGS 621 Pedology Honours</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>AGS 622 Soil Fertility &amp; Plant Nutrition Hons</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>AGS 601 Soil Science Project</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>AGS 602 Seminars in Advanced Soil Science</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td><strong>Total for Qualification</strong></td>
<td></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

Notes:
1. AGS 611 and AGS 612 will be presented during the first semester and the examination will be written in June.
2. AGS 621 and AGS 622 will be presented during the second semester and the examinations will be written in November.
3. The Head of Department may require a student to do certain ancillary undergraduate modules if deemed necessary.

THE DEGREE OF MASTER OF AGRICULTURE
(Refer also to the Statute and General Rules for the degree of Master)

Ag14 Study programme
The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Board: Total credits for the programme is 128 credits

- 71000 M Agric in Agricultural Economics AGE 700
- 71001 M Agric in Agricultural Extension AGX 700

Ag 15 Admission
A person shall not be admitted as a candidate for the degree unless s/he holds the degree of Bachelor of Agriculture (Honours) of the University or has been admitted to the status thereof, and has satisfied the Senate as to his/her qualifications in the subject of his/her proposed course of study.

Ag 16 Examinations
The degree may be conferred *cum laude* on a candidate who obtains a mark of not less than 75% for:
(a) the dissertation, where no examination is written; or
(b) the dissertation and examination combined, where an examination is written.
THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURE
(Refer also to the Statute and General Rules for the degree of Master)

Ag 17 Study programme
Ag 17.1 The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Board: Total credits for the programme is 128 credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>72500</td>
<td>M Sc Agric in Agricultural Economics</td>
</tr>
<tr>
<td>72501</td>
<td>M Sc Agric in Economics</td>
</tr>
<tr>
<td>72502</td>
<td>M Sc Agric in Crop Science</td>
</tr>
<tr>
<td>72503</td>
<td>M Sc Agric in Animal Science</td>
</tr>
<tr>
<td>72504</td>
<td>M Sc Agric in Soil Science</td>
</tr>
<tr>
<td>72505</td>
<td>M Sc Agric in Horticultural Science</td>
</tr>
<tr>
<td>72506</td>
<td>M Sc Agric in Pasture Science</td>
</tr>
<tr>
<td>72507</td>
<td>M Sc Agric in Agricultural Extension</td>
</tr>
</tbody>
</table>

Ag 17.2 A candidate for the degree shall present a seminar on the research undertaken prior to the submission of the dissertation.

Ag 18 Admission
Ag 18.1 A person shall not be admitted as a candidate for the degree unless s/he holds a qualification in Agriculture at NQF level 7 at the University or has been admitted to the status thereof, and has satisfied the Senate as to his/her qualifications in the subject of his/her proposed course of study.

Ag 19 Examination
Ag 19.1 A candidate shall submit a dissertation and in addition may be required to present himself/herself for such examination as is determined by the Senate on the recommendation of the School of Agriculture and Agribusiness, and the Board.

Ag 19.2 The minimum pass mark for the degree shall be:

a) 50% for the dissertation; or

b) 50% for the dissertation and an average of 50% for the examination.

Ag 19.3 The degree may be conferred *cum laude* on a candidate who obtains a mark of not less than 75% for:

(a) the dissertation, where no examination is written; or

(b) the dissertation and examination combined, where an examination is written.

THE DEGREE OF DOCTOR OF PHILOSOPHY (PhD)

Ag 20 Study programme
Ag 20.1 A candidate for the degree shall be required to pursue an approved course of study and research on some subject connected with aspects of agriculture. The programme has a credit value of 360.

Ag 20.2 The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Board:

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>73001</td>
<td>Ph D in Agricultural Economics</td>
</tr>
<tr>
<td>73002</td>
<td>Ph D in Agricultural Extension</td>
</tr>
</tbody>
</table>
DESCRIPTION OF POSTGRADUATE MODULES

AGA 601 Seminar in Advanced Animal Science
Purpose: To enable students to improve their writing and oral presentation skills.
Content: Selected topics in animal science chosen in consultation with academic staff members.
Instruction: Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.
Assessment: Written reports and oral presentation
Credits: 16

AGA 602 Project
Purpose: A comprehensive report on research in a selected field of Animal Science.
Credits: 32

AGA 603 Mini-seminars in Animal Science
Purpose: To enable students to improve their writing and oral presentation skills.
Content: Selected topics in animal science chosen in consultation with academic staff members.
Instruction: Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.
Assessment: Written reports.
Credits: 16

AGA 604 Oral Exam
Assessment: An oral examination on the contents of the project report.
Credits: 4

AGA 605 Physiology of Digestion and Rumenology and Energy and Protein Metabolism
Purpose: To have students fully appreciate and understand digestion in the ruminant animal.
Contents: Topics to be covered latest developments in the areas of rumen physiology and metabolism.
Assessment: Three hour exam paper
Credits: 20

AGA 606 Vitamins, Minerals, Non-Ruminant Nutrition and Research Techniques
Purpose: To teach students and get them to appreciate the value of research and how it is conducted.
Contents: Definition of research, proposal writing, methods of conducting research.
Assessment: Three hour exam paper
Credits: 20

AGA 607 Feeding Practices in Animal Production
Purpose: To familiarize students with the current feeding practices in the Animal production industry.
Contents: The subject will cover production of the major livestock species with special emphasis on the latest developments in the feed industry. The course will also include field visits to farms and related industries.
Assessment: Three hour exam paper
Credits: 20

AGC 612 Advanced topics in selected fields of Crop Physiology
Purpose: This module is aimed at giving the learners a more advanced knowledge of Crop Physiology and to equip him/her for research in Crop Science.
Contents: Reading assignments on ten to twelve selected topics.
Instruction: Largely self-directed study involving literature searches and reviews, the preparation of assignments and oral presentation thereof to peers and lecturer(s).
Assessment: Written and oral presentations will be assessed. The final summative assessment will be in the form of a 3-hour externally moderated exam.
Credits: 20

AGC 603 Special topics in crop experimentation and biometry
Purpose: This module is aimed at giving learners a more advanced knowledge of crop experimentation to equip him/her for research in Crop Science.
Contents: A study of advanced crop experimentation and biometry. Reading assignments on ten to twelve selected topics in crop experimentation.
Instruction: Largely self directed involving practice in data analysis and interpretation and writing of experiments in format for journal publication.
Assessment: Written and oral presentations will be assessed. Summative assessment consists of a final 3-hour externally moderated exam.
Credits: 20

AGC 624 Advanced topics in selected fields of Crop Ecology
Purpose: This module is intended to give the student some insight into issues of crop ecology.
Contents: Reading assignments on ten to twelve topics on crop ecology.
Instruction: Largely self-directed study involving literature searches and reviews, the preparation of assignments and the oral presentation thereof to peers and lecturer(s).
Assessment: Written and oral presentations will be assessed. Summative assessment consists of a final 3-hour externally moderated exam.
Credits: 20
AGC 605  Project
Purpose: Learners are required to do a literature search on a scientific topic to be researched and to write a project proposal. Thereafter they conduct a research project, guided by the lecturer(s) in Crop Science. A dissertation is written and an oral presentation made. This research project teaches the learner to conduct research and write up the results according to accepted scientific norms. It prepares the learner for the work situation, including a research career or for further postgraduate studies.

Contents: The learner is required to conduct a research project. It involves a literature search, a project proposal, the project work, the dissertation and an oral presentation.

Instruction: This exercise requires independent work on the part of the learner. Research is conducted independently, but under the guidance of at least one supervisor. The learner writes the dissertation in an acceptable format. The report is also presented orally, preferably with the aid of PowerPoint.

Assessment: The learner will be required to demonstrate to the supervisor(s) and external examiners the ability to write a dissertation that is linguistically, technically and scientifically correct.

Credits: 32

AGC 606  Oral Examination on the Project in Crop Production
Purpose: Learners are required to make an oral presentation of their project to a critical scientific audience.

Contents: The learner is required to conduct a research project in Crop Science guided by at least one supervisor. An oral presentation (preferably with the aid of PowerPoint) should reflect a good understanding of the field of research and the report itself.

Assessment: A mark is given by two or more academics to the learner, based on their assessment of the oral presentation, including answers to questions during the presentation of the report and subsequently also if deemed necessary.

Credits: 4

AGC 607/608  Seminars in Crop Science
Purpose: Learners are required to do a comprehensive literature search on a scientific topic and a critical review thereof, write it up according to an accepted format, present it orally and answer questions posed by peers and lecturers. This prepares the learner to be able to access information and analyse it, and furthermore to present it to a critical scientific audience. One or both of the two seminars can serve as the literature review for the research project.

Contents: The learner is required to prepare two type-written seminars on given topics and present them orally.

Instruction: This exercise requires independent work on the part of the learner in finding the information in primary and secondary literature in the library and on the internet. The learner writes up the seminar in a format such that it represents a critical review of the literature on the topic.
investigated. The seminar is presented orally, preferably with the aid of PowerPoint. The learner is guided by the lecturer as necessary.

Assessment: A mark is given for the written seminar, which is assessed by two or more academics. Likewise, the oral presentation and replies to questions are assessed according to certain guidelines and an aggregate mark is given. Fellow learners may also be required to assess their peers as a learning exercise and to avoid them being merely passive listeners.

Credits: 32 (two seminars, each 16 credits)

AGE 501: Project in Agricultural Economics

Purpose: The module provides learners with the necessary knowledge base and insight to design a research plan and conduct a small research project using sound scientific principles.

Contents: Students carry out a small research project on a subject of their choice (in accordance with the module co-ordinator) executing all the stages of research, i.e. proposal writing, sampling, carrying out of the research, laboratory analysis, statistical analysis, writing up of report, etc

Instruction: Group work: A problem-solving approach, with an emphasis on group learning encourages cognitive development at different levels. Develop social and communication skills, as well as to solve problems and reflect on the methods of learning. Self-directed study and resource based learning: For the development of data collection and assimilation, critical thinking and communication skills.

Assessment: The project will be examined internally and externally.

Credits: 36

AGE 502: Seminars in Agricultural Economics

Purpose: To facilitate the learning process for the learners to develop the necessary skills involved in the reviewing of literature, the writing of a scientific article, and the delivery of an oral presentation.

Contents: Learners are required to prepare a written seminar and present it orally on selected topics in Agricultural Economics.

Instruction: Self-directed study and resource based learning: For the development of data collection and assimilation, critical thinking and communication skills.

Assessment: Written seminar: (80%) Oral Presentation: (20%)

Credits: 32

AGE 503: Advanced Farm Planning and Decision Making

Purpose: To provide learners with a thorough understanding as well as necessary skill for applying linear and related programming techniques to typical farm business. Planning situations

Contents: The basics of planning enterprise combinations, The basics of Linear Programming, Model construction to deal with specific situations

Instruction: Informal lectures – for the transmission of content and understanding of concepts. Laboratory sessions and practical assignments Discussion sessions during which the class will discuss assigned readings and analyse farm planning issues.

Assessment: One externally moderated 3-hour examination paper.
AGE 504: Agricultural Marketing
Purpose: To provide the learners with a deeper understanding of the marketing and agro-food sector.
Contents: Selected topics in Agricultural Marketing compatible with the students interests and his/her present or future employment.
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics. Discussion sessions during which the class will discuss assigned readings and analyse agricultural marketing issues.
Assessment: One externally moderated 3-hour examination paper.
Credits: 20

AGE 505: Agricultural Development
Purpose: To provide the learners with a deeper understanding of the role of agricultural and rural development among small-scale farmers.
Contents: Selected topics in Agricultural Development compatible with the students interests and his/her present or future employment.
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics. Discussion sessions during which the class will discuss assigned readings and analyse agricultural development issues.
Assessment: One externally moderated 3-hour examination paper.
Credits: 20

AGE 506: Methods of Agricultural Economics and Farm Management Research
Purpose: To provide learners with (i) an introduction to the fundamentals of research methods in agricultural economics and farm business management, and (ii) an ability to evaluate the methodology used in current agricultural economics and farm business management.
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Discussion sessions during which the class will discuss assigned readings and analyse farm research issues.
Assessment: One externally moderated 3-hour examination paper.
Credits: 20
AGE 601: Project in Agricultural Economics
Purpose: The module provides learners with the necessary knowledge base and insight to design a research plan and conduct a small research project using sound scientific principles.
Contents: Students carry out a small research project on a subject of their choice (in accordance with the module co-ordinator) executing all the stages of research, i.e. proposal writing, sampling, carrying out of the research, laboratory analysis, statistical analysis, writing up of report, etc.
Instruction: Group work: A problem-solving approach, with an emphasis on group learning encourages cognitive development at different levels. Develop social and communication skills, as well as to solve problems and reflect on the methods of learning. Self-directed study and resource based learning: For the development of data collection and assimilation, critical thinking and communication skills.
Assessment: The project will be examined internally and externally.
Credits: 36

AGE 602: Seminars in Agricultural Economics
Purpose: To facilitate the learning process for the learners to develop the necessary skills involved in the reviewing of literature, the writing of a scientific article, and the delivery of an oral presentation.
Contents: Learners are required to prepare a written seminar and present it orally on selected topics in Agricultural Economics.
Instruction: Self-directed study and resource based learning: For the development of data collection and assimilation, critical thinking and communication skills.
Assessment: Written seminar: (80%) Oral Presentation: (20%)
Credits: 32

AGE 604: Methods of Agricultural Economics Research
Purpose: To provide learners with (i) an introduction to the fundamentals of research methods in agricultural economics, and (ii) an ability to evaluate the methodology used in current agricultural economics.
Contents: Underlying principles of agricultural economic research, The development of a research proposal, The collection of data for research, Methods of analysis relevant to typical research areas, Interpretation and presentation of results
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Discussion sessions during which the class will discuss assigned readings and analyse agricultural economics research issues.
Assessment: One externally moderated 3-hour examination paper.
Credits: 20

AGE 605: Agricultural Production Theory and Farm Business Management
Purpose: To provide learners with a thorough understanding as well as necessary skill for applying programming techniques to typical farm business planning situations
Contents: Response analysis of factors of production, Aggregate supply response analysis, Derived demand for factors of production, Farm planning techniques
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Laboratory sessions and practical assignments Discussion sessions during which the class will discuss assigned readings and analyse farm production and planning issues.

Assessment: One externally moderated 3-hour examination paper.

Credits: 20

AGE 606: Agricultural Marketing, Prices and Policy

Purpose: To provide the learners with a deeper understanding of the marketing and policy in the agro-food sector.

Contents: Selected topics in Agricultural Marketing compatible with the student’s interests and his/her present or future employment.

Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics Discussion sessions during which the class will discuss assigned readings and analyse agricultural marketing and policy issues.

Assessment: One externally moderated 3-hour examination paper.

Credits: 20

AGE 607: Economics of Agricultural Development and Project Appraisal

Purpose: To provide the learners with a deeper understanding of the role of agricultural development and project appraisal.

Contents: Selected topics in Agricultural Development and project appraisal compatible with the student’s interests and his/her present or future employment.

Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics Discussion sessions during which the class will discuss assigned readings and analyse agricultural marketing and policy issues.

Assessment: One externally moderated 3-hour examination paper.

Credits: 20

AGE 608: Agricultural Resource Economics

Purpose: To provide learners with a thorough understanding of the application of economic principles to questions regarding the use of natural resources, particularly those related to agriculture.

Contents: Selected topics in Agricultural Resource Economics that will include, *inter alia*, the characteristics of natural resources, problems encountered in the evaluation of investment projects using social cost-benefit analysis, the tragedy of the commons, renewable and non-renewable resources and issues of the day relating to the use of natural resources.

Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics Discussion sessions during which the class will discuss assigned readings and analyse agricultural marketing and policy issues.

Assessment: One externally moderated 3-hour examination paper.

Credits: 20
AGE 609  Special Topics in Agricultural Economics
Purpose: To provide learners with a thorough understanding of a topic of interest to them which may be related to their research direction and is not covered by other Honours courses.
Content: The topics will vary depending on the special interests of the particular students. This module will only be offered if the Department has staff with the expertise to assist the students.
Instruction: Informal lectures – for the transmission of content and understanding of concepts. Self-directed study of selected topics Discussion sessions during which the class will discuss assigned readings on the issues.
Assessment: One externally moderated 3-hour examination paper.
Credits: 20

AGH 601  Project
Purpose: Learners are required to do a literature search on a scientific topic to be researched and to write a project proposal. Thereafter they conduct a research project, guided by the lecturer(s) in Horticultural Science. A dissertation is written and an oral presentation made. This research project teaches the learner to conduct research and write up the results according to accepted scientific norms. It prepares the learner for the work situation, including a research career or for further postgraduate studies.
Contents: The learner is required to conduct a research project. It involves a literature search, a project proposal, the project work, the dissertation and an oral presentation.
Instruction: This exercise requires independent work on the part of the learner. Research is conducted independently, but under the guidance of at least one supervisor. The learner writes the dissertation in an acceptable format. The report is also presented orally, preferably with the aid of PowerPoint.
Assessment: The learner will be required to demonstrate to the supervisor and external examiners the ability to write a dissertation that is linguistically, technically and scientifically correct.
Credits: 36

AGH 602  Seminars
Purpose: Learners are required to do a comprehensive literature search on a scientific topic and a critical review thereof, write it up according to an accepted format, present it orally and answer questions posed by peers and lecturers. This prepares the learner to be able to access information and analyze it, and furthermore to present it to a critical scientific audience. One or both of the seminars can serve as the literature review for the research project.
Contents: The learner is required to prepare two type-written seminars on given topics and present them orally.
Instruction: This exercise requires independent work on the part of the learner in finding the information in primary and secondary literature in the library and on the internet. The learner writes up the seminar in a format such that it represents a critical review of the literature on the topic.
investigated. The seminar is presented orally, preferably with the aid of PowerPoint. The learner is guided by the lecturer as necessary.

Assessment: A mark is given for the written seminar, which is assessed by two or more academics for conformity to certain requirements known to the learner. Likewise, the oral presentation and replies to questions are assessed according to certain guidelines and an aggregate mark is given. Fellow learners may also be required to assess their peers as a learning exercise and to avoid them being merely passive listeners.

Credits: 32 (Two seminars, each 16 credits)

AGH 604 Advanced studies in the field of the student's project
Purpose: This module is intended to give the student a greater insight into certain issues or problems relating to the field of his/her research project.
Contents: A study of scientific and related issues in the field of the student’s horticultural research project. Reading assignments on ten to twelve selected topics.
Instruction: Largely self-directed study involving literature searches and reviews, the preparation of assignments and the oral presentation thereof to peers and lecturer(s). Lecturer(s) will prepare and present some of the topics.
Assessment: Written and oral presentations will be assessed. Summative assessment consists of a final 3-hour paper with essay-type questions.
Credits: 20

AGH 615 Advanced topics in selected fields of Horticultural Science
Purpose: This module is intended to give the learner a greater insight into certain topics in Horticultural Science, which may not have been adequately covered in undergraduate years.
Contents: Reading assignments on ten to twelve selected topics. Particular student interests can be accommodated to a limited extent.
Instruction: Largely self-directed study involving literature searches and reviews, the preparation of assignments and the oral presentation thereof to peers and lecturer. Lecturer(s) will prepare and present some of the topics.
Assessment: Written and oral presentations will be assessed. Summative assessment consists of a final 3-hour paper with essay-type questions.
Credits: 20

AGH 616 Advanced topics in selected fields of Plant Tissue Culture/Plant Propagation
Purpose: This module is intended to give the learner a greater insight into certain topics in plant propagation which may not have been adequately covered in undergraduate years.
Contents: Reading assignments on ten to twelve selected topics. Particular student interests can be accommodated to a limited extent.
Instruction: Largely self-directed study involving literature searches and reviews, the preparation of assignments and the oral presentation thereof to peers and lecturer(s). Lecturer(s) will prepare and present some of the topics.
Assessment: Written and oral presentations will be assessed. Summative assessment consists of a final 3-hour paper with mainly essay-type questions.

Credits: 20

AGP 601 Selected Topics in Advanced Pasture Science
Purpose: Students will be assigned with topics relevant to their area of specialisation and/or career interest.
Contents: Topics assigned by the module lecturer in the student's area of specialisation.
Assessment: Three hour exam paper
Credits: 20

AGP 602 Research Techniques in Pasture Management
Purpose: To enable the students to appreciate the various pasture research techniques that have been developed and are currently applied in the field.
Contents: Techniques for assessing the condition of the veld, identifying key grass species, estimating the grazing and browsing capacities and estimating the fuel load for veld burning.
Assessment: Three hour exam paper
Credits: 20

AGP 603 Project
Purpose: To introduce students to advanced methods of scientific research in pasture science
Content: Students are required to carry out a short research project based on a topic in pasture science chosen in consultation with an academic staff member.
Instruction: Self-directed study and regular consultation with project supervisor
Assessment: A comprehensive report on research in a selected field of Pasture Science
Credits: 36

AGP 604 Oral examination
Assessment: An oral examination on the contents of the project report.
Credits: 4

AGP 605 Seminar in Advanced Pasture Science
Purpose: To enable students to improve their writing and oral presentation skills.
Content: Selected topics in pasture science chosen in consultation with academic staff members.
Instruction: Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.
Assessment: Written reports and oral presentation
Credits: 16

AGP 606 Seminar in Advanced Pasture Science
Purpose: To enable students to improve their writing and oral presentation skills.
**Content:** Selected topics in pasture science chosen in consultation with academic staff members.

**Instruction:** Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.

**Assessment:** Written reports and oral presentation

**Credits:** 16

**AGP 607 Seminar in Advanced Pasture Science**

**Purpose:** To enable students to improve their writing and oral presentation skills.

**Content:** Selected topics in pasture science chosen in consultation with academic staff members.

**Instruction:** Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.

**Assessment:** Written reports and oral presentation

**Credits:** 16

**AGS 601 Project in Soil Science**

**Purpose:** To introduce students to advanced methods of scientific research in soil science

**Content:** Students are required to carry out a short research project based on a topic in soil science chosen in consultation with an academic staff member.

**Instruction:** Self-directed study and regular consultation with project supervisor

**Assessment:** Project Report

**Credits:** 36

**AGS 602 Seminars in Advanced Soil Science**

**Purpose:** To enable students to improve their writing and oral presentation skills.

**Content:** Selected topics in soil science chosen in consultation with academic staff members.

**Instruction:** Self-directed study and resource based learning intended to develop information retrieval skills, critical thinking and communication skills.

**Assessment:** Written reports and oral presentation

**Credits:** 32

**AGS 611 Soil Chemistry Honours**

**Purpose:** To provide students with increased knowledge of important chemical processes occurring in soil and their consequences on nutrient behavior and management.

**Content:** Advanced topics in soil chemistry selected to advance the learners’ knowledge of soil chemical processes related to soil productivity and environmental preservation.

**Instruction:** Self-directed study of the selected topics coupled with discussion sessions during which the class will discuss assigned readings.

**Assessment:** Formative assessment during the preparation and presentation of assignments. Summative assessment in the form of a final externally moderated examination paper at end of first semester. No tests.

**Credits:** 20
AGS 612  Soil Physics Honours
Purpose: This module is meant for postgraduate Soil Science students to give them an advanced knowledge of Soil Physics as part of an integrated Honours programme.
Content: Advanced topics in soil physics, selected to advance the learners knowledge of soil physics and related agricultural and environmental issues.
Instruction: Self study assignments, presentation and group discussions of assignments.
Assessment: Formative assessment during the preparation and presentation of assignments. Summative assessment in the form of a final externally moderated examination paper at end of first semester. No tests.
Credits: 20

AGS 621  Pedology Honours
Purpose: To introduce students to more advanced topics in soil genesis, soil mineralogy, soil classification and land evaluation, and relate these to soil and environmental management and land use planning.
Content: Selected advanced topics in Soil genesis, Soil mineralogy, Soil classification, Soil suitability, Land evaluation.
Instruction: Lectures – to give students theoretical concepts and factual knowledge; self-directed study of the selected topics; and discussion sessions during which the class will discuss assigned readings and debate about pertinent issues.
Assessment: Continuous assessment during the semester with each assignment. Summative assessment in the form of externally moderated examination paper at end of second semester. No tests.
Credits: 20

AGS 622  Soil Fertility and Plant Nutrition Honours
Purpose: To provide students with increased knowledge of nutrients and nutrient management through in-depth study of selected topics in Soil fertility and Plant Nutrition compatible with the interests of the student and his/her future employment.
Content: Selected topics in Soil fertility and Plant Nutrition compatible with the students' interests and his/her present or future employment.
Instruction: Self-directed study of selected topics coupled with discussion sessions during which the class will discuss assigned readings and analyze practical soil fertility problems.
Assessment: Formative assessment during the preparation and presentation of assignments. No tests. Summative assessment in the form of a final externally moderated examination paper at end of second semester. No tests.
Credits: 20

AGX 501  Basis and philosophy of agricultural extension and rural development:
Contents: A general study of the principle components. Aspects of applied rural sociology concerned with rural communities and change in agriculture.
Aspects of applied psychology concerned with adolescents and adults: the theory and principles of learning and adult education. A comparison of the organization and management, aims and methods of agricultural extension and rural development in less developed countries; key factors in rural development; application of the concept of Farming Systems Research and Extension.

Credits: 20

**AGX 502 Communication, Leadership and Management:**
Contents: The theory and use of mass media; leadership and group dynamics; production and use of visual aids; inter-personal communication; traditional methods of communication; special problems in largely illiterate societies; psychological barriers of effective communication; communication networks.
The management of agricultural extension and rural development organisations and projects; setting organisational objectives; criteria of efficiency, organisational structures, leadership styles, job specifications, motivational theories, training.

Credits: 20

**AGX 503 Evaluation and Research:**
Contents: Methods of data collection in agricultural extension and rural development. Aspects of project appraisal and evaluation. Evaluation of extension and development organisations; evaluation of communication methods. The planning, aims, objectives and evaluation of extension and rural development programmes;

Credits: 20

**AGX 504 Dissertation**
Contents: Candidates are required to present a dissertation on an approved topic in some aspect of agricultural extension or rural development. Candidates will be expected to provide evidence in the dissertation of their competence in the use of research techniques appropriate to the field of study. The dissertation should normally fall within the range of 12 000 to 25 000 words.

Credits: 36

**AGX 506 Seminars**
Content: Seminars presented during the module of the year.
Credits: 32
SCHOOL OF PHYSICAL & COMPUTATIONAL SCIENCES

VISION

The School of Physical & Computational Sciences, in accordance with the vision of the University, seeks to provide quality education across all its various disciplines relevant to the needs of our local, provincial, national and international environment in the critical areas of Science and Technology.

MISSION

The School of Physical & Computational Sciences, in association with its partners in other Faculties, other educational, technical and technological institutions, as well as other stakeholders, would like to equip our learners with life skills, competencies and the intellectual apparatus (such as critical analysis) in their chosen field(s) of study in order to be national and international assets.

SCHOOL OF BIOLOGICAL & ENVIRONMENTAL SCIENCES

VISION

To be a School that strives for innovation and reflection in teaching and excellence in research that is relevant to the local and international community.

MISSION

To be a School of academic excellence that is recognized nationally and internationally.

To teach and mentor our students and prepare them for careers in science.

To allow our staff to pursue academic freedom within a supportive and responsible environment.

To support our rural community through our knowledge and skills.
INTRODUCTION TO THE DEGREE BACHELOR OF SCIENCE (BSc)

Guidance to the Selection of Courses and Curricula

The Faculty offers degrees in pure Science, Agriculture and Nursing Science at various levels. To follow a BSc Degree it is compulsory to have passed Matric Mathematics with at least an E symbol. A degree is not simply any combination of subjects, but should be carefully constructed around specific major subjects. Some subject combinations are not allowed, but even some permissible combinations are not as meaningful as others. It is very important that each student should plan his/her curriculum carefully to ensure that subject combinations are meaningful and that all the necessary pre-requisites and co-requisites are met. All students, and particularly new students, are therefore advised to discuss their subject choices with Faculty staff members.

Learners should consult (1) the General University Rules, (2) the rules of the School where courses are taken, and (3) the descriptions of the modules in which they wish to participate. All these rules apply in one way or another to the academic work and the general conduct expected from the student.

In the description below the specific module (course) codes are given where it is necessary to make a distinction. Codes such as PAC 100 or BCH 200 are more general and refer to all the modules which make up the first year Chemistry or second year Biochemistry component, for instance. Note that in the module codes the first digit indicates the level (100, 200, etc.) at which the module is offered; the second normally indicates the semester (first or second) in which it is offered; the third is simply a serial number.

The following undergraduate subjects are offered in the School of Science:

**Applied Mathematics**: the application of Mathematics to physical phenomena; offered at second- and third year levels after completion of Mathematics 100 and Physics 100.

**Biochemistry**: the chemistry of living organisms; offered at second- and third year levels after completion of Biology 100, Chemistry 100 and Mathematics 100; Physics 100 also recommended.

**Biology**: a first year course in plant and animal structure and function; this is a service course for students in Agriculture and does not lead to either Botany 200 or Zoology 200.

**Botany**: the study of plants, offered at first-, second- and third year levels; Chemistry 100 required at 300 level.

**Chemistry**: the study of chemical compounds and chemical reactions; offered at first-, second- and third year levels; Mathematics 100 is required to proceed to Chemistry 200.

**Computer Science**: the study of computers, including computer hardware and software.

**Entomology**: the study of insects, offered at second- and third year levels after completion of Zoology 100; Chemistry 100 required at 300 level.
Geographical Information Systems (GIS): essentially the study of computer-based mapping, manipulation and interpretation of geospatial information; offered at second and third year levels; the pre-requisites are basic computer literacy and either first year Geology or Geography.

Geography: the study of the earth’s surface and the atmosphere, as well as the effect of humans; offered at first-, second- and third year levels.

Geology: the study of the earth’s crust, including rock types and the factors which shape the crust; offered at first-, second- and third year levels; at third year level Chemistry 100 is required, and Physics 100 is recommended.

(Pure) Mathematics: the mother of the sciences and the key to much of what is offered in the natural sciences; offered at first-, second- and third year levels.

Mathematical Statistics: a mathematical approach to statistics, which is an analytical study of distribution patterns and probability; offered at second- and third year levels after completion of either Statistics 100 or Mathematics 100.

Microbiology: the study of micro-organisms, their chemistry and influence on other life forms; offered at second- and third year levels after completion of Biology 100 and Chemistry 100.

Physics: the study of physical phenomena, such as the properties of matter, mechanics, heat, magnetism, electricity, waves and optics; the higher level Physics requires Mathematics at 100 and 200 level.

Statistics: a first year course in distribution patterns and probability theories; leads to Mathematical Statistics and second- and third year levels.

Zoology: the study of animals, offered at first-, second- and third year levels;

More details on the scope and contents of each subject and the postgraduate courses are given under the descriptions of the modules.

During the second and third year, a student does two subjects (his/her majors) plus one other subject, which could be either a second or a first year course. After deciding on his/her majors, the student is advised to consider what the pre-requisites are for each course/module, and to plan his/her curriculum accordingly.

The following subjects are available as majors in BSc. The middle column lists the module (course) codes while the pre-requisites are given in summarised format in the right-hand column. (Refer to the module descriptions for more specific information.)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Course Codes</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>MAP 211, 221</td>
<td>MAT 100 plus PHY 121/123</td>
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<tr>
<td></td>
<td>MAP 311, 312, 321, 322</td>
<td>MAP 200 plus MAT 211</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>BCH 214, 223</td>
<td>PAC 100 plus MAT 111 or 112 or equivalent or STA 111/121, plus either BOT 100 or ZOO 100 or BIO 100</td>
</tr>
<tr>
<td></td>
<td>BCH 313, 314, 321, 323</td>
<td>BCH 200</td>
</tr>
<tr>
<td>Botany</td>
<td>BOT 211, 221</td>
<td>BOT 100</td>
</tr>
<tr>
<td></td>
<td>BOT 312, 313, 322, 323</td>
<td>BOT 200 plus PAC 100</td>
</tr>
<tr>
<td>Subject</td>
<td>Course Codes</td>
<td>Pre-requisites</td>
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<tr>
<td>Chemistry</td>
<td>PAC 200</td>
<td>PAC 100 <em>plus</em> MAT 111 or 112 or equivalent</td>
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<td></td>
<td>PAC 300</td>
<td>PAC 200</td>
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<tr>
<td>Computer Science</td>
<td>CSC 211, 212, 223, 224</td>
<td>CSC 121</td>
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<td>CSC 312, 313, 323, 324</td>
<td>CSC 200</td>
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<tr>
<td>Entomology</td>
<td>ENT 211, 221</td>
<td>ZOO 100</td>
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<tr>
<td></td>
<td>ENT 312, 313, 322, 323</td>
<td>ENT 200, PAC 100</td>
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<tr>
<td>Geography</td>
<td>GEG 211, 221</td>
<td>GEG 100</td>
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<tr>
<td></td>
<td>GEG 312, 313, 322, 323</td>
<td>GEG 200</td>
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<tr>
<td>Geographic Information Systems</td>
<td>GIS 211, 221</td>
<td>GLG 100 <em>or</em> GEG 100 <em>plus</em> CSC 113 or equivalent 1st yr module of minimum 16 credits.</td>
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<td></td>
<td>GIS 312, 313, 322, 323</td>
<td>GIS 200</td>
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<tr>
<td>Geology</td>
<td>GLG 211, 221</td>
<td>GLG 100</td>
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<td>GLG 312, 313, 322, 323</td>
<td>GLG 200, PAC 100</td>
</tr>
<tr>
<td>Mathematics</td>
<td>MAT 211, 212, 223, 224, 225</td>
<td>MAT 100</td>
</tr>
<tr>
<td></td>
<td>MAT 311, 322, 303, 304</td>
<td>MAT 200</td>
</tr>
<tr>
<td>Microbiology</td>
<td>MIC 211, 212, 221, 222</td>
<td>PAC 100 <em>plus</em> either BOT 100 or ZOO 100 or BIO 100</td>
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<td></td>
<td>MIC 311, 312, 321, 322</td>
<td>MIC 200 (BCH 223)</td>
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<tr>
<td>Physics</td>
<td>PHY 211, 212, 221, 222</td>
<td>PHY 100 <em>plus</em> MAT 100</td>
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<td></td>
<td>PHY 311, 312, 321, 322</td>
<td>PHY 200 <em>plus</em> MAT/MAP 200</td>
</tr>
<tr>
<td>Statistics</td>
<td>STM 211, 221</td>
<td>STA 100</td>
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<tr>
<td></td>
<td>STM 312, 313, 322, 323</td>
<td>STM 200</td>
</tr>
<tr>
<td>Zoology</td>
<td>ZOO 212, 222</td>
<td>ZOO 100</td>
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<tr>
<td></td>
<td>ZOO 314, 315, 324, 325</td>
<td>ZOO 200,</td>
</tr>
</tbody>
</table>

**Meaningful Combinations**
Following is a list of meaningful subject combinations at second- and third year level in a BSc degree:

**Applied Mathematics**: Pure Mathematics and/or Physics.
**Biochemistry**: Chemistry, Microbiology, Botany, Computer Science or Zoology.
**Botany**: Chemistry, Microbiology or Zoology.
**Chemistry:** Biochemistry, Geology, Mathematics, Microbiology, Physics, Zoology.

**Computer Science:** many other sciences, but especially GIS.

**Entomology:** Chemistry, Biochemistry, Zoology.

**Geology:** Chemistry, Physics, GIS, Computer Science, Soil Science, Geography

**Geographic Information Systems (GIS):** Botany, Computer Science, Entomology, Geography, Geology, Physics, Statistics, Zoology

**Geography:** Botany, GIS, Geology, Computer Science, Zoology, Chemistry

**Pure Mathematics:** Applied Mathematics, Chemistry, Computer Science, Mathematical Statistics, Physics.

**Mathematical Statistics:** Computer Science, GIS, Mathematics.

**Microbiology:** Biochemistry, Botany, Chemistry.

**Physics:** Applied Mathematics, Chemistry, (Pure) Mathematics.

**Zoology:** Biochemistry, Botany, Chemistry, Entomology.

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**Lecture Timetable**

<table>
<thead>
<tr>
<th>Time</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
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</thead>
<tbody>
<tr>
<td>08:00 - 08:45</td>
<td>B</td>
<td>F</td>
<td>D</td>
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<td>E</td>
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<tr>
<td>08:55 - 09:40</td>
<td>A</td>
<td>B</td>
<td>G</td>
<td>D</td>
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<td>09:50 - 10:35</td>
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<td>D</td>
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<tr>
<td>10:45 - 11:30</td>
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<td>D</td>
<td>A</td>
<td>G</td>
<td>F</td>
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<tr>
<td>11:40 - 12:25</td>
<td>E</td>
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<td>F</td>
<td>C</td>
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<tr>
<td>12:35 - 13:20</td>
<td>E</td>
<td>G</td>
<td>F</td>
<td>B</td>
<td>H</td>
</tr>
<tr>
<td>14:00 - 17:00</td>
<td></td>
<td></td>
<td></td>
<td>PRACTICALS</td>
<td></td>
</tr>
</tbody>
</table>

---

**Lecture Groups**

In the table below the subjects are listed according to the lecture groups.

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
<th>Group F</th>
<th>Group G</th>
<th>Group H</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 111</td>
<td>ECO 111</td>
<td>CSC 100</td>
<td>AGF 112</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 111</td>
<td>AGP 211</td>
</tr>
<tr>
<td>BIO 121</td>
<td>ECO 121</td>
<td>CLT 121</td>
<td>AGF 122</td>
<td>AGC 121</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
</tr>
<tr>
<td>CLT 111</td>
<td>PAC 101</td>
<td>MAT 011</td>
<td>AGF 122</td>
<td>GEG 100</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>AGS 211</td>
</tr>
<tr>
<td>GLG 100</td>
<td>PAC 110</td>
<td>MAT 100</td>
<td>MAT 100</td>
<td>PHY 100</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>AGS 221</td>
</tr>
<tr>
<td>MNU 100</td>
<td>PAC 121</td>
<td>STA 100</td>
<td>STA 100</td>
<td>PHY 113</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>ECS 211</td>
</tr>
<tr>
<td>ZOO 100</td>
<td></td>
<td>STA 111</td>
<td>STA 111</td>
<td>PHY 114</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>GIS 222</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STA 121</td>
<td>STA 121</td>
<td>PHY 123</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>GIS 200</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>AGA 111</td>
<td>PHY 124</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>MAT 200</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>AGC 111</td>
<td>AFA 111</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>MIC 200</td>
</tr>
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<td></td>
<td>AGS 211</td>
<td>AGG 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>AGW 211</td>
</tr>
<tr>
<td>AGP 211</td>
<td>AGS 221</td>
<td>AGE 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td>AGX 221</td>
</tr>
<tr>
<td>AGP 222</td>
<td>AGS 221</td>
<td>AGE 222</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
<tr>
<td>ECO 222</td>
<td>AGV 221</td>
<td>ECO 211</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
<tr>
<td>GIS 200</td>
<td>CSC 200</td>
<td>GEG 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
<tr>
<td>MAT 100</td>
<td>ENT 200</td>
<td>GEG 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
<tr>
<td>MAT 200</td>
<td></td>
<td>GEG 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
<tr>
<td>MIC 200</td>
<td></td>
<td>GEG 221</td>
<td>AGC 111</td>
<td>AGE 121</td>
<td>AGE 121</td>
<td>AGP 222</td>
<td></td>
</tr>
</tbody>
</table>
Practical Timetable

First year courses have one practical per week, or an extended tutorial in the case of Mathematics and Statistics, and allocations are made in accordance with the ‘stream’ (curriculum) followed and the availability of laboratory space. Each first year subject has one practical per week, but there could be duplicate slots. Students must attend during the slot allocated to them and may not change without consulting the relevant Head of Department. Second and third year subjects can have 2 practicals per week. **Attendance of all lectures, practicals and tutorials is compulsory.**

<table>
<thead>
<tr>
<th>Day &amp; Time</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 14h00 – 17h00</td>
<td>100: PHY, STA, ZOO</td>
</tr>
<tr>
<td></td>
<td>200: BCH, GIS, MAP</td>
</tr>
<tr>
<td></td>
<td>300: GEG, ZOO</td>
</tr>
<tr>
<td>Tuesday 14h00 – 17h00</td>
<td>100: PAC, GLG, MAT, ZOO</td>
</tr>
<tr>
<td></td>
<td>200: BOT, GLG, MAT</td>
</tr>
<tr>
<td></td>
<td>300: STM, MIC, PHY, ZOO</td>
</tr>
<tr>
<td>Wednesday 14h00 – 17h00</td>
<td>100: GEG, PAC, PHY, BIO</td>
</tr>
<tr>
<td></td>
<td>200: GLG, PHY, ZOO</td>
</tr>
<tr>
<td></td>
<td>300: BCH, GLG, MAP</td>
</tr>
<tr>
<td>Thursday 14h00 – 17h00</td>
<td>100: BOT, BIO, PAC</td>
</tr>
<tr>
<td></td>
<td>200: GEG, PHY, STM, ZOO</td>
</tr>
<tr>
<td></td>
<td>300: BOT, GLG, MAT</td>
</tr>
<tr>
<td>Friday 10h45 – 13h00</td>
<td>200: PAC</td>
</tr>
<tr>
<td></td>
<td>300: PAC, GIS</td>
</tr>
<tr>
<td>Friday 14h00 – 17h00</td>
<td>100: BIO, MAT, PHY</td>
</tr>
<tr>
<td></td>
<td>200: GEG, PAC</td>
</tr>
<tr>
<td></td>
<td>300: PAC, GIS</td>
</tr>
</tbody>
</table>

For practicals in Computer Science and Entomology, please consult with the relevant Head of Department.
### Lecture Venues

The lecture slots and the lecture venues for the different subjects are as follows:

<table>
<thead>
<tr>
<th>Course/Module</th>
<th>Lecture Group</th>
<th>Lecture Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 214</td>
<td>F</td>
<td>NE 24</td>
</tr>
<tr>
<td>BCH 223</td>
<td>D</td>
<td>NE 2</td>
</tr>
<tr>
<td>BCH 300</td>
<td>B</td>
<td>NE 26</td>
</tr>
<tr>
<td>BIO 100</td>
<td>A</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>BOT 100</td>
<td>F</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>BOT 200</td>
<td>G</td>
<td>Botany – 1st Floor</td>
</tr>
<tr>
<td>BOT 300</td>
<td>F</td>
<td>Botany – 1st Floor</td>
</tr>
<tr>
<td>CSC 100</td>
<td>C</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>CSC 200</td>
<td>B</td>
<td>Biology lecture theatre</td>
</tr>
<tr>
<td>CSC 300</td>
<td>A</td>
<td>Biology lecture theatre</td>
</tr>
<tr>
<td>ENT 200</td>
<td>B</td>
<td>Zoology</td>
</tr>
<tr>
<td>ENT 300</td>
<td>A</td>
<td>Zoology</td>
</tr>
<tr>
<td>GEG 100</td>
<td>E</td>
<td>Geography</td>
</tr>
<tr>
<td>GEG 200</td>
<td>C</td>
<td>Geography</td>
</tr>
<tr>
<td>GEG 300</td>
<td>D</td>
<td>Geography</td>
</tr>
<tr>
<td>GIS 200</td>
<td>A</td>
<td>GIS</td>
</tr>
<tr>
<td>GIS 300</td>
<td>E</td>
<td>GIS</td>
</tr>
<tr>
<td>GLG 100</td>
<td>A</td>
<td>NE 7</td>
</tr>
<tr>
<td>GLG 200</td>
<td>D</td>
<td>NE 7</td>
</tr>
<tr>
<td>GLG 300</td>
<td>C</td>
<td>NE 7</td>
</tr>
<tr>
<td>MAP 200</td>
<td>D</td>
<td>Livingstone Hall</td>
</tr>
<tr>
<td>MAP 300</td>
<td>C</td>
<td>Livingstone Hall</td>
</tr>
<tr>
<td>MAT 011</td>
<td>D</td>
<td>Biology Lecture Theatre</td>
</tr>
<tr>
<td>MAT 111/112</td>
<td>D</td>
<td>Black Lecture Theatre</td>
</tr>
<tr>
<td>MAT 113</td>
<td>D</td>
<td>NE 2</td>
</tr>
<tr>
<td>MAT 122</td>
<td>D</td>
<td>Black Lecture Theatre</td>
</tr>
<tr>
<td>MAT 121/123</td>
<td>D</td>
<td>Biology Lecture Theatre</td>
</tr>
<tr>
<td>MAT 021</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>MAT 200</td>
<td>A</td>
<td>NE 26</td>
</tr>
<tr>
<td>Course/Module</td>
<td>Lecture Group</td>
<td>Lecture Venue</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>MAT 300</td>
<td>B</td>
<td>NE 28</td>
</tr>
<tr>
<td>MIC 200</td>
<td>A</td>
<td>Microbiology lab</td>
</tr>
<tr>
<td>MIC 300</td>
<td>C</td>
<td>NE 26</td>
</tr>
<tr>
<td>PAC 110 &amp; 121</td>
<td>B</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>PAC 101</td>
<td>B</td>
<td>NE 2</td>
</tr>
<tr>
<td>PAC 200</td>
<td>C &amp; E</td>
<td>NE 2</td>
</tr>
<tr>
<td>PAC 300</td>
<td>E</td>
<td>NE 7</td>
</tr>
<tr>
<td>PHY 100 (major)</td>
<td>E</td>
<td>LV 102</td>
</tr>
<tr>
<td>PHY 100 (ancillary)</td>
<td>E</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>PHY 200</td>
<td>C</td>
<td>LV 102</td>
</tr>
<tr>
<td>PHY 300</td>
<td>A</td>
<td>LV 102</td>
</tr>
<tr>
<td>STA 111, 121</td>
<td>D</td>
<td>NE 11 &amp; 12</td>
</tr>
<tr>
<td>STA 114, 124</td>
<td>C</td>
<td>Biology Lecture Theatre</td>
</tr>
<tr>
<td>STM 200</td>
<td>C</td>
<td>LV 87</td>
</tr>
<tr>
<td>STM 300</td>
<td>D</td>
<td>LV 87</td>
</tr>
<tr>
<td>ZOO 100</td>
<td>A</td>
<td>NE 2</td>
</tr>
<tr>
<td>ZOO 200</td>
<td>C</td>
<td>Zoology</td>
</tr>
<tr>
<td>ZOO 300</td>
<td>D</td>
<td>Zoology</td>
</tr>
</tbody>
</table>

SCIENCE AND TECHNOLOGY FOUNDATION PROGRAMME (STFP)

1. Background and Entry Requirements
The Science and Technology Foundation Programme (STFP) is intended to provide a strong science foundation to students who do not meet University and/or Faculty of Science and Agriculture entry requirements. The STFP programme follows an extended curriculum model where the first academic year of a BSc degree is spread over two years and “extra time” is used for support. Also, the renaming of the BSc courses offered in the STFP (note: all STFP courses are derived from regular University courses that fulfill SAQA regulations) are for tracking purposes. The minimum entrance requirements for the STFP is a pass in Mathematics and Physical Science at level 3 and a pass in either Life Science or Geography or Agriculture or Info Technology at level 3, The minimum period for the STFP is 4 years (384 credits).

2. STFP Course Structure
The STFP Year One is a fixed curriculum and students will register for the courses as illustrated in Table 1. In STFP Year Two, students must first check their prerequisite(s) and/or major courses of their choice. If any of the STFP Year Two courses is coinciding with the prerequisite(s) and/or major course(s) of a student’s choice, s/he may be allowed to substitute any of the STFP Year Two course(s) with
the prerequisite(s) and major course(s) but must still register for the rest of the other courses where there are no clashes. This will apply under the following conditions:

1. STFP students must still register for the course(s) they have failed during their Year One of the programme, but that will be subject to the recommendations by the STFP Programme Manager since the space is limited for repeaters.

2. For the STFP student to register for 2nd year courses, s/he must have (a) obtained at least 96 credits after the third semester according to Faculty of Science and Agriculture rules and (b) confirmed co- and pre-requisites for the particular course(s).

3. Comply with all the Faculty of Science and Agriculture rules and regulations.

Table 1 STFP Course Structure: Year One (Fixed Curriculum)

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication and Life Skills (CLS 111F)</td>
<td>Communication and Life Skills (CLS 121F)</td>
<td>Value addition course (32 Credits required to apply for full exemption)</td>
</tr>
<tr>
<td>Computer Literacy for Science (CSC 111)</td>
<td>Computer Literacy for Science (CSC 112)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>CSC 111F</td>
<td>CSC 121F</td>
<td></td>
</tr>
<tr>
<td>Chemistry (PAC 110)</td>
<td>Chemistry (PAC 110)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>PAC 111F</td>
<td>PAC 121F</td>
<td></td>
</tr>
<tr>
<td>Physics (PHY 111)</td>
<td>Physics (PHY 112)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>PHY 111F</td>
<td>PHY 122F</td>
<td></td>
</tr>
<tr>
<td>Mathematics (MAT 111)</td>
<td>Mathematics (MAT 111)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>MAT 111F</td>
<td>MAT 121F</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>64</td>
</tr>
</tbody>
</table>

STFP Year Two:

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (MAT 121)</td>
<td>Mathematics (MAT 121)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>MAT 113F</td>
<td>MAT 123F</td>
<td></td>
</tr>
<tr>
<td>Physics (PHY 121)</td>
<td>Physics (PHY 122)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>PHY 113F</td>
<td>PHY 123F</td>
<td></td>
</tr>
<tr>
<td>Descriptive Chemistry (PAC 121)</td>
<td>Descriptive Chemistry (PAC 121)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>(PAC 113F)</td>
<td>(PAC 123F)</td>
<td></td>
</tr>
<tr>
<td>Elementary Computer Programming (CSC 121)</td>
<td>Elementary Computer Programming (CSC 121)</td>
<td>8 + 8</td>
</tr>
<tr>
<td>CSC 113F</td>
<td>CSC 123F</td>
<td></td>
</tr>
<tr>
<td>Any first year course of the student’s choice (confirm prerequisites)</td>
<td>Any first or second* year course of the student’s choice (Confirm co- and pre-requisites etc.)</td>
<td>16 + 16</td>
</tr>
<tr>
<td>TOTAL (Year 2)</td>
<td></td>
<td>96</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>144</td>
</tr>
</tbody>
</table>

(Estimated total credits)
Provided a student has obtained 96 credits at the end of the first semester of year two.

**NB:** STFP Year Two students will be allowed to register for the STFP Year Two courses under the following conditions:

- For **Physics** *(PHY 113F and PHY 123F)*, STFP student in Year Two may register for these modules even if s/he has failed one or both Year One modules (i.e. PHY 111F and PHY 122F). The student must, however, re-register for the module(s) s/he has failed in Year One.

- For **Chemistry** *(PAC 113F and PAC 123F)*, STFP student in Year Two may register for this course if s/he either has passed both Year One modules (PAC 111F and PAC 121F) or the final mark average of the two Year One modules is 50 or above, even if a student has failed one of the two Year One modules. The student must, however, re-register for the module(s) s/he has failed in Year One.

- For **Mathematics** *(MAT 113F and MAT 123F)*, STFP student in Year Two may register for this course if s/he has either passed both Year One modules (MAT 111F and MAT 121F) or the final average of the two Year One modules is 40 or above, even if a student has failed one or both of the Year One modules. The student must, however, re-register for the module(s) s/he has failed in Year One.

- For **Computer Science** *(CSC 113F and CSC 123F)*, STFP student in Year Two may register for this course if s/he has passed CSC 121F even if s/he has failed CSC 111F. The student must, however, re-register for the module(s) s/he has failed in Year One.

**Note:** The above-stated regulations are based on the Faculty of Science and Agriculture rules.

**RULES FOR THE SCHOOLS OF BIOLOGICAL & ENVIRONMENTAL SCIENCES AND PHYSICAL & COMPUTATIONAL SCIENCES**

The following rules and regulations of the School must be read in conjunction with the provisions of the Higher Education Act, the University Statute, and the general rules and regulations of the University. Where a learner includes a module or modules from another faculty in his/her programme, the rules and regulations of that faculty apply to the module(s) in question.

**THE DEGREE BACHELOR OF SCIENCE (40000)**

**S1** Duration:
The duration and subdivision of curricula are given with each individual curriculum (see below). In the case of a three year undergraduate curriculum, a degree is awarded upon the completion of the specified modules for the third year of the curriculum with a minimum total of 384 credits. In the case of a four-year undergraduate curriculum a total of 512 credits in the specified modules is required to qualify for the degree.
Composition of Curriculum:

S2.1 A double-major curriculum for the BSc degree must include 64 credits in each of two subjects (i.e. a total of 128 credits), selected as majors, at the 300 level. A single-major curriculum for the BSc degree is a structured curriculum which must include at least 72 credits at the 300 level, of which at least 48 must be in the same subject, which is offered as major.

S2.2 The modules for the degree shall be selected from the following two groups of subjects, viz.:

Group 1 (Courses governed by Faculty of Science & Agriculture rules)
- Applied Mathematics
- Biokinetics
- Biology
- Biochemistry
- Botany
- Chemistry
- Computer Science
- Entomology
- Geographical Information Systems
- Geography
- Geology
- Human Movement Studies
- Mathematics
- Mathematical Statistics
- Microbiology
- Psychology
- Physics
- Soil Science
- Statistics
- Statistical Methods
- Zoology

Group 2 (Governed by the rules of the Faculty given in brackets)
- A maximum of 32 credits from one of the following subjects:
  - Accounting (Commerce)
  - English (Humanities)
  - Philosophy (Humanities)
  - English for Academic Purposes (Humanities)

Determination of the Year of Study

S3.1 In a three-year degree programme, a learner will be deemed to be –
(1) at the 100 level until s/he has obtained a minimum of 75% of the credits at the 100 level; no credits obtained at a higher level will be taken into account for this purpose;
(2) at the 200 level if s/he has passed all the prerequisites for second year level and at least 75% of first year credits; no credits obtained at a higher level will be taken into account for this purpose;
(3) at the 300 level if s/he has passed all his/her majors up to the 200 level and has not more than 48 credits outstanding from the second year.
A learner’s promotion status (year level) is determined at the end of the academic year, after the supplementary and special examinations, and does not change as a result of mid-year (first semester) credits obtained.

S 4  Restrictions on the Number of Credits per Year
S4.1 A student shall not be permitted to register for more than 88 credits in any one semester, provided that the Board of Faculty, on the recommendation of the Heads of Departments, only in exceptional cases, permit a student in his/her final year of study, to register for 16 additional credits per semester.
S4.2 All modules registered by a student must be such that there are no timetable clashes.
S4.3 A student shall not be permitted to register for a module unless the prerequisite and corequisite requirements have been met.

S 5  Other Restrictions on the Selection of Courses
S5.1 Modules in Numerical Mathematics (at the 100 level) may only be taken before (neither after, nor concurrently with) modules in Applied Mathematics.
S5.2 No learner shall obtain credit for both Mathematics and Statistics at the 100 level.
S5.3 A learner shall not be credited for both Psychology at the 200 or 300 level and any Statistics module(s) at 100 level.
S5.4 A learner who has passed STA 121 with at least 60% may proceed to STM 212. However, no credit shall be given to a learner for STA 111 or STA 121 obtained concurrently with or after having passed any module in Mathematical Statistics.

S 6  Examinations (Formative and Summative Assessments)
The semester mark and the examination mark shall each count 50% towards the final mark, except where the module description specifies a different composition or alternative method(s) of assessment.

MODULES AND COMBINATIONS FOR STUDENTS MAJORING IN BOTANY

BOTANY 300 AND ZOOLOGY 300

First Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOT 111 / 121</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>ZOO 111 / 121</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PAC 110 / 121</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PHY 113, 114 / 123, 124*</td>
<td>8 + 8</td>
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| Total per Year | 128 |

* or STA 100 (16 credits per semester)
### Second Year (NQF 5)

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<tbody>
<tr>
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<tr>
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### Third Year (NQF 6)

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**Note:**
- Total for Qualification: 400

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**Note:**
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**Botany 300 and Zoology 300 with Biochemistry 2000**
### BOTANY 300 AND MICROBIOLOGY 300

First Year (NQF 5)

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Total for Qualification 400

### BOTANY 300 AND CHEMISTRY 300

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* or PHY 100 or STA 100 (16 credits per semester)

Second Year (NQF 5)

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### BOTANY 300 AND BIOCHEMISTRY 300

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* or PHY 100 or STA 100 (16 credits per semester)

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<td>BCH 214 / 223</td>
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* or MIC200

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### BOTANY 300 AND ENTOMOLOGY 300

### First Year (NQF 5)

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* or STA 100 (16 credits per semester)
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* or BCH200 or MIC200

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### Modules and Combinations for Students Majoring in Biochemistry

#### Biochemistry 300 and Microbiology 300

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* or STA 111/121

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* or ZOO 212 / 222

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<td>PAC 321, 312, 323, 314 and 326</td>
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### Total for Qualification

**400**

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### BIOCHEMISTRY 300 AND BOTANY 300

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* or ZOO 212 / 222
### Third Year (NQF 6)

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### BIOCHEMISTRY 300 AND ZOOLOGY 300

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* or STA 111 / 121

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* or MIC 211, 212 / 221, 222

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### BIOCHEMISTRY 300 AND COMPUTER SCIENCE 300

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**Total for Qualification** 400

### BIOCHEMISTRY 300 AND STATISTICS 300

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### BIOCHEMISTRY 300 AND ENTOMOLOGY 300

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* or ZOO 212 / 222 or MIC 211, 212 / 221, 222

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**Total for Qualification** 400

### MODULES AND COMBINATIONS FOR STUDENTS MAJORING IN MICROBIOLOGY

#### MICROBIOLOGY 300 AND BIOCHEMISTRY 300

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### MICROBIOLOGY 300 AND BOTANY 300

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MICROBIOLOGY 300 AND ENTOMOLOGY 300

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# MODULES AND COMBINATIONS FOR STUDENTS MAJORING IN CHEMISTRY

## CHEMISTRY SINGLE MAJOR

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## CHEMISTRY 300 AND BIOCHEMISTRY 300

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**Total for Qualification** 400

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**CHEMISTRY 300 AND BOTANY 300**

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* or STA 111 / 121

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**CHEMISTRY 300 AND COMPUTER SCIENCE 300**

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### CHEMISTRY 300 AND GEOLOGY 300

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MODULES AND COMBINATIONS FOR STUDENT MAJORING IN MATHEMATICAL STATISTICS

STATISTICS 300 AND MATHEMATICS 300

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Second Year (NQF 5)

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STATISTICS 300 AND BIOCHEMISTRY 300

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### Statistics 300 and Geology 300

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<td>CSC 211 / 212 / 223 / 224</td>
<td>12 + 12</td>
<td>12 + 12</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>144</td>
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</table>

#### Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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</thead>
<tbody>
<tr>
<td>STM 312, 313 / 322, 323</td>
<td>16 + 16</td>
<td>16 + 16</td>
</tr>
<tr>
<td>GLG 312, 313 / 322, 323</td>
<td>16 + 16</td>
<td>16 + 16</td>
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<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
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<tr>
<td><strong>Total per Year</strong></td>
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**Total for Qualification**: 402

### STATISTICS 300 AND GEOLOGY 300

#### First Year (NQF 5)

<table>
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<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>STA 111 / 121 or MAT 111 / 121</td>
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<td>CSC 113 / 121</td>
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<tr>
<td>GLG 111 / 121</td>
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<td>Any other Science subject</td>
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<tr>
<td><strong>Total per Year</strong></td>
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#### Second Year (NQF 5)

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<th>Modules</th>
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<td>STM 212 / 222</td>
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<td>GLG 211 / 221</td>
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<td>CSC 211 / 212 / 223 / 224</td>
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#### Third Year (NQF 6)

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<tr>
<th>Modules</th>
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<tbody>
<tr>
<td>STM 312, 313 / 322, 323</td>
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<tr>
<td>GLG 312, 313 / 322, 323</td>
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<td><strong>Total per Semester</strong></td>
<td>64</td>
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</tr>
<tr>
<td><strong>Total per Year</strong></td>
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**Total for Qualification**: 402

### STATISTICS 300 AND COMPUTER SCIENCE 300

#### First Year (NQF 5)

<table>
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<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>STA 111 / 121 or MAT 111 / 121</td>
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</tr>
<tr>
<td>CSC 113 / 121</td>
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<td>Any other Science subject</td>
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<td><strong>Total per Year</strong></td>
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## Second Year (NQF 5)

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<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM 212 / 222 or STM 211 / 221</td>
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<td>24</td>
</tr>
<tr>
<td>CSC 211 / 212 / 223 / 224</td>
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<td>Any other 1st or 2nd year Science module</td>
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<td>Total per Year</td>
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## Third Year (NQF 6)

<table>
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<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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</thead>
<tbody>
<tr>
<td>STM 312, 313 / 322, 323</td>
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<td>16 + 16</td>
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<tr>
<td>CSC 312 / 313 / 323 / 324</td>
<td>16 + 16</td>
<td>16 + 16</td>
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<tr>
<td>Total per Semester</td>
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**MODULES AND COMBINATIONS FOR STUDENTS MAJORING IN GEOLOGY**

**GEOLOGY 300 AND COMPUTER SCIENCE 300**

### First Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG 111 / 121</td>
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<td>16</td>
</tr>
<tr>
<td>PAC 110 / 121</td>
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<td>16</td>
</tr>
<tr>
<td>CSC 113 / 121</td>
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<td>16</td>
</tr>
<tr>
<td>MAT 112 or 122 / 113 or 123 *</td>
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<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Total per Year</td>
<td>128</td>
<td>128</td>
</tr>
</tbody>
</table>

* Or PHY 100 (16 credits per semester)

### Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG 211 / 221</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>CSC 211, 212 / 223, 224</td>
<td>12 + 12</td>
<td>12 + 12</td>
</tr>
<tr>
<td>GIS 211 / 221*</td>
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<tr>
<td>Total per Semester</td>
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<td>72</td>
</tr>
<tr>
<td>Total per Year</td>
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<td>144</td>
</tr>
</tbody>
</table>

*Or PHY200 or MAT (24 credits per semester)

*Or PAC 200 (80 credits for two semesters, 176 credits total per year)

### Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG312, 313 / GLG322, GLG323</td>
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<td>16 + 16</td>
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<tr>
<td>CSC 312, 313 / 323,324</td>
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<tr>
<td>Total per Semester</td>
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<td>Total per Year</td>
<td>128</td>
<td>128</td>
</tr>
<tr>
<td>Total for Qualification</td>
<td>400 (432 if PAC200 is taken in second year)</td>
<td>400 (432 if PAC200 is taken in second year)</td>
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</table>
# GEOLOGY 300 AND CHEMISTRY 300

## First Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
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<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG 111 / 121</td>
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<tr>
<td>PAC 110 / 121</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>MAT 112 or 122 / 113 or 123</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>CSC 113 / 121 *</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>128</td>
<td></td>
</tr>
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</table>

* Or PHY 100 (16 credits per semester)

## Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG 211 / 221</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>PAC 211, 213 / 222, 223, 224</td>
<td>16 + 16</td>
<td>16 + 16 + 16</td>
</tr>
<tr>
<td>CSC 211, 212 / 223, 224 *</td>
<td>12 + 12</td>
<td>12 + 12</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
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<td>96</td>
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<tr>
<td><strong>Total per Year</strong></td>
<td>176</td>
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* Or GIS200 or MAT200 (24 credits per semester)

## Third Year (NQF 6)

<table>
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<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>GLG 312, 313 / 322, 323</td>
<td>16 + 16</td>
<td>16 + 16</td>
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<tr>
<td>PAC 312, 314 / PAC321, 323, 324</td>
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<tr>
<td><strong>Total per Semester</strong></td>
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<td>80</td>
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<td><strong>Total for Qualification</strong></td>
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# GEOLOGY 300 AND GIS 300

## First Year (NQF 5)

<table>
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<tr>
<th>Modules</th>
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<th>Semester 2</th>
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</thead>
<tbody>
<tr>
<td>GLG 111 / 121</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PAC 110 / 121</td>
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<tr>
<td>MAT 112 or 122 / 113 or 123 *</td>
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<td>16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>

* Or PHY 100 (16 credits per semester)

## Second Year (NQF 5)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLG 211 / 221</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>GIS 211 / 221</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>CSC 211, 212 / 223, 224 *</td>
<td>12 + 12</td>
<td>12 + 12</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total per Year</strong></td>
<td>144 (176 if PAC200 is taken)</td>
<td></td>
</tr>
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</table>

* Or PHY200 (24 credits per semester) or
*Or PAC200 (80 credits for two semesters, 176 credits total per year)

### Third Year (NQF 6)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>GLG312, 313 / 322, 323</td>
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<td>16 + 16</td>
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<tr>
<td>GIS 312, 313 / 322, 323</td>
<td>16 + 16</td>
<td>16 + 16</td>
</tr>
<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
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</tr>
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<td><strong>Total per Year</strong></td>
<td>128</td>
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<td><strong>Total for Qualification</strong></td>
<td>400 (432 if PAC200 is taken in second year)</td>
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**GEOLOGY 300 AND PHYSICS 300**

### First Year (NQF 5)

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<tbody>
<tr>
<td>GLG 111 / 121</td>
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<td>PAC 110 / 121</td>
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<td>PHY 100</td>
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<td>MAT 112 or 122 / MAT 113 or 123 *</td>
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<tr>
<td><strong>Total per Semester</strong></td>
<td>64</td>
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<tr>
<th>Modules</th>
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<th>Semester 2</th>
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<tbody>
<tr>
<td>GLG 211 / GLG221</td>
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<td>PHY 200</td>
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<td>MAT 211, 212 / MAT 223, 224 or 225</td>
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<td><strong>Total per Semester</strong></td>
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<tr>
<td>GLG312, 313 / GLG322, 323</td>
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<td>PHY311, 312 / PHY322, 323</td>
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DESCRIPTION OF MODULES IN SCIENCE CURRICULAE

VALUE-ADDED MODULES

CLS 111F Communication & Life Skills
Purpose: As well as academic achievement and intellectual ability, the workplace expects Science, Engineering, Agriculture and Technology (SEAT) graduates to be able to demonstrate a range of communication skills. This is essential for enabling them to market the products they will have designed. The course is also intended to capacitate them with skills to understand and apply English in a scientific context.

Contents: Interpretation of confusing words in science, analytic thinking skills, reading with understanding, skills for concise and clear writing, public speaking, summarizing and outlining, as well as assertiveness skills.

Instruction: Lectures, tutorials, projects, debates, individual and group assignments.

Assessment: Assignments, class tests, assessment of projects, peer assessment (debates).

Credits: 16 (For application for full exemption)

CLS 121F Communication & Life Skills
Purpose: This module continues from CLS 111F and is an application of communication skills introduced earlier. This module will enable the learner to enhance communication skills and apply them in real-life situations.

Contents: Skills for concise and clear writing, public speaking, comprehension and interpretation of scientific data, basic project management skills, debating skills, leadership skills, and proposal writing skills.

Instruction: Lectures, tutorials, projects, debates, individual and group assignments.

Assessment: Assignments, class tests, assessment of projects, peer assessment (debates) and assessment of project.

Credits: 16 (For application for full exemption)

APPLIED MATHEMATICS

Applied Mathematics is a two-year major course, starting at 200 level.

MAP 211: Introduction to Numerical Analysis.
Purpose: The module is the second stage in the process of empowering learners who are going to pursue careers in Applied Mathematics, Physics, Engineering, Surveying, Financial Mathematics and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Finite differences; polynomial approximations; collocation and osculation polynomials; Taylor polynomials; error analysis; interpolation and prediction; introduction to numerical differentiation and integration; solutions to non-linear equations; solutions of linear systems.

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 24
Prerequisite: MAT 111 (or MAT 112) and MAT 121 or 60% for MAT 123

**MAP 221:** Introduction to Analytical Methods.
 Purpose: The module is the second stage in the process of empowering learners who are going to pursue careers in Engineering, Surveying, Financial Mathematics and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Application of ordinary differential equations; Laplace transforms and their application to physical problems; Fourier series and Fourier integrals; gamma, beta and other special functions.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 24

Pre-requisites: MAP 211 plus PHY 121 or PHY 123

**MAP 311:** Special and Orthogonal Functions.
 Purpose: The module is the third stage in the process of empowering learners who are going to pursue careers in Applied Mathematics, Physics, Statistics, Engineering, Surveying, Financial Mathematics and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Bessel functions; Legendre functions and other orthogonal functions; Sturm-Liouville system; Eigenvalues and Eigenvectors.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 16

Pre-requisites: MAP 211 & MAT 211

**MAP 312:** Advanced Numerical Differentiation and Integration.
 Purpose: The module is the third stage in the process of empowering learners who are going to pursue careers in Applied Mathematics, Physics, Engineering, Surveying, Financial Mathematics and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Advanced numerical differentiation and integration; singular integrals and Gaussian integration; methods for solving sums and series; approximating solutions to difference equations.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 16

Prerequisite: MAP 211

**MAP 321:** Partial Differential Equations; Conformal Mapping; Calculus of Variations.
 Purpose: The module is the third stage in the process of empowering learners who are going to pursue careers in Applied Mathematics, Physics, Engineering, Surveying, Financial Mathematics and Actuarial Science.
It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Partial differential equations; complex variables; conformal mapping; calculus of variations.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 16

Prerequisite: MAP 311

**MAP 322: Numerical Solutions to Differential Equations.**

Purpose: The module is the third stage in the process of empowering learners who are going to pursue careers in Applied Mathematics, Physics, Engineering, Surveying, Financial Mathematics and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Numerical solutions to differential equations of first and higher order; least-squares polynomial approximation; boundary value problems.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 16

Prerequisite: MAP 312.

**BIOCHEMISTRY**

**BCH 214:** Introductory Biochemistry (Previously BCH 211, 212, 213)

Purpose: Introduction to biochemical concepts, practical aspects and elementary theory of biochemical techniques

Contents: Cell types, structural and functional organization, water as biological solvent, pH, acids and bases, buffers, structure and basic chemistry of amino acids, peptides, and proteins, carbohydrates, lipids, nucleic acids and vitamins, various chromatographic and electrophoretic techniques, centrifugation and spectrophotometry and bioenergetics

Instruction: Lectures: 180 minutes per week. Practicals: 1 x 3-hour sessions per week. Tutorials: 60 minutes per week.

Credits: 24

Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: PAC110 and PAC121, plus BOT 111/121 or ZOO 111/121 or BIO 111/121, plus MAT 111/121 or STA111/121.

**BCH 223:** Metabolism and Enzymology (Previously BCH 221, 222)

Purpose: To provide students with a broad knowledge and understanding of pathways involved in the synthesis or breakdown of biomacromolecules and how catalytic reactions within these pathways are regulated.

Contents: Principles of metabolism. Glycolysis, fermentations, carbohydrate metabolism, electron transfer and oxidative phosphorylation, photo-
synthesis, fatty acid oxidation, ketone bodies, basic enzymology and strategies used in the investigation of enzymes.

Instruction: Lectures: 180 minutes per week. Practicals: 1 x 3-hour session per week. Tutorials: 60 minutes per week.

Credits: 24

Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: BCH 214

**BCH 313: Advanced Metabolism**

Purpose: To provide students with an in-depth knowledge and understanding of pathways involved in the synthesis of biomacromolecules and how catalytic reactions within these pathways are regulated.


Instruction: Lectures: 180 minutes per week. Practicals: Minimum of 1 x 3-hour session per week. Tutorials: 60 minutes per week.

Credits: 16

Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: BCH 223

**BCH 314: Theory of laboratory techniques**

Purpose: To provide students with a broad knowledge and hands-on experience of advanced biochemical techniques

Contents: Detailed lectures on the fundamental principles of the following techniques: HPLC, GC, 2D gel electrophoresis, UV/Vis/fluorescent spectrophotometry, ultracentrifugation, mass spectrometry and NMR

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Tutorials: 60 minutes per week

Credits: 16

Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: BCH 223

**BCH 321: Physiological Biochemistry**

Purpose: Study selected topics in medical biochemistry.

Contents: Blood, protein composition, clotting, immune response, iron metabolism, haemoglobin, kidney function, muscle, nerve cells, photochemistry of vision.

Instruction: Lectures: 180 minutes per week. Practicals: Minimum of 2 x 3-hour sessions per week.

Tutorials: 90 minutes per week.
Credits: 16
Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: BCH 313 and BCH 314

**BCH 323: Information Flow and Introduction to Bioinformatics**

**Purpose:** To provide students with a broad knowledge and understanding of DNA, RNA and Protein synthesis and structure.

**Contents:** An introduction to DNA/RNA structure and the regulation of DNA synthesis and replication, transcription and translation and protein degradation. Students will also be introduced to hands-on experience of Bioinformatics software and public databases.

**Instruction:** Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Tutorials: 60 minutes per week

Credits: 16
Assessment: Continuous assessment through class participation in lectures, practical work and assignments and through at least two theory tests. Summative assessment: 1 x 3 hour theory examination paper.

Pre-requisites: BCH 313 and BCH 314

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### BIOLOGY

This is offered as a service course to students in Science and Agriculture at the 100 level. It does NOT lead to Botany or Zoology at the 200 level.

**BIO 111: Plant Biology**

**Purpose:** The module will introduce the learners to cell biology, plant anatomy, plant morphology, plant kingdom and ecology. The learners will learn the basic cell biology, which will lead them to the understanding of cell organelles and their functions. Such knowledge will lay a firm foundation which the learners will require to understand cell structure and function, plant anatomy and morphology. The learners will also learn the anatomy of plant development in gymnosperm and angiosperm. They will acquire knowledge about environment, plant classification, and skeleton of the plant body, respiration and photosynthesis.

**Content:** Plant cell structure and metabolism, anatomy and morphology, plant kingdom and ecology.

**Instructions:** Lectures: 180 minutes per week. Practicals: one 3-hour session per week (depending on the number of students per current year); tutorials 45-90 minutes per week.

Credits: 16

Pre-requisites: None

**BIO 111F:** Refer to BIO 111 for information
BIO 121: Animal Biology
Purpose: Introduces the learner to basic animal biology and the diversity of animal life forms.
Contents: Architectural patterns of animals; animal classification; review of invertebrate and vertebrate groups; aspects of animal biology
Instructions: Lectures: 180 minutes per week. Practicals: one 3-hour session per week (depending on the number of students per year); tutorials 45-90 minutes per week.
Credits: 16
Pre-requisites: None

BIO 121F Refer to BIO 121 for information

BIOMETRY

AGB 311: Agricultural Biometry.
Contents: Single-factor experiments; Completely randomized designs and randomized block designs; Latin Squares designs and lattice designs; Factorial experiments; Split-plot designs; Regression and Correlation; Multiple Linear Regression; The ANOVA table.
Instructions: Three lectures and one compulsory practical per week.
Credits: 16
Assessment: one 3-hour examination paper
Pre-requisites: STA 111 plus either STA 121 or STA 122.

Contents: Least Significant Difference Tests; Duncan’s Multiple Range test; Missing Data; Outliers; Interpretation of Statistical Results; Contingency tables; Tests of homogeneity of populations.
Instructions: Three lectures and one compulsory practical per week.
Credits: 16
Assessment: one 3-hour examination paper
Prerequisite: AGB 311.

BOTANY

BOT 111: Introductory Botany
Purpose: The module will introduce the learner to plant cell structure, metabolism, genetics, plant tissues and anatomy. Such knowledge will lay a firm foundation to the following semester and subsequent years of study in Botany.
Contents: Plant cell structure and metabolism: development of the cell theory; prokaryotic vs. eukaryotic cells; internal structures of a typical plant cell; respiration; photosynthesis. Genetics: cell division – mitosis and meiosis; chromosomes and the concept of the gene; expression of the gene - protein synthesis and its significance; basic Mendelian genetics;
linkage; mutation. Plant tissues and anatomy: apical meristems; tissue types; primary anatomy of the root, stem and leaf; secondary growth; modifications of roots, stems and leaves.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.

Credits: 16

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: None.

**BOT 121: Introduction to Ecology, Physiology and Plant Diversity**

**Purpose:** The module will introduce students to the study of ecology, physiology and plant diversity. Students will learn basic concepts which are necessary for further studies in Botany.

**Contents:** Ecology: defining Ecology; plants and people; biodiversity loss; new crops and genetic engineering; resources needed for plant growth; nutrient cycling; pesticides and ecosystems; the transition to sustainability in the new millennium. Physiology: plant nutrition and soils; mineral deficiency; the importance of water; the movement of water and solutes in plants; water relations; external factors and plant growth; tropisms (photo, gravi, hydro, thigmo); circadian rhythms; photoperiodism; hormonal control of flowering; dormancy. Plant Diversity: taxonomy and hierarchical classification; methods of classification; basic plant nomenclature principles; the major groups of plants and their life histories.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.

Credits: 16

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: A semester mark of at least 40% for BOT 111.

**BOT 211: Evolutionary Survey of the Plant Kingdom**

**Purpose:** The module will educate students as to the overarching theory of the evolutionary origin of the diversity of the major plant divisions, from viruses and bacteria through algae, mosses and ferns to the seed-bearing plants. Major themes, such as adaptations to life on land and the origin and development of important structures e.g. the flower, will be systematically developed.

**Contents:** Theories on the origin of life; Viruses: structure, mode of life, HIV; Bacteria: structure, growth and ecological significance; Algae: comparative morphology and life cycles of Chlorophyta, Phaeophyta and Rhodophyta and Bacillariophyta, algae as precursors of land plants, ecological significance; Bryophytes: life cycle and reproductive structures; Seedless vascular plants: Psilophyta, Lycophyta, Sphenophyta and Pterophyta, lines of evolution; Seed Plants:
Gymnosperms and Angiosperms: origins and development.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week.

Credits: 24

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: BOT 111 and BOT 121

**BOT 221: Genetics, Plant Ecology, Taxonomy and Physiology**

Purpose: Genetics: to advance the learner's knowledge of elementary genetics to include the complexities of phenomena such as 'linkages', 'epistasis' and 'pleiotropy'. These concepts will be developed once the core principles of DNA replication, protein synthesis, meiosis and monohybrid and dihybrid crosses have been taught. Plant Ecology: this part will equip students with the knowledge of the extent of human impact on natural cycles and serve as introductory towards BOT 313. Plant Taxonomy: this will equip students with knowledge of the taxonomy/systematics of higher plants and provides an understanding of the naming and hierarchical position of the different groups, which will find important applications in many other fields of study. It will form the basis for further study in BOT 323 systematics. Plant Physiology: will serve to impact the knowledge of various physiological processes that take place in higher plants. Will form the foundation towards physiology in BOT 322.

Contents: Genetics: genetic terminology, nucleic acid and protein structure, meiosis and mitosis, dihybrid crosses, Mendel's laws, polygenic inheritance, epistasis, pleiotrophy, gene interaction, lethal alleles, essential genes, penetrance and expressivity. Plant Ecology: the carbon cycle and climate change, introduction to resource and environmental economics, environmental ethics. Plant Taxonomy: introduction to systematic botany, definitions, objectives, the need for names, phases of systematic botany, critical problems and opportunities, historical background to classification, the influence of Darwin's theory of evolution on systematics, plant nomenclature, basis of scientific names, rules of nomenclature. Plant Physiology: soil composition, formation and types and their importance to plants, micro and macro elements essential for the growth of plants, sources of water to plants, how water is absorbed and transported within plants, transpiration and various factors affecting it, stomata structure and functions, various experiments to determine the rate of transpiration.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Practical field trips where required.

Credits: 24

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: BOT 111 and BOT 121, and a semester mark of at least 40% for BOT 211
BOT 312: Plant Anatomy
Purpose: The module will equip the learners with a broader knowledge about anatomy of specialization in the angiosperms. Such knowledge will be vital and important in understanding the other disciplines of Botany.
Contents: Cell wall, classification of meristems, differentiation, unusual (analogous) secondary development, leaf initiation, histogenesis and leaf development, anatomical leaf specialization with respect to photosynthetic C3-, C4-, and CAM species, plasmodesmata with respect to structure and function, pathway of translocation.
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.
Credits: 16
Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: theory examination paper.
Pre-requisites: BOT 211 and BOT 221 and PAC100
Co-requisite: BOT 313

BOT 313: Plant Ecology
Purpose: This module will equip students with the knowledge of the extent of human impact on natural cycles, provide an overview of South African vegetation types and their conservation, acquaint them with tools used in ecological economics and their ethical basis, and explore descriptions of primary productivity and plant community patterns in space and time. In addition to the theoretical studies, learners will be required to plan, execute, and present (in written and oral form), a research project dealing with a topic of ecological interest.
Contents: Human Impacts on natural systems: the carbon cycle and climate change, introduction to resource and environmental economics, environmental ethics. Plant community ecology: biodiversity, diversity indices, South African plant diversity, community patterns in space, community patterns in time, patterns in primary productivity.
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.
Credits: 16
Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: theory examination paper.
Pre-requisites: BOT 211 and BOT 221 and PAC100
Co-requisite: BOT 312

BOT 322: Plant Biochemistry
Purpose: To teach students photosynthesis in C3 plants and cellular respiration. Biochemistry of photorespiration and carbon concentrating mechanisms and Crassulacean Acid Metabolism are dealt with in this module. Students will also be familiarized with the basic carbohydrate metabolism, the hexose monophosphate junction and sink-source relation in the cytoplasm and compartmentalization of carbohydrate
metabolism, nitrogen fixation: the nitrogen cycle, nitrogenase, and genetics of nitrogen fixation, nitrogen metabolism: uptake of nitrate and its conversion to ammonia; regulation of plant development: role of hormones and their biochemistry, photoperiodism and phytochrome, introduction to biotechnology: tissue and cell culture; recombinant DNA.

Contents: Photosynthesis: carbon reactions, Calvin cycle, photorespiration, CO₂-concentrating mechanisms, C4 metabolism, Crassulacean Acid Metabolism, physiological and ecological considerations. Assimilation of nutrients: nitrogen in the environment, nitrate assimilation, ammonia assimilation, biological nitrogen assimilation. Secondary metabolism such as: phenolic compounds and alkaloids.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.

Credits: 16

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: theory examination paper.

Pre-requisites: BOT 211 and BOT 221, plus PAC 110 & PAC 121; and a semester mark of at least 40% for BOT 312 and BOT 313.

Co-requisite: BOT 323

BOT 323: Plant Systematics

Purpose: This module has two main objectives: i) to teach basic botanical facts as applied to higher vascular plants and ii) to relate these facts to systematic principles. These will provide an understanding of the naming and hierarchical position of the different groups, which will find important applications in many other fields of study. Some of these, to name but a few, include: studies in plant breeding for crop production (including genetic studies); the naming and classification of medicinal plants and other Ethnobotanical studies; the compilation of desperately needed inventories of ecosystems before they are destroyed by human practices. In addition to theoretical studies, students will be required to practice techniques of plant collection, identification and preservation.

Contents: Introduction to Systematic Botany, definitions, objectives, the need for names, phases of Systematic Botany, critical problems and opportunities, historical background to classification, a survey of systems developed through the ages, the influence of Darwin's theory of evolution on systematics, plant nomenclature, basis of scientific names, rules of nomenclature, principles of plant taxonomy, sources of taxonomic evidence, higher plant evolution, variation and biosystematics, sources of variation, natural selection, formation of new species, hybridization.

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students may be required to undertake practical projects.

Credits: 16

Assessment: Continuous assessment through class participation in lectures, through practical work and through at least two theory tests and one practical test. The projects may also be assessed. Summative assessment: theory examination paper.
Pre-requisites: BOT 211 and BOT 221, plus PAC 110 & PAC 121; and a semester mark of at least 40% for BOT 312 and BOT 313.

Co-requisite: BOT 322

CHEMISTRY

FIRST YEAR CHEMISTRY

All the BSc students majoring in Chemistry (single and double majors) register for PAC110 and are examined at the end of the first semester. They can then proceed to PAC121 and are examined in November. BAgric students register for PAC 101 and study over 2 semesters and write the examination in November. BSc students majoring in Chemistry also register for MAT111 (or MAT112), plus students should register for MAT121 (or MAT123) and pass it by the beginning of their third year.

PAC 110: Basic Chemistry. (Equivalent to PAC 101)
Purpose: To lay the foundation in stoichiometry, structural chemistry, and solution chemistry.
Contents: Basic concepts of matter; Gases; Chemical arithmetic; Chemical analysis; Thermochemistry; Atomic structure; Chemical bonding; Solution chemistry; Acid-base equilibria; Redox equilibria.
Instruction: Lectures, laboratory course, and tutorials
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: none

PAC 111F Refer to PAC 110 for information.
PAC 121F

PAC 121: Descriptive Chemistry.
Purpose: To lay the foundation in the chemistry of inorganic and organic compounds, as well as qualitative and quantitative analysis.
Contents: Chemistry of the elements and their compounds (occurrence, nomenclature, synthesis, properties, and application); Theory of solubility; Analytical groups of ions; Qualitative and quantitative analysis; Classes of organic compounds (nomenclature, structure, synthetic methods, basic physical and chemical properties).
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 110

PAC 113F Refer to PAC 121 for information.
PAC123F
SECOND YEAR CHEMISTRY

Only the students with PAC 110 and PAC 121 plus MAT 111 (MAT 112) can proceed to second year, but they should register for MAT 121 (MAT 123) and pass it by the beginning of the third year. There are two options.

Option 1: Chemistry / Applied Chemistry majors. They must register for all modules listed.

Option 2: Chemistry / Other Branch of Science majors. They must register for PAC 211, PAC 213, PAC 222, PAC 223, and PAC 224.

PAC 211: Inorganic Chemistry 1
Purpose: To expand the knowledge of inorganic, coordination, and organometallic chemistry, as well as theoretical models of structural inorganic chemistry.
Contents: Chemical bonding; Transition elements and basic organometallic compounds; Theory of coordination compounds; Reaction ability of coordination compounds.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 100, MAT 111/112 & MAT 121/123
Target group: Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for B.Sc. students in Agriculture.

PAC 222: Analytical Chemistry 1
Purpose: To provide knowledge in quantitative chemical analysis.
Contents: Statistical evaluation of data; Laboratory techniques; Titrimetry; Gravimetric analysis; Non-aqueous solvents; Separation techniques.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 211
Target group: Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for B.Sc. students in Agriculture.

PAC 213: Organic Chemistry 1
Purpose: To expand the knowledge of major classes of organic compounds.
Contents: The nature of organic compounds; Alkanes; Alkenes; Alkynes; Alkyl halides; Alcohols; Ethers; Aldehydes and ketones; Carboxylic acids.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 100, MAT 111/112
Target group: Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for B.Sc. students in Agriculture.

**PAC 223: Organic Chemistry 2**

**Purpose:** To give advanced knowledge of classes of organic compounds as well as structural organic chemistry.

**Contents:** Carbonyl chemistry; Aromatic compounds; The structure of benzene; Polycyclic aromatic hydrocarbons; Carbohydrates; Stereochemistry; Phenols.

**Instruction:** Lectures, laboratory course, and tutorials.

**Credits:** 16

**Assessment:** Major tests, laboratory reports, assignments, three-hour examination paper.

**Pre-requisites:** PAC 213.

**Target group:** Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for B.Sc. students in Agriculture.

**PAC 224: Physical Chemistry 1**

**Purpose:** To give comprehensive knowledge of chemical thermodynamics.

**Contents:** Gases; Thermodynamics; Solutions; Electrochemistry.

**Instruction:** Lectures, laboratory course, and tutorials.

**Credits:** 16

**Assessment:** Major tests, laboratory reports, assignments, three-hour examination paper.

**Pre-requisites:** PAC 211 and PAC 213.

**Target group:** Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for B.Sc. students in Agriculture.

**PAC 225: Chemical Technology 1**

**Purpose:** To give comprehensive knowledge of processes and apparatus of industrial chemistry and manufacturing of inorganic compounds.

**Contents:** Apparatus and plant equipment; Industrial inorganic chemicals; Fossil fuels; Mineralogical and geological chemistry; Extractive metallurgy; Air pollution and industrial hygiene; Water treatment and disposal; Pharmaceuticals.

**Instruction:** Lectures, laboratory course, and tutorials.

**Credits:** 16

**Assessment:** Major tests, laboratory reports, assignments, three-hour examination paper.

**Pre-requisites:** PAC 211.

**Target group:** Students majoring in Chemistry and Applied Chemistry.

**PAC 216: Environmental Chemistry 1**

**Purpose:** To lay foundations of general environmental science and environmental health.
Contents: Analyzing environmental issues from global and regional levels; Sustainable development; Concept of Integrated Life-Cycle management; Environmental health.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.

Pre-requisites: PAC 100, MAT 111/112.

Target group: Students majoring in Chemistry and Applied Chemistry.

**PAC 227: Materials Chemistry 1**

**Purpose:** To give comprehensive knowledge of modern inorganic materials.

**Contents:** Molecular superconductors; Molecular inorganic magnetic materials; Metal-containing materials for non-linear optics; Intercalation compounds; Biogenic materials.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.

Pre-requisites: PAC 213.

Target group: Students majoring in Chemistry and Applied Chemistry.

**PAC 218: Computational Chemistry 1**

**Purpose:** To give knowledge of mathematical methods in chemistry, as well as modern software applied in chemistry.

**Contents:** A review of the mathematical methods with the emphasis on the chemical illustrations; Information technology in chemistry; Computational chemistry; Problems with closed-form algorithms; Roots of equation; Systems of linear simultaneous equations; Regression analysis; Operating systems; General software.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: major tests, laboratory reports, assignments, three-hour examination paper.

Pre-requisites: PAC 100, MAT 111/112.

Target group: Students majoring in Chemistry and Applied Chemistry.

**THIRD YEAR CHEMISTRY**

**Option 1.** Chemistry / Applied Chemistry majors must have passed all PAC 200 courses, as well as MAT 111 (or MAT 112) and MAT 121 (or MAT123). They register for all the courses listed.

**Option 2.** Chemistry / Other Branch of Science double majors must have passed PAC 211, PAC 222, PAC 213, PAC 223, PAC 224, MAT 111 (or MAT 112) and MAT 121 (or MAT123). They register for PAC 321, PAC 312, PAC 323, PAC 314, and PAC 324.
PAC 321: Inorganic Chemistry 2
Purpose: To give profound knowledge of modern principles of inorganic, organometallic, and coordination chemistry.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 312, PAC 314.
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

PAC 312: Analytical Chemistry 2
Purpose: To give profound knowledge of instrumental methods of chemical analysis and industrial control.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 200, MAT 121/123.
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

PAC 323: Organic Chemistry 3
Purpose: To expand knowledge of advanced organic and polymer chemistry.

Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 312, PAC 314, PAC223
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

PAC 314: Physical Chemistry 2
Purpose: To give comprehensive knowledge of chemical kinetics, quantum chemistry, and molecular spectroscopy.

Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 200, MAT 121/123.
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

Purpose: To give advanced knowledge of disperse systems, surface phenomena, and catalysis.

Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 312, PAC 314.
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

**PAC 315: Chemical Technology 2**

Purpose: To give knowledge of manufacturing of basic classes of organic compounds.


Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 200, MAT 121/123.
Target group: Students majoring in Chemistry and Applied Chemistry.

**PAC 326: Environmental Chemistry 2**

Purpose: To provide knowledge of environmental pollution and monitoring.


Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 312, PAC 314.
Target group: Students majoring in Chemistry and Applied Chemistry.
PAC 317: **Material Chemistry 2**

**Purpose:** To provide knowledge of modern organic and organometallic materials.


**Instruction:** Lectures, laboratory course, and tutorials.

**Credits:** 16

**Assessment:** Major tests, laboratory reports, assignments, three-hour examination paper.

**Pre-requisites:** PAC 200, MAT 121/123.

**Target group:** Students majoring in Chemistry and Applied Chemistry.

PAC 328: **Computational Chemistry 2**

**Purpose:** To provide knowledge of numerical methods of chemistry and chemical information systems.


**Instruction:** Lectures, laboratory course, and tutorials.

**Credits:** 16
Assessment: Major tests, laboratory reports, assignments, three-hour examination paper.
Pre-requisites: PAC 312, PAC 314.
Target group: Students majoring in Chemistry and Applied Chemistry.

COMPUTER SCIENCE

CLT 111 and CLT 121 are offered by the Teaching and Learning Centre. These courses are identical, with CLT111 offered in the first semester and CLT121 in the second.

CLT 111/121 Introduction to computers and computing
Purpose: This is a computer literacy course designed for those with no prior knowledge of computers. It covers the general theory of how computers work, as well as standard practical uses of computers.
Content: Theory: Uses of computers; components of a computer, processor, memory, input devices, output devices; theoretical aspects of word processors, spreadsheets, databases and presentations; computer networks and the Internet; an introduction to basic HTML
Practical: Use of the operating system, the file management system, word processing, spreadsheets, presentations, databases and the World Wide Web and electronic mail.
Pre-requisites: None
Instruction: Lectures and practicals
Credits: 8
Assessment: Assignments, tests and examination

CSC111F: Introduction to Computers and Computing
Purpose: This is a computer literacy course designed for those with no prior knowledge of computers. It covers the general theory of how computers work, as well as standard practical uses of computers.
Content: Theory: Uses of computers; components of a computer, processor, memory, input devices, output devices; theoretical aspects of word processors, spreadsheets, and databases; computer networks and the Internet; an introduction to basic HTML
Practical: Use of the operating system, the file system, word processing and other applications, the World Wide Web and electronic mail.
Pre-requisites: None
Instruction: 180 minutes per week of lectures; 120 minutes per week of formal practicals; Self study
Credits: 8
Assessment: Monitoring of practical work. Two tests (25% each) as continuous assessment. One two hour examination as summative assessment.

CSC121F: Introduction to Programming Concepts
Purpose: Intended for first year students who are already computer literate and wish to have some knowledge of computer programming concepts.
Content: Introduction to algorithmics and computer programming; variables and data types; assignment; conditional branching
Pre-requisites: A basic knowledge of computer literacy
Instruction: 180 minutes per week of lectures; 120 minutes per week of formal practicals; Self study
Credits: 8
Assessment: Monitoring of practical work. Two tests (25% each) as continuous assessment. One two hour examination as summative assessment.

**CSC113: Introduction to Computing and Programming Concepts**
Purpose: Intended for students who have no previous knowledge of computers and wish to obtain a basic understanding of computer science
Content: Theory: Uses of computers; components of a computer, processor, memory, input devices, output devices; theoretical aspects of word processors, spreadsheets, and databases; computer networks and the Internet; an introduction to basic HTML, algorithms, basic programming concepts using Visual Basic for Applications
Practical: Use of the operating system, the file system, word processing, spreadsheets, and other applications, the World Wide Web and electronic mail, programming using Visual Basic for Applications
Pre-requisites: None
Instruction: 180 minutes per week of lectures; 120 minutes per week of formal practicals; Self study
Credits: 16
Assessment: Monitoring of practical work. Four tests as continuous assessment. One three hour examination as summative assessment.

**CSC 121: Elementary Computer Programming**
Purpose: Introduce computer programming and algorithmics using a programming language such as Visual Basic, C++ or Java.
Content: The programming environment; variables and declarations; conditional statements; file I/O; use of functions and procedures; repetition using the For and While loop; the ASCII character set; arrays; structures / records; graphics; design of algorithms;
Pre-requisites: CSC113
Instruction: 180 minutes per week of lectures; 120 minutes per week of formal practicals; Laboratory demonstrations; Self study
Credits: 16
Assessment: Monitoring of practical work and/or assignments. Four tests as continuous assessment. One three hour examination as summative assessment.

**CSC 113F and CSC123F** Refer to CSC 121 for information.

**CSC 211: Advanced Programming**
Purpose: This module is intended for students who already have a basic understanding of computer programming and wish to deepen their knowledge of this subject by learning a higher level programming language.
Content: Basic syntax of the C++ programming language; variables and data types; conditional branches and repetition; input and output; functions; arrays; structures; searching and sorting; pointers; parameter passing; introduction to classes; constructors
Pre-requisites: CSC 121
Instruction: 135 minutes per week of lectures; 120 minutes per week of formal practicals; Laboratory demonstrations; Self study
Credits: 12
Assessment: Monitoring of practical work and/or assignments; Four tests as continuous assessment. One three hour examination as summative assessment.

CSC 212: Computer Architecture and Organisation
Purpose: This module aims at giving a more detailed model of the working computer, in order to support a better awareness in writing computer programs in high level languages.
Content: Non decimal numbering systems; Logic circuits and Boolean logic; The structure of a simple computing machine; Machine code and assembly code; Developing programs in assembly. Applications of binary arithmetic.
Pre-requisites: CSC 121
Instruction: 135 minutes per week of lectures. A total of 180 minutes of formal practicals. Laboratory demonstrations. Self study and assignments
Credits: 12
Assessment: Monitoring of practical work and/or assignments. Two or three tests as continuous assessment. One three hour examination as summative assessment.

CSC 223: Data Structures and Algorithms
Purpose: The module introduces a selection of the standard data structures used for data storage and manipulation.
Content: Data structures that use arrays: stacks, queues and circular queues. Data structures that use linked lists: dynamic stacks and queues, doubly linked lists, deques, hash tables. Binary trees. Introduction to algorithmic complexity.
Pre-requisites: CSC 211
Instruction: 135 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations. Self study and assignments
Credits: 12
Assessment: Monitoring of practical work and/or assignments. Four tests as continuous assessment. One three hour examination as summative assessment.

CSC 224: Database Management and Design
Purpose: The module is meant to introduce information systems analysis and design techniques as well as the fundamentals of modern database theory.
Content: Introduction to the types of database; database modelling and design; database management techniques.
Pre-requisites: CSC 121
Instruction: 135 minutes of lectures per week. 60 minutes of practical work per week. Self study and assigned project work.
Credits: 12
Assessment: Three tests will be given in the course as continuous assessment. Practical work will be monitored and a practical project portfolio will be handed in at the end of the course. One 3-hour examination at the end of the course as summative assessment.

CSC 312: Operating Systems
Purpose: Understanding of the interface between the user and the hardware, that is the basic software that manages all the hardware of a computer and computer systems, namely the CPU, FILE, MEMORY and DEVICE management.
Content: Computer System overview; multiprogramming batch, time sharing, real time systems; process management and control; switching context, uni-processor scheduling; multi-processor and real time scheduling; concurrency: mutual exclusion and synchronization, deadlock and starvation; memory management: contiguous allocation, paging & segmentation, virtual memory; file management: file system and implementation; networking and distributed processing; distributed process management; security.
Pre-requisites: None
Instruction: 135 minutes of lectures per week. Four sessions of 60 to 90 minutes of practical work in Linux per week. Four sessions of 60 minutes of tutorials per week. One workshop on Open Source Software. Self-study.
Credits: 16
Assessment: Continuous assessment by means of tests and assignments. One three hour examination as summative assessment

CSC 313: Object Oriented Programming
Purpose: The module introduces the paradigm of object oriented programming and includes a substantial treatment of the Java programming language.
Content: Basic syntax of the Java programming language; classes; primitive data types; conditional branches and repetition; access modifiers; applets; interfaces; static methods and variables; inheritance; polymorphism; graphical user interfaces; exceptions; input and output using files.
Pre-requisites: CSC 211
Instruction: 135 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations. Self-study and assignments
Credits: 16
Assessment: Monitoring of practical work and/or assignments. Four tests as continuous assessment. One three hour examination as summative assessment.

CSC 323: Introduction to Computer Networks
Purpose: Understanding of the fundamental of the principles and techniques of digital data/analog transmission communication systems specially in a computers network as well as the physical topologies and soft topologies(protocols).
Content: Networks categories, data transmission, media, interfaces, signaling, LAN architecture and hardware, network models and protocols. A study is made of networks from a designer’s point of view. The University Intranet and the Internet are used as case studies

Pre-requisites: None
Instruction: 135 minutes of lectures per week. Workshops (2) on Departmental networks.
Credits: 16
Assessment: Tests and assignments as continuous assessment. One three hour final examination as summative assessment.

CSC 324: Software Engineering
Purpose: The module introduces software engineering techniques including object oriented analysis and design
Content: Project planning and scheduling; software quality; software cost estimation; requirements analysis; system design; program design; Object-oriented analysis and design; object-oriented modeling languages; object-oriented programming languages; case study based project.
Pre-requisites: None
Instruction: 135 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations.
Credits: 16
Assessment: Two tests, two system development group projects, and two assignments as continuous assessment. Observation is made on participation at group work. One 3-hour examination as summative assessment.

ENTOMOLOGY

Entomology is a two-year major course, starting at 200 level. However, students need to pass ZOO 111, ZOO 121, PAC 110, PAC 121 and all Entomology modules (i.e. ENT 211, ENT 221, ENT 312, ENT 313, ENT 322, ENT 323) in order to major in Entomology.

ENT 211: General Entomology
Purpose: Introduces learners to the Insecta, the most diverse group of animals inhabiting different ecosystems. Discusses the relevance of insects to society. It is designed for majors in Entomology, other life science majors and Livestock science.
Contents: Introduction: Why study insects, Insect abundance, Insects as a natural Resource, Insects as model biological systems, Human and insect interactions. Arthropod Diversity: Taxonomic naming conventions. Phylum Arthropoda and morphological characteristics of arthropods Kingdom – Animalia; Phylum- Arthropoda ; Superclass –Hexapoda; Class-Insecta, its orders and characteristics; phylogenetic relationships. Reasons for its success. External morphology (structure and function) Internal anatomy Excretory system and removal of waste from the insect body. Recognition of insects; Collection is required
Instruction: Lectures: 180 minutes per week, plus one practical session (3 hours) per week. Learners will be required to do field work over weekends.

Credits: 24

Assessment: Formative assessment by on-going evaluation through weekly assessment. Summative assessment through assignments, class tests and one 3-hour examination paper will be based on both the theoretical and the practical knowledge

Pre-requisites: ZOO 121 and attendance of ZOO 111

ENT 221: Applied Entomology

Purpose: Introduces learners to the Insect life histories, structural organization of locomotion the nervous system, vision, muscle structure and contraction as well as the endocrine system. It also deals with certain aspects of medical and veterinary Entomology

Contents: Insect Biology including life histories, reproduction, metamorphosis and development. Locomotion, nervous system and co-ordination. Insect vision. Structure, functions and physiology of muscles. Endocrine system and its functions (Hormones) Introduction to Agriculture, Medical and Veterinary Pesticide usage and their advantages and disadvantages, Forensic Entomology; Insect identification

Instruction: Lectures: 180 minutes per week, plus one practical session (3 hours) per week. Insect collection and identification is an important component of the course

Credits: 24

Assessment: Continuous assessment through class participation in lectures, at least two theory tests and one practical test. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: ZOO 111, ZOO 121; and attendance in ENT 211

ENT 312: The physiological basis of insect behaviour

Purpose: This module targets all learners in Biochemistry, Botany, Ecology, Entomology, Microbiology, Zoology, Pasture Science and Livestock Science (especially those majoring in Zoology, Agronomy, Livestock Science and Ecology) and provides them with graduate-level knowledge, specific skills and applied appreciation of animal basic physiology with specific reference to insects

Contents: Insect external and internal communication as well as coordination Perception of the external world includes discussion of: basic unit of the nervous system, insulation within the nervous system, electrical properties of neurons including generation of action potentials and the role of chemical messengers. Types of environmental stimuli and detectors or receptors (Mechanical, chemical, thermal and photo receptors). Insect semiochemicals and communication Insect endocrine systems and their role in internal insect communication regulation and co-ordination

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students will be required to write comprehensive essays on assigned topics

Credits: 16

Assessment: Continuous assessment through class participation in lectures, at least
two theory tests and one project or seminar presentation. Semester mark is determined by a continuous assessment through class tests worth 60% and Assignments Essays/ Seminar /Projects worth 40%. The final course consists of 50% from the semester mark and 50% from one externally moderated 3-hour exam.

Pre-requisites: ZOO 111, ZOO 121; PAC 110, PAC 121; ENT 221 and at least attendance to the ENT 211 module.

**ENT 313: Insect habitats and adaptations**

**Purpose:** This module targets all learners in Biochemistry, Botany, Ecology, Entomology, Microbiology, Zoology, Pasture Science and Livestock Science (especially those majoring in Zoology, Agronomy, Livestock Science and Ecology) and provides them with graduate-level knowledge, specific skills and applied appreciation of animal basic physiology with specific reference to insects.

**Contents:** Why most animals are insects – Factors that contributed to insect success and radiation into different habitats. Variations in insect habitats: Insects adapted to live in the decomposing part of the soil breaking down of decaying vegetation, litter and recycling of matter and their ecological. This section covers the significance the various insect types: Saprophagous or detritivores, Xylophagous, Coprophagous, Necrophages and Fungivorous insects. Aquatic, phytophagous and entomophagous insects will also be discussed. Discussion of social insects their organization, economic and ecological importance.

**Instruction:** Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students will be required to write comprehensive essays on assigned topics.

**Credits:** 16

**Assessment:** Continuous assessment through class participation in lectures, at least two theory tests and one project or seminar presentation. Semester mark is determined by a continuous assessment through class tests worth 60% and Assignments Essays/ Seminar /Projects worth 40%. The final course consists of 50% from the semester mark and 50% from one externally moderated 3-hour exam.

Pre-requisites: ZOO 111, ZOO 121; PAC 110, PAC 121; ENT 221 and at least attendance to the ENT 211 module.

**ENT 322: Insect behaviour and Ecology**

**Purpose:** This module targets all learners in Biochemistry, Botany, Ecology, Entomology, Microbiology, Zoology, Pasture Science and Livestock Science (especially those majoring in Zoology, Agronomy, Livestock Science and Ecology) and provides them with graduate-level knowledge, specific skills and applied appreciation of animal basic physiology with specific reference to insects.

**Contents:** Behavior: Historical development of animal behaviour (ethology) and its implications. The contribution of Charles Darwin (1809-1882) to ethology especially, the departure from anthropomorphism. This section defines ethology discusses the need study animal behaviour (ethology) and the founders of modern ethology. Aspects defining animal
behaviour: -Developmental influences on instinct & learning, -Neuroendocrine mechanisms supporting behaviour, -Sensory processes affecting communication& orientation, -The filtering process, Basic responses and patterns of behaviour, -Reflexes or simple behaviour patterns,-Fixed action patterns (complex behaviour), -Orientation (Primary and Secondary orientation, -Mechanisms of orientation (Taxes, Kinesis and Transverse orientation) Learned behaviour (conditioning & habituation); Behavioural adaptations and genetic control of behaviour; Behaviour, reproductive isolation and speciation Ecology: Objectives of insect ecology and its relevance to pest management; Ecological explanations and levels of ecological organizations; Discussion of populations and factors influencing population changes especially the determinants of insect abundance. Types of ecosystem and the performance insect populations in those systems especially the ecological role of insect outbreaks in agroecosystems; Introduction to pest management strategy especially the significance of sampling and surveillance and economic decision levels for pest populations

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students will be required to write comprehensive essays on assigned topics

Credits: 16
Assessment: Continuous assessment through class participation in lectures, at least two theory tests and one project or seminar presentation. Semester mark is determined by a continuous assessment through class tests worth 60% and Assignments Essays/ Seminar /Projects worth 40%. The final course consists of 50% from the semester mark and 50% from one externally moderated 3-hour exam.

Pre-requisites: ZOO 111, ZOO 121; PAC 110, PAC 121; ENT 221, ENT 221 and at least attendance to the ENT 312 and 313 modules.

ENT 323: Pest management theory and practices
Purpose: This module targets all learners in Biochemistry, Botany, Ecology, Entomology, Microbiology, Zoology, Pasteure Science and Livestock Science (especially those majoring in Zoology, Agronomy, Livestock Science and Ecology) and provides them with graduate-level knowledge, specific skills and applied appreciation of animal basic physiology with specific reference to insects

Contents: Pest management theory: Historical aspects of pest technology, The concept of pest management, Definition and characteristics of pest management, Pest management strategies, Development of a pest management programme, Information and tactics Managing insects with resistant plants and the role of insect plant interactions: Insect and host plant relationships, Mechanisms of plant resistance to insect attack, Genetic nature of plant resistance to insect, Factors mediating the expression of resistance, Biotechnology and resistant-variety development, Use of plant resistance in insect pest management Managing with Natural enemies and other biological agents: Rational and theory behind biological control, Agents of biological control, The practice of biological control Managing by modifying insect development and behavior: Disrupting normal
growth and development, Modifying behavior patterns Managing the Ecological backlash: What is the ecological backlash, Resistance of pest populations to pest management tactics, Pest population resurgence and replacement

Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week. Students will be required to write comprehensive essays on assigned topics

Credits: 16

Assessment: Continuous assessment through class participation in lectures, at least two theory tests and one project or seminar presentation. Semester mark is determined by a continuous assessment through class tests worth 60% and Assignments Essays/ Seminar /Projects worth 40%. The final course consists of 50% from the semester mark and 50% from one externally moderated 3-hour exam.

Pre-requisites: ZOO 111, ZOO 121; PAC 110, PAC 121; ENT 221, ENT 221 and at least attendance to the ENT 312 and 313 modules.

GEOGRAPHICAL INFORMATION SYSTEMS

Purpose: To familiarise students in detail with maps, in order to expose them to the basic building blocks of GIS. To introduce them to the concept of basic GIS in order that they will be able to know when one could apply GIS to a project.

Contents: Mapwork; Maps in GIS; Aerial photograph interpretation; and introduction to GIS;

Instruction: Lectures, practicals.

Credits: 24

Assessment: Class tests, Assignments, Practical tests, One 3-hour exam paper.

Pre-requisites: CSC 113 (or equivalent 1st yr module of minimum 16 credits) plus GEG 100 or GLG 100

Target group: Students of the Faculty of Science and Agriculture and students from other Faculties with the necessary pre-requisites wishing to do GIS at second year level.

Note: The number of students that we are able to enrol for GIS 211 each year is limited, and students are accepted based on their academic merit.

GIS 221: Functionality of Geographical Information Systems.
Purpose: To familiarise students with the functionality of GIS, in a comprehensive manner and providing application of theory, using real-world examples.

Contents: Data structures (raster, vector and CAD), attribute databases; data conversion; GIS data acquisition and importing; applications in GIS.

Instruction: Lectures, practicals.

Credits: 24

Assessment: Class tests, Assignments, Practical tests, One 3-hour exam paper

Pre-requisites: GIS 211
Target group: Students of the Faculty of Science and Agriculture and students from other Faculties with the necessary pre-requisites wishing to do GIS at second year level.

**GIS 312: GIS Database Design & Management**
*Purpose:* Provide learners with a sound background of databases and the power of these tools. To familiarise learners in some detail with the more complex functions of GIS databases.
*Contents:* Creation of spatial databases; Relational and Geodatabases; Database queries; Attribute data; and Database analysis.
*Instruction:* Lectures, practicals.
*Credits:* 16
*Assessment:* Continuous assessment through class participation in lectures, through practical assignments and/or tests, through at least two theory tests, and through one mini project. Summative assessment through one 3-hour exam paper on theory.
*Pre-requisites:* GIS 211 and GIS 221.
*Co-requisites:* GIS 313.
*Target group:* Students with the necessary pre-requisites wishing to major in GIS for the BSc degree.

**GIS 313: Spatial Analysis**
*Purpose:* To familiarise learners in some detail with the more complex analytical functions of GIS. To enable learners to perform GIS analysis, to plan, implement and manage GIS projects with quality results and outputs.
*Contents:* Introduction to spatial analysis; Vector analysis; Raster analysis; Digital Elevation Models.
*Instruction:* Lectures, practicals.
*Credits:* 16
*Assessment:* Continuous assessment through class participation in lectures, through practical assignments and/or tests, through at least two theory tests, and through one mini project. Summative assessment through one 3-hour exam paper on theory.
*Pre-requisites:* GIS 211 and GIS 221.
*Co-requisites:* GIS 312.
*Target group:* Students with the necessary pre-requisites wishing to major in GIS for the BSc degree.

**GIS 322: Introduction to Remote Sensing**
*Purpose:* To equip learners with a working knowledge of remote sensing, satellite imagery, image processing techniques, applications and uses of remote sensing.
*Contents:* Introduction to Remote Sensing (electromagnetic spectrum, data acquisition and display, platforms & sensors, image interpretation and applications).
*Instruction:* Lectures, practicals.
*Credits:* 16
*Assessment:* Continuous assessment through class participation in lectures, through practical assignments and/or tests, and through at least two theory
tests. Summative assessment through one 3-hour exam paper on theory.

Pre-requisites: GIS 312 and GIS 313.
Co-requisites: GIS 323.
Target group: Students with the necessary pre-requisites wishing to major in GIS for the BSc degree.

GIS 323: GIS Project Management
Purpose: To equip learners with the practical GIS skills to be able to initiate and commence GIS projects within their disciplines.
Contents: Project Management Techniques; Application in GIS Projects.
Instruction: Lectures, practicals.
Credits: 16
Assessment: Continuous assessment through class participation in lectures, through practical assignments and/or tests, through at least two theory tests, and through one mini project. Summative assessment through one 3-hour exam paper on theory.

Pre-requisites: GIS 312 and GIS 313.
Co-requisites: GIS 322.
Target group: Students with the necessary pre-requisites wishing to major in GIS for the BSc degree.

GEOGRAPHY AND ENVIRONMENTAL STUDIES

Undergraduate students in the Faculty of Science and Agriculture; the Faculty of Social Sciences and Humanities; and in the Faculty of Education may register for modules offered in Geography and Environmental Studies.

Students registered for the modules in Year 1 and Year 2 are required to attend lectures, tutorials and practical sessions, and participate in field studies organized by the Discipline. Students in Year 3 attend lectures and practical sessions, participate in field studies, and are required to submit independent and/or group research projects.

GEG 111: Geomorphology; Economic Geography and Population Geography (Introduction to Human Geographies I)
Purpose: To introduce students to basic concepts in Geography with particular reference to Geomorphology, and selected fields of study within Human Geographies.
Contents: (1) Geomorphology: The Geomorphology component of this module focuses on the earth as a dynamic planet whose surface is actively shaped by physical forces. The emphasis is on the following topics: Earth’s internal structure and dynamic crust; tectonic processes, earthquakes and volcanism; rock formation, weathering and mass movement; slope development theories; river systems and landforms; coastal processes and landforms; aeolian processes and arid landscapes.
(2) The Human Geographies sub-module focuses on selected themes. The first set of themes includes the following: The first set of themes has two components. The first component of this theme examines the
relationship between culture and nature, including how nature is shaped by the human imagination and the Marxist concept of producing nature. The second component investigates the interaction between society and space, specifically focusing on how spatial patterns reflect social structures and how place and space actively contributes to the construction and reproduction of social identities.

The second set of themes concentrates on two principal areas of study, namely, Local-Global Relations with reference to local matters and global visions, and mosaics, systems and networks; and a focus on Control and Freedom with reference to multiple spaces and locating freedoms.

Instruction: Lectures: 3 hours/week, 1 practical session (3 hours)
Credits: 16
Assessment: 1 x 3-hour paper
Prerequisite: None

GEG 121: Climatology; Settlement Geography and Regional Geography (Introduction to Human Geographies II)
Purpose: To introduce students to basic concepts in Geography with particular reference to Climatology, and to selected aspects of Human Geographies.
Contents: (1) Climatology: This sub-module focuses on the study of fundamental climatology and meteorology at the global, regional and local scale. Course content: Composition of the atmosphere, vertical structure of the atmosphere, physical processes for heating and cooling, horizontal winds in the atmosphere, primary, secondary and tertiary circulation, global winds, major and minor disturbances, South African climate, weather symbols and climate classification.
(2) The Human Geographies sub-module focuses on selected themes. The first set of themes concentrated on three principle areas of study, namely, self-reflexivity in the study of Human Geography; the critique of geographical images; and distinctions between masculinist and feminist geographies.
The second set of themes concentrates on two principal areas of study, namely, Human Geography: Science-Art; and Histories of Human Geographies, and the Art of Human Geography.

Instruction: Lectures: 3 hours/week, 1 practical session (3 hours)
Credits: 16
Assessment: 1 x 3-hour paper
Prerequisite: None

GEG 211: Pedology, Population, Climatology, Settlement Geography, Environmental Studies
Purpose: To study the interrelationships between selected fields of physical and human geography, and environmental studies
Contents: (1) Pedology: Soil formation and soil properties, the geography of soils, soil classification systems, soil types and general soil classification.
(2) Population: Population growth and its impact on renewable resources, food security, job opportunities, health and service delivery. Population size, distribution and density; population census and
demographic characteristics. Population trends in South and southern Africa are discussed, and compared with those of the First World.
(3) Climatology: This sub-module provides an in-depth understanding of the generic processes governing atmospheric circulation and those specific to southern Africa. The course content includes: Pressure, temperature and density relationship; radiation laws; large-scale weather processes and systems; general circulation of the southern hemisphere; atmospheric circulation and weather over southern Africa; air masses and cyclonic storms; fronts and depression; weather and climate in temperate latitudes and the laws of thermodynamics.
(4) Settlement Geography: This sub-module focuses on the challenges facing urban settlements, namely, urbanisation and counterurbanisation, gentrification and loft living in the central city, and inequality in the global city. It also includes aspects that focus on sensing the city-urban experiences; sensing everyday geographies; the blurring of country and city; and commodifying the countryside.
(5) Environmental Studies: Introduction to principal concepts: Environmental studies, environmental science, multi-disciplinarity, interdisciplinarity, stewardship, domination and the precautionary principle of environmental management. Relationship between environmental studies and coastal and tourism development in South and southern Africa. Gender and environment studies.

Instruction: Lectures: 3 hours/week, 1 practical session (3 hours)
Credits: 24
Assessment: 1 x 3-hour paper
Prerequisite: GEG 111 & GEG 121

GEG 221: Economic Geography, Geomorphology, Statistics for Geographers, Geographical Information Systems and Remote Sensing

Purpose: To study the interrelationships between selected fields of physical and human geography with particular reference to economic geography and geomorphology; to introduce students to skills and techniques in geographical research.

Contents: (1) Economic Geography: This sub-module has two key themes. The first theme introduces students to development geographies, with a focus on select theories of economic development and underdevelopment; criticisms of these theories and alternative ways of viewing of development and underdevelopment; and local and global resistance to neo-liberal economic policies and practices. The second theme in this sub-module introduces students to economic geographies, concentrating on production geographies; the geography of money and finance; and consumption geographies.
(2) Geomorphology: This sub-module provides a systematic overview of the forms and processes associated with rivers and drainage basins. Topics include: Basin hydrology, drainage networks, river hydraulics, sediment transport processes, channel morphology, channel change, and human impacts on fluvial systems. Under human impacts the following are examined: How land uses such as grazing, agriculture
(cultivation), logging, urbanization, floods and erosion control affect fluvial processes, morphology, and riparian ecology and habitat?

(3) Statistics for Geographers: This sub-module focuses on the application of statistical methods in research in both human and physical geography. It is concerned with the scientific method of collection, presentation, organisation, analysis and interpretation of numerical data. The course content includes the introduction to statistical methods, central tendency, dispersion and variability, frequency distribution, sampling, sample characteristics and statistical estimation, statistical inference and the testing of hypothesis in both parametric and non-parametric tests and relationships.

Instruction: Lectures: 3 hours/week, 1 practical session (3 hours)
Credits: 24
Assessment: 1 x 3-hour paper
Prerequisite: GEG 111 & GEG 121

GEG 312: Economic Geography and Geographical Research
Purpose: The GEG 312 module introduces students to applied concepts in Geography with particular reference to Economic Geography, and to Geographical Research. Economic Geography seeks to explain patterns in the world’s economic landscapes, and reviews theoretical approaches to understanding the development of these patterns. The major dimensions of the world’s contemporary economic landscapes are described at various scales. Particular focus is on multi-national trading partnerships involving South Africa, Southern Africa and Africa and the roles of governments and other organisations and institutions in promoting the distribution and expansion of the world economy. The use of case-studies helps students to think critically about economic issues affecting individuals at the local scale, and to consider how these issues are interlinked with situations at the regional, national and global levels. For the Geographical Research component, students work in groups of three or four persons on a selected research topic of their choice. The purpose of this exercise is to train students in undertaking research.

Content: The Evolution of Economic Geography as a Discipline; The Spatial Organization of the World Economy; International Trade, Globalization, Trade reform and liberalization, Development strategies in Asia and Latin America, Trade agreements (e.g., Asia Pacific Economic Co-Operation), Patterns in International Trade; Foreign Direct Investment (FDI) and the Growth of Multinational Enterprises; The Spatial Transformation of the Periphery, and Transnational Corporations. The Geographical Research component introduces students to the steps in the presentation of a dissertation proposal, the importance of the conceptual framework in research, the compilation of the literature review, the identification of gaps in their chosen field of research, the establishment of the research problem and research questions, and the presentation of the aims and objectives of their research. The research may be in Human Geography, Physical Geography or in Environmental Studies.

Instruction: Lectures: four lectures per week, and one practical session per week. The first practical session is used to introduce students to the group research project. Students subsequently meet for a 3-hour practical
every third week for their research project. Students will be required to undertake at least one field study as part of their coursework.

Credits: 16

Assessment: Continuous assessment based on class participation, class presentations and attendance of lectures. Students are required to submit at least one assignment and write one theory test. In addition, students are assessed on their research project, practical work and their field study. The summative assessment comprises a 1½ hour theory examination paper.

Pre-requisites: GEG 211 and GEG 221
Co-requisite: GEG 313, GIS211

GEG 313: Biogeography

Purpose: This module introduces students to applied concepts in Geography with particular reference to Biogeography. It is designed to prepare students to actively participate in natural resources and ecosystems conservation practices and management. Therefore, it intends to cultivate a sense of critical thinking within students, instil interest in research, show its application and relevance in practical situations and demonstrate the relevance of this discipline to environmental management and impact assessment. At the end of this course students shall have gained skills related to practical application of Biogeography and develop an appreciation of the ‘scientific method’.

Content: Introduction to biogeography, biogeographical processes: speciation, diversification, extinction; biogeographical patterns: distributions processes; ecological biogeography: ecosystem processes, habitats, ecological niche; conservation biogeography: South African biomes, biodiversity

Instruction: Lectures: four lectures per week. Practical: one 3-hour session per week. Students are required to undertake a field excursion which will culminate in the submission of a fieldwork report.

Credits: 16

Assessment: Continuous assessment through class participation, class presentations, attendance at lectures and practical work. In addition, students are expected to submit at least one assignment and write at least one theory test and one practical test. The field report will also be assessed. Summative assessment: 1½ hour theory examination paper.

Pre-requisites: GEG 211 and GEG 221
Co-requisite: GEG 312, GIS211

GEG 322: Climatology and Geomorphology

Purpose: The GEG 322 module introduces students to applied concepts in Geography with particular reference to Climatology and Geomorphology. This course is designed to prepare students to actively participate in natural resources and ecosystems conservation practices and management as well as to give students sound knowledge on macro- and micro-atmospheric processes. Therefore, it intends to cultivate a sense of critical thinking within students, instil interest in research, show the application and relevance of Climatology and Geomorphology in practical situations, and demonstrate the relevance of these disciplines
to environmental management and impact assessment. At the end of this course students shall have gained skills related to practical application of Physical Geography and enhance their appreciation of the ‘scientific method’.

Content: CLIMATOLOGY: Ocean – atmospheric interactions, wind and ocean movement, upwelling, thermohaline circulation, the Walker circulation and ENSO, ENSO and South African rainfall; boundary layer processes: turbulence in the boundary layer, boundary layer modification by urban areas, air pollution climatology; extreme climatic events and hazards: tropical cyclones, floods and droughts, thunderstorms and tornadoes, climate and health, recent global climate change

GEOMORPHOLOGY: Slope forms, processes and structural control, weathering processes, mass movement processes, scarification; landscape evolution, slope development theories, factors controlling slope development; geomorphic aspects of soil erosion, soil erosion processes, gully development, soil erodibility; soil erosion distribution in South Africa, social aspect of soil erosion, soil erosion and land tenure, government intervention; political aspects of soil degradation: marginalization and soil/land degradation, political unrest and land degradation; soil management and conservation.

Instruction: Lectures: four lectures per week. Practical: one 3-hour session per week. Students are required to undertake a field excursion which will culminate to the submission of a fieldwork report.

Credits: 16

Assessment: Continuous assessment through class participation, class presentations, attendance at lectures and practical work. Students are required to submit at least two assignments and write two theory tests and two practical tests. The field report will also be assessed.

Summative assessment: 1½ hour theory examination paper.

Pre-requisites: GEG 211 and GEG 221

Co-requisite: GEG 323, GIS221

GEG 323: Settlement Geography and Geographical Research

Purpose: The Settlement Geography component of this module is grounded within paradigm shifts in Human Geography in general, and more specifically in South Africa, with particular focus on Radical, Feminist, and Postmodern Geographies. This sub-module seeks to ensure the development of a sound understanding of critical themes in urban-political study, within selected theoretical perspectives. The Geographical Research component is geared towards training students via their group research projects (commenced in the first semester as part of GEG 312) to collect and analyse field data, and write a group research report within acceptable scientific criteria for presentation at a Departmental seminar, specifically arranged for this purpose.

This module seeks to challenge students to think critically, debate issues, reflect strategically, and apply their knowledge and skills in novel ways to advance solutions to geographical and environmental problems in South Africa.
Content: The themes selected for study in the Settlement Geography sub-module include: paradigms in human geography studies; urban power and the political economy of cities, including local governance, the change from managerialism to entrepreneurialism, and the consequences for residents at the local sphere; state restructuring, local politics and civil society in South Africa’s urban environment; postmodern urban structure; postmodern perspectives on urban politics in South Africa; global cities discourse; and a study of urban dynamics in East London.

The Geographical Research component includes sampling, qualitative and quantitative data collection techniques, geographical information systems and remote sensing. Students prepare their data collection instruments; pilot these; collect data; engage in data analysis; and present a bound copy of their research project within prescribed norms for a dissertation.

Instruction: Lectures: two lectures per week for the Settlement Geography sub-module. Formal meetings with academic staff for the research project are held once every fortnight during the practical period. [The research project session alternates with the practical session for the GEG 322 module]. A field study of East London.

Credits: 16

Assessment: One assignment and one test in Settlement Geography. Assessment of work-in-progress, and the final submission and presentation of the group research project. Summative assessment: one-and-a-half-hour written examination. Final module result determined on equal weighting of semester mark and summative examination mark.

Pre-requisites: GEG 211 and GEG 221

Co-requisites: GEG 322

GEOLOGY

GLG 111: Elementary Geology 1.

Purpose: To lay a foundation for further geological study and to serve as a service course to students of related natural science disciplines. Achieved through the description and classification of fundamental earth processes and materials, and their impact on the physical environment.

Contents: Introduction to Geology, including elementary crystallography and mineralogy; Introduction to Earth materials and the physical environment.

Instruction: Lectures; Practical laboratory and field instruction.

Credits: 16

Assessment: Major tests and class tests, assignments, practical projects, lecture attendance and a three-hour examination.

Pre-requisites: None

Target Group: Students of the School of Science and of the Soil Science Department in the School of Agriculture. May also be taken as an ancillary course by other agriculture students.
GLG 121: Elementary Geology 2.
Purpose: To expand on the basic concepts of physical geology and on the objectives of GLG111, with the focus on earth structures and landforms, sedimentary surface processes and South African geological occurrences.
Contents: Surface and sub-surface geological processes and their products; Historical Geology.
Instruction: Lectures; practical instruction; field excursion(s).
Credits: 16
Assessment: Major tests, class tests, practical tests, assignments, three-hour examination.
Prerequisite: None
Target Group: Students of the School of Science and of the Soil Science Department in the School of Agriculture. May also be taken as an ancillary course by other agriculture students.

GLG 211: Intermediate Geology 1.
Purpose: To equip students with adequate knowledge of crystallography, mineralogy and structural geology required for studies in advanced geology.
Contents: Mineral Properties; Earth Structures.
Instruction: Lectures, tutorials, practical instruction, field project.
Credits: 24
Assessment: Major tests, class tests, assignments, practical projects, three-hour examination.
Pre-requisites: GLG111
Target Group: Students of the School of Science and of the Soil Science Department in the School of Agriculture wishing to major in Geology, and other students wishing to do Geology at second year level.

GLG 221: Intermediate Geology 2.
Purpose: To further prepare students for studies in advanced geology with emphasis on petrology and on the geology of South Africa.
Contents: Petrology; South African Geology.
Instruction: Lectures, tutorials, practical instruction, field excursion.
Credits: 24
Assessment: Major tests, class tests, assignments, practical projects and tests, excursion report, three-hour examination.
Prerequisite: GLG121
Target Group: Students of the School of Science and of the Soil Science Department in the School of Agriculture wishing to major in Geology, and other students with the necessary pre-requisites wishing to do Geology at second year level.

GLG 312: Geochemistry and Hydrogeology
Purpose: Geochemistry introduces basic concepts and analytical methods of Geochemistry and their application to mining, water and environmental sciences. Hydrogeology introduces basic concepts of groundwater and basic mathematics on theories of groundwater flow and well hydraulics.
The material covered by the Geochemistry component, includes solid, aqueous and applied geochemistry, geochemical sampling methods and quality control and analytical techniques. The Hydrogeology component covers an introduction to groundwater, Darcy's law, Groundwater flow equation, Flow net and a number of other groundwater topics. It also includes Well Hydraulics and Pumping Test Analysis.

Instruction: The course consists of 48 comprehensive lectures, complemented by extensive practical and field instruction.

Credits: 16
Assessment: 1 three hour examination constitutes 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisite: GLG 211
Co-requisite: PAC 110

GLG 313: Structural Geology and South Africa Geology

Purpose: The structural geology component serves to advance the student's knowledge of structural geology through stress and strain analysis and exploring structural associations and applications in structural geology. The South African geology component outlines characteristics of regional geological, tectonic and lithostratigraphic units in Southern Africa and examines their controls of mineralization and application to economic and social aspects.

Content: Structural geology includes the following topics: force and stress; strain analysis; stress analysis in earth structures; structure association; meteorite impact structure, field mapping, data collection, processing and interpretation. South African Geology provides an introduction to Late Precambrian tectonic patterns in South Western Africa; The Swazain, Vaalian and Mokolian structures of the North Western Cape Province; the Lithostratigraphy of the Cape Supergroup; the glaciation history of Gondwanaland; Neotectonics and a number of other topics.

Instruction: The course consists of 48 comprehensive lectures, complemented by extensive practical and field instruction.

Credits: 16
Assessment: 1 three hour examination constitutes 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisite: GLG 211
Co-requisite: PAC 110

GLG 322: Metamorphic Petrology and Engineering Geology

Purpose: To equip students with the basic knowledge and skills for recognition, classification and study of metamorphic rocks and to enable them to analyse the processes and conditions under which metamorphic alteration of solid earth materials occurred. Engineering geology introduces basic concepts of engineering geology and the application of geology to engineering.

Content: The first component examines the definition of and types of metamorphism, controlling factors of metamorphism, geothermometry and geobarometry, metamorphic textures and case studies. The
engineering component covers rock types and stratigraphy, surface processes, geological structures, groundwater conditions and supply, geological materials used in construction, site investigation and engineering geological maps, geology and planning and geology and construction

Instruction: The course consists of 48 comprehensive lectures, complemented by extensive practical instruction.

Credits: 16
Assessment: 1 three hour examination constitutes 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisites: GLG 211 & GLG221
Co-requisite: PAC 121

GLG 323: Economic Geology, Statistics and Data Analysis

Purpose: To equip students with knowledge and skills required by geoscientists in the exploration and exploitation of mineral deposits. The statistics and data analysis component enables students to use basic statistics and data analysis to evaluate and analyse geo-data.

Content: Economic geology examines ore forming processes, types and characteristics of ore deposits, and research techniques. Statistics and Data Analysis provides an introduction to GeoStatistics, statistical tests, the Volume-variance relationship, and estimation, Kriging and contouring, Bivariate Considerations and Multivariate Models.

Instruction: The course consists of 48 comprehensive lectures, complemented by extensive practical instruction.

Credits: 16
Assessment: 1 three hour examination constitutes 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisites: GLG 211 & GLG221
Co-requisite: PAC 121

HUMAN MOVEMENT SCIENCES

Description of the other core and elective modules can be obtained in the Faculty Prospectus of Social Science and Humanities.

HUS 111: Foundation of Human Movement studies

Purpose: To provide students with an elementary knowledge and understanding of Foundations of sport and exercise science.


Instruction: Lectures, self-study and learner presentation.

Credits: 8
Assessment: Continuous assessment through: Tests, Group presentations, Assignments. Summative assessment: 3 hour examination

HUS 112: Anatomy and Movement

Purpose: Introduce learners to basic human movement through anatomy which include knowledge of the different bones, joints and muscles.
Contents: Identifying location of all major bones, joints and muscle of the human body as well as how these influence movement
Instruction: Lectures, field activities with children, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Assignments and practical demonstrations; Summative assessment: 3 hour examination

HUS 121: Motor Development and Child Movement Experiences
Purpose: Introduce learners to the concepts of motor development processes and how they affect movement capabilities and experiences among children.
Contents: Postnatal motor development of children and development of fundamental movement skills.
Instruction: Lectures, field activities with children, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Assignments and practical demonstrations; Summative assessment: 3 hour examination

HUS 122: Physiology
Purpose: Introduce learners to basic physiological functioning of the human body.
Contents: Understand the basic structural organization of the human body; cell functioning; structure and how these structures form various systems like cardiovascular-, digestive-, muscle-, nervous- end endocrine system.
Instruction: Lectures, field activities with children, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Assignments and practical demonstrations; Summative assessment: 3 hour examination

HUS 211: Sport management
Purpose: To provide students with an elementary knowledge and understanding of sport management
Contents: The study of the foundations, and functions and challenges of sport management.
Instruction: Lectures, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Group presentations, Assignments. Summative assessment: 3 hour examination
Pre requisite: HUS 111

HUS 212: Exercise Physiology I
Purpose: To provide students with a basic knowledge of how human physiology functions during movement/exercise/sport.
Contents: Basic functioning of energy systems; neuromuscular structures, and respiratory system during exercise.
Instruction: Lectures, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Group presentations, assignments, Summative assessment: 3 hour examination

Pre requisite: HUS 112

HUS 221: **Motor learning**
Purpose: Introduction to the study of motor learning and movement control for development of performance skills required in physical activities and sports.
Contents: The course covers the essence of movement and anatomy of movement, movement production and programs, principles of motor control and movement accuracy, information processing and decision-making, principles of human skilled performance, principles of skill learning, teaching for motor learning and performance and integration and application.
Instruction: Lectures, group discussions, laboratory experiments and presentations, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Group and individual assignments, Summative assessment: 3 hour examination

Pre requisite: HUS 121

HUS 222: **Exercise Physiology II**
Purpose: To provide students with a basic knowledge of how human physiology functions during movement/exercise/sport.
Contents: Basic cardiovascular functioning; environmental influences on performance; optimizing performance through egogenic aids.
Instruction: Lectures, self-study and learner presentation.
Credits: 8
Assessment: Continuous assessment through: Tests, Group presentations, Assignments.

Pre requisite: HUS 122

HUS 311: **Sport Psychology**
Purpose: To provide students with a basic knowledge regarding sport psychology and the influence it has on physical activity and sport performance.
Contents: The study of the psychological principles in a sporting context.
Instruction: Lectures, self-study and learner presentation.
Credits: 16
Assessment: Continuous assessment through: Tests, Group presentations, Assignments. Summative assessment: 3 hour examination

Prerequisite: HUS 211

HUS 312: **Exercise science and coaching I**
Purpose: To assist students to apply Exercise Physiology principals into practice by writing scientific based training programs.
Contents: Basic training principles for sport performance; role of recovering and tapering; writing training programs for the improvement of strength, power, speed; agility; aerobic- and anaerobic endurance;
Instruction: Lectures, self-study and learner presentation.
Credits: 16
Assessment: Continuous assessment through: Tests, Group presentations, Assignments.
Prerequisite: HUS 212

HUS 321: Research Methods in physical activity
Purpose: Learners to acquire the research fundamentals applied in health related physical activity and sport settings.
Contents: The research process and statistical and measurement concepts.
Instruction: Lectures, practical activities, self-study and learner presentations.
Credits: 16
Assessment: Continuous assessment through: Tests, Assignments and report writing
Summative assessment: 3 hour examination
Prerequisite: HUS 212

HUS 322: Exercise science and coaching II
Purpose: To assist students to apply Exercise Physiology principals into practice by writing scientific based training programs.
Contents: Basic knowledge of periodization principles; overtraining and how to prevent it in sport people; training programs for specialized population such as children and elderly; understanding nutritional basics; basics of common sport injuries and rehabilitation.
Instruction: Lectures, self-study and learner presentation.
Credits: 16
Assessment: Continuous assessment through: Tests, Group presentations, Assignments.
Prerequisite: HUS 222

Practical courses
Students will have the opportunity to do two practical courses every year (one is compulsory and one is by choice). Delivery of these courses will depend on the number of interested individuals. Due to the nature and delivery of these courses, some might be presented after class hours. The list of courses will be made available at the start of each academic year by the Head of Department.

MATHEMATICS

Introduction to Mathematics:
MAT 011 is an introductory module in Mathematics and is usually offered in the first semester only. It is recommended for candidates with an E (Standard Grade) or lower symbol in matriculation Mathematics. Learners who pass this module can register for any module offered at the University of Fort Hare that requires a pass mark in matriculation Mathematics. Students with a D or higher symbol (Standard Grade) in matriculation Mathematics will not receive credit for this module.

MAT 011: A Pre-calculus Course in Mathematics
Purpose: This module offers basic mathematical skills, not acquired in school, which are fundamental in the B Sc, B Sc (Agric) and B Comm programmes. Students who do not qualify to do Mathematical
Contents: Fundamentals of Algebra: real numbers, absolute value, exponents, fundamental operations with polynomials and rational functions,

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 8
Prerequisite: Matriculation Mathematics with an E (Standard Grade) or lower symbol. For NSC a level 3 pass.

FIRST YEAR MODULES

MAT 111 and MAT121 are recommended for candidates who are strong in Mathematics and who intend majoring in the mathematical sciences or related subjects, e.g. Mathematical Statistics, Applied Mathematics or Physics. They offer the same computational grounding as MAT 112 (MAT 122) and MAT 123 (MAT 113), but in greater depth. MAT 112 and MAT 122 are equivalent modules. MAT 112 is offered in the first semester and MAT 122 in the second semester. Similarly, MAT 113 and MAT 123 are equivalent courses offered respectively in the first and second semesters. The primary aim of MAT 112 (MAT 122) and MAT 123 (MAT 113) is to cater for curricula where Mathematics is a first year ancillary. The emphasis here is on applications and computational skills. The entrance requirements for MAT 112 (MAT 122) are the same as for MAT 111.

Summary of Undergraduate Mathematics Modules

<table>
<thead>
<tr>
<th>Pre-calculus Module</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 011</td>
<td>= MAT 021</td>
<td></td>
</tr>
<tr>
<td>Calculus for non-majors (combine xx2 and xx3)</td>
<td>MAT 112</td>
<td>= MAT 122</td>
</tr>
<tr>
<td>MAT 113</td>
<td>= MAT 123</td>
<td></td>
</tr>
<tr>
<td>Calculus for majors</td>
<td>MAT 111</td>
<td>MAT 121</td>
</tr>
<tr>
<td>MAT 211, MAT 212</td>
<td>MAT 223, MAT 224, MAT 225</td>
<td></td>
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<tr>
<td>MAT 311</td>
<td>MAT 322</td>
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<tr>
<td></td>
<td>MAT303, MAT 304</td>
<td></td>
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</tbody>
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MAT 111: A Theoretical Approach to Differential Calculus
Purpose: The module is the initial stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics and

Contents: Induction; the binomial theorem; radian measure; limits and continuity; exponential, logarithmic and inverse functions; differential calculus with applications; indeterminate forms; the Mean Value theorem; elementary integration.

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 16
Prerequisite: Matriculation Mathematics with an E symbol (HG) or D (SG), or MAT 011 (021) or an equivalent or for NSC a level 4 pass.

MAT 111F Refer to MAT 111 for information.
MAT 121F

MAT 112 (MAT 122): A Practical Approach to Differential Calculus
Purpose: The module is the initial stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics Education, (iii) pursue careers in Financial Mathematics and Statistics. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills. Since First Year Mathematics is usually a prerequisite for many Science Programmes, this module caters for such programmes.

Contents: The real number system; functions; inequalities; mathematical induction; the binomial theorem; exponential, logarithmic and inverse functions; differential calculus with applications; elementary integration.

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 16
Prerequisite: Matriculation Mathematics with an E symbol (HG) or D (SG), or MAT 011 (021) or an equivalent or for NSC a level 4 pass

MAT 121: A Theoretical Approach to Integral Calculus
Purpose: The module follows MAT 111 (or MAT 112) in providing the initial stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics and Mathematics Education, (iii) pursue careers in Physics, Mathematical Statistics, Applied Mathematics, Engineering, Surveying, Actuarial Science, Financial Mathematics and Business Mathematics.

Contents: Further integration; conic sections; hyperbolic functions; polar coordinates; vectors; determinants and matrices with applications; complex numbers; partial derivatives; infinite series; Taylor’s theorem; first order differential equations.

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 16
Prerequisite: A minimum final mark of 40% for MAT 111, or 60% in MAT 112

**MAT 123 (MAT 113): A Practical Approach to Integral Calculus**

**Purpose:** The module follows MAT 112 and MAT 122 (or MAT 111) in providing the initial stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics Education, (iii) pursue careers in Financial Mathematics and Statistics. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills. Since First Year Mathematics is usually a prerequisite for many Science Programmes, this module also caters for such programmes.

**Contents:** Further integration; polar coordinates; conic sections; determinants and matrices; vectors; complex numbers; introduction to partial derivatives and differential equations.

**Instruction:** Lectures, tutorials, assignments and group discussions

**Assessment:** Assignments, class tests and examination

**Credits:** 16

**Prerequisite:** A minimum final mark of 40% for MAT 112 or MAT 111.

**MAT 113F** Refer to MAT 121 for information.

**MAT 123F**

### SECOND YEAR MODULES

MAT 211, 212 and 223 are compulsory components. In addition, learners have to choose between MAT 224 and MAT 225.

**MAT 211: Advanced Calculus**

**Purpose:** The module follows MAT 121 or MAT 123 (or MAT 113) and is the second stage in the process of empowering learners who are going to pursue careers in Mathematics teaching and lecturing. It is compulsory for all students who are going to major in Mathematics, Mathematical Statistics, Applied Mathematics and Physics. It also prepares learners who want to pursue careers in Engineering, Surveying, Financial Mathematics, Business Mathematics and Actuarial Science. It is highly recommended for Bachelor of Commerce students who want to major in Accounting, Economics and Business Economics as it touches on the concept of optimisation and other related computational skills.

**Contents:** Differential equations; functions of several variables; limits and continuity; partial derivatives and applications; multiple integrals; vector analysis.

**Instruction:** Lectures, tutorials, assignments and group discussions

**Assessment:** Assignments, class tests and examination

**Credits:** 16

**Pre-requisites:** MAT 111 and 121; or at least 60% final mark for MAT 112 (MAT 122) and MAT 123 (MAT 113).
**MAT 212: Fundamentals**

**Purpose:** The module follows MAT 121 or MAT 123 and is the second stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical, Physical and Computer Sciences, (iii) pursue careers in Engineering, Surveying, Financial Mathematics, Mathematical Statistics and Actuarial Science. It also trains learners to think and reason logically, critically and creatively in any discipline. It is fundamental and thus compulsory for anyone who wants to major in Mathematics and Applied Mathematics.

**Contents:** Elementary mathematical logic, number and set theory; introduction to groups, rings and fields.

**Instruction:** Lectures, tutorials, assignments and group discussions

**Assessment:** Assignments, class tests and examination

**Credits:** 8

**Pre-requisites:** MAT 111 and 121; or MAT 112 (MAT 122) and 60% pass in MAT 123 (MAT 113).

**MAT 223: Linear Algebra**

**Purpose:** The module follows MAT 121 or MAT 123 and is the second stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical, Physical and Computer Sciences, (iii) pursue careers in Engineering, Surveying, Financial Mathematics, Mathematical Statistics and Actuarial Science. It also trains learners to think and reason logically, critically and creatively in any discipline.

**Contents:** Linear systems; matrix algebra; determinants; vector spaces; linear transformations; eigenvalues and eigenvectors; quadratic forms. [This is a compulsory module for Mathematics 2; in addition the learner must choose between MAT 224 and MAT 225.]

**Instruction:** Lectures, tutorials, assignments and group discussions

**Assessment:** Assignments, class tests and examination

**Credits:** 12

**Pre-requisites:** MAT 212.

**MAT 224: Real Analysis**

**Purpose:** The module follows MAT 121 or MAT 123 (or MAT 113) and is the second stage in the process of empowering learners who are going to pursue careers in Mathematics teaching and lecturing. It is compulsory for students who are going to do postgraduate studies in Mathematics. It is also highly recommended for learners who are going to major in Applied Mathematics and Mathematical Statistics. It introduces students to abstract thinking, which is an essential tool in doing proofs in Mathematics. The module also encourages learners to think and reason logically, critically and creatively in any discipline.

**Contents:** Cardinality, order properties, completeness and topology of the real line; convexity on $R$; sequences and series; limits and continuities on $R$; differentiation; conver-gence; Riemann integration. [Optional module.]
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 12
Pre-requisites: MAT 211 and MAT 212

MAT 225: Geometry
Purpose: The module follows MAT 121 or MAT 123 and is the second stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical, Physical and Computer Sciences, (iii) pursue careers in Engineering, Surveying, Financial Mathematics, Mathematical Statistics and Actuarial Science.
Contents: Euclidean and non-Euclidean geometries. [Optional module.]
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 12
Pre-requisites: MAT 212

THIRD YEAR MODULES

MAT 311 and MAT 322 are compulsory components; in addition, candidates have to choose between MAT 303 and MAT 304. Note: MAT 304 is intended mainly for prospective teachers of Mathematics.

MAT 311: Abstract Algebra
Purpose: The module follows MAT 223 and is the third stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics, Physical Sciences, and Mathematical Statistics. It also trains learners to think and reason logically, critically and creatively in any discipline.
Contents: Groups, rings, fields and algebras.
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 22
Pre-requisites: MAT 212 and MAT 223.

MAT 322: Complex Analysis
Purpose: The module follows MAT 211 and is the third stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics, Applied Mathematics, Mathematical Statistics, Physics, Engineering, Surveying and Actuarial Science. It seeks to assist learners who want to apply Mathematics in those disciplines and areas of life that require high-level mathematical skills.
Contents: Functions of a complex variable; derivatives; Cauchy-Riemann equations; integration; Cauchy's theorem; contour integrals; Taylor and Laurent expansions; residue theory; conformal mappings and applications; analytic continuation and Riemann surfaces.
Instruction: Lectures, tutorials, assignments and group discussions

174
Assessment: Assignments, class tests and examination
Credits: 22
Pre-requisites: MAT 211 and MAT 212.

MAT 303: Real Analysis
Purpose: The module follows MAT 224 and is the third stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics and Mathematical Statistics. It also trains learners to think and reason abstractly, logically, critically and creatively in any discipline.
Contents: Metric spaces; introduction to normed spaces; function spaces; Stone Weierstrass theorem; some fixed point theorems and applications; inverse and implicit function theorems; Lebesgue integral; $L^p$-spaces.
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 22
Pre-requisites: MAT 224.

Purpose: The module is the third stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematics and Mathematical Statistics.
Contents: Overview of some numeral systems; Babylonian, Egyptian and Pythagorean mathematics; the Axiomatic Method; Euclid’s elements and non-Euclidean geometry; Hindu, Arabian and European mathematics; analytic geometry; algebraic structure; sets and the fundamental concepts of mathematics; crises in the foundations of mathematics; philosophies of mathematics.
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 22
Pre-requisites: MAT 211 and MAT 212.

MATHEMATICAL STATISTICS AND STATISTICS

Statistical Methods:

STA 114 Descriptive Statistics: Correlation, Regression and the Normal Distribution
Contents: Introduction, preliminary concepts, frequency distributions, graphical representation, measures of central tendency, measures of variability, basic ideas of probability, normal distribution, standard scores, correlations & regression.
Credits: 16
Assessment: One 2-hour paper
Pre-requisites: None
STA 124  Applied Statistical Inference and Estimation
Contents: Sampling distributions, basic principles of statistical inference, estimation and confidence levels, hypothesis testing, parametric and non-parametric tests, tests for stochastic independence, goodness of fit tests.
Credits: 16
Assessment: One 2-hour paper
Pre-requisites: STA 114

Statistics:

The following modules in Statistics are required for Mathematical Statistics at the 200 and 300 level. Candidates must take STA 111 and either STA 121 or STA 122, not both. STA 121 is designed for Science students, whereas STA 122 is more suitable for Commerce students.

STA 111: Descriptive Statistics and Differentiation
Contents: Introduction to Statistics; collection, classification and tabulation of statistical data; graphical representation of statistical data; measures of location and dispersion; basic probability concepts; discrete and continuous probability distributions; linear regression and correlation analysis; differentiation of elementary functions with applications. One weekly tutorial.
Credits: 16
Assessment: One 2-hour examination paper
Pre-requisites: Matriculation Mathematics with at least an E symbol (SG) or NSC pass at level 4

STA 121: Estimation, Hypothesis Testing and Elementary Integration
Contents: Sampling distributions; Point estimates and confidence intervals; Parametric and non-parametric hypothesis testing; Analysis of variance (ANOVA); Integration of elementary functions. One tutorial per week.
Credits: 16
Assessment: One 2-hour paper
Prerequisite: STA 111.

STA 122: Estimation, Hypothesis Testing and Statistics for Economists
Contents: Sampling distributions; Point estimates and confidence intervals; Parametric and non-parametric hypothesis testing; Analysis of variance (ANOVA); Index numbers; Time Series. One tutorial per week.
Credits: 16
Assessment: One 2-hour paper
Prerequisite: STA 111.

Mathematical Statistics:

Candidates have to choose between (1) STM 211 + STM 221 or (2) STM 212 + STM 222. The first combination requires Mathematics at the 100 level, while the second combination requires Statistics at the 100 level.
STM 211: **Introduction to Mathematical Statistics A**
Contents: Axioms of probability; conditional probability and independence; random variables and distributions; 2- and higher dimensional random variables; expected values and moments; moment generating functions; the law of large numbers and the Central Limit Theorem. One compulsory practical session per week.

Credits: 24
Assessment: One 3-hour paper
Pre-requisite: MAT 111 and 121; or at least 60% final mark for MAT 112 (MAT 122) and MAT 123 (MAT 113).

STM 212: **Introduction to Mathematical Statistics B**
Contents: Series; partial differentiation; probability, conditional probability and stochastic independence; random variables; independence of random variables; 2- and higher dimensional random variables including functions of random variables; expected values and moments; moment-generating functions with some properties and applications; the law of large numbers and the central limit theorem with applications; discrete distributions. One compulsory practical session per week.

Credits: 24
Assessment: One 3-hour paper
Prerequisite: At least 60% in STA 121.

STM 221: **Introduction to Mathematical Statistics C**
Contents: Continuous distributions; Applied hypothesis testing; Introduction to sampling theory; Point and Interval estimation of parameters; Bayes estimates; Linear regression and correlation. One compulsory practical session per week.

Credits: 24
Assessment: One 3-hour paper
Prerequisite: STM 211.

STM 222: **Introduction to Mathematical Statistics D**.
Contents: Continuous distributions; Applied hypothesis testing; Introduction to sampling theory; Point and Interval estimation of parameters; Bayes estimates; Linear regression and correlation. One compulsory practical session per week.

Credits: 24
Assessment: One 3-hour paper.
Prerequisite: STM 212.

STM 312: **Advanced Mathematical Statistics A1**
Purpose: Learners are to acquire an advanced knowledge of the statistical techniques applied in the derivation of optimal methods for analysing data.

Contents: Transformation of random variables, Order statistics, Families of random variables, Sampling distributions, Limiting distributions and stochastic convergence, Point estimation and properties of estimates, Quadratic forms, Multivariate normal distribution.
Instruction: Lectures: 3 hours per week for 13 weeks, Tutorials: One 3 hour session per week.
Credits: 16
Assessment: Continuous assessment through participation in lectures and tutorials, short assignments and through two major tests. One summative assessment through one 3-hour examination.
Pre-requisites: STM221 or STM222

**STM 313 : Introductory Applied Statistics B1**

**Purpose:** Learners are to acquire advanced knowledge of statistical techniques applied in deriving optimal methods of analysing data.

**Contents:** Normal Z-score test for one and two independent populations. Student's t-test for one and two independent populations. Mann-Whitney U-test. Paired samples t-test and Wilcoxon’s Signed rank test for two dependent populations. One-way fixed effects ANOVA, Kruskal-Wallis test and Two-way fixed effects ANOVA for tests concerning more than two independent populations. Least significant difference and Honestly significant difference-Tukey, Scheffe for Multiple comparison procedures. Chi-square goodness of fit test and Chi-square test for independence for testing the association between categorical variables.

**Instruction:** Lectures: 3 lectures per week for 13 weeks, Tutorials/Practical: One 3-hour session per week.

**Credits:** 16

**Assessment:** Continuous assessment through participation in lectures and tutorials, short assignments and through two major tests. One summative assessment through one 3-hour examination.

**Pre-requisites:** STM221 or STM222

**STM 322 : Advanced Mathematical Statistics A2**

**Purpose:** Learners are to acquire an introductory knowledge of statistical software packages and develop skills in computerised statistical data analysis.


**Instruction:** Lectures: 3 hours per week, Tutorials: One hour per week, Practical: One 3-hour session per week.

**Credits:** 16

**Assessment:** Continuous assessment through participation in lectures and tutorials, practical work, short assignments, two major tests and one summative assessment through one 3-hour examination.

**Pre-requisites:** STM312

**STM 323 : Introductory Applied Statistics B2**

**Purpose:** Learners are to acquire an introductory knowledge of statistical software packages and develop skills in computerised statistical data analysis.

Instruction: Lectures: 3 hours per week, Tutorials: One hour per week, Practicals: One 3-hour session per week.

Credits: 16

Assessment: Continuous assessment through participation in lectures and tutorials, practical work, short assignments and two major tests. One summative assessment through one 3-hour examination.

Pre-requisites: STM313

MICROBIOLOGY

MIC 211: Introduction to Microbiology
Purpose: Introduce the learner to the microbial world and the techniques used in studying microorganisms, thus laying a foundation for a better understanding of specialized branches of microbiology.

Contents: The history and scope of microbiology; the taxonomy of microorganisms; the anatomy of microorganisms; the nutrition of microorganisms; the growth of microorganisms; disinfection and sterilization; the immune system; and viruses.

Instruction: Lectures 120 minutes per week; Practicals: 2 x 3-Hour sessions per week; Tutorials: 90 minutes per week

Credits: 16

Assessment: Formal tests, short surprise tests, assignments and practicals, formal 3 hour examination.

Prerequisite: PAC 110 & PAC121 plus BOT 111 or ZOO 111 or BIO111

MIC 212: Mendelian Genetics & Chromosomal inheritance
Purpose: An introduction to microbial genetics through Mendelian genetics and chromosomal inheritance.

Contents: Principle of Mendelian inheritance: mono-, di- and trihybrid crosses; test cross; dominance, co-dominance and incomplete dominance; multiple alleles; non-allelic gene interactions; mitosis and meiosis; chromosomal basis of inheritance; sex chromosomes; linked genes and linkage analysis; mechanisms of crossing over; chromosome mapping.

Instruction: Lectures 120 minutes per week. Practicals: 2 x 3-Hour sessions per week. Tutorials: 90 minutes per week

Credits: 8 credits

Assessment: Formal tests, short surprise tests, assignments and practicals, formal examination.

Prerequisite: PAC 110, plus ZOO 111 or BOT 111
MIC 221: **Soil and Environmental Microbiology**  
**Purpose:** Introduction to basic principles in soil microbiology and the role of soil microbes in the environmental biogeoecycles.  
**Contents:** History and scope of soil microbiology; diversity of microbial world; nutritional classification; soil bacterial metabolism and soil cycles; microbial soil interactions.  
**Instruction:** Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week. Tutorials: 90 minutes per week  
**Credits:** 12 credits  
**Assessment:** Formal tests, short surprise tests, assignments and practicals, formal examination.  
**Prerequisite:** MIC 211

MIC 222: **Microbial Genetics**  
**Purpose:** An introduction to microbial genetics  
**Contents:** Historical background; the Watson/Crick model of DNA and the bacterial gene structure; DNA replication, transcription and translation; types of mutations and detection; bacterial transformation and transduction; the lactose operon.  
**Instruction:** Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week. Tutorials: 90 minutes per week  
**Credits:** 12 credits  
**Assessment:** Formal tests, short surprise tests, assignments and practicals, formal examination.  
**Prerequisite:** MIC 211 and MIC 212

MIC 311: **Microbial Physiology and Metabolism**  
**Purpose:** Discuss the physiology of microbial cells in order to gain a better understanding of their structure and functions, the way in which they take-up nutritive materials and metabolize them; and examine the process of morphogenesis and differentiation in microbial cells, as well as why and how microorganisms communicate.  
**Content:** Coverage of the basic areas of cell structure and functions; substrate uptake and entry to the cell; carbohydrates metabolism and energy production; metabolism of lipid, sterol and nitrogen; metabolism of amino acids, purine and pyrimidine; microbial growth and its regulation; morphogenesis, differentiation and intercellular interaction in microbial world.  
**Instruction:** Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week. Tutorials: 90 minutes per week  
**Credits:** 16  
**Assessment:** Formal tests, short surprise tests, assignments and practicals, formal examination.  
**Prerequisite:** MIC 211

MIC 312: **Immunology, Virology and Antimicrobial Chemotherapy**  
**Purpose:** Provide the learners with important knowledge on the immune system and its mechanisms for protecting the body from pathogens and the response of infectious agents as well as to outline the major viruses involved in human diseases and how the major antibiotic and drugs
work, the mechanisms involved in the damage of pathogen while causing minimal damage to the host.

Contents: Structure and properties of certain viruses; viruses involved in human diseases; structure of immunoglobulins; immunoglobulin genetics; fundamentals of the immune response; theories of antibody synthesis; interaction of antigen and antibody; hypersensitivity reactions; immunity; general properties of antimicrobial, antibacterial, antiviral, antifungal, anti-protozoal, anthelminthic agents; clinical strategies of the prescription of antibiotics; chemotherapeutic agents; biotechnological aspects involved in development of antimicrobial and chemotherapeutic agents.

Instruction: Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week.

Credits: 16

Assessment: Formal tests, short surprise tests, assignments and practicals, formal examination.

Prerequisite: MIC 211

MIC 321: Molecular Biology and Basic Genetic Engineering

Purpose: Review the general concept of heredity and explain the recombinational processes by which genes are exchanged and the natural ways by which DNA is transferred from one cell to another; and discuss practical applications of microbial genetics and the technology arising from it. Equip learners with basic molecular cloning techniques such as restriction digestion and agarose gel electrophoresis, hybridization, etc.

Contents: Biosynthesis of DNA, RNA and proteins; repair mechanisms and recombination; techniques used in nucleic acid manipulations; types of plasmids and the main vector types used in molecular cloning; basic genetic engineering.

Instruction: Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week. Tutorials: 90 minutes per week

Credits: 16

Assessment: Formal tests, short surprise tests, assignments and practicals, formal examination.

Prerequisite: MIC 212

MIC 322: Applied Microbiology and Biotechnology

Purpose: Discuss the diversity of microbial processes and products; the microbiological methodology required to develop a successful biotechnological process from the isolation of the culture to the recovery of the products; and the aspects of food poisonings, spoilage and preservation as well as quality assurance and production control.

Contents: Principle of using microorganisms in industrial processes; the culture - isolation techniques, screening for new or desired products, inoculum development and long-term preservation of industrially important microorganisms; production methods in industrial microbiology – shake-flask, solid-state and continuous culture fermentations; microbiological production of selected foods, drinks, pharmaceuticals and industrial chemicals; product recovery; immobilization techniques and cell culture; food microbiology - food poisoning and other food-borne hazards;
food spoilage and food preservation; food quality assurance and production control – HACCAP system and hazard analysis of food.

Instruction: Lectures 120 minutes per week. Practicals: 1 x 3-Hour sessions per week. Tutorials: 90 minutes per week

Credits: 16

Assessment: Formal tests, short surprise tests, assignments and practicals, formal examination.

Prerequisite: MIC 311

NUMERICAL MATHEMATICS

MNU 111: Introduction to Numerical Mathematics.

Purpose: The module is the initial stage in the process of empowering learners who are going to pursue careers in Engineering, Surveying, Financial Mathematics and Actuarial Science. It also trains learners to think and reason logically, critically and creatively in any discipline. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Boolean logic, set theory, mathematics of computing, probability theory, independence, independent trials, and random variables; introduction to computers; elementary programming.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 16

Pre-requisites: Matriculation Mathematics with pass at level 4, or MAT 011 (021) or an equivalent

MNU 121: Markov Chains, Linear Programming and the Theory of Games.

Purpose: The module follows MNU 111 and is part of the initial stage in the process of empowering learners who are going to pursue careers in Engineering, Surveying, Financial Mathematics and Actuarial Science. It also trains learners to think and reason logically, critically and creatively in any discipline. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.

Contents: Markov Chains; Linear Programming and the Theory of Games.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: Assignments, class tests and examination

Credits: 8

Prerequisite: MNU 111.

MNU 122: Computational Methods

Purpose: The module follows MNU 111 and is part of the initial stage in the process of empowering learners who are going to pursue careers in Engineering, Surveying, Financial Mathematics and Actuarial Science. It also trains learners to think and reason logically, critically and creatively in any discipline. It seeks to assist learners who want to apply Mathematics in those disciplines, businesses and areas of life that require high-level mathematical skills.
Contents: Error Analysis, Solutions of Non-linear Equations with one variable; solutions to linear systems using Gauss elimination method; curve fitting; introduction to numerical differentiation and integration.

Instruction: Lectures, tutorials, assignments and group discussions
Assessment: Assignments, class tests and examination
Credits: 8
Prerequisite: MNU 111.

PHYSICS

The first year modules in Physics are offered in two streams, viz. Physics Major and Physics Ancillary. The latter is offered over two semesters at the 100 level and is intended for learners who would like a background in Physics without calculus (i.e. an average background in Mathematics), and who would major in Biochemistry, Botany, Chemistry, Entomology, Microbiology and/or Zoology. Candidates who have successfully completed these ancillary modules would not ipso facto qualify to do a second year in Physics, but may apply to the Head of Department for admission, who will make a recommendation to the Faculty.

The Physics Major programme is intended for learners who would like to continue their studies in Physics to the 200 and 300 level and who have a good background in Mathematics.

Physics 100 Major Modules

**PHY 111: Mechanics of a Particle**
Purpose: To build up competence in basic principles of mechanics, that is problem solving skills, experimentation and data analysis. To build a basic understanding of the mechanics of a particles and applications.
Contents: Vectors and scalars; kinematics; dynamics of a particle; work and energy; Newton's laws and their applications. Conservation of energy; momentum and impulse; rotational motion; gravitation; periodic motion; fluid mechanics
Instruction: Lectures, laboratory course, and tutorials.
Credits: 8
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 111 or MAT 112 (MAT 122).

**PHY 111F** Refer to PHY 111 for information.

**PHY 112: Properties of Matter and Thermodynamics**
Purpose: To build up competence in basic principles of heat transfer, that is problem solving skills, experimentation and data analysis. To build a basic understanding and application of the three Thermodynamic Laws in simple cases.
Contents: Elasticity, fluids, heat and thermodynamics; first law of thermodynamics; heat engines; internal combustion engines;
refrigerators; Carnot cycle; second law of thermodynamics; entropy and solar applications.

Instruction: Lectures, laboratory course, and tutorials.
Credits: 8
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 121 or MAT 123 (MAT 113).

**PHY 121: Electricity and Magnetism**

**Purpose:** To provide competence in basic electromagnetic theory, that is problem solving skills, experimentation and data analysis in simple electrical circuits. These skills are of fundamental importance and are relied heavily upon by many other fields in physics and engineering.

**Contents:** Electric charge; conductors and insulators; electric field; Coulomb’s law; Gauss’ law; electric potential. Electricity: electric current; resistivity and resistance; energy in electric circuits; DC circuits; Kirchhoff’s rules; electrical measuring instruments; magnetic field and magnetic forces; sources of magnetic field

Instruction: Lectures, laboratory course, and tutorials.
Credits: 8
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 121 or MAT 123 (MAT 113).

**PHY 122: Waves, Vibrations & Optics**

**Purpose:** To introduce sinusoidal waves. To develop the understanding of mechanical waves and investigate the nature of light and its propagation. To study geometric optics and understand interference diffraction.

**Contents:** Introduction to electromagnetic waves; sinusoidal waves; energy in electromagnetic waves; standing waves; electromagnetic spectrum; mechanical waves; superposition and normal modes. Optics: nature of light and its propagation; geometric optics; optical instruments; interference diffraction.

Instruction: Lectures, laboratory course, and tutorials.
Credits: 8
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 11 or MAT 112 (MAT 122).

**PHY 122F** Refer to PHY 112 for information.

**PHY 113F** Refer to PHY 121 for information.

**PHY 123F** Refer to PHY 122 for information.

184
Physics 100 Ancillary Modules

PHY 113: Elementary Mechanics

Purpose: This module is meant to be a service course in those programmes which only need it as an ancillary module such as agriculture and medicine. Students may be allowed to move vertically with the physics major course provided s/he gets an average of 75%.

Contents: Mechanics of solids; measurements; vectors and scalars; kinematics at constant acceleration; circular motion; forces in equilibrium; laws of motion; conservation of energy of momentum. Statics; torques and equilibrium of a rigid body; rigid body motion; angular momentum; hydrostatics and hydrodynamics; flow meters; viscosity.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 8

Assessment: Major tests, laboratory reports, assignments, and two-hour examination paper.

Pre-requisites: Matriculation Mathematics

PHY 114: Heat and Modern Physics

Purpose: To build up competence in basic principles of heat transfer, Thermodynamics and Modern Physics, that is problem solving skills, experimentation and data analysis in these fields.

Contents: Heat: temperature and expansion; quantity of heat; heat transfer; phase change; methods of heat transfer; thermal properties of matter; first and second laws of thermodynamics. X-ray production; photons; photo-electric effect; Compton effect; Bohr’s atomic nucleus; carbon-14 dating; biological effects.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 8

Assessment: Major tests, laboratory reports, assignments, and two-hour examination paper.

Pre-requisites: Matriculation Mathematics

PHY 114F: Refer to PHY114 for information

PHY115F Refer to PHY113 for information

PHY 123: Electromagnetism

Purpose: To provide competence in basic electromagnetic theory (without using calculus), that is problem solving skills, experimentation and data analysis in simple electrical circuits. This module is meant to be a service course in those programmes which only need it as an ancillary module such as agriculture and medicine to mention a few. Students may be allowed to move vertically with the physics major course provided s/he gets an average of 75%.

Contents: Electric forces, fields and electric currents; resistance and electromotive force; Ohm’s law and Kirchhoff’s law; voltmeter, ohmmeter, ammeter; electrical safety; magnetic force on a moving charge and current.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 8
Assessment: Major tests, laboratory reports, assignments, and two-hour examination paper.
Pre-requisites: Matriculation Mathematics.

**PHY 124: Waves and Optics**
Purpose: To introduce sinusoidal waves. To develop the understanding of mechanical waves and investigate the nature of light and its propagation. To study geometric optics and understand interference diffraction.
Contents: Electro-magnetic waves and applications; nature and propagation of light; reflection and refraction; images formed by a single surface; lenses and optical instruments. Phenomena: transverse and longitudinal waves; reflections and normal modes; acoustic phenomena. Wave properties of light; mirrors, lenses and optical instruments.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 8
Assessment: Major tests, laboratory reports, assignments, and two-hour examination paper.
Pre-requisites: Matriculation Mathematics

**PHY 124F: Refer to PHY124 for information**

**PHY 125F: Refer to PHY123 for information**

**PHY 211: Mechanics**
Purpose: To provide a thorough understanding and knowledge of the mechanics of one-particle systems and system of particles; to provide an introduction to damped harmonic oscillations, rigid body rotation and collisions in one and two dimensions.
Contents: Dynamics of a one-particle system; damped harmonic oscillator; central forces and system of particles; rigid body rotation; collisions.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 12
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 111 and MAT 121 or MAT 123.
Co-requisite: MAT 211 and MAT 212 or MAP 211.

**PHY 212: Electromagnetism and AC Theory**
Purpose: To study the energy of a system of charges; to study the differences between the integrals of different concepts; Analyse Laplace’s equation and develop some basics in AC.
Contents: Energy of a system of charges; line integral of the electric field; the gradient and the divergence; Laplace’s equation; Thevenin’s theorem; introduction to AC theory: impedance in RLC series and parallel circuits; resonance, AC bridges, filter networks; power in AC circuits; self- and mutual inductance; transformers.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 12
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 121 and/or MAT 112 or 60% final mark for MAT 112.
Co-requisite: MAT 211 and MAT 212 or MAP 211.

PHY 221: Waves, Vibrations and Optics
Purpose: Core module in one second year curriculum, viz. Physical Science, and an elective at the third year of other Science curricula.
Contents: Fourier series and transforms; normal modes of vibrations. Geometric and physical optics; interference, coherence and incoherence; Fresnel and Fraunhofer diffraction.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 12
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 122.
Co-requisite: MAT 223 or MAP 221.

PHY 222: Advanced Electromagnetism
Purpose: To study the relativistic effects on Coulomb’s law; to apply Maxwell’s equations in solving electromagnetic problems.
Contents: Relativistic effects on Coulomb’s Law; Special Theory of Relativity; fields of moving charges; the curl of a vector function; properties of the magnetic field; Maxwell’s equations of electromagnetism.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 12
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 121 and MAT 121 or MAT 123.
Co-requisite: MAT 223 or MAP 221.

PHY 311: Modern Physics
Purpose: To study atomic physics and the Schrödinger equations.
Contents: Atomic Physics; Planck radiation law; photons; Schrödinger’s equation.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 211 & PHY 221 and MAT 223 or MAP 221.

PHY 312: Thermal Physics
Purpose: To build up the principles of Equilibrium Thermodynamics and kinetic theory and derive the three Thermodynamic Laws. To introduce the concepts heat engines, and to understand how to apply them in simple and complex cases.
Contents: Temperature and zeroth law; intensive and extensive state coordinates; first law of thermodynamics; heat transfer; expansion and equation of state; adiabatic processes; root-mean square values. Kinetic theory of gases; heat engines and refrigerators; second law of thermodynamics; entropy; Maxwell’s distribution of molecular velocities.
PHY 321: Quantum Mechanics and Solid State Physics
Purpose: To introduce students to quantum mechanics; to further develop understanding of Schrödinger’s equations; to introduce the study of solid-state physics.
Contents: Introduction to quantum mechanics; Schrödinger’s equation; crystal structures; free electron theory; band theory; semi-conductors and their applications in PV systems.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 211, PHY 221 and MAT 223 or MAP 221.

PHY 322: Mathematical Methods and Statistical Mechanics
Purpose: To build up the principles of reversible Thermodynamic systems and their entropy. To introduce the concepts of statistical mechanics, and their application in different thermodynamic systems. Enhance the students mathematical background. Enable students to link up physics principles with mathematical theory and its applications.
Contents: Carnot cycle and the thermodynamic temperature scale; entropy and the Second Law of Thermodynamics; principle of caratheodory; exact and inexact differentials; isotherms of a pure substance and the phase equilibrium diagram; mathematical methods and Maxwell’s relation; heat capacity equations; statistical mechanisms of weakly interacting particles; partition function; Maxwell’s distribution of molecular speeds. Vector analysis and operations; Dirac delta function; Theory of vector fields; Tensor analysis; Bessel functions; Legendre polynomials.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, and three-hour examination paper.
Pre-requisites: PHY 211, PHY 221 and MAT 223 or MAP 221.

STATISTICAL METHODS

See Mathematical Statistics.

STATISTICS

See Mathematical Statistics.
ZOOLOGY

Zoology is a three-year major course. Students need to pass all modules (i.e. ZOO 111, ZOO 121, ZOO 212, ZOO 222, ZOO 314, ZOO 315, ZOO 324 and ZOO 325) in order to major in Zoology.

ZOO 111 General Introduction to Animal Biology  
Purpose: Introduces the learner to animal biological systems.  
Contents: Cell structure and function; digestion, circulation and respiration; homeostasis, nervous and endocrine systems; reproduction, genetics and development.  
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week.  
Credits: 16  
Assessment: Continuous assessment through participation in lectures and practical work; at least two theory tests and one practical test will contribute the major portion of the semester mark. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: None.

ZOO 121 Introduction to Animal Diversity  
Purpose: Introduces the learner to the diversity of animal life forms.  
Contents: Invertebrate diversity and classification; vertebrate diversity and classification.  
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week.  
Credits: 16  
Assessment: Continuous assessment through participation in lectures and practical work; at least two theory tests and one practical test will contribute the major portion of the semester mark. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: None.

ZOO 212 Fundamental Concepts in Animal Biology I  
Purpose: To introduce students to fundamental concepts in animal biology; to develop a cognitive approach to zoology.  
Contents: Scientific thinking and method; introductory ecology; fundamentals of evolutionary biology; introduction to animal behaviour.  
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week.  
Credits: 24  
Assessment: Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the major portion of the semester mark. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: At least one module at ZOO 100 level
ZOO 222  Fundamental Concepts in Animal Biology II
Purpose:  To introduce students to fundamental concepts in animal biology; to give students deeper insight into those disciplines in which the Department of Zoology has particular expertise.
Contents:  Scientific thinking and method; introductory ecology; fundamentals of evolutionary biology; introduction to animal behaviour.
Instruction:  Lectures: 180 minutes per week. Practicals: one 3-hour session per week.
Credits:  24
Assessment:  Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the major portion of the semester mark. Summative assessment: one 3-hour theory examination paper.
Pre-requisites:  At least one module at ZOO 100 level

ZOO 314  Animal Diversity and Conservation I
Purpose:  Provides learners with graduate-level knowledge, specific skills and applied competence in fields relating to diversity and conservation.
Contents:  Ecophysiology; systematics, biogeography and evolution;
Instruction:  Lectures: 180 minutes per week. Practicals: one 3-hour session per week.
Credits:  16
Assessment:  Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the major portion of the semester mark. Summative assessment: one 2-hour theory examination paper.
Pre-requisites:  ZOO 111, ZOO 121 and at least one module at ZOO 200 level.

ZOO 315  Animal Diversity and Conservation II
Purpose:  Provides learners with graduate-level knowledge, specific skills and applied competence in fields relating to diversity and conservation.
Contents:  Primate biology and behaviour; biodiversity and conservation.
Instruction:  Lectures: 180 minutes per week. Practicals: one 3-hour session per week.
Credits:  16
Assessment:  Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the major portion of the semester mark. Summative assessment: one 2-hour theory examination paper.
Pre-requisites:  ZOO 111, ZOO 121 and at least one module at ZOO 200 level.

ZOO 324  Animal Ecology and Conservation I
Purpose:  Provides learners with graduate-level knowledge, specific skills and applied competence in fields relating to ecology and conservation.
Contents:  Introduction to ecological modelling; behavioural ecology.
Instruction:  Lectures: 180 minutes per week. Practicals: one 3-hour session per week.
Credits:  16
Assessment:  Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the
major portion of the semester mark. Summative assessment: one 2-hour theory examination paper.

Pre-requisites: ZOO 111, ZOO 121 and ZOO 212.

ZOO 325 Animal Ecology and Conservation II
Purpose: Provides learners with graduate-level knowledge, specific skills and applied competence in fields relating to ecology and conservation.
Contents: Aquaculture; research techniques in animal ecology.
Instruction: Lectures: 180 minutes per week. Practicals: one 3-hour session per week.
Credits: 16
Assessment: Continuous assessment through participation in lectures and practical work; class tests, practical reports and assignments will contribute the major portion of the semester mark. Summative assessment: one 2-hour theory examination paper.

Pre-requisites: ZOO 111, ZOO 121 and ZOO 212.

SCHOOL OF HEALTH SCIENCES

NURSING SCIENCE DEGREES

Rules for Nursing Science degrees
The rules and regulations which follow must be read in conjunction with those of the Faculty of Science and Agriculture, the provisions of the Higher Education Act, the University Statute, and the general rules and regulations of the University. Where a learner includes a module(s) from another faculty in the curriculum, the rules and regulations of that faculty apply to that/those module(s).

THE DEGREE BACCALAUREUS CURATIONIS (44000)

NSc 1. Admission
It is recommended that Mathematics, Physical Science and Biology be taken as Matriculation subjects. Every learner shall register at the University and shall be awarded a bursary under the jurisdiction of the Department of Health of the Eastern Cape Province. This appointment shall be on the recommendation of the Head of Department of Nursing Sciences of the University. Students shall adhere to the regulations governing such posts.

NSc 2. Duration
2.1 The curriculum shall extend over a minimum period of four years of full-time study. It entails systematic professional practice instruction, which includes laboratory and clinical training, and shall extend over the full period of the module of study. Clinical training shall be done in general and midwifery hospitals, psychiatric hospitals and community health service facilities in the Eastern Cape Province.

2.2 Practical and clinical training: All facets of clinical training including the scope and timetable will be arranged by the Head of Department of Nursing Sciences.
### NSc 3 Curriculum
Candidates for the degree follow a fixed curriculum consisting of the following modules.

<table>
<thead>
<tr>
<th>Year Level</th>
<th>Semester 1</th>
<th>Credits</th>
<th>Semester 2</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>One</strong></td>
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<tr>
<td>Fundamental Nursing Science</td>
<td>NBG 111E</td>
<td>16</td>
<td>NBG 121E</td>
<td>16</td>
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<td>NCH 111E</td>
<td>8</td>
<td>NCH 121E</td>
<td>8</td>
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<tr>
<td>Anatomy</td>
<td>NAN 111E</td>
<td>12</td>
<td>NAN 121E</td>
<td>12</td>
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<tr>
<td>Sociology 1</td>
<td>SOC 111E</td>
<td>16</td>
<td>SOC 122E</td>
<td>16</td>
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<tr>
<td>English for Special Purposes</td>
<td>ENS 111E</td>
<td>16</td>
<td>ENS 122E</td>
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<td>Computer Literacy</td>
<td>CPL 101E</td>
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<td><strong>Two</strong></td>
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<tr>
<td>Medical/Surgical Nursing</td>
<td>NBG 211E</td>
<td>16</td>
<td>NBG 221E</td>
<td>16</td>
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<td>Psychology 1</td>
<td>PSY 111E</td>
<td>16</td>
<td>PSY 122E</td>
<td>16</td>
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<tr>
<td>Nursing Pharmacology</td>
<td>NPP 111E</td>
<td>16</td>
<td>NPP 121E</td>
<td>8</td>
</tr>
<tr>
<td>Physiology</td>
<td>NPH 111E</td>
<td>16</td>
<td>NPH 121E</td>
<td>12</td>
</tr>
<tr>
<td>Introduction to Pathogens</td>
<td></td>
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<tr>
<td><strong>Three</strong></td>
<td></td>
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<tr>
<td>Specialised Nursing Care</td>
<td>NBG 311E</td>
<td>16</td>
<td>NBG 321E</td>
<td>16</td>
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<tr>
<td>Midwifery I</td>
<td>NBM 111E</td>
<td>12</td>
<td>NBM 121E</td>
<td>12</td>
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<td>NBC 111E</td>
<td>12</td>
<td>NBC 121E</td>
<td>12</td>
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<td>12</td>
<td>NBP 121E</td>
<td>12</td>
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<td>16</td>
<td>SOC 221E or PSY 221E</td>
<td>16</td>
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<td>16</td>
<td>NBZ 421E</td>
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<td>16</td>
<td>NBP 221E</td>
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<td>16</td>
<td>NBM 221E</td>
<td>16</td>
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<td>Community Nursing Science 2</td>
<td>NBC 211E</td>
<td>16</td>
<td>NBC 221E</td>
<td>16</td>
</tr>
</tbody>
</table>

### NSc 4. Determination of year of study

4.1 To be promoted to the 200 level, a candidate must have passed all the modules at 100 level.
4.2 To be promoted to the 300 level, a candidate must have passed all the modules at 200 level.
4.3 To be promoted to the 400 level, a candidate must have passed all the modules at 300 level.
4.4 A learner who is repeating any module must continue his/her clinical nursing training in the clinical areas as stipulated by the Head of Department.
4.5 No student shall be permitted to register for higher level courses whilst carrying outstanding clinical practica from the preceding level of study.

### NSc 5. Examinations (Assessments)

5.1 The semester mark and examination mark shall each count 50% towards the final mark in a module.
5.2 A sub minimum of 40% shall apply in all Nursing courses.
5.3 No candidate shall be admitted to the examination at the end of a module unless s/he has attended at least 85% of the lectures and has met all the prescribed clinical requirements.
5.4 For all subjects with both theoretical and practical components, as well as Anatomy and Physiology the following rules will apply:
5.4.1 Credit will only be given if both the practical and theoretical components are passed.
5.4.2 Where the candidate fails one of the two components s/he may be granted a supplementary examination in the component which was failed (for this purpose only, the practical and theoretical components will be considered as separate modules);

5.4.3 A candidate who fails a supplementary examination must repeat the entire module.

5.4.4 To pass the examination in the practical component of the module, a candidate must obtain at least 50% in the practical examination.

5.4.5 Throughout the duration of study, a candidate may be admitted to a supplementary practical examination in any module in which the practical examination was failed, provided a mark of at least 45% was obtained in the initial practical examination.

5.4.6 A fourth year student may be granted permission to write supplementary in a course, regardless of the mark obtained provided it is the last remaining requirement for the degree.

NSc 6. Distinction
To obtain the degree with distinction, a candidate must obtain an average of at least 70% for all modules in the third and fourth years of study and must, in addition, obtain at least 75% in each of the following:
Midwifery at 200 levels
Community Nursing Science at 200 levels
General Nursing Science at 300 levels
Psychiatric Nursing Science at 200 levels

<table>
<thead>
<tr>
<th>Subject</th>
<th>Course Code</th>
<th>Prerequisite</th>
</tr>
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<tbody>
<tr>
<td>Basic Chemistry and Biophysics for Nursing Science</td>
<td>NCH 111E</td>
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<tr>
<td>Organic Chemistry and Biophysics for Nursing Science</td>
<td>NCH 121E</td>
<td>NCH 111E</td>
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<tr>
<td>Primary Health Care</td>
<td>NBC 111E</td>
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<tr>
<td>Epidemiology and Community development</td>
<td>NBC 121E</td>
<td>NBC 111E</td>
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<tr>
<td>Care of Clients in Specialized Setting</td>
<td>NBC 211E</td>
<td>NBC 121E</td>
</tr>
<tr>
<td>Research and planning of Health Services</td>
<td>NBC 221E</td>
<td>NBC 211E</td>
</tr>
<tr>
<td>Basic Nursing and Nursing Process</td>
<td>NBG 111E</td>
<td>None</td>
</tr>
<tr>
<td>Human Needs and Nursing Process</td>
<td>NBG 121E</td>
<td>NBG 111E</td>
</tr>
<tr>
<td>Medical/Surgical Nursing 1</td>
<td>NBG 211E</td>
<td>NBG 121E &amp; NAN 121E</td>
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<td>Medical/ Surgical Nursing 2</td>
<td>NBG 221E</td>
<td>NBG 211E</td>
</tr>
<tr>
<td>Specialized Nursing Care 1</td>
<td>NBG 311E</td>
<td>NBG 221E &amp; NPH 121E &amp; NCH 121E &amp; NMP 121E</td>
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<tr>
<td>Specialized Nursing Care 2</td>
<td>NBG 321E</td>
<td>NBG 311E</td>
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<tr>
<td>Introduction to Human Anatomy 1</td>
<td>NAN 111E</td>
<td>None</td>
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<tr>
<td>Introduction to Human Anatomy 2</td>
<td>NAN 121E</td>
<td>NAN 111E</td>
</tr>
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<td>Physiological Process 1</td>
<td>NPH 111E</td>
<td>NAN 121E</td>
</tr>
<tr>
<td>Physiological Process 2</td>
<td>NPH 121E</td>
<td>NPH 111E</td>
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<tr>
<td>Normal Pregnancy and Normal Child Birth</td>
<td>NBM 111E</td>
<td>NPH 121E</td>
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<td>Normal Newborn &amp; Puerperium</td>
<td>NBM 121E</td>
<td>NBM 111E</td>
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<tr>
<td>Complications of childbearing</td>
<td>NBM 211E</td>
<td>NBM 121E</td>
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<td>Newborn Complications and Contemporary Issues in Maternal and Child Health</td>
<td>NBM 221E</td>
<td>NBM 211E</td>
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<td>Administrative and Management Process</td>
<td>NBA 111E</td>
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<tr>
<td>Subject</td>
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<td>Prerequisite</td>
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<tr>
<td>Unit Management and Administration</td>
<td>NBA 121E</td>
<td>NBA 111E</td>
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<td>Aspects of Human Resource Management</td>
<td>NBA 211E</td>
<td>NBA 121E</td>
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<tr>
<td>Diverse issues in Health Management</td>
<td>NBA 221E</td>
<td>NBA 211E</td>
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<tr>
<td>Contemporary Issues In Nursing and Health Management</td>
<td>NBA 311E</td>
<td>NBA 221E</td>
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<tr>
<td>The Research Process</td>
<td>NBA 312E</td>
<td>NBA 221E</td>
</tr>
<tr>
<td>Administration and Management of Human Resources for Health</td>
<td>NBA 321E</td>
<td>NBA 311E</td>
</tr>
<tr>
<td>Teaching/Learning Process</td>
<td>NBE 111E</td>
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<tr>
<td>Educational Technology and Professionalism</td>
<td>NBE 121E</td>
<td>NBE 111E</td>
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<tr>
<td>Philosophy of Nursing Education</td>
<td>NBE 211E</td>
<td>NBE 121E</td>
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<tr>
<td>Evaluation and Andragogics</td>
<td>NBE 221E</td>
<td>NBE 211E</td>
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<td>Comparative Studies</td>
<td>NBE 311E</td>
<td>NBE 221E</td>
</tr>
<tr>
<td>Contemporary Issues in Nursing Education</td>
<td>NBE 321E</td>
<td>NBE 311E</td>
</tr>
<tr>
<td>Introduction to Pathogens</td>
<td>NMP 121E</td>
<td>NAN 121E &amp; NPH 111E</td>
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<tr>
<td>Nursing Pharmacology 1</td>
<td>NPP 111E</td>
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<tr>
<td>Nursing Pharmacology 1</td>
<td>NPP 121E</td>
<td>NPP111E</td>
</tr>
<tr>
<td>Ethos of Nursing and Nursing Management</td>
<td>NBZ 411E</td>
<td>NBG 321E</td>
</tr>
<tr>
<td>Research in Nursing</td>
<td>NBZ 421E</td>
<td>NBZ 411E</td>
</tr>
<tr>
<td>Orientation to Psychiatry; Mental Health and Illness</td>
<td>NBP 111E</td>
<td>NPH 121E</td>
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<tr>
<td>Application of the Nursing Process Across the lifespan</td>
<td>NBP 121E</td>
<td>NBP 111E</td>
</tr>
<tr>
<td>Psychiatric &amp; Interpersonal Skills; Contemporary Psychiatric Issues</td>
<td>NBP 211E</td>
<td>NBP 121E</td>
</tr>
<tr>
<td>Theories of Helping; Community Psychiatry and Related Issues</td>
<td>NBP 221E</td>
<td>NBP 211E</td>
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</tbody>
</table>

DESCRIPTION OF NURSING SCIENCE MODULES

BIOPHYSICAL SCIENCE

**NCH 111E:** Basic Chemistry and Biophysics for Nursing Sciences.

**Purpose:** To introduce the learners to the fundamentals of basic chemistry and physics.

**Contents:** Matter, atomic structure and nuclear chemistry; mole concept, solutions and colloids; liquid, acids and bases; state of matter; velocity, acceleration, work, force and energy; mechanics; electricity and bio-electronic equipment; heat, sight and hearing.

**Instruction:** Lectures; tutorials and practical laboratory

**Credits:** 8

**Assessment:** Major tests, class tests, assignments, practical projects, lecture and practical attendance and one three - hour examination paper internally moderated.

**Prerequisite:** None
NCH 121E: Organic Chemistry and Biophysics for Nursing Sciences.
Purpose: To equip students with an in-depth knowledge of carbon chemistry in order to appreciate the importance of organic carbon in nutritional and health related issues.
Contents: Hydrocarbons, substituted hydrocarbons, alcohols, carboxylic acids and their derivatives; carbohydrates, lipids, amino acids and proteins, hormones, vitamins, enzymes, metabolism, antibodies and nutrition, nucleic acids.
Instruction: Lectures; tutorials and practical instruction
Credits: 8
Assessment: Major tests, class tests, practical tests, assignments, and one three-hour examination paper internally moderated.
Prerequisite: NCH 111E

COMMUNITY NURSING SCIENCE

NBC 111E: Primary Health Care.
Purpose: To prepare nurse practitioners to function at primary health level of care within Comprehensive framework of the District health services.
Contents: Historical overview of the development of Community Nursing Science; international health service; comprehensive health care systems; primary health care; nutrition; integrated management of childhood infections; management of HIV in children; sexually transmitted infections; South African Health Policy Guidelines; White paper for the transformation of the health System in South Africa, District Health Systems.
Instruction: Group discussion, Role-play, Experiential learning, Peer group teaching/learning
Credits: 12
Assessment: Formative and summative evaluation: Continuous assessment through projects; health education talks; Tests, one three-hour examination paper; workbooks; and assignments.
Prerequisite: None

NBC 121E: Epidemiology and Community Development.
Purpose: To prepare nurse practitioners to function as primary health level of care within Comprehensive framework of the District health services.
Contents: Demographic aspects and health care statistics; prevention of communicable and non-communicable diseases, introduction to health education; Epidemiology; Tuberculosis control; home based care and community based care; acute HIV/AIDS care; opportunistic infections; expanded programme of immunization.
Instruction: Group discussion, Role-play, Experiential learning, Peer group teaching/learning
Credits: 12
Assessment: Formative and summative evaluation: Continuous assessment through projects, workbooks, and assignments; health education talks; tests; one three-hour examination paper, and one objective structured clinical evaluation. (OSCE).
Prerequisite: NBC 111E
**NBC 211E: Care of Clients in Specialized Settings.**

**Purpose:** The purpose of this module is to develop community-nursing students’ knowledge and skills so that they acquire the ability to plan, implement and evaluate health service delivery for clients in specialized settings.

**Contents:** Occupational health services; school health services; maternal, child and women’s health; youth and adolescent health, health education; physical assessment; care of the individuals in urban, peri urban and rural community settings; care and management of HIV positive clients, including ARV treatment; essential drug list standard guidelines.

**Instruction:** Lectures, group discussions; collaborative learning approaches; self-directed learning; role-play; student-led seminars; community-based learning experiences; problem-based learning.

**Credits:** 16

**Assessment:** Theoretical component counts for 70% (tests, assignments, case study analysis, seminar work and group projects). Practical component counts for 30% (clinical evaluation, objective structured clinical evaluation (OSCE), and oral examination).

**Prerequisite:** NBC 121E

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**NBC 221E: Research and Planning of Health Services.**

**Purpose:** The purpose of this module is to equip students with community nursing knowledge and skills to enable them to plan, implement and evaluate health services within the primary health care framework.

**Contents:** Family planning services; research process; genetic services; planning of health services; family health; family violence; care of the homeless clients; common problems in the community; economic influences in community nursing; Use of mass media in Health education; Indicator driven health Information systems.

**Instruction:** Lectures, group discussions; collaborative learning approaches; self-directed learning; role-play; student-led seminars; community-based learning experiences; problem-based learning.

**Credits:** 16

**Assessment:** Theoretical component counts for 70% (tests, assignments, case study analysis, Seminar work and group projects). Practical component counts for 30% (clinical evaluation, objective structured clinical evaluation (OSCE), and oral examination).

**Prerequisite:** NBC 211E

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**FUNDAMENTAL NURSING SCIENCE**

**NBG 111E Basic Nursing and Nursing Process**

**Purpose:** To provide an introduction to basic needs of man using the primary health care approach, for all age groups at individual, family, and community levels including groups at high risk along the health and illness-continuum.

**Contents:** Introduction to nursing science, health and illness; promoting well-being through lifespan; elements of holistic care; nursing process; basic nursing skills; nutrition through the lifecycle; interpersonal skills; infection control; life orientation; introduction to midwifery; introduction to community nursing science; first aid; nature of nursing and ethical...
conduct; basic concepts relating to the management of HIV/AIDS; environmental health; health education and aspects of professional practice including theories of nursing relevant to this level.

Instruction: Group discussion, role-play, lectures (formal and informal), case studies and demonstrations.

Credits: 16

Assessment: Tests, assessments, class work, case study, family study and community survey. One three-hour examination paper internally moderated and objective structured clinical evaluation (OSCE).

Prerequisites: None

**NBG 121E**  Human Needs and Basic Nursing Care

**Purpose:** To equip the learners with the knowledge, skills and values of meeting the basic needs of man along the health/illness continuum throughout life span using the scientific approach.

**Content:** Basic human needs, development of nursing care plans for basic nursing care; the unconscious patient; hemorrhage, shock; pre and post operative care; medico-legal hazards; the terminally ill patient;

**Instruction:** Group discussion, learner presentation, resource-based learning, self directed learning, role-play, lectures (formal and informal), and demonstrations.

**Credits:** 16

**Assessment:** Tests, assessments, class work, case study, and one three-hour examination paper internally moderated and objective structured clinical evaluation (OSCE).

**Prerequisites:** NBG 111E

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**GENERAL NURSING SCIENCE**

**NBG 211E**  Medical & Surgical Nursing 1

**Purpose:** To equip the learners with knowledge and skills to care for individuals, families and communities at primary, secondary and tertiary levels using the scientific approach.

**Contents:** General medical and surgical nursing aspects in accordance with the nursing process; digestive system; cardiovascular system and hematological conditions; and respiratory system. Burns, geriatric care, basic concepts relating to HIV/AIDS and opportunistic infections, application of interpersonal skills; health education, concepts relating to immunization and certain aspects of professional practice.

**Instruction:** Small group discussion, experimental learning, class presentations, role-play, practical demonstration, field base teaching, self activities of self directed learning, case studies/scenarios

**Credits:** 16

**Assessment:** Tests, assessments, class work, case study, and one three-hour examination paper internally moderated, objective structure clinical evaluation (OSCE).

**Prerequisite:** NBG 121E and NAN 121E
**NBG 221E  Medical & Surgical Nursing 2**

**Purpose:** To equip the learners with knowledge and skills to care for individuals, families and communities at primary, secondary and tertiary levels using the scientific approach.

**Contents:** General medical and surgical nursing aspects in accordance with the nursing process; endocrine and metabolic disorders; renal system; pediatric medical and surgical conditions; medico-legal aspects; dietary requirements in various conditions; all HIV/AIDS related conditions are integrated in all systems, certain aspects of professional practice, health education and assessment.

**Instruction:** Small group discussion, experimental learning, class presentations, role-play, practical demonstration, field based teaching, self activity of self directed learning, case studies

**Credits:** 16

**Assessment:** Tests, assessments, one three-hour written paper examination paper internally moderated, objective structure clinical evaluation (OSCE).

**Prerequisite:** NBG 121E and NAN 121E

**NBG 311E  Specialized Nursing Care 1**

**Purpose:** To equip the nursing students with knowledge, skills and values for providing safe, organized, holistic and effective care for clients with a range of problems related to: sensory – perceptual alterations; reproductive issues; problem associated with anesthesia. To enable nursing students to nurse effectively, meeting the client’s needs and identify and solve health problems. To determine rationale for nursing decisions and applying relevant knowledge, principles and theories from natural, biological, social and medical sciences; To prepare, support and care for patients during and after investigations and therapeutic procedures; To enable students to draw relevant discharge and nursing care plans for patients undergoing surgical procedures including anaesthesia and anesthetic emergencies; as well as to help student to develop critical thinking and clinical judgment skills.

**Contents:** Sensory perceptual problems: nervous systems, eyes, ears and skin disorders. Reproductive problems: male and female reproductive problems. Autoimmune disorders including HIV/AIDS, nursing care of patients undergoing surgical procedures including anaesthesia and anesthetic emergencies; infection control; administration of medicine; some aspects of professional practice, health education and palliative care.

**Instruction:** Lectures, case studies, problem based learning, small group discussions, clinical demonstrations, seminar presentations

**Credits:** 16

**Assessment:** Assignments, tests, one three-hour written examination paper externally moderated, clinical comprehensive examination. Theory accounts for 70% and practical 30%

**Prerequisite:** NBG 221E, NPH 121E, NCH 121E and NMP 121
**NBG 321E: Specialized Nursing Care 2**

**Purpose:** To enable nursing students to develop cognitive, psychomotor, and affective competencies required to care for a critically ill patient; to enable the students to develop competencies required for comprehensive nursing, for a cancer patient and his family; to enable students to deal with acute and chronic pain; to enable students to care and support clients with physical disabilities and plan for follow up care of such clients and to enable students to develop critical reasoning skills.

**Contents:** Intensive care nursing. The critically ill patients; emergencies in medical and surgical units; medico-legal hazards; nursing care of the chronically ill: orthopaedic nursing, oncology, and rehabilitation principles.

**Instruction:** Lectures, case studies, problem based learning, small group discussions, demonstrations, seminar presentations.

**Credits:** 16

**Assessment:** Assignments, tests, one three-hour written examination paper externally moderated, clinical comprehensive examination. Theory accounts for 70% and practical 30%

**Prerequisite:** NBG 311E

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**HUMAN ANATOMY FOR NURSES**

**NAN 111E: Introduction to Human Anatomy 1**

**Purpose:** To provide a basic understanding of the gross anatomy, histology and embryology of the various organ systems of the human body to first year nursing students.

**Contents:** Introduction to anatomical nomenclature; structure & interaction of cells & tissues, integumentary system, skeletal system, articulations, muscular system and cardiovascular system. Practical work includes practice in microscope skills, histology, gross anatomy, using anatomical models and wet specimens (when available). In addition, students may witness a post mortem in a public mortuary.

**Instruction:** Lectures, tutorials, and laboratory practicals

**Credits:** 12

**Assessment:** Class tests, assignments, practical tests, one three-hour examination paper and one three hour practical examination

**Prerequisite:** None

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**NAN 121E: Introduction to Human Anatomy 2**

**Purpose:** To provide a basic understanding of the gross anatomy, histology and embryology of the various organ systems of the human body to first year nursing students.

**Contents:** Structure of the digestive, urinary, respiratory, reproductive, endocrine & nervous systems. Practical work includes practice in microscope skills, histology, gross anatomy using anatomical models and wet specimens (when available). In addition, students may witness a post mortem in a public mortuary.

**Instruction:** Lectures, tutorials and laboratory practicals.

**Credits:** 12
Assessment: Class tests, assignments, practical test, one three-hour examination paper and one three hour practical examination.
Prerequisite: NAN 111E

**PHYSIOLOGY FOR NURSES**

**NPH 111E: Physiological Processes 1**
*Purpose:* To give a thorough understanding of basic physiological mechanisms as a prerequisite in the training of student nurses.
*Contents:* Cellular & muscle physiology, gastrointestinal physiology, respiratory physiology, cardiovascular physiology, and renal physiology. Practical work will include a variety of physiological principles relevant to nursing such as audiovisuals, enzyme action in digestion, spirometry, respiratory auscultation, blood physiology, blood pressure and pulse determinations, dialysis, filtration, acid-base balance.
*Instruction:* Lectures, tutorials, practical laboratory and field work.
*Credits:* 12
*Assessment:* Class tests, assignments, case studies, practical write-ups and a test and one three-hour examination paper.
*Prerequisite:* NAN 111E & NAN 121E

**NPH 121E: Physiological Processes 2**
*Purpose:* To give a thorough understanding of basic physiological mechanisms as a prerequisite in the training of student nurses.
*Contents:* Endocrinology, metabolism, reproductive physiology, medical genetics, and neurophysiology 1 & 2. Practical work will include experience with a variety of physiological principles relevant to nursing, i.e. human reflex physiology etc.
*Instruction:* Lectures, tutorials, practical laboratory, and field work.
*Credits:* 12
*Assessment:* Class tests, assignments, case studies, research seminar, practical write-ups and a test and one three-hour examination paper.
*Prerequisite:* NAN 121E & NPH 111E

**MIDWIFERY**

**NBM 111E: Normal Pregnancy and Normal Child Birth.**
*Purpose:* To enable the students to function as competent practitioners in regard to women’s health issues as well as the child bearing processes within the primary health framework as well as hospital setting.
*Contents:* Women’s health and women’s rights; history of midwifery; anatomy and physiology affecting conception and child birth; normal pregnancy, normal labour; HIV/AIDS in pregnancy; prevention of mother to child transmission (PMTCT); Antiretroviral drugs within the context of PMTCT, principles of BBI; application of South African Nursing Council (SANC) regulations; health education; interpersonal skills; prevention of infections; immediate care of new born baby and mother; normal labour and partogram.
*Instruction:* Lectures, demonstrations, small group discussions, case studies, seminar presentations, self-directed learning.
Credits: 12
Assessment: Tests, assignments, one three-hour examination paper internally moderated, oral, practicals, objective structured clinical evaluation (OSCE)
Prerequisite: NAN 121E, NPH 121E, NCH 121E and NMP 121E

**NBM 121E: Normal Newborn**

**Purpose:** To equip the student midwife with knowledge, skills and values required for the practice of midwifery in respect of mother and baby soon after delivery. To prevent complications that may arise following childbirth.

**Contents:** The normal newborn baby; infant feeding practices including babies born of HIV/AIDS positive mothers; minor disorders of neonate and their management; health education; normal puerperium.

**Instruction:** Lectures, demonstrations, small group discussions, case studies, presentations, self-directed learning.

**Credits:** 12
**Assessment:** Tests, assignments, one three-hour examinations paper internally moderated, oral, practicals, objective structured clinical evaluation (OSCE)
**Prerequisite:** NBM 111E

**NBM 211E: Complications of Childbearing.**

**Purpose:** To equip the student midwife with knowledge, skills and values required for the practice of midwifery regarding early detection, prevention and management of abnormal conditions arising during the childbearing cycle.

**Contents:** Diagnosis and management of complications of pregnancy; malpositions and malpresentations; complications of labour; complications of the puerperium according to the National Guidelines. Care of pregnant women with HIV/AIDS through the pregnancy and childbearing stage including management of ARV’s in pregnancy and childbearing, ARVs in neonates; choice in termination of pregnancy, health education.

**Instruction:** Lectures, case studies, small group discussions, demonstrations, presentation, and problem based learning, self directed learning

**Credits:** 16
**Assessment:** Tests, assignments, one three-hour examination paper externally moderated, oral, practicals, objective structured clinical evaluation (OSCE)
**Prerequisite:** NBM 121E

**NBM 221E: Newborn Complications and Contemporary Issues in Maternal and Child Health.**

**Purpose:** To equip the student midwife with the knowledge, skills and values required for the practice of midwifery related to: surgical and operative procedures; abnormalities and complications of the neonate; contemporary issues in maternal and child health.

**Contents:** Pain relief in labour; surgical and operative procedures; abnormalities and complications of the neonate; ethical legal aspects; administrative
aspects; care of neonate born from HIV positive mother; health education and genetic disorders of neonates.

Instruction: Lectures, small group discussions, case studies, demonstrations, seminar presentations, self directed learning.

Credits: 16

Assessment: Tests, assignments, one three-hour examination paper externally moderated, oral, practicals, objective structured clinical evaluation (OSCE)

Prerequisite: NBM 211E

**NURSING MICROBIOLOGY AND PARASITOLOGY**

**NMP 121E: Introduction to Pathogens**

**Purpose:** To introduce students to the basic knowledge of pathogens and to the techniques for the prevention of infections.

**Contents:** Significance of microorganisms; bacteria and viruses; fungi; protozoans and helminths; biology of the HIV/AIDS pandemic, immunology; microbial pathogenicity; infectious diseases of humans; environmental microbiology. Practical work will include observation of microbial growth in the lab; preparation of fresh material for observation; microscope slides; sterilization; laboratory diagnosis of diseases; disinfection and infection control. In addition, trips to relevant industries and hospitals will be taken for students to witness some of the techniques.

**Instruction:** Lectures, tutorials, practical laboratory, case studies and field work

**Credits:** 8

**Assessment:** Class tests, assignments, case studies, practical tests and one three hour examination paper.

**Prerequisite:** NPH 111E & NAN 121E

**NURSING PHARMACOLOGY**

**NPP 111E: Nursing Pharmacology 1**

**Purpose:** To introduce and guide prospective nurse practitioners in the safe and effective use of pharmaceutical agents.

**Contents:** The receptor theory and pharmaco-dynamics; pharmacokinetics and biopharmaceutics; introduction to the autonomic nervous system; drugs acting on the peripheral nervous system; cardiovascular drugs; psychopharmacology; antibiotics and anti-infective agents.

**Instruction:** Lectures, discussions, group work and tutorials

**Credits:** 8

**Assessment:** Tests, assignments and one three hour internally moderated examination paper

**Prerequisite:** None

**NPP 121E: Nursing Pharmacology 2**

**Purpose:** To prepare prospective nurse practitioners to effectively analyze, synthesize and apply acceptable knowledge and skills in therapeutics.
Contents: Anti-inflammatory agents; analgesia and anaesthetics; central nervous system agents; gastro-intestinal agents; endocrine system agents; respiratory drugs; anticancer drugs; vaccines and the cold chain; vitamins and nutritional agents; toxicology and drug dependence; prescribing and drug administration; patient compliance and counseling; legislation regarding prescribing and drug distribution; therapeutics and Standard Therapeutic Guidelines (STGs); rational drug use and essential drug programme.

Instruction: Lectures, discussions, group work and tutorials
Credits: 8
Assessment: Tests, assignments and one three-hour internally moderated examination paper
Prerequisite: NPP 111E

PROFESSIONAL NURSING PRACTICE

NBZ 411E Ethos of Nursing and Nursing Management.
Purpose: To develop in nursing understanding of the professional issues that influences the provision of optimal patient care and clients in both hospital-based and specialized community-based settings.
Content Ethos of nursing, including ethics; philosophy and theory of professional nursing practice; nursing management. Management of nursing unit includes: management levels, management systems, decision making strategies, analysis of management of process as applied by unit manager, analysis of participative management, evaluation of quality of nursing unit management; provision of optimum care to patients and clients.
Instruction: Lectures, group discussions; collaborative learning approaches; self-directed learning; role-play; student-led seminars; field-based learning experiences; case study analysis.
Credits: 16
Assessment: Theoretical component counts for 70% (tests, assessments, case study analysis, seminar work and group projects). Practical component counts for 30% (clinical evaluation, objective structured clinical evaluation (OSCE), and oral examination).
Prerequisites: NBG 311E and NBG 321E

NBZ 421E: Research in Nursing
Purpose: To develop competency in clinical teaching, disaster management and in clinical research among final year B.Cur nursing students
Content: Clinical teaching and disaster control, team building, nursing service policy and procedure manual, HIV/AIDS policies, leadership, supervision, equipment and supplies, scheduling of staff; financial management.
Instruction: Lectures, group discussions; collaborative learning approaches; self-directed learning; role-play; student-led seminars; field-based learning experiences; case study analysis.
Credits 16
Assessment: Theoretical component counts for 70% (tests, assessments, case study analysis, seminar work and group projects). Practical component
counts for 30% (clinical evaluation, objective structured clinical evaluation (OSCE), and oral examination).

Prerequisite: NBZ 411E

**PSYCHIATRIC NURSING SCIENCE**

**NBP 111E: Orientation to Psychiatry: Mental Health and Illness**

**Purpose:** Instill and develop an insight in learners about the concept psychiatry as well as the scientific, cultural and ethical principles that will maintain the dignity of the mentally affected persons.

**Contents:** Orientation psychiatry; psychiatry classification and the Mental Health Act; milieu therapy and biological therapies; stress, anxiety and coping; somatoform, and dissociative disorders; organic mental syndromes; considering the rights as outlined by the Mental Health Act 17 of 2002.

**Instruction:** Facilitated learning, discussions, presentations, problem presentations and problem solving, Video role-plays and case studies, assignments, field trips, learners’ role play.

**Credits:** 12

**Assessment:** Practical – continuous evaluations, objective structured clinical, One three-hour internally moderated examination paper, evaluations, orals.

Prerequisite: NPH 121E

**NBP 121E: Application of the Nursing Process across the Lifespan**

**Purpose:** Develop the skill of caring, problem solving and instituting a sense of independence to patients and families both in the unit and community.

**Contents:** Mood disorder; schizophrenia and psychotic disorders; personality disorders; gender and sexual disorders; psychoactive substance use disorders; AIDS; psychopathology in children, adolescents and the elderly; mentally retardation.

**Instruction:** Facilitated group work, discussions and presentations, Problem presentation; problem solving, lectures, case studies

**Credits:** 12

**Assessment:** Practical – continuous evaluations, objective structured clinical, One three-hour internally moderated examination paper, evaluations, orals.

Prerequisite: NBP 111E

**NBP 211E: Psychiatric and Interpersonal Skills: Contemporary Psychiatric Issues**

**Purpose:** Manage mental illness using interpersonal skills, with specific reference to special age groups and persons presenting with psychiatric emergencies.

**Contents:** Development of interpersonal skills and techniques; psychiatric nursing skills; self-development; violence and victims of violence; crisis intervention.

**Instruction:** Facilitated classroom work; discussions, presentations, problem presentation and problem solving, tutorials, field trips, placements, self-directed study, assignment, case study

**Credits:** 16

**Assessment:** Tests, assignments, one three-hour externally moderated examination paper. Objective
structured clinical exam (OSCE)

Prerequisite: NBP 121E

NBP 221E: Theories of Helping: Community Psychiatry and Related Issues
Purpose: Manage mental illness to specific groups including persons presenting with psychiatric emergencies using interpersonal skills.
Contents: Psychological personality theories and the helping process; transcultural issues relevant to psychiatry; ethical dilemmas in psychiatry; comprehensive mental health services in South Africa and the Eastern Cape.
Instruction: Facilitated class work; discussions, presentations, video role-plays, practicals, tutorials, field trips, placements, post conferences, problem presentation/problem solving, resource based learning, self directed study, study through assignments and case studies.
Credits: 16
Assessment: Tests and Assignments, One three-hour paper-externally moderated, practical, clinical examination, objective structured clinical examination, oral examination.
Prerequisite: NBP 211E
Target group: All B Cur students

THE DEGREE BACHELOR OF SCIENCE HONOURS

S8 Study Programme in the School of Science
The degree may be obtained in any of the following options, in consultation with the Head of Department concerned and subject to the approval of the Faculty Board:
41001 Applied Mathematics
41007 Applied Remote Sensing and GIS
41014 Applied Statistics
41016 Biochemistry
41002 Botany
41003 Chemistry
41004 Computer Science
41005 Entomology
41006 Geography
41012 Geology
41013 Mathematics
41008 Mathematical Statistics
41009 Microbiology
41010 Physics
41011 Zoology

S9 Admission
S9.1 A learner shall be admitted to the Honours programme in a subject only with the permission of the relevant Head of Department. Normally a learner will be admitted to an Honours programme in a subject in which an average mark of 60% in all the modules required of the particular subject was obtained in the final undergraduate year.
S10 Examination (Summative Assessment)
S10.1 The examination shall be by means of any combination of written theory papers, oral examinations, project work, practicals and/or a mini-dissertation. The date and nature of the examination will be determined by the Head of Department concerned and details are given in each programme description.
S10.2 A sub-minimum of 40% shall apply to all components (papers and mini-dissertations) in an Honours programme.
S10.3 Credits shall normally be retained for a period not exceeding three consecutive academic years. Where this period is exceeded, the candidate must apply in writing, giving full reasons for the delay in completing the outstanding module(s), and the application will then serve before the Board of the School, which will make its recommendation to Senate.
S10.4 The degree shall be awarded with distinction if an aggregate of 75% is obtained in all modules collectively (not necessarily in each individual module) specified for the subject.

APPLIED MATHEMATICS OPTION 41001

Prerequisites: 64 credits in MAP at 300 level; a good pass in Mathematics at the 300 level is also advisable. The Honours module comprises 5 topics (125 credits), selected from the following papers in consultation with the Head of Department. A maximum of two topics (50 credits) may be selected from the Honours modules in Mathematics, Physics and Computer Science, in consultation with the Head of Department.

MAP 511: Advanced Mathematical Methods.
Purpose: Fundamental in Applied Mathematics and Physics.
Contents: Fourier series, Integral transforms, Special functions, Residue theorem, Convolution theorem, Approximation theorem, Norms.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 300.

MAP 513: Mathematical Modelling.
Purpose: Critically essential in Applied Mathematics.
Contents: Mathematical Biology, Ecology, Financial mathematics, heat flow in special medium, waves, weather.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 300.

MAP 515: Calculus of Variations.
Purpose: It is the backbone of Applied Mathematics.
Contents: Extremum of functions of many variables, the variation of a functional and its properties, Euler's equations, invariance of Euler's equation, The Hamilton-Jacobi theory, the variational principles of mechanics,
Ritz method, Kantorovich method, variational methods for finding eigenvalues and eigenfunctions.

**Instruction:** Lectures, Seminars and assignments.
**Credits:** 25
**Assessment:** Assignments, Class Tests, Examination.
**Prerequisites:** MAP 300.

**MAP 516: Differential Geometry.**
**Purpose:** Essential in Applied Mathematics and Physics.

**Instruction:** Lectures, Seminars and assignments.
**Credits:** 25
**Assessment:** Assignments, Class Tests, Examination.
**Prerequisites:** MAP 300.

**MAP 527: Quantum Field Theory.**
**Purpose:** For application in Physics.
**Contents:** Canonical quantization- for bosons, fermions. Significance of creation and annihilation operators; field operators. Path integral methods. Gauge theory.

**Instruction:** Lectures, Seminars and assignments.
**Credits:** 25
**Assessment:** Assignments, Class Tests, Examination.
**Prerequisites:** MAP 300.

**MAP 529: Control Theory.**
**Purpose:** Essential in decision making and Computer Science.
**Contents:** Problems of mathematical control theory, specific models, controllability and observability, stability and stabilizability, optimal control.

**Instruction:** Lectures, Seminars and assignments.
**Credits:** 25
**Assessment:** Assignments, Class Tests, Examination.
**Prerequisites:** MAP 300.

**MAQ 521: Advanced Classical Mechanics.**
**Purpose:** Essential in Theoretical Physics.
**Contents:** Methods of plane statics, applications of plane statics, plane dynamics, applications of plane dynamics, mechanics in space and applications, the equations of Lagrange and Hamilton.

**Instruction:** Lectures, Seminars and assignments.
**Credits:** 25
**Assessment:** Assignments, Class Tests, Examination.
**Prerequisites:** MAP 300.
MAQ 522: Numerical Analysis.
Purpose: Essential in Applied Mathematics.
Contents: Solution of differential equations-one step and multistep methods, error analysis, advanced quadrature methods for Lipchitz functions.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 300.

APPLIED REMOTE SENSING AND GIS OPTION 41007

The Honours programme consists of four compulsory modules. Three of the modules will be assessed by means of a 3-hour examination together with various assignments and practical work conducted during the module. The fourth module includes project work and relevant support courses (assessed). Credits from Honours modules in Computer Science, Geography or Geology may be recognised in lieu of alternate credits in GIS provided the sum is not less than 120 credits, of which at least 100 must be from Applied Remote Sensing and GIS, and prior approval is received from the Honours Programme Coordinator.

Prerequisites for the Honours programme: BSc with GIS 312, 313, 322, 323 with a minimum of 60% (average). Prospective candidates must contact the Head of Department, as previous GIS experience will be considered, as will the possibility of attendance and successful completion of an intensive short introductory course.

Purpose: This module provides a solid understanding of the basic principles of the remote sensing process and in the implementation of this data via satellite image processing techniques. The module is aimed at developing both a strong theoretical knowledge of the subject area and at building confidence and experience in the practical implementation of this theory utilising professional GIS/Image Processing software.
Contents: The electromagnetic spectrum, radiation and the atmosphere; reflectance signatures, platforms and sensors; interpretation of remotely sensed images (visual interpretation); image pre-processing, image enhancement, image transformations and image classifications.
Instruction: Lectures, practicals.
Credits: 25
Assessment: Practical, literature-review and seminar assignments, One 3-hour exam paper
Prerequisites: GIS 322
Target group: Students having successfully completed a BSc degree with the necessary prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.
Purpose: To expose, inform and instruct students in the application of remote sensing to solving real-world environmental problems and to expose them to more advanced and up-to-date technologies.
Contents: Remote sensing applications in natural resource management; remote sensing applications in geology and hydrology; remote sensing applications in disaster management; emerging remote sensing technologies.
Instruction: Lectures, practicals
Credits: 25
Assessment: Practical, literature-review and seminar assignments, One 3-hour exam paper.
Target group: Students having successfully completed a BSc degree with the necessary prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

GIS 503: GIS for Decision Support.
Purpose: To expose, inform and instruct students in the application of Geographical Information Systems (GIS) to solving real-world problems and to expose them to the process, practical and theoretical issues involved in utilising GIS for decision support and problem solving.
Contents: Review of GIS fundamentals; basic and advanced analysis techniques in GIS; GIS for decision support and tools for decision-makers; Mini-project.
Instruction: Lectures, practicals
Credits: 25
Assessment: Practical, literature-review and seminar assignments, One 3-hour exam paper.
Target group: Students having successfully completed a BSc degree with the necessary prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

GIS 504: Applied Honours Project and Research Methodology.
Purpose: To produce one or more GIS/remote sensing research projects that utilize the theory, methodology and techniques learnt during the Honours year.
Contents: Project planning, project proposal, project work (field work, practical work, analysis and interpretation); interim project report; final project report; final project presentation.
Instruction: Lectures and project supervision
Credits: 50
Assessment: Continuous evaluation through various “milestones” (project proposal, project planning, interim report and presentation). Final research report externally moderated. Final research report presentation at an internal symposium.
Target group: Students having successfully completed a BSc degree with the necessary prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.
APPLIED STATISTICS OPTION 41014

Prerequisite: Normally 60% in STM 312, 313, 322 and 323. The examination consists of six papers (not less than 126 credits). No more than 2 papers (a maximum of 50 credits) may be selected from Honours papers offered in Mathematics, Applied Mathematics, GIS and/or Computer Science; any such selection must be made in consultation with the Head of Department.

**STM 502: Multivariate Statistical Analysis**
Contents: Aspects of Multivariate Analysis; Matrix Algebra and Random Variables; Sample Geometry and Random Sampling; The Multivariate Normal Distribution; Hotelling’s $T^2$ test; Likelihood Ratio Tests; Confidence Regions; One-way MANOVA.
Credits: 22 credits

**STM 505: Fixed Effects Modelling.**
Contents: The General Linear Model; The general linear model expressed in terms of matrices; Estimation and Inference; Analysis of variance and covariance; Binary response variables.
Credits: 22 credits.

**STM 508: Non-Parametric Statistics**
Contents: Introduction to non-parametric statistics; Tests of location; Tests of spread; Two-sample procedures and their extensions; Tests based on empirical distribution functions; Log-linear models.
Credits: 22 credits

**STS 501: Operations Research.** (Previously STM 541)
Contents: Linear Programming; The simplex method; Risk theory; Decision theory; Bayes Risk; Minimax methods; Simulation; Stochastic models.
Credits: 22 credits.

**STS 502: Applied Time Series Analysis.** (Previously STM 542)
Contents: Methods of describing time series; Trend, Seasonality and Error; Mathematical Models for Time Series; Stationary and Second-order stationary process; ARIMA processes; Box-Jenkins methods; Forecasting; The Frequency domain; Spectral Analysis.
Credits: 22 credits

**STS 503: Bayesian Statistics.** (Previously STM 546)
Contents: Introduction to the fundamentals of Bayesian statistics; Subjective probability; Representing prior knowledge; Conjugate priors; Improper priors; Markov chain simulation.
Credits: 22 credits.

**STS 504: Applied Multivariate Statistics.** (Previously STM 547)
Contents: Principal Components; Graphing Principal Components; Factor Rotation and Factor Scores; Discrimination; Classification; Classification with two Multivariate Normal Populations; Clustering.
Credits: 22 credits.

**STS 505:** Random Effects Modelling. (Previously STM 548)
Contents: Exponential Family of Distributions; Generalized Linear Models; Random Effects Models; Covariance Structures; Non-normal errors; Repeated Measures; Binary data; Categorical data.
Credits: 22 credits.

**STS 506:** Research Methodology. (Previously STM 550)
Contents: Design and analysis of an experiment; Sample-size calculations; Questionnaire design; Sampling techniques; Literature searches.
Credits: 18 credits.

**MATHEMATICAL STATISTICS OPTION 41008**

**Prerequisite:** Normally 60% in STM 312, 313, 322 and 323. The examination consists of five papers (=125 credits). No more than 2 papers (a maximum of 50 credits) may be selected from Honours papers offered in Mathematics, Applied Mathematics, GIS and/or Computer Science; any such selection must be made in consultation with the Head of Department.

**STM 501:** Stochastic Processes
Contents: Introduction to stochastic models and processes. Introduction to Markov Chain theory. Introduction to point processes and Brownian Motion.
Credits: 22

**STM 502:** Multivariate Statistical Analysis
Contents: Aspects of Multivariate Analysis; Matrix Algebra and Random Variables; Sample Geometry and Random Sampling; The Multivariate Normal Distribution; Hotelling’s $T^2$ test; Likelihood Ratio Tests; Confidence Regions; One-way MANOVA.
Credits: 22

**STM 503:** Regression Theory
Contents: The General Linear Model; The general linear model expressed in terms of matrices; Estimation and Inference; Analysis of variance and covariance; Binary response variables.
Credits: 22

**STM 504:** Measure and Probability Theory
Contents: Introduction to Hilbert Spaces from a statistical point of view. Introduction to the theory of Copulas and how they can be used in the case of Extreme Value Distributions. Theory of Lebesque Integrals
Credits: 22

**STM 508:** Non-Parametric Statistics
Contents: Introduction to non-parametric statistics; Tests of location; Tests of spread; Two-sample procedures and their extensions; Tests based on empirical distribution functions; Log-linear models.
Credits: 22

STS 502: Time Series Analysis. (Previously STM 542)
Contents: Methods of describing time series; Trend, Seasonality and Error; Mathematical Models for Time Series; Stationary and Second-order stationary process; ARIMA processes; Box-Jenkins methods; Forecasting; The Frequency domain; Spectral Analysis.
Credits: 22

STS 503: Bayesian Statistics. (Previously STM 546)
Contents: Introduction to the fundamentals of Bayesian statistics; Subjective probability; Representing prior knowledge; Conjugate priors; Improper priors; Markov chain simulation.
Credits: 22

STS 506: Research Methodology. (Previously STM 550)
Contents: Design and analysis of an experiment; Sample-size calculations; Questionnaire design; Sampling techniques; Literature searches.
Credits: 18

BIOCHEMISTRY OPTION 41016

Prerequisites: For admission to the Honours programme in Biochemistry a learner must have obtained at least an aggregate of 60% in the Biochemistry 300 level modules. Candidates for Honours in Biochemistry shall submit notebooks containing a record of the practical work they have performed. The record shall be approved by a supervisor. The Honours programme comprises four written papers (BCH 511-514) of three hours each, and two additional presentations (BCH 525 & 526):

BCH 511: Structure of biomolecules
Purpose: To develop an in-depth knowledge of advanced fundamental principles in Biochemistry and to acquaint students with software packages to visualize protein structure.
Contents: Protein and structure and function.
Instruction: Formal lectures, computer demonstrations, reading of relevant literature and publications on the topics. Discussions under the supervision of the study leaders. Use of the library and the internet.
Credits: 20
Assessment: Continuous assessment through class participation in lectures, practical work and written assignments and problem solving tutorials and through at least one theory test. Summative assessment: 1 x 3 hour theory examination paper. Assessment will be carried out by the responsible lecturers and moderated externally.

BCH 512: Advanced theory of techniques.
Purpose: To train students on the theory, current approach and application of advanced laboratory techniques.
Contents: Topics on HPLC, GC-MS, NMR, Centrifugation, Spectrophotometry, Protein Purification and Electrophoresis, Advanced enzyme kinetics, PCR and DNA sequencing.

Instruction: Reading of relevant literature and publications on the topics. Discussions under the supervision of the study leaders. Use of the library and the internet.

Credits: 20

Assessment: Written assignments, Problem solving tutorials. One 3 hour examination paper. Assessment will be carried out by the responsible lecturers and moderated externally.

**BCH 513: Molecular biology and genetic engineering.**

Purpose: To develop an in-depth knowledge of advanced fundamental principles in molecular biology and genetic engineering.

Contents: Competent cell preparation and transformation. Preparation of site-directed-mutated plasmids, Isolation of genomic and plasmid DNA. Restriction enzyme digestion of DNA. DNA analysis by Southern Blot. PCR of plasmid DNA. Purification of PCR products, Sequencing and analysis.

Instruction: Formal lectures, computer demonstrations, reading of relevant literature and publications on the topics. Discussions under the supervision of the study leaders. Use of the library and the internet.

Credits: 20

Assessment: Written assignments, Problem solving tutorials. One 3 hour examination paper. Assessment will be carried out by the responsible lecturers and moderated externally.

**BCH 514: Current topics in Biochemistry.**

Purpose: To develop an understanding and role of Biochemistry in Life and its relationship to the community and environment.

Contents: This module will introduce students to specific topics such as the application of Biochemistry in Food production, Agriculture and Industry. Biochemistry and disease etc.

Instruction: Reading of relevant literature and publications on the topics. Discussions under the supervision of the study leaders. Use of the library and the internet.

Credits: 20

Assessment: Written assignments, Problem solving tutorials. One 3 hour examination paper. Assessment will be carried out by the responsible lecturers and moderated externally.

**BCH 525: Practical and project presentations.**

Purpose: To develop competence in explaining research methodology concisely, ability to describe, evaluate and draw reasonable conclusions from research data.

Contents: Selected project topic with the assistance of the supervisor

Instruction: Students will be given guidance on collecting, analysing and critically evaluating information. Guidance on preparing and delivering a
scientific presentation will also be given. Departmental facilities will be available for preparation of presentation media.

Credits: 20
Assessment: Students shall submit notebooks containing a record of practical work to be marked and approved by the supervisor. Students will be required to do an oral presentation of the project. Assessment will be carried out by the responsible lecturers and the external examiner.

BCH 526: Seminars.
Purpose: To develop an expertise in scientific writing, presentation and communication.
Contents: Selected seminar topics with the assistance of the supervisor
Instruction: Students will be given guidance in literature reviewing, presentation of seminars and oral presentation techniques. Departmental facilities will be available for preparation of presentation media.
Credits: 28
Assessment: Students are required to make a written submission and an oral presentation of the seminar topics. Assessment will be carried out by the responsible lecturers.

BOTANY OPTION 41002

The Honours programme in Botany allows the learner to specialize in particular areas of study, according to preference. The learner selects two options from the study areas listed below (BOT 501 – BOT 505), as their Major and Minor options. In addition, the student must complete three compulsory modules (BOT 506, 507 and 508). Prerequisites for Botany Honours are at least an aggregate of 60% in BOT 300 level modules.

Electives: (BOT 501 – BOT 505 – select TWO of these options):

BOT 501: Plant Anatomy
Purpose: Through self-directed reading, students will acquire reading and writing skills as well as advanced knowledge of the subject area.
Contents: Under the guidance of the supervisor, 6 topics will be selected for research and synthesis in the form of referenced essays.
Instruction: Self-directed reading and essay writing for the selected topics, and tutorials and individual discussion of selected topics with supervisor.
Credit value: 25
Assessment: Learners will provide, by way of a 3-hour theory examination, essays that reflect ability to synthesize information from a variety of sources and show development of logical argument. The exam will be assessed by an external examiner in addition to the internal supervisor.

BOT 502: Plant Ecology
Purpose: Through self-directed reading, students will acquire reading and writing skills as well as advanced knowledge of the subject area.
Contents: Under the guidance of the supervisor, 6 topics will be selected for research and synthesis in the form of referenced essays.
Instruction: Self-directed reading and essay writing for the selected topics, and tutorials and individual discussion of selected topics with supervisor.

Credit value: 25

Assessment: Learners will provide, by way of a 3-hour theory examination, essays that reflect ability to synthesize information from a variety of sources and show development of logical argument. The exam will be assessed by an external examiner in addition to the internal supervisor.

BOT 503: Plant Physiology

Purpose: Students will be required to plan, execute and write-up a research project dealing with a topic of interest, selected with the assistance of their supervisor.

Contents: The students will select a project topic in conjunction with a supervisor.

Instruction: Teaching of research skills through supervision of directed research project.

Credit value: 25

Assessment: Learners will be assessed (both internally and externally) on the basis of their written project report and in form of a written 3-hour examination. Students will need to demonstrate ability to make use of data collection methods, data analysis and display and the discussion of results obtained.

BOT 504: Plant Systematics

Purpose: The module has four main objectives:

i) to expand on the basic systematic principles learnt in the Bot 321 course;

ii) to apply these principles in the context of modern taxonomic revisions;

iii) to show how systematic principles are important to contemporary botanical and environmental issues from a world perspective;

iv) to teach students to conduct independent research on systematic/taxonomic problems.

Contents: 1. Theory: The learner will be required to independently research the following topics, and write essays to be presented weekly at a discussion group:

a) Linnaeus – encyclopaedist and teacher;

b) The concept of a species;

c) Continental drift and land-bridges – the explanation of inter-continental plant distributions;

d) Origin of the Cape Flora;

e) Weighting in Numerical Taxonomy;

f) An appraisal of the modern systems of Angiosperm classification;

g) Chemotaxonomy – a tool for modern Biosystematists and Phytomedicine.

In addition, learners electing Systematics as the Major option, are expected to acquire a reasonable knowledge (in theory and practical) of a single large family of the flowering plants (eg Orchidaceae).
2. Practical: Learners will be taught all aspects of plant identification using keys, the herbarium and other means, as well as the practical implications of the revision of a genus. A visit to a major herbarium in the region will be undertaken to illustrate the practical running and operation of such a facility.

3. Project: Each student will be required to collect, identify and preserve a number of plants, according to the learner’s interest.

Instruction: Independent research (under guidance), essays and discussions and practicals, Critically analyze and interpret the results obtained and submit a comprehensive write-up of the practical work and herbarium visit.

Credit value: 25

Assessment: At least two seminars from the above essay topics are to be presented as seminars, and evaluated by staff of the department. In addition, the course will be examined (internally and externally) by a formal 3-hour examination paper, as well as by continuous assessment of tasks, assignments, practicals and projects

**BOT 505: Horticultural Sciences**

**Purpose:** Students will be required to plan, execute and write-up a mini-research project dealing with a chosen horticultural topic.

**Contents:** The student will select a project topic in conjunction with a supervisor.

**Instruction:** Teaching of research skills through supervision of directed research project.

**Credit value:** 25

**Assessment:** Learners will be assessed on the basis of their written project report and by a written 3-hour examination which will be accessed internally and externally. Students will need to demonstrate ability to make use of data collection methods.

**Compulsory modules:**

**BOT 506: General Botany**

**Purpose:** This course aims at giving students the practice and understanding of techniques available to Botanists, and their applications. Many of these techniques will be required by the students on execution of their projects and subsequent research.

**Contents:** This shall consist of reading, essay writing and practical work on a variety of topics in plant sciences. The essays and practical write-ups shall form the basis of the study material required for a 3-hour, internally and externally assessed examination paper.

**Instruction:** Discussions, practical demonstrations and the use of library and internet material.

**Credit value:** 22 credits

**Assessment:** The course will be examined by a formal 3-hour examination paper (accessed internally and externally), as well as by continuous assessment of tasks, assignments, and essays.
BOT 507: Module work
Purpose: To train the learner to access and analyze information on various topics.
Contents: Essays on varied aspects of botanical and scientific issues in general.
Instruction: Discussions and the use of library and internet material.
Credit value: 22 credits
Assessment: A total of 5 seminars must be presented. These will be assessed by Botany staff members. One seminar each must cover aspects of the two electives chosen. A third, general seminar, must be presented from the topics for BOT 506. Seminars 4 and 5 must be presentations of the research projects carried out for the two electives (under BOT 508)

BOT 508: Projects
Purpose: To train the learners in research methodology, scientific thinking and analysis. On completion of this module, the student should be capable of independent research, and have the ability to write up and submit a research paper for publication.
Contents: The learner will select two research projects from the selected courses (BOT 501 – 505), in consultation with his/her supervisors.
Instruction: This will consist of research work carried out under the close guidance of supervisors in both of the chosen elective options.
Credit value: 32 credits
Assessment: The projects will be presented as mini-dissertations and submitted at the end of the honours programme. These will be assessed internally as well as by an external examiner and the marks will be averaged to give a mark for the course.

CHEMISTRY OPTION 41003
Entry is through an approved BSc degree in which Chemistry was a major or one of the major subjects studied. Students are required to study all theory courses in Analytical, Inorganic, Organic and Physical Chemistry. Research seminars and a research project are a part of the curriculum and examinations are internally and externally assessed.

CHE 501 Analytical Chemistry
Purpose: To develop an in depth knowledge of advanced fundamental principles of instrumental techniques and to acquaint students with chromatographic and spectrometric procedures.
Contents: Topics in separation techniques: solvent extraction, solid phase and solid micro extraction, supercritical Fluid chromatography and extraction, Liquid chromatography, Gas chromatography, Capillary electrophoresis, Gravimetry, Electrochemical Techniques: Polarography stripping, Voltammetry; atomic fluorescence spectrometry. Molecular spectrometry; Infrared spectrometry, Mass spectrometry, Radiochemical methods in analysis, thermal techniques such as thermo gravity; Differential Thermal analysis and Differential scanning colorimetry; sampling and sample treatment and the role of computers and microprocessors in analytical chemistry.
CHE 502: Inorganic Chemistry
Purpose: To provide an in depth understanding of modern inorganic theories and fundamental principles of the various elements and groups in the periodic table, synthetic techniques of the various inorganic compounds with emphasis on their industrial and practical applications.
Contents: d-block metal chemistry (general considerations), bonding in d-block metal complexes (valence bond theory, crystal field theory, molecular orbital theory, ligand field theory), electrons in multi-electron systems, electronic spectra and magnetic properties of coordination complexes. The second and third row metals chemistry. Organometallic compounds of d-block elements, chemistry of lanthanoid and actinoids, inorganic reaction mechanisms, catalysis and industrial processes, solid state chemistry (ionic solids, superconductivity, ceramic materials, CVD, inorganic fibres and carbon nanotubes); the trace metals of life, some specialized topics in modern inorganic chemistry.

Instruction: Lectures and seminars by students on specialized topics
Credit: 22
Assessment: Tests, assignments, term paper and 3hrs examinations.
Prerequisite: PAC 211, 321, 314

CHE 503 Organic Chemistry
Purpose: To enable students to develop a critical understanding of Organic chemistry, extend their knowledge of organic compounds and to prepare them for research and further postgraduate studies.
Content: Separation, purification and determination of purity in organic compounds; Use of Organic Spectroscopic techniques for structure determination; Organic synthesis, synthetic planning, strategy, and protecting groups; Natural products-carbohydrates, proteins, steroids and terpenes; Synthetic materials-monomers and polymers, applications and current trends; Heterocyclic compounds and their chemistry.

Instruction: Formal lectures and assignments
Credit: 22
Assessment: Tests and a 3-hour externally moderated examination at the end of the year

CHE 504 Physical Chemistry
Purpose: To enable students to develop a critical understanding of Physical chemistry, extend their knowledge of Physical Chemistry techniques and to prepare them for research and further postgraduate studies.
Contents: Introduction. Liquid surfaces, Thermodynamics of interfaces, Liquid interfaces, Thermodynamics of interfaces, The electric double layer, Effects at charged interfaces, Surface forces, Contact angle phenomena and wetting, Solid surfaces, Adsorption, Surface modification, Friction; lubrication; and wear. Surfactants; micelles; emulsions; and foams. Thin films on surfaces of liquids.

Instruction: Formal lectures and assignments
Credits: 22
Assessment: Tests and a 3-hour externally moderated examination at the end of the year

CHE 505: Honours Research Project. 22 credits.
CHE 506: Seminar (on an approved research project). 22 credits.

COMPUTER SCIENCE OPTION 41004

Prerequisite: B Sc in Computer Science. The Honours course consists of a compulsory mini-project (CSC 501, 50 credits) and five alternate modules (CSC5xx, 15 credits each), giving 125 credits for the degree. Credits from Honours modules in Mathematics Statistics or GIS may be recognized in lieu of alternate credits in Computer Science provided the sum is not less than 120 credits, of which at least 95 must be from Computer Science, and prior approval is received from the Head of Department.

CSC 501: Mini Project
Purpose: To provide an introduction to research methodology by carrying out a small research project under the supervision of a departmental staff member.
Credits: 50

CSC 512: Computer Networks
Purpose: Understanding of the systems, transmission techniques and control, protocols, and security issues in use in local /metropolitan/wide area computer networking.
Content: Networks from a designer’s point of view; systems, transmission techniques and control, protocols, and security issues in use in LAN, MAN and WAN.
Instruction: 20 hours of lectures. Individual presentations. Networking assignments and practical work.
Credits: 15
Assessment: Presentations, assignments, tests as continuous assessment. One two hour examination as summative assessment.

CSC 513: Distributed and Parallel Computing
Purpose: This course describes a variety of distributed parallel and client server options, from formal specifications to practical implementations. A special emphasis is placed on affordable asynchronous processing, currently the most prevalent model.
Content: Understanding parallel processors and distributed programming, models of parallel computation, middleware terms and concepts, low level synchronisation and communication, designing a parallel algorithms, Ada and comparison with Occam, CSP meta-language, LINDA (Getting the job done), middleware in the world of distributed computing and some promising future architecture.
Instruction: 20 hours of lectures. Assignments, practical work.
Credits: 15
Assessment: Assignments and parallel programming as continuous assessment. One two hour final examination as summative assessment

**CSC 515: Advanced Java**

**Purpose:** The module builds on undergraduate work by introducing advanced features of the Java programming language.

**Content:** Advanced features of GUI design, abstract classes, IO with binary files, multithreading, database access, introduction to servlets.

**Instruction:** 20 hours of lectures. Self study and programming assignments

**Credits:** 15

**Assessment:** Programming assignments as continuous assessment. One two hour final examination as summative assessment

**CSC 516: E-business Fundamentals (CSC 526)**

**Purpose:** The course introduces a variety of concepts and techniques used in the electronic business world, with emphasis on recent developments.

**Content:** A study of selected principles and technologies used in the conduct of electronic business – detailed content may be adjusted to incorporate the most recent advances in this rapidly developing area.

**Instruction:** 20 hours of lectures. Case studies and practical work

**Credits:** 15

**Assessment:** Assignments, practical work and/or presentations as continuous assessment. One two hour examination as summative assessment

**CSC 517: Theory of Computing (CSC 527)**

**Purpose:** To introduce the various theoretical computing machines and formal language types, and to investigate the limits of computability.

**Content:** Finite state automata (deterministic and nondeterministic), pushdown automata, Turing machines, formal languages, computability and complexity, the classes P, NP and NPC

**Instruction:** 20 hours of lectures

**Credits:** 15

**Assessment:** Three assignments as continuous assessment and one three-hour final examination as summative assessment.

**CSC 518: Intelligent Systems**

**Purpose:** This module provides an introduction to applied Intelligent Systems exposing students to a wide range of tools and methods in the design, analysis, optimization and control of industrial systems preparing them for the modern industrial environment. It is also intended to motivate and prepare students to conduct research projects and for further study through advanced courses in related areas.

**Content:** A selection of topics from knowledge based systems, ontologies, uncertainty reasoning, artificial neural networks, Bayesian networks, evolution computing, case based reasoning, fuzzy logic, optimization schemes and hybrid intelligent systems.

**Instruction:** 20 hours of lectures

**Credits:** 15
Assessment: Continuous assessment based on test and/or assignments and/or practical work, as well as one three-hour final examination as summative assessment.

CSC 521: Computer Graphics
Purpose: To provide an introduction to various graphics devices and a good understanding of 2D and 3D computer graphics and standards as well as an introduction to the generation of photo realistic images.
Content: Concepts of 2- and 3- Dimensional computer graphics, photo realistic rendering, and virtual reality are discussed in this course.
Instruction: 20 hours of lectures. Graphics related programming work using OpenGL
Credits: 15
Assessment: Graphics programming assignments and practicals as continuous assessment. One two hour final examination as summative assessment

CSC 522: Human Computer Interaction
Purpose: The module provides insight into the techniques used in HCI.
Content: The essentials of user interface design.
Instruction: 20 hours of lectures. Group presentations. Practical assignments
Credits: 15
Assessment: Essays and assignments as continuous assessment. One two hour final examination as summative assessment

CSC 523: Distributed Web Computing
Purpose: The course addresses some of the issues and specific applications relating to distributed web-based technology.
Content: Current techniques that enable web-based technology and selected current applications that are based on distributed web computing
Instruction: 20 hours of lectures. Case studies and practical work
Credits: 15
Assessment: Assignments, practical work and/or presentations as continuous assessment. One two hour examination as summative assessment.

CSC 524: Advanced Computer Architecture
Purpose: To introduce students to advanced, modern aspects of computer architecture.
Content: An introduction to modern aspects of computer architecture. Assembly Language for processors such as the Intel or SPARC; RISC and CISC processors; A quantitative approach of the computer architecture.
Instruction: 20 hours of lectures. Assembly language programming practicals
Credits: 15
Assessment: Programming assignments as continuous assessment. One two hour final examination as summative assessment

CSC 529: Information and Communication Technology for Development
Purpose: This module prepares students to undertake both research and development projects in the use of Information and Communication Technology for social and economic development in the developing World
Content: A selection of concepts including environment, social, food security, education, security, health, governance, among others that are critical in attaining millennium development goals for the developing World. Expert guest lectures, readings on case studies of projects in ICT4D. Students will be divided into groups and each group will research one case study and then present their findings to the class as a whole. The presentations will be followed by a discussion in which the concepts presented earlier will be applied.

Instruction: 20 hours of lectures
Credits: 15
Assessment: Continuous assessment based on tests and/or assignments and/or practical work, as well as one three-hour final examination.

ENTOMOLOGY OPTION 41005

The Honours programme in Entomology allows the learner to begin a research project in particular areas of Entomological study, according to preference. There are six compulsory modules, namely ENT 501-506. Within these modules, the learner is exposed to wide range of topics from which he selects to concentrate on those most relevant to his area of interest or his research project. A pass mark of 50% in all the six modules must be achieved for the Honours degree.

The prerequisites for Entomology Honours are ENT 312, 313, 322 & 323.

ENT 501: Honours research project
Purpose: To cultivate research skills in Entomology with respect to the designing and compiling a research project, and analyzing and presenting the results in written format.
Contents: Topic for research to be decided in consultation with academic staff in Entomology.
Instruction: Self-study, including experimental work under supervision of a study leader.
Credits: 24
Assessment: Project report in the form of a mini-dissertation.

ENT 502: Major seminar
Purpose: To develop abilities in the presentation of entomological research work; to develop basic research writing skills in Entomology; to develop skills in the use of PowerPoint and in structuring a presentation for maximum impact.
Contents: Topics for presentation include the Honours research proposal (generally in June), the results of Honours research project (generally in November) and others to be selected with the approval of the student’s academic advisor(s)
Instruction: Self-study under supervision of a study leader.
Credits: 24
Assessment: Seminars in the form of a PowerPoint-assisted presentation to staff and students; seminar in the form of a major research essay.
ENT 503: Science research methodology
Purpose: To acquaint the learner with general zoological field techniques, including trapping, radio tracking, monitoring of climatic conditions, assessment of vegetation types, and identification of species under study.
Contents: A Field trip to a nearby nature reserve approximately one week in duration.
Instruction: Self-study, including practical work, under the supervision of a study leader.
Credit value: 24
Assessment: Field reports and seminar reports relating to research methodology.

ENT 504: Scientific analysis and interpretation.
Purpose: To introduce the learner to a range of analytical methodologies; to develop advanced reading skills and methods of critical analysis of published material; to develop basic statistical and computer skills.
Contents: A reading course and discussion groups devoted to research methodologies; computer-assisted workshops
Instruction: Lectures, seminars and workshops led by academic staff; self-study under supervision of a study leader
Credit value: 20
Assessment: Continuous assessment through participation in discussions; practical reports, assignments and tests.

ENT 505: Anatomy, Cytology, Physiology and Biochemistry of Insects and Mites.
Purpose: Students will be required to read relevant original research papers and write a well researched essay on the above topics. The aim is to broaden the student’s knowledge and build capacity in writing
Contents: The content is based on certain aspects of physiology
Instruction: Reading of selected original and recent research papers on the topics
Credit value: 20
Assessment: The course will be examined by a formal 3-hour examination paper (assessed internally and externally), as well as by continuous assessment of tasks, assignments, and essays.

ENT 506: Taxonomy, Economic Entomology, Biogeography, Behaviour and Ecology
Purpose: Students will be required to get a global view of ecology and proceed on to read relevant original research papers to gain information needed to write a well researched essay on the physical and biological (ecological) factors and how they relate to insect diversity, activity (timing of insect appearance or phenology), and abundance.
Contents: Appreciating ecology in the context of things and insects as populations. Discussing the types of physical factors that play significant roles in ecology with reference to original research work. Discuss biological factors such as populations attributes (density, age distribution and birth and death rates). The importance of such factors in the management of specific insect pest species.
Instruction: Discussions and the use of library and internet material.
Credit value: 20 credits
Assessment: The course will be examined by a formal 3-hour examination paper (assessed internally and externally), as well as by continuous assessment of tasks, assignments, and essays.

**GEOGRAPHY OPTION 41006**

The Department of Geography and Environmental Science offers full-time programmes of study leading towards the Honours, Masters, and Doctorate degrees at both the Alice and the East London Campuses. Students in full-time employment may register on a part-time for postgraduate study in the Department. Lectures for the course-work modules at the Honours and Masters levels, and the research seminars for postgraduate students are normally offered in the afternoons.

The Honours degree is designed to provide a balance between selected specializations in Physical and Human Geography, and Environmental Management.

The coursework modules offered at the postgraduate level take the form of lectures, seminars, field trips and group discussions. Students are assessed on an on-going basis during the semester, and on the basis of their input at lectures, seminars, presentations, field work and assignments. This assessment constitutes fifty percent of the final mark for the module. Marks attained in the final (summative) examination in each module constitute the other fifty percent of the final result.

The rules applicable to Honours level study in the Faculty of Science and Agriculture apply equally to students registered for the BSc Honours degree in Geography. Normally a student shall be admitted to the Honours degree programme if s/he has obtained an average of 60% in the Geography undergraduate modules, his/her Geography majors, and in the undergraduate degree programme, and has completed the undergraduate degree in the prescribed minimum number of years set for the degree. Candidates who have equivalent qualifications in other study programmes may also be admitted to the BSc Honours degree in Geography.

Students with foreign qualifications are required to evaluate such qualifications with the appropriate South African Qualification Authority (SAQA) prior to making application for admission to the University, for postgraduate studies in Geography and Environmental Science. Equivalency certificates from SAQA need normally to be submitted at the time of application.

The Honours degree programme comprises two compulsory modules (GEG 501/GEG 501E and GEG 502/GEG 502E), and the selection of three other modules at the GEG 500 level. (The “E” refers to the module offered at the East London Campus). The Department normally offers a total of eight modules at the Honours level, but the actual offering in any year is contingent upon the specialty areas of academic staff within the Department.

The total credits for the Honours Degree programme are 128. To graduate, students are required to pass each of the five modules that they are registered for. Full-time students may register for all five modules during the academic year. Part-time students may register for a maximum of three modules, including GEG...
501/GEG 501E and GEG 502/GEG 502E, in their first year of study, and the remaining modules during their second year of study.

**GEG 501/GEG 501E: Theory of Geography (compulsory)**

**Purpose:** To study paradigm shifts in geographical thought, the factors and persons responsible for contributing to these shifts, the philosophies underpinning the paradigms, the research methodologies associated with each paradigm and their influence on the selection of research locations, with particular emphasis on the post-World War II period. To present a framework for a research proposal, and discuss the structure and presentation of a research project.

**Content:** Geography as a changing discipline with reference to the paradigms: Postmodern Geographies, Feminist Geographies, Regional Geography, Geography as Spatial Science, Humanistic Geography, Applied Geography and Radical Geographies, and their influence on South African Geography. Research methodology, research designs, qualitative and quantitative research techniques, remote sensing and geographical information systems in geographical and environmental research. Requirements for preparation of research proposal; structure and technical requirements for presentation of research project.

**Instruction:** Formal lectures and student presentation of seminars. One lecture per week; three hours duration. Lectures extend over 21 weeks.

**Credits:** 32

**Assessment:** Submission of three assignments, each weighted equally. Summative assessment: four-hour written examination. Final module result determined on equal weighting of semester mark and summative examination mark. Students must obtain a minimum of 50% in this module to qualify for graduation with the B Sc Honours degree in Geography.

**Co-requisite:** GEG 502/GEG 502E

**GEG 502/GEG 502E: Dissertation (compulsory)**

**Purpose:** To undertake and present independent research on a selected topic in Geography and/or Environmental Science.

**Contents:** The preparation of the dissertation is conducted in parallel with the Theory of Geography (GEG 501/GEG 501E) module which incorporates research methods and techniques. The selection of the research topic and the research problem must be undertaken in consultation with the Supervisor and the Head of the Department: Geography and Environmental Science. Prepare, present and submit for approval written dissertation proposal at a seminar in the Department. Complete and submit written dissertation in accordance with approved research proposal. The dissertation must be completed in accordance with the Department’s scientific style and guidelines.

For the dissertation, students need to design, undertake and defend their research on a problem within a specified field in geography or environmental studies/science. Students need to review critically current literature in the field of research; justify selection of research problem; explain research methodology and techniques to be used;
select research location; collect, analyze and present research data; display mastery of technical aspects and literary requirements in dissertation writing; establish conclusions; make recommendations based on research; defend findings and relate these to other research. Develop research and creative skills for application in novel and applied research. Provide training in the preparation and sharing of dissertation results in seminars and at student conferences. Develop appreciation for comments and critiques on research.

The last date for submission of the final draft of the mini-dissertation to the internal examiner in the Discipline for comment shall be the first Friday in November of each year. This will enable the supervisor to return the final draft with comments by the end of the academic year. Students are required to make necessary revisions before final deposit of their mini-dissertations on 09 January in accordance with University regulations.

Instruction: Students need to meet the University’s norm of at least one meeting a month with their Supervisors. The responsibility rests with the student to ensure that s/he fulfils this requirement. The consultation dates and times between the Supervisor and the students are normally established at the beginning of each academic Year, for the calendar Year. Each consultation normally lasts for an hour.

Credits: 36
Assessment: Two academics assess the dissertation. One of the examiners is external to the University. The final mark for the dissertation comprises the average of the two assessments.

Co-requisite: GEG 501

GEG 508/ GEG 508E: Cartography, Geographical Information Systems and Remote Sensing

Contents: This module is offered to students who are registered only on a full time basis. It concentrates on the various spatial data gathering processes, the visualization of spatial data and the making of maps using computers, introduction to remote sensing, the use of remote sensing techniques in environmental studies, the utilization of geographical information systems (GIS) in decision making and integrated development planning. The module is designed to provide candidates with skills in the application of GIS and remote sensing for research purposes, particularly for their mini-dissertations.

Instruction: 3 hours per week
Assessment: 1 x 3 hour paper
Credits: 20

GEG 515/GEG 515E: Physical Geography: Climatology

Purpose: To study the effects of climate on human activities and the physical environment

Contents: This module deals with climatological and weather patterns via multidisciplinary and interdisciplinary approaches. It equips students with advanced theories on climatological and meteorological processes and provides an analytical and interdisciplinary perspective on climate change issues. The course includes the following: General circulation
of the southern hemisphere, southern African weather and climate, frontal system, frontogenesis and frontolysis, cyclone and cyclogenesis, convective activity and formation of convectional cell, urban-rural micro-climates, climate and weather hazards, stratospheric ozone, drought and desertification, global warming, El Niño and La Niña, management of climatologically-induced disasters, environmental risk assessment and analysis, diurnal forcing and local circulations, ocean circulation, climate prediction, interannual variability of the atmosphere-ocean system, dynamics of tropical climates, and planetary micro-scale boundary layer climates.

Instruction: 3 hours per week
Assessment: 1 x 3 hour paper
Credits: 20

GEG 517/GEG 517E: Human Geography: Economic Geography
Contents: This module is focuses on specific themes within Economic Geography. The themes are selected to cover a broad range of spatial economic scales from the global to the local. Emphasis centres on global organizations, institutions and systems that impact on economic development at the regional and local level, and on the differences and interrelationship between the North and the South. The module also focuses on South Africa's newly emerging post-apartheid economic spatial framework, as well as the emerging dimensions within the Southern African Development Community, and the rest of Africa (including, New Programme for African Development [NEPAD]).

Instruction: 3 hours per week
Assessment: 1 x 3 hour paper
Credits: 20

GEG 523/GEG 523E: Integrated Environmental Management
Purpose: To provide an understanding of the management and utilization of natural resources
Contents: This is a one Semester module. The course entails the management and utilization of resources. Participants gain insights into human activities and the implications of local, national and international policies on environmental issues. Learners partake in the assessment of decisions taken by governments and practitioners by relating to theoretical base of environmental economics, waste management and land degradation. Sustainable development of resources is emphasized in the practice of ecosystem management. The contents of the module include resource analysis; principles of environmental management; compartmental and ecosystem approaches to environmental management; land as a resource; land tenure systems in Africa; the agrarian question; environmental legislation and environmental justice; communities and game park management; introduction to environment impact assessment practices; environmental auditing and monitoring; and ISO 9000 and 14000 regulations and standards.

Instruction: 3 hours per week
Assessment: Class attendance and participation in discussions. Written assignments and a practical group analysis of an environmental problem that is undertaken as a case study by a site visit. Participants submit an environmental assessment report. The final assessment comprises a 3-hour written examination.

Credits: 20

GEG 524: Physical Geography: Geomorphology
Purpose: To study the relationship between human activities and geomorphic processes on the physical environment
Contents: This module focuses on the application of geomorphology into real life problems. The emphasis is on weathering, slope instability (scarification), soil erosion, land degradation, soil conservation, geomorphology in environmental management, geomorphology in impact assessment, and the Landcare programme (Landcare South Africa). Students are required to submit a minor research project based on a selected topic in Geomorphology.
Instruction: 3 hours per week
Assessment: 1 x 3 hour paper
Credits: 20

GEG 526/GEG 526E: Human Geography: Settlement Geography
Purpose: The GEG 526 module seeks to explain, analyse, critically evaluate and develop an appreciation of the multifaceted economic, political, social and cultural processes and dynamics that shape the urban environment. The module adopts a theoretical approach and is grounded largely within the Radical, Feminist and Postmodern Geographies paradigms. The module identifies the significant role-players in urban-political geography and their substantive contributions to its development. It highlights geographical concepts and terminology, and their usage in geographical writings, seminars and conferences.
Contents: The module concentrates on selected themes within Settlement Geography, with reference to urban-political geography and the South African urban environment. The themes include: (1) Fordism, Flexible Accumulation, the New International Division of Labour (NIDL), and the Regulation Approach to Development; (2) The Political-economy of Cities and Communities; (3) Postmodernism and Settlement Geography, Engendering Settlement Geography, and Postmodern Urbanism; (4) World Cities: Formation, Theory and Discourse; The Global Economy, Glocalization and Microgeographies; Globalization, Urbanization and Uneven Development; Perspectives on the Global City in (and from) the Global South; and (5) The South African Urban Environment: Progrowth Coalitions, Urban Regimes and Postmodern Politics.
Instruction: Formal lectures and student presentation of seminars. One lecture per week; three hours duration. Lectures extend over 13 weeks. A field study of East London.
Credits: 20
Assessment: Submission of three assignments during the semester, each weighted equally. Summative assessment: one three-hour written examination.
Final module result determined on equal weighting of semester mark and summative examination mark.

**GEOLOGY OPTION 41012**

**Purpose:** To prepare the student for a career as a geologist and for geological research.

**Instruction:** Seminars; practical instruction; geological field work.

**Assessment:** Student presentations, assignments, practical reports, one three-hour examination in each of GLG501, GLG502, GLG503 and GLG504. Assignments and practical reports to be submitted for evaluation.

**Prerequisite:** B.Sc. degree with Geology major (GLG311 & GLG321).

**Target Group:** Geology graduates.

**GLG 505:** Assignments and Practical Projects.

**Contents:** Reports on seminars, topics and practical projects. To be bound in hard cover and submitted for evaluation.

**Credits:** 28.

**GLG 511:** Geochemistry; Economic Geology; Geophysics.

**Purpose:** To expose students to advanced level studies in these sub-disciplines.

**Contents:** Topics in Geochemistry such as the behaviour of various elements in different geological processes, stable and radiogenic isotope uses in geology, and environmental geochemistry; topics in Economic Geology such as the genesis of a number of ore deposit types, exploration, target generation and resource evaluation; and topics in Geophysics such as applications of airborne gravity and magnetic surveys, and mining-induced seismicity.

**Instruction:** Seminars; practical instruction; geological field work.

**Assessment:** Seminar assessment, practical assessment, one three-hour examination

**Credits:** 25.

**GLG 512:** Advanced Crystallography; Mineralogy; Petrology.

**Purpose:** To expose students to advanced level studies in these sub-disciplines.

**Contents:** Topics in Advanced Crystallography and Mineralogy such as the application of modern analytical and identification methods, the characteristics of certain mineral groups; and topics in Petrology such as petrogenesis of different rock suites.

**Instruction:** Seminars; practical instruction; geological field work.

**Assessment:** Seminar assessment, practical assessment, one three-hour examination

**Credits:** 25.

**GLG 521:** Sedimentology; Environmental Geology; Geohydrology; Palaeontology; South African Geology.

**Purpose:** To expose students to advanced level studies in these sub-disciplines.

**Contents:** Selected topics in Sedimentology such as environmental interpretation, placer processes, provenance interpretation; topics in Environmental Geology such as waste and waste water management, water pollution and water quality studies, geochemical modeling for long-term water
quality prediction, geochemical test techniques, environmental risk assessment; topics in Geohydrology such as groundwater geochemistry, groundwater exploration and assessment, groundwater modelling; topics in South African Geology such as the tectonostratigraphic evolution of rock sequences in Africa. Topics in vertebrate palaeontology may be offered.

Instruction: Seminars; practical instruction; geological field work.
Assessment: Seminar assessment, practical assessment, one three-hour examination
Credits: 25.

**GLG 522: Structural Geology; Mining Geology; Engineering Geology.**

Purpose: To expose students to advanced level studies in these sub-disciplines.
Contents: Selected topics in Structural Geology such as structural mapping, stress mapping and analysis, plate tectonic and implication in ore deposits and continental evolution, structural controls for mineralization and water resource assessment, application in engineering geology, mining and remote sensing in interpretation of structures; selected topics in Mining Geology such as the SAMREC code for geologists, ore body modeling, resource and reserve evaluation and the mining geology of one or more southern African mineral deposits; and topics in Engineering Geology such as mining induced subsidence, engineering and geotechnical characterization of earth materials and the use of geophysical methods in engineering geology investigations.

Instruction: Seminars; practical instruction; geological field work.
Assessment: Seminar assessment, practical assessment, one three-hour examination
Credits: 25.

**MATHEMATICS OPTION 41013**

Prospective candidates should consult the Head of Department. Normally candidates will not be admitted unless they have obtained an average of at least 60% in all the required third-year Mathematics modules at the first attempt.

The examination consists of five papers (each carrying 25 credits), or four papers and a project (each worth 25 credits). A maximum of 50 credits may be selected from Honours papers offered in Applied Mathematics, Computer Science or Mathematical Statistics.

The following papers are usually in the Programme from which learners must make their selection in consultation with the Head of Department. (Other topics may be offered, depending on the interests of incumbent staff members.)

**MAT 502 Ring Theory**

Purpose: The module follows MAT 311 (MAT 321) or preferably MAT 511 and goes deeper into some aspects of rings that were treated superficially previously.

Instruction: Lectures, Seminars and assignments.
Credit Value: 25
Assessment: Assignments, Class Tests, Examinations
Prerequisite: MAT 311 or MAT 321

MAT 503: Module Theory
Purpose: The module follows MAT 311 (or MAT321) or preferably MAT 511 and goes deeper into aspects of module theory that have been treated superficially previously.

Contents: Modules, Homomorphisms, Exact sequences, Free Modules and Vector Spaces, Projective and Injective modules, Hom and Duality, Tensor Products, Modules over a Principal Ideal Domain, Algebras, Primary decompositions, Noetherian and Artinian Modules, Nakayama's Lemma and the Krull Intersection Theorem.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisite: MAT 311 or MAT 321

MAT 506 Complex Variables
Purpose: Core in Mathematical and Physical Sciences Programmes.


Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisite: MAT 312 or MAT 322

MAT 507: Functional Analysis
Purpose: The module follows MAT 303 or General Topology and goes deeper into certain aspects of Real Analysis and Topology.


Instruction: Lectures, Seminars and assignments.
Credits: 25
MAT 509: **Graph Theory & Combinatorics**  
**Purpose:** For application in computational aspects of Mathematical Sciences.  
**Contents:** Graphs, Paths and Searching, Trees, Networks, Cycles and Circuits, Planarity, Matchings, Special Topics and Application.  
**Instruction:** Lectures, Seminars and assignments.  
**Assessment:** Assignments, Class Tests, Examination.  
**Credits:** 25  
**Prerequisite:** MAT 303 or MAT 321

**MAT 511:** **Group Theory**  
**Purpose:** Core in Postgraduate Mathematics. The module follows MAT 311 and is the fourth stage of the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical and Physical Sciences.  
**Instruction:** Lectures, Seminars and assignments.  
**Credits:** 25  
**Assessment:** Assignments, Class Tests, Examination.  
**Pre-requisite:** MAT 311

**MAT 504:** **General Topology**  
**Purpose:** The module follows MAT 303 and is the fourth stage in the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical and Physical Sciences. It goes deeper into topological aspects of Real Analysis.  
**Contents:** Topological Spaces, Bases and Sub-bases, Subspaces, Continuous Functions, Product Spaces, Weak topologies, Quotient Spaces, Convergence, Nets, Filters, Separation Axioms, Regularity, Normal Spaces, Countability Properties, Compact Spaces, Locally Compact Spaces, Compactification, Metrizable Spaces, Connected Spaces, Path-wise and local Connectedness, Homotopy.  
**Instruction:** Lectures, Seminars and assignments.
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 303 or MAT 515.

MAT 515  Real Analysis
Purpose: The module caters for postgraduate students who have a weak background of Real Analysis or who have not done any Real Analysis in their undergraduate studies.
Contents: Topology of \( \mathbb{R}^n \), Metric Spaces, Topological Spaces, Continuity, Uniform Convergence, Function Spaces, Normed Spaces, Compactness, Connectedness, Contraction Maps and Fixed Points, Inverse and Implicit Function Theorems, The Riemann Integral.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 515.

MAT 508: Measure and Integration Theory
Purpose: For further Application in Mathematical and Physical Sciences.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 303 or MAT 515.

MICROBIOLOGY OPTION 41009

Pre-requisites: An aggregate of 60% in the Microbiology 300 level modules. The Microbiology Honours programme is comprised of four written papers (MIC 501-504) of three hours each, and two additional modules: practical & project presentations and seminars (MIC 505 & 506).

MIC 511  General Microbiology
Purpose: Through self-directed study learners will be required to critically review the general principles and concepts of Microbiology and examine selected specialized topics related to current advances in Microbiology.
Contents: In addition to the reviewing of general topics including the nutrition, growth and control of microorganisms - microbial metabolisms - general principles of microbial genetics - taxonomy of prokaryotes - fundamentals of the immune response - general principles in applied and industrial microbiology, learners will examine under the guidance of the module coordinator 5 selected topics on advances in microbiology.
Instruction: Self-directed reading, essay writing, discussion forum on selected topics as well as serving as demonstrator in undergraduate practical classes.
Credits: 22
Assessment: Learners will undergo both theoretical and practical assessments.
MIC 512  Techniques in Microbiology
Purpose: Develop a hand on selected techniques for investigations in microbiology
Contents: Hand on techniques including DNA sequencing, Fluorescence Microscopy, Electron Microscopy, Gas Chromatography and Mass Spectrometry, and Atomic Adsorption Spectrometry
Instruction: Practical classes aimed at developing hand on particular techniques
Credits: 22
Assessment: Learners will be assessed on the basis of assignment and in the form of a written 3-hours paper.

MIC 513  Molecular Biology and Genetic Engineering
Purpose: Introduce and familiarize the learners with the techniques that they would require to isolate DNA, prepare a cloning vector, ligate the vector and insert, prepare the cells for the uptake of DNA and to be able to identify the clone using non radioactive labeling methods and/or PCR technique.
Contents: DNA-RNA and protein isolation. Preparation of vector and insert DNA for ligation; preparation and transformation of Escherichia coli; identification of recombinant clones; isolation and confirmation of the recombinant plasmid: plasmid isolation, DNA quantification, Northern, Southern and Western blot and hybridization.
Instruction: Group learning, laboratory training, self-directed study
Credits: 22
Assessment: Learners will be assessed in the form of a written 3-hours paper.

MIC 514  Biotechnology and Environmental Microbiology
Purpose: Explore the interrelationships between microorganisms and their biotic and abiotic environment as well as critically discuss their role in the global ecology and maintenance of the quality of the environment.
Contents: Historical overview of Environmental Microbiology; structure, behaviour and growth of microorganisms as related to the environment; microbial communities and ecosystems; techniques in microbial ecology; workshops on selected biotechnological aspects of microbial ecology
Instruction: Self-directed reading and group discussion as well as laboratory exercise in the form of mini projects under the guidance of the module coordinator.
Credits: 22
Assessment: Learners will be assessed in the form of a written 3-hours paper.

MIC 525  Practical and Project Presentations
Purpose: Initiate the learners in research methodology, scientific thinking, writing and presentation with particular focus on Microbiology
Contents: Scientific approach/Research methodology; proposal writing; research planning; research execution and data collection; data analysis; scientific reporting and communication.
Instruction: Learners are guided stepwise into the following: literature review, preparation of mini-research proposal, selection of appropriate techniques, designing of the experiments and the actual execution of the
experiments and data collection. They are also guided in the interpretation of their results and scientific writing of a mini dissertation.

Credits: 22
Assessment: Learners will be assessed on the basis of the research report (mini dissertation).

MIC 526  Seminars
Purpose: Introduce the learners to the art of writing and presenting a seminar.
Contents: Literature search and analysis; writing and presentation of seminars.
Credits: 22
Assessment: Learners will be assessed on the basis of the written reports and oral presentations of at least two seminars.

PHYSICS OPTION 41010

For admission to the Honours qualifications in Physics a learner must have obtained (1) 64 credits in either Mathematics or Applied Mathematics at the 300 level, or (2) an average of at least 60% in PHY 311, PHY 312, PHY 321 and PHY 322; and a total of 48 credits in Mathematics at the 200 level, or (3) an aggregate of at least 60% in MAP 211 and MAP 221. A learner shall not be admitted to the Honours programme in Theoretical Physics unless he/she has passed PHY 311, PHY 312, PHY 321, PHY 322, MAP 311, MAP 312, MAP 321 and MAP 322.

Candidates for Honours in Physics shall either submit notebooks containing a record of the practical work they have performed, or a project report. A supervisor shall approve the record. The Honours programme consists of five compulsory modules (PHY 501, 502, 503, 504 and 505)(110 credits) plus a total of 24 credits from the other modules listed below.

Core curriculum (compulsory modules of 110 credits):

PHY 501: Advanced classical mechanics
Purpose: To provide a thorough understanding and knowledge of the theoretical aspects of classical mechanics, Lagrangian and Hamiltonian dynamics; to provide a thorough understanding and knowledge of rigid body motion, canonical transformations and the Hamilton-Jacobi theory.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours
Credits: 22
Assessment: Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.
PHY 502: Electrodynamics
Purpose: To build up advance principles of electrostatic, magnetism and electrodynamics. Advance mathematical methods of physics are introduced to solve Electrostatic potential Magnetostatics problems and Time-Varying Fields problems using Maxwell’s Equations.
Contents: Introduction to Electrostatics; Boundary-Value problems in Electrostatics I; Boundary-Value problems in Electrostatics II; Multipoles, Electrostatics of Macroscopic Media and Dielectrics; Magnetostatics; Time-Varying fields and energy considerations, Maxwell Equations, and Conservation Laws; Plane Electromagnetic waves and wave propagation.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.
Credits: 22
Assessment: Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

PHY 503: Quantum Mechanics
Purpose: To provide a thorough understanding and knowledge of the theoretical aspects of quantum theory; to provide a thorough understanding and knowledge of quantum mechanical methods, the relation between classical mechanics and wave mechanics and the discrete and continuous energy spectra.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.
Credits: 22
Assessment: Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

PHY 504: Statistical Mechanics
Purpose: To provide a thorough understanding and knowledge of the theoretical aspects of Statistical mechanics and Quantum statistics; to provide a thorough understanding and knowledge of statistical thermodynamics.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.

Credits: 22

Assessment: Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

PHY 505: Project or Experiments
Purpose: To build up research skills, such as proposal writing, data collection, data analysis, scientific writing, independent thinking, team work, etc.
Contents: This module has no specific course content. Students may select their topics of research after contacting a supervisor of their choice in the department or in any other research institution as long as the Physics department approves the research OR students can choose to do 12 experiments from physics honours experiment.
Instruction: Formal Seminars (3 hours/week): used for presentation of theory related to research work, and discuss candidate’s research progress. Tutorial 1 hour per week.
Credits: 22
Assessment: Seminar + field work and a Mini dissertation Weigh 50% each.

Electives (total of 24 credits):

PHY 511: Advanced Mathematical Methods of Physics. (12 credits)
PHY 512: Introductory Solid State Physics. (12 credits)
PHY 513: Nuclear Physics. (12 credits)
PHY 514: Quantum Electrodynamics and Field Theory. (12 credits)

PHY 516: Special Topics in Physics
Purpose: To build up principles of some special topics in physics. This module will depend on the availability of a specialist in certain advanced topics of physics. It will be used when there is a visiting lecturer who specializes in other topics that we do not offer or to supplement research students.
Contents: Depend on topics offered in a particular year
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 240 hours.
Credits: 12
Assessment: Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

PHY 521: Mathematical Techniques. (12 credits)
PHY 522: **Solid State Physics**

**Purpose:** To provide a thorough understanding and knowledge of the theoretical aspects of solid state physics, crystal structures, semiconductor crystals, energy bands and crystal defects


**Instruction:** 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 240 hours.

**Credits:** 12

**Assessment:** Weekly pre-laboratory and tutorial tests. Two tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

PHY 523: **Nuclear Resonance, Fluorescence and Mossbauer.** (12 credits)

PHY 524: **Symmetry and Particle Physics.** (12 credits)

PHY 525: **Continuous Media.** (12 credits)

PHY 526 **Special Topics in Physics, II.** (12 credits)

**ZOVOLOGY OPTION 41011**

Prerequisites for the programme are ZOO 314, 315, 324 and 325. All six units below are compulsory. The learner must prepare a portfolio which includes essays, reports, presentations and participation in research seminars, as listed below. Total credits is 130.

ZOO 501: **Honours research project**

**Purpose:** To cultivate research skills in Zoology with respect to designing and completing a research project, and analyzing and presenting the results in written format.

**Contents:** Topic for research to be selected in consultation with academic staff in Zoology.

**Instruction:** Self-study, including experimental work under supervision of a study leader.

**Credits:** 30

**Assessment:** Project report in the form of a mini-dissertation.
ZOO 502: **Major seminar**

**Purpose:** To develop abilities in the presentation of zoological research work; to develop basic research writing skills in Zoology; to develop skills in the use of PowerPoint, and in structuring a presentation for a maximum impact.

**Contents:** Topics for presentation include the Honours research proposal (generally in June), the results of the Honours research project (generally in November) and others to be selected with the approval of the student's academic advisor(s).

**Instruction:** Self-study, under supervision of a study leader.

**Credits:** 20

**Assessment:** Seminar in the form of a PowerPoint-assisted presentation to staff and students; seminar in the form of a major research essay.

ZOO 503: **Field research methodology**

**Purpose:** To acquaint the learner with general zoological field techniques, including trapping, radio-tracking, monitoring of climatic conditions, assessment of vegetation types, and identification of species under study.

**Contents:** A field trip to a nearby nature reserve approximately one week in duration.

**Instruction:** Self-study, including practical work, under the supervision of a study leader.

**Credits:** 20

**Assessment:** Field reports and seminar reports relating to research methodology.

ZOO 504: **Scientific analysis and interpretation**

**Purpose:** To introduce students to a range of analytical methodologies; to develop advanced reading skills and methods of critical analysis of published material; to develop basic statistical and computer skills.

**Contents:** A reading course and discussion groups devoted to research methodologies; computer-assisted workshops.

**Instruction:** Lectures, seminars and workshops led by academic staff; self-study under supervision of a study leader.

**Credits:** 20

**Assessment:** Continuous assessment through participation in discussions; practical reports, assignments and tests.

ZOO 511: **Evolution, systematics and conservation biology**

**Purpose:** To familiarise students with concepts of fundamental importance to zoological research; to provide students with opportunities to formulate and express their opinions on crucial scientific issues.

**Contents:** Seminars, lectures and discussion groups led by study leaders.

**Instruction:** Both formal and informal instruction from study leaders; self-study in terms of participation.

**Credits:** 20

**Assessment:** Continuous assessment through participation in discussions and through seminar reports; one research essay; one three-hour exam in June.
ZOO 521: **Aquatic and terrestrial ecology**

**Purpose:** To familiarise students with the applications of zoological theory to the maintenance of biodiversity; to develop postgraduate level knowledge in the field of ecology; to equip students with knowledge appropriate to careers in the conservation sector.

**Contents:** A series of seminars, lectures and discussion groups led by study leaders.

**Instruction:** Both formal and informal instruction from study leaders; self-study in terms of participation.

**Credits:** 20

**Assessment:** Continuous assessment through participation in discussions and through seminar reports; one research essay; one three-hour exam in November.

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**THE DEGREE MASTER OF SCIENCE**

**S11 Subject fields within the Schools of Science**

The degree of Master of Science may be obtained in any of the following subjects:

- 41501 Applied Mathematics
- 41507 Applied Remote Sensing and GIS
- 41514 Applied Statistics
- 41512 Biochemistry
- 41515 Biostatistics and Epidemiology
- 41502 Botany
- 41503 Chemistry
- 41504 Computer Science
- 41516 Ethnobotany
- 41505 Entomology
- 71002 Environmental Studies (MPhil)
- 41506 Geography
- 41517 Geology
- 41513 Mathematics
- 41508 Mathematical Statistics
- 41509 Microbiology
- 41510 Physics
- 41511 Zoology

**S12 Admission**

**S12.1** A learner shall be admitted to the Masters degree in a subject only with the permission of the Head of Department. Normally a learner will be admitted to a Masters programme in a subject in which an average mark of 60% in all the modules required at the 500 level was obtained.

**S12.2** Where a learner obtained his/her Honours degree (or an equivalent qualification) at another university, he/she must first apply for recognition of his/her status by Senate before being admitted to the Masters programme. Until final recognition is given, admission is provisional.
S13 Examination (Assessment)

S13.1 The examination shall be by means of written theory papers, and/or oral examinations and/or a dissertation, as prescribed in a Programme. Candidates may be required to pass a translation test.

S13.2 A sub-minimum of 40% shall apply to all components (papers and dissertations) of a Master’s programme.

S13.3 Credit for papers (modules) passed shall normally be retained for a period not exceeding three consecutive academic years. Where this period is exceeded, the candidate must apply in writing, giving full reasons for the delay in completing the outstanding module(s), and the application will then serve before the Board of Faculty, which will make its recommendation to Senate.

S13.4 Distinction:

13.4.1 Where the examination consists of individual papers, a candidate will be awarded the degree with distinction if an average of at least 75% for the examination as a whole was obtained;

13.4.2 Where the examination consists of a dissertation, the candidate shall pass with distinction if, in the opinion of the examiners, the desired standard was attained;

13.4.3 Where the examination consists of a dissertation plus a written and/or oral examination, the above-mentioned requirements shall apply to the papers and dissertation respectively.

S13.5 Every dissertation shall be accompanied by a declaration which clearly stipulates how much of the work contained in the dissertation represents the candidate’s own work both in conception and in execution.

S13.6 The candidate must be registered for at least one year full-time study or two years part-time study before the degree may be awarded.

MASTER OF SCIENCE IN APPLIED MATHEMATICS 41501

Normally a learner shall not be admitted to the Masters qualification unless he/she has obtained an aggregate of at least 60% for the Honours degree at the first attempt.

The qualification may be obtained in one of two ways, i.e. –

An extended dissertation (MAQ 701, 256 credits); OR

A dissertation of limited scope (MAQ 702, 200 credits), plus two papers (each carrying 28 credits), selected from those listed below. These papers must be selected in consultation with the Head of Department. The Masters papers listed below cover the same topics as the Honours papers, but in greater depth.

MAP 701: Advanced Mathematical Methods.

Purpose: Fundamental in Applied Mathematics and Physics.


Instruction: Lectures, Seminars and assignments.
Assessment: Assignments, Class Tests, Examination.
Credits: 25
Prerequisites: MAP 500.

MAP 703: Mathematical Modelling.
Purpose: Critically essential in Applied Mathematics.
Contents: HIV/AIDS epidemic, Malaria in Provinces where mosquitoes are prevalent, heat flow in different media, Ecology, Rural-Urban migration.
Instruction: Lectures, Seminars and assignments.
Credit: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 500.

MAP 705: Calculus of Variations.
Purpose: It is the backbone of Applied Mathematics.
Instruction: Lectures, Seminars and assignments.
Credit: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 500.

MAQ 703: Numerical Analysis.
Purpose: Essential in Applied Mathematics.
Instruction: Lectures, Seminars and assignments.
Credit: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 500.

MASTER OF SCIENCE IN APPLIED STATISTICS 41514

Normally a learner shall not be admitted to the Masters programme in Applied Statistics unless he/she has obtained an aggregate of at least 60% for the Honours degree.

The qualification may be obtained in one of two ways, i.e. –

An extended dissertation (STM 701, 125 credits); OR
A dissertation of limited scope (65 credits) plus three papers (each carrying 20 credits) from those listed below. The Masters papers listed below cover the same topics as the Honours papers, but in greater depth. A maximum of two papers (50 credits) may be selected from Masters papers offered in Applied Mathematics, Computer Science, GIS and/or Mathematics. Any selection must be made in consultation with the Head of Department.

**STM 702:** A half dissertation (65 credits),

**STM 704:** Advanced Multivariate Statistical Analysis
Contents: Wishart Distribution and an introduction to Zonal Polynomials. Introduction to Differential Geometry and Statistical Manifolds. Extreme Value Distributions and their use in the Investigation of the Probabilities of Rare Events.
Credits: 20

**STM 709:** Advanced Experimental Design
Contents: Analysis of Variance, unbalanced and nested factors: Complete randomised design, Randomised complete block design, Latin squares split-plot and repeated measures design: incomplete block, fractional factorial, response surface designs; confounding.
Credits: 20
Prerequisites: STS 504, STS 506.

**STS 701:** Generalised Mixed Models. (Previously STM 710)
Credits: 20

**STS 702:** Applied Non-parametric Statistics (Previously STM 711)
Contents: Nonparametric testing and estimation procedures are introduced. Topics include one sample location problem, two sample location problem, two sample dispersion problem, one-way layout, independence problem and regression problems.
Credits: 20

**STS 703:** Advanced Time Series Analysis (Previously STM 741)
Contents: The course deals primarily with spectral theory of time series. Spectral representation of stationary stochastic processes with discrete and continuous time, autoregressive and moving average models, theory of filtering and prediction of time series, parametric and nonparametric spectral estimation will be discussed in detail. In addition to this, the course will include an introduction to Kalman filtering and state-space models.
Credits: 20

**STS 704:** Applied Statistical Decision Theory (Previously STM 743)
Contents: Introduction to loss function and risk, conditional Bayesian decision principle, Frequentist Decision theory, Discision between Bayesian and frequentist, sufficient statistic, convexity
and any of the modules listed under Applied Statistics Honours not already offered by the candidate.

**MASTER OF SCIENCE IN MATHEMATICAL STATISTICS 41508**

Normally a learner shall not be admitted to the Masters programme in Mathematical Statistics unless he/she has obtained an aggregate of at least 60% for the Honours degree.

The qualification may be obtained in one of two ways, i.e. –

An extended dissertation (**STM 700**, 125 credits); **OR**

A dissertation of limited scope (65 credits), plus three papers (each carrying 20 credits) from those listed below. The Masters papers listed below cover the same topics as the Honours papers, but in greater depth. A maximum of two papers (40 credits) may be selected from Masters papers offered in Applied Mathematics, Computer Science or Mathematical Statistics. Any selection must be made in consultation with the Head of Department.

**STM 702:** A half dissertation (65 credits),

**STM 704:** Advanced Multivariate Statistical Analysis.
Contents: Wishart Distribution and an introduction to Zonal Polynomials. Introduction to Differential Geometry and Statistical Manifolds. Extreme Value Distributions and their use in the Investigation of the Probabilities of Rare Events.
Credits: 20

**STM 705:** Advanced Regression Theory
Contents: Exponential Family of Distributions; Generalized Linear Models; Random Effects Models; Covariance Structures; Non-normal errors; Repeated Measures; Binary data; Categorical data. Generalised Estimating Equation
Credits: 20

**STM 709:** Advanced Experimental Design
Contents: Analysis of Variance, unbalanced and nested factors: Complete randomised design, Randomised complete block design, Latin squares split-plot and repeated measures design: incomplete block, fractional factorial, response surface designs; confounding.
Credits: 20
Prerequisites: STS 504, STS 506.
STM 707: Methods of Multivariate Statistics
Contents: Principal Components; Graphing Principal Components; Factor Rotation and Factor Scores; Discrimination; Classification; Classification with two Multivariate Normal Populations; Clustering.
Credits: 20

STM 708: Advanced Non-Parametric Statistics
Contents: Non-Parametric testing and estimation procedures are introduced. Topics include one- and two-sample location problems, one-way layouts independence and regression problems
Credits: 20

STS 701: Generalised Mixed Models. (Previously STM 710)
Credits: 20

STS 702: Applied Non-parametric Statistics (Previously STM 711)
Contents: Exponential Family of Distributions; Generalized Linear Models; Random Effects Models; Covariance Structures; Non-normal errors; Repeated Measures; Binary data; Categorical data. Generalised Estimating Equation
Credits: 20

STS 703: Advanced Time Series Analysis (Previously STM 741)
Contents: The course deals primarily with spectral theory of time series. Spectral representation of stationary stochastic processes with discrete and continuous time, autoregressive and moving average models, theory of filtering and prediction of time series, parametric and nonparametric spectral estimation will be discussed in detail. In addition to this, the course will include an introduction to Kalman filtering and state-space models.
Credits: 20

STS 704: Advanced Statistical Decision Theory (Previously STM 743)
Contents: Introduction to loss function and risk, conditional Bayesian decision principle, Frequentist Decision theory, Decision between Bayesian and frequentist, sufficient statistic, convexity
Credits: 20

STS 705: Graphical Modelling (Previously STM 744)

and any of the modules listed under Applied Statistics Honours and Mathematical Statistics Honours not already offered by the candidate.
This qualification will comprise three modules (of 20 credits each) and a dissertation (65 credits) of limited scope, to be decided in consultation with the Head of Department.

**STB 701:** Half dissertation (Biostatistics and epidemiology)
Contents: Experimental Design; Data Collection; Data Analysis; Correct reporting of results.
Credits: 65

**STB 712:** Survival Analysis (STB 722)
Contents: Estimation of Survival Curves using the Kaplan-Meier Estimator; Estimation of instantaneous Mortality or Hazard Rates; Comparison of two or more Survival Curves using a Log-Rank test; Fitting of Cox Model to data and the Assessment of the Significance and Scientific Impact of included Predictors; Use of Time-Dependent covariates in the Cox Model; Nested Cohort Methods; Analysis of Correlated Survival Data; Parametric Survival Methods and Accelerated Failure time Models.
Credits: 20

**STB 703:** Clinical Epidemiology.
Contents: Clinical Epidemiology; Diagnostic and Screening Tests; Randomized Controlled Trials; Non-randomized Studies; Therapeutic Safety.
Credits: 20

**STB 704:** Epidemiology.
Contents: Dynamics of Disease Transmission; Measurement of Occurrence of Disease; Randomized Trials; Cohort Studies; Case-control and Cross-sectional Studies; Risk Assessment; Application of Epidemiology to Evaluation and Policy.
Credits: 20

**STB 705:** Design of Clinical Trials.
Contents: Research Designs; Randomization; Case-Control Studies; Cohort Studies; Diagnostic Tests; Methods of Regression.
Credits: 20

**STB 706:** Categorical Data Analysis.
Contents: Logistic Regression Analysis with Multiple Predictors; Testing for Significant covariates; Graphical and other methods for Model assessment; Interpretation of all coefficients in model; Conditional Logistic Regression; Multivariate Logistic Regression; Generalised Estimating Equations.
Credits: 20
STB 707: Biostatistics.
Contents: Estimation; Hypothesis testing; Inference; Non-Parametric statistics; Analysis of Variance and Covariance; Robustness; Discrimination and Classification; Principle Component Analysis.
Credits: 20

MASTER OF SCIENCE IN BIOCHEMISTRY 41512

The Master’s programme is by dissertation only, on a suitable topic in Biochemistry approved by the Head of Department. Admission to the programme is dependent on background, as well as on the availability of adequate supervision in the prospective student’s chosen area. A full-time Master’s student is expected to complete the requirements for the qualification within two years of first registration.

BCH 700: Biochemistry Master’s Dissertation
Purpose: Students will be required to plan, execute, and write-up a Master’s dissertation dealing with a topic of interest, selected with the assistance of their supervisor.
Contents: The student will select a project topic in conjunction with a supervisor.
Instruction: Teaching of research skills through supervision of research project.
Credit value: 256
Assessment: The learner will be assessed (both internally and by two external examiners) on the basis of the submitted dissertation. The thesis must make a contribution to the scientific knowledge and insight of a selected subject; as well afford evidence of individual and original scientific thought.
Prerequisite: Normally a learner shall not be admitted to the Masters qualification unless s/he has obtained an aggregate of at least 60% for the BSc Honours in Biochemistry or other relevant discipline.

MASTER OF SCIENCE IN BOTANY 41502

A master of Science degree in Botany can be obtained by means of an approved dissertation (BOT700, 256 credits) in consultation with the Botany Head of Department.

BOT 700: Botany Master’s Dissertation
Purpose: Students will be required to plan, execute, and write-up a Master’s dissertation dealing with a topic of interest, selected with the assistance of their supervisor.
Contents: The student will select a project topic in conjunction with a supervisor.
Instruction: Teaching of research skills through supervision of research project.
Credit value: 256
Assessment: The learner will be assessed (both internally and by two external examiners) on the basis of the submitted dissertation. The thesis must make a contribution to the scientific knowledge and insight of a selected subject; as well afford evidence of individual and original scientific thought.
Prerequisite: An Honours qualification in Botany or in a relevant Scientific, Agricultural or Horticultural discipline, subject to the approval of the Botany Head of Department.

**MASTER OF SCIENCE IN CHEMISTRY 41503**

Entry is through an approved B Sc Honours degree in which Chemistry was one of the major subjects studied.

**CHE 700: Research Project** (Research seminars and a research project resulting in an approved dissertation which will be examined internally and externally). 256 credits.

**MASTER OF SCIENCE IN COMPUTER SCIENCE 41504**

The Master’s programme is by dissertation only, on a suitable topic in Computer Science approved by the Head of Department. Admission to the programme is dependent on background, as well as on the availability of adequate supervision in the prospective student’s chosen area. A full-time Master’s student is expected to complete the requirements for the qualification within two years of first registration.

Credits: 256

**MASTER OF SCIENCE IN ETHNOBOTANY 41516**

A Master of Science degree in Ethnobotany can be obtained by means of an approved dissertation (BOT 710, 256 credits) in consultation with the Botany Head of Department:

**BOT 710: Ethnobotany Master’s Dissertation**

**Purpose:** Students will be required to plan, execute, and write-up a Master's dissertation dealing with a topic of interest, selected with the assistance of their supervisor.

**Contents:** The student will select a project topic in conjunction with a supervisor.

**Instruction:** Teaching of research skills through supervision of research project

**Credit value:** 256

**Assessment:** The learner will be assessed (both internally and by two external examiners) on the basis of the submitted dissertation, which must make a contribution to the scientific knowledge and insight of a selected subject; as well afford evidence of individual and original scientific thought.

**Prerequisite:** An Honours qualification in Botany or in a relevant Scientific, Agricultural or Horticultural discipline, subject to the approval of the Botany Head of Department.

**MASTER OF SCIENCE IN ENTOMOLOGY 41505**

A Master of Science degree in Entomology can be obtained by means of an approved dissertation
ENT 700  Master of Science in Entomology
Purpose: To equip postgraduate students with the requisite skills to plan, execute and write up a research dissertation dealing with a topic selected with the assistance and approval of his/her supervisor.
Instruction: Supervised self-study of a selected topic. Where applicable, additional course-work may be prescribed.
Credit value: 256
Assessment: The candidate’s dissertation will be assessed by an internal examiner (who is not the supervisor) and two external examiners. The dissertation must demonstrate the candidate’s ability to undertake independent research (including a comprehensive literature review) and his/her grasp of the research methods and analytical techniques of the chosen field.
Pre-requisite: BSc Honours in Entomology, or an equivalent qualification with the approval of the University Senate.

MASTER DEGREE STUDIES IN GEOGRAPHY

The Department offers full-time programmes of study leading towards the Masters degree. However, students in full-time employment may register on a part-time basis on condition that they provide written evidence to the Head of Department for Geography and Environmental Science that their employer has granted them leave from work to attend lectures and seminars. Lectures for the course-work modules at the Masters level and the research seminars for postgraduate students are normally offered in the afternoons.

The Masters programme on offer in the Discipline depends largely on the fields of specialization of academic staff.

The coursework modules offered at the postgraduate level take the form of lectures, seminars, field trips and group discussions. Students are assessed on an on-going basis during the semester, and on the basis of their input at lectures, seminars, presentations and assignments. This assessment constitutes fifty percent of the final mark for the module. Marks attained in the final (summative) examination in each module constitute the other fifty percent of the final result.

Geography and Environmental Studies offers Master’s degrees by full dissertation, and by course-work and dissertation. Students may choose either route to obtaining a Masters degree. The Statute and the General Rules for the award of a Masters degree apply. Normally a student shall not be admitted to the Masters programme unless he has satisfied the Department’s requirements for admission to postgraduate studies and has obtained an aggregate of at least 60% for the Honours degree at the first attempt. The Masters degree comprises 128 credits. The Statute and the General Rules for the award of a Masters degree apply.

MASTER OF SCIENCE IN GEOGRAPHY 41506
Purpose: To undertake and present independent research on a selected topic in Geography
Students with a B Sc Honours degree in Geography or an equivalent degree may be admitted to the M Sc degree in Geography. This degree is by full dissertation. This degree is offered in the Faculty of Science and Agriculture and subject to the University's General Rules, and any other specific rules of the Faculty, pertaining to the degree of Master of Science.

The selection of the dissertation topic is made in conjunction with the Supervisor and the Head of the Department, and on the basis of faculty expertise in Geography. The student is assigned a supervisor for the duration of the research. Students are required to meet their supervisors for a one-hour consultation meeting, at least once a month to discuss progress with their research, problems encountered in their research and how these may be overcome, and their research schedule for the next month.

The student must present and defend his/her written dissertation proposal at a Departmental seminar arranged specifically for this purpose. The Head of Department and academic staff in the Discipline, together with the Faculty’s Higher Degrees Committee, must approve this proposal in advance of the student undertaking the research. Approved dissertation proposals will be kept on file in the Department and in the Faculty Office. Students are also encouraged to submit the approved proposals for research funding.

The student must display competencies and skills in undertaking his/her research; mastery of the technical components and literary requirements in dissertation writing; the ability to draw conclusions and recommendations from the research; to defend the research findings and to relate these to other research; and, if possible, contribute to the development of knowledge. Students lacking the requisite skills to successfully complete their dissertations will be required to participate in the Discipline’s postgraduate programme in research methods and techniques. It is important for students to present the draft chapters of their dissertation to their supervisors on an on-going basis throughout the period of their research to ensure continuous feedback on their work and a quick response to emerging difficulties that could otherwise delay graduation.

Students are also required to present their research (in progress) in seminars and at conferences; to develop an appreciation for comments and critique on their work; and prepare manuscripts for submission for publication in journals. The dissertation must be completed in accordance with the scientific style that the Department approves. The last date for submission of the final draft of the dissertation to the internal examiner shall be the first Friday in November of each year. Supervisors shall normally return these final drafts with comments to the students by the last working day of the second semester. Students are required to make the necessary revisions before final deposit of their dissertations on 09 January of the next year, in accordance with University regulations. Meeting these deadlines will ensure that the assessment will be completed in time for graduation. Failure to meet this deadline will mean that the dissertation will only be examined during the next academic year, following the student’s re-registration. The dissertation must meet the Department’s requirements in terms of the quality of work, technical details, style and presentation before the Supervisor gives his/her consent for the dissertation to be forwarded to the External Examiners.
The degree is awarded on the basis of the successful completion and submission of the dissertation. Students are also required to submit the required number of bound copies of the final and approved dissertation to the University prior to graduation.

Credits: 128

THE M PHIL DEGREE IN ENVIRONMENTAL STUDIES - 71002

The M Phil programme is designed for students who wish to study for the Masters Degree in Environmental Studies by coursework and dissertation, do not necessarily have a B Sc Honours degree, and are precluded from registering for the M Sc degree. Students registered for the M Phil degree are required to successfully complete a coursework dissertation [(GEG 705/GEG 705E) (90 credits)], the Research Methodology and Research Report module [(GEG 701/GEG 701E) (30 credits)], plus two other modules (30 credits each). The GEG 701/GEG 701E and GEG 705/GEG 705E modules are compulsory.

The M Phil programme is designed to run over a minimum period of two years of study for full-time students. Full-time students normally complete their coursework and engage in preliminary work towards their dissertation in the first year of registration. This preliminary work normally includes the formal presentation in the Department of the dissertation proposal. The completion of the dissertation is usually undertaken in the second year of study and after the successful completion of the other three modules. Full-time students may register for all the four modules in the first year of study.

Part-time students normally register for two modules (GEG 701/GEG 701E and GEG 705/GEG 705E) in their first year of study, and the remaining modules during their second year of study. Part-time students usually complete their dissertations in their third year of study. However, students at the East London campus may be forced to take modules on offer in a given year.

Students sit a four-hour written examination in each of the coursework modules (excluding GEG 705/GEG 705E – the coursework dissertation). To graduate, students must successfully complete each of the four modules that they are registered for (including the dissertation). To be credited for the GEG 701 module, students are required to obtain a minimum of 50% in the overall examination.

The final date for the submission of the dissertation (GEG 705/GEG 705E) to the internal supervisor is the first Friday in November of each year. Final draft dissertations will be returned to students by the end of the second semester with comments from the supervisor. This will ensure that all revisions are completed before the final submission to the University on 09 January of the following year.

GEG 701/GEG 701E: Research Methodology and Research Reports

Purpose: To study different research methodologies in geographical and environmental sciences, and their relations to different paradigms and philosophies. The second aim is to provide guidance in writing a research proposal and in the design and presentation of a dissertation for the course-work Masters Degree in Environmental Studies.
Contents: Analyse contribution of the different paradigms in Geography to the development of research methods in environmental studies. Discuss the external and internal environmental contexts contributing to the adoption of different paradigms and research methods in environmental and geographical studies. Compare and contrast paradigms and methodological changes in South African environmental studies with those elsewhere. Identify contribution of individual scholars in shaping the development of geographical and environmental studies thought and research methods. Appreciate philosophical and methodological debates amongst scholars within, and between, different paradigms with specific reference to geographical and environmental studies. Study research designs, methods and techniques in geographical and environmental studies. Determine application of philosophies and research methodologies to empirical research designs in geographical and environmental studies. Understand principles of research project leadership and research project management. Develop appreciation of research integrity and research ethics. Assimilate techniques, skills and style in scientific research and report writing.

Instruction: Formal lectures and student presentation of seminars. One lecture per week; three hours duration. Lectures extend over 13 weeks.

Credits: 20

Assessment: Submission of three assignments during the semester, each weighted equally. Summative assessment: one four-hour written examination. Final module result determined on equal weighting of semester mark (based on results in the three assignments) and summative examination mark. (To be credited with a pass for the GEG 701 module, students must obtain a minimum of 50% in their final result).

Co-requisite: GEG 705/GEG 705E

GEG 712/GEG 712E: Natural Resources Management

Purpose: To study the application of physical concepts to environmental processes.

Contents: This is a one-semester module. This module caters specifically for persons with a natural and/or physical sciences background who intend to pursue a career in the field of environmental science. This module is particularly suited to persons already in consulting, education, and research. The contents of this module include natural resources management; environmental impact assessment; applied geomorphology; land resources management; aspects of pedology; applied hydrology and applied climatology; water resources and catchment management; environmental auditing, risk assessment and risk management; integrity and environmental ethics; conflict management in environmental resources; environmental resources management policy issues; and aspects of South Africa’s environmental law.

Assessment: The assessment of participants includes class attendance and participation in discussions, the submission of assignments, the presentation of readings on theoretical applications of environmental management, and a 4-hour final examination.

Credits: 2

252
GEG 723/GEG 723E: Environmental Impact Assessment

Purpose: To understand and apply environmental tools to environmental management.

Contents: This is a one-semester module. This module is suitable for persons with a human and/or social sciences background who intend to pursue a career in the field of environmental management. This module is particularly suited to persons already in consulting, education and research. The contents of this module include: Policy and environmental implications of environmental impact assessment; environmentally sustainable development and natural resources utilization; economic and social aspects of environmental resources management; global environmental issues (ISO 1400) and environmental auditing; risk assessment and risk management; integrity and environmental ethics; conflict management in environmental resources management; environmental resources management policy issues; north-south trade relationship and environmental economics; and aspects of South Africa’s environmental law.

Assessment: The assessment of participants includes class attendance and participation in discussions, the submission of assignments, the presentation of readings on theoretical applications of environmental management, and a 4-hour final examination.

Credits: 20

GEG 724/GEG 724E: Ecological Basis of Integrated Environmental Management

Purpose: To study biological and ecological processes in integrated environment management

Contents: The module deals with the scientific basis of ecosystem management and the processes of environmental maintenance. The operational and managerial requirements for the safeguard of local and global environments are emphasized. The contents of the module include the ecological basis for integrated environment management; approaches, principles and procedures of protected areas; approaches to terrestrial ecological resources management; coastal zone management and coastal resources management; sustainable development and policy issues on coastal-terrestrial resources utilization; and international and national issues of biodiversity.

Assessment: The assessment of participants includes class attendance and participation in class discussions, the submission of assignments, the presentation of readings on theoretical and philosophical applications of environmental management, and a 4-hour final examination.

Credits: 20

GEG 705/GEG 705E: Mini-dissertation

Purpose: To undertake and present independent research on a selected topic in Environmental Studies.

Contents: The preparation of the dissertation is underpinned by a readings course in research methods and techniques (see GEG 701/GEG 701E). For the coursework dissertation, students need to design, undertake and defend their research on a problem of their choice within a specified field in environmental studies. This involves: Reviewing critically
current literature related to the topic of research; justifying selection of research problem; explaining research methods and techniques to be used; selecting research location; and collecting, collating, assimilating, interrogating, analyzing, synthesizing and representing data. Display mastery of technical components and literary requirements in dissertation writing. Draw conclusions and make recommendations based on research. Defend findings, relate these to other research, and if possible, contribute to the development of knowledge. Acquire research skills for application in novel and applied environmental situations and in the resolution of societal problems. Provide training in the preparation and dissemination of research findings, for example, in manuscripts for publication in periodicals. Develop responsiveness to comments and critiques on research. Prepare and submit dissertation.

**Instruction:** Students need to meet the University’s norm of at least one meeting a month with their Supervisors. The responsibility rests with the student to ensure that s/he fulfils this requirement. The consultation dates and times between the Supervisor and the students are normally established at the beginning of each academic Year, for the calendar Year. Each consultation normally lasts for an hour.

**Assessment:** The student is assessed on the basis of the coursework dissertation that is submitted to the Department. Normally, two examiners (one of whom is external to the University) assess the dissertation. The Supervisor/Department must have deemed the coursework dissertation to have attained a satisfactory standard before it is submitted for formal examination. The 9th January of each Year is the final date for submission of the coursework dissertation to the University’s Examinations Office.

**Credits:** 68

**MASTER OF SCIENCE IN GEOLOGY 41517**

**Topics:** The Department of Geology offers Master's degrees by full dissertation in
- Geology
- Applied geology,
- Geochemistry,
- Geophysics,
- Engineering geology,
- Water quality and environmental management.

The Statute and the General Rules for the award of a Masters degree apply. Normally a student shall not be admitted to the Masters programme unless he has satisfied the programme requirements for admission to post-graduate studies and has obtained an Honours degree in geology. Candidates with Honours degrees in disciplines other than in geosciences (e.g. in GIS, Chemistry, Physics, Soil Science and Environmental Science) might be considered. Such candidates may be required to follow additional courses in geosciences during their study.
GLG 700: Masters Research Project
Purpose: To undertake and present independent research on a selected topic in Geology and Applied Geology and their sub-disciplines.
Assessment: This degree is offered in the Faculty of Science and Agriculture and subject to the General Rules, and any other specific rules of the Faculty, pertaining to the degree of Master of Science.
Period: 2 years in general.
Employment opportunity: Mining, exploration, ore resource evaluation and resource-related stock exchange analyses, water quality and environmental management, construction, geological education and any other relevant fields.

MASTER OF SCIENCE IN APPLIED REMOTE SENSING AND GIS 41507

A Masters of Science Degree in Applied Remote Sensing and GIS can be obtained by means of an approved thesis only. Admission to the programme is dependent on the candidate's background, as well as the availability of adequate supervision in the candidate's chosen area.

Purpose: Students at this level will be required to plan, execute and write up a Master's thesis dealing with a topic of interest, which was selected with the assistance of their supervisor(s).
Contents: The student will select a research project topic in conjunction with a supervisor.
Instruction: Teaching of research skills through supervision of the research project.
Credits: 256
Assessment: The student will be assessed (both internally and by two external examiners) based on their submitted thesis. The thesis must contribute to the scientific knowledge and insight of a selected subject; as well afford evidence of individual and original scientific thought.
Prerequisites: BSc. Hons. in Applied Remote Sensing and GIS.
Target group: Students having successfully completed a BSc Honours Degree with the prerequisites wishing to pursue a Masters Degree in Remote Sensing and GIS.

MASTER OF SCIENCE IN MATHEMATICS 41513

Normally a candidate will not be admitted to the Masters module unless he/she has obtained an aggregate of at least 60% for the Honours degree at the first attempt.

The qualification may be obtained in one of two ways, i.e. –

An extended dissertation (MAH 702, 125 credits); OR

A dissertation of limited scope (MAH 701, 25 credits), plus four papers (each carrying 25 credits) from those listed below. The Masters papers listed below cover the same topics as the Honours papers, but in greater depth. A maximum of two papers (50 credits) may be selected from Masters papers offered in Applied
Mathematics, Computer Science or Mathematical Statistics. Any selection must be made in consultation with the Head of Department.

**MAT 701: Group Theory**

**Purpose:** Core in Postgraduate Algebra. The module follows MAT 511 and is the fifth stage of the process of empowering learners who are going to (i) pursue careers in Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical and Physical Sciences.


**Instruction:** Lectures, Seminars and assignments.

**Credits:** 25

**Assessment:** Assignments, Class Tests, Examination.

**Prerequisites:** MAT 500

**MAT 702: Ring Theory**

**Purpose:** The module follows MAT 511 and goes deeper into some aspects of rings that were treated superficially previously.


**Instruction:** Lectures, Seminars and assignments.

**Credits:** 25

**Assessment:** Assignments, Class Tests, Examinations

**Prerequisites:** MAT 500

**MAT 703: Module Theory**

**Purpose:** The module follows MAT 511 and goes deeper into aspects of module theory that have been treated superficially previously.

**Contents:** Modules, Homomorphisms, Exact sequences, Free Modules and Vector Spaces, Projective and Injective modules, Hom and Duality, Tensor Products, Modules over a Principal Ideal Domain, Algebras, Primary decompositions, Noetherian and Artinian Modules, Nakayama's Lemma and the Krull Intersection Theorem.

**Instruction:** Lectures, Seminars and assignments.

**Credits:** 25

**Assessment:** Assignments, Class Tests, Examination.

**Prerequisites:** MAT 500

**MAT 704: General Topology**

**Purpose:** The module follows MAT 514 and is the fifth stage in the process of empowering learners who are going to (i) pursue careers in
Mathematics teaching and lecturing, (ii) do postgraduate studies and research in Mathematical and Physical Sciences. It goes deeper into topological aspects of Real Analysis.

Contents: Topological Spaces, Bases and Sub-bases, Subspaces, Continuous Functions, Product Spaces, Weak topologies, Quotient Spaces, Convergence, Nets, Filters, Separation Axioms, Regularity, Normal Spaces, Countability Properties, Compact Spaces, Locally Compact Spaces, Compactification, Metrizable Spaces, Connected Spaces, Path-wise and local Connectedness, Homotopy.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAT 705: Real Analysis
Purpose: The module caters for postgraduate students who have a weak background in topological aspects of Mathematics which are essential in postgraduate mathematics.

Contents: Topology of $\mathbb{R}^n$, Metric Spaces, Topological Spaces, Continuity, Uniform Convergence, Function Spaces, Normed Spaces, Compactness, Connectedness, Contraction Maps and Fixed Points, Inverse and Implicit Function Theorems, The Riemann Integral.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAT 706: Complex Variables
Purpose: Core in Mathematical and Physical Sciences Programmes.


Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAT 707: Functional Analysis
Purpose: The module follows MAT 704 or General Topology and goes deeper into certain aspects of Real Analysis and Topology.

Contents: Topological Vector Spaces, Completeness, Convexity, Duality in Banach Spaces, Applications, Test Functions and Distributions, Fourier Transforms, Applications to Differential Equations, Banach Algebras,
Commutative Banach Algebras, Bounded Operators on a Hilbert Space.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAT 708: **Measure and Integration Theory**
Purpose: For further Application in Mathematical and Physical Sciences.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAT 709: **Graph Theory & Combinatorics**
Purpose: For application in computational aspects of Mathematical Sciences.
Contents: Graphs, Paths and Searching, Trees, Networks, Cycles and Circuits, Planarity, Matchings, Special Topics and Application.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 500.

MAH 701: **Mini-dissertation** (previously MAT 710)
Purpose: To introduce students to research techniques, strategies and writing of research reports in Mathematics.
Contents: Topic will be chosen in consultation with the students concerned.
Instruction: Tutorials, Seminars and assignments.
Credits: 25
Assessment: Assignments and essay, seminar presentations
Prerequisites: MAT 333 or MAT 515 and MAT 500.

**MASTER OF SCIENCE IN MICROBIOLOGY  41509**

**Prerequisites:** BSc Honours in Microbiology or an equivalent qualification obtained with an aggregate of at least 60%.

MIC 700
Purpose: The candidate is required to plan, institute and execute a scientific investigation that will lead to the writing of a dissertation.
Contents: The MSc in Microbiology programme is offered by dissertation alone. The subject matter of the dissertation should preferably fall within the research interests of the academics at the department to permit the necessary supervision. Two research teams are functional in
microbiology, namely the Water Research group and the Environmental & Natural Products Biotechnology research group.

Instruction: Supervised self-study of the selected topic, research planning and execution and dissertation writing.

Assessment: Learners will be assessed on the basis of the dissertation alone.

**MASTER OF SCIENCE IN PHYSICS 41510**

A Master of Science degree in Physics can be obtained in one of two ways, namely:

A. An approved dissertation on a research project (**PHY 700**, 256 credits); or
B. An approved mini-dissertation on a research project (**PHZ 702**, 128 credits) plus the three modules listed below (=3 x 43 credits)

**PHY 700: Masters Research Project**

Purpose: To build up research skills, such as proposal writing, data collection, data analysis, scientific writing, independent thinking, team work, etc.

Contents: This module has no specific course content. Students may select their topics of research after contacting a supervisor of their choice in the department or in any other research institution as long as the Physics department approves the research.

Instruction: Formal Seminars (3 hours/week): used for presentation of theory related to research work, and discuss candidate’s research progress. Tutorial 1 hour per week

Credits: 256

Assessment: Full Masters dissertation.

**PHY 706: Semiconductor Physics and Renewable Energy**

Purpose: To provide a thorough understanding and knowledge of the theoretical aspects of semiconductor physics and renewable energies; to provide a thorough understanding and knowledge of Bipolar, Unipolar and Photonic devices.


Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 240 hours.

Credits: 43

Assessment: Weekly pre-laboratory and tutorial tests. Four tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.
**PHY 707: Advanced Solid State Physics**

**Purpose:** To provide a thorough understanding and knowledge of the theoretical and practical aspects of solid-state physics.

**Contents:** Review of fundamentals; Atoms and molecules: Energy levels and wave functions; The free-electron approximation; Bonding and energy levels; Bloch functions, band structures and Brillouin zones; Semiconductor crystals; Optical processes and excitons.

**Instruction:** 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.

**Credits:** 43

**Assessment:** Weekly pre-laboratory and tutorial tests. Four tests based on tutorial and lecture materials and a final externally moderated examination. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

**PHZ 701: Special Topics in Physics** (previously PHY 751)

**Purpose:** To build up principles of some special topics in physics. This module will depend on the availability of a specialist in certain advanced topics of physics. It will be used when there is a visiting lecturer who specializes in other topics that we do not offer or to supplement research students.

**Contents:** Depend on topics offered in a particular year

**Instruction:** 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 240 hours.

**Credits:** 43

**Assessment:** Weekly tutorial tests. Four tests based on tutorial and lecture materials. Final assessment is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements.

**PHZ 702: Masters Mini Research Project** (previously PHY750)

**Purpose:** To build up research skills, such as proposal writing, data collection, data analysis, scientific writing, independent thinking, team work, etc.

**Contents:** This module has no specific course content. Students may select their topics of research after contacting a supervisor of their choice in the department or in any other research institution as long as the Physics department approves the research.

**Instruction:** Formal Seminars (3 hours/week): used for presentation of theory related to research work, and discuss candidate’s research progress. Tutorial 1 hour per week

**Credits:** 128

**Assessment:** Seminar (50%) + field work and a Mini dissertation (50%)
MASTER OF SCIENCE IN ZOOLOGY  41511

ZOO 700  Master of Science in Zoology
Purpose:  To equip postgraduate students with the requisite skills to plan, execute and write up a research dissertation dealing with a topic selected with the assistance and approval of his/her supervisor.
Instruction:  Supervised self-study of a selected topic. Where applicable, additional course-work may be prescribed.
Credit value: 256
Assessment:  The candidate’s dissertation will be assessed by an internal examiner (who is not the supervisor) and two external examiners. The dissertation must demonstrate the candidate’s ability to undertake independent research (including a comprehensive literature review) and his/her grasp of the research methods and analytical techniques of the chosen field.
Pre-requisite:  BSc Honours in Zoology, or an equivalent qualification with the approval of the University Senate.

THE DEGREE MASTER OF NURSING SCIENCE  
(MAGISTER CURATIONIS)  47000

The general rules for the Master’s degree are applicable.

NSc 13 ADMISSION

Unless the Senate decides otherwise and subjects to the specific requirements set out in rule NSc 14 for a particular field of study, a candidate shall be admitted to the studies for the degree of Master Curationis only if he/she
- holds an approved post in which the particular specialty in advanced study is being undertaken
- is in possession of the degree of B.Cur or B.Cur, (I et A)
- has a 4 year comprehensive diploma, at least 1 year clinical experience in the specialist field
- holds a bachelor’s degree in nursing and is registered as a general nurse and midwife. In the case of males, registration as a general nurse, plus any other post-basic registration
- holds proof of registration as a general nurse and midwife, or any other post-basic qualification (in the case of males) with the South African Nursing Council. The said registration must be maintained throughout the period of study.

NSc 14 FIELD OF STUDY

The degree of Master Curationis may be obtained by either a combination of course-work and a mini-dissertation or by means of a dissertation (NMS700E) as prescribed by the Head of the Department in one of the following fields: -
- Advanced General Nursing Science
- Advanced Community Health Nursing Science
- Advanced Psychiatric Nursing Science
The admission requirements for the different fields of study are as follows:

- **Advanced General Nursing Science:**
  Registration with the South African Nursing Council as a general nurse, plus any other post-basic registration

- **Advanced Community Health Nursing Science:**
  Registration with the South African Nursing Council as a community health nurse

- **Advanced Nursing Administration:**
  Registration with the South African Nursing Council as a general nurse and midwife, and as a nursing administrator for which the qualification was obtained at a university. In the case of males registration as a general nurse plus any other post-basic registration and as a nursing administrator for which the qualification was obtained at a university

- **Advanced Psychiatric Nursing Science:**
  Registration with the South African Nursing Council as a psychiatric nurse and registration in one other recognized nursing field

- **Advanced Midwifery and Neonatal Nursing Science:**
  Registration with the South African Nursing Council as a general nurse and a midwife

- **Advanced Nursing Education:**
  Registration with the South African Nursing Council as a general nurse, midwife, and as a nurse educator, for which the qualification was obtained at a university. In the case of males registration as a general nurse, plus any other post-basic registration and registration as a nurse educator, for which the qualification was obtained at a university.

**DURATION OF STUDY**
The curriculum shall extend over a minimum period of two (2) years of part-time study.
The qualifications shall be obtained in accordance with the general rules applied to the Masters qualifications. In the case where the qualification is obtained by means of a dissertation, the examiners may also conduct oral examinations.
# PROGRAMME OF STUDY

## PART 1: GENERAL

**Fundamental Courses (Undertaken by all Masters students)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NMS702</td>
<td>Research Methods and Techniques</td>
<td>16</td>
</tr>
<tr>
<td>NME701</td>
<td>Ethos of Nursing and Professional Practice</td>
<td>16</td>
</tr>
<tr>
<td>NMH701</td>
<td>Management of HIV/AIDS in Clinical and Community Settings</td>
<td>16</td>
</tr>
<tr>
<td>NMR701</td>
<td>Research Paper</td>
<td>16</td>
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</tbody>
</table>

## PART 2: SPECIFIC CORE COURSES

### M CUR: NON-CLINICAL MASTERS

**Advanced Nursing Administration**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NML701</td>
<td>Organizations and Management</td>
<td>16</td>
</tr>
<tr>
<td>NML702</td>
<td>Theory and Administrative Practice</td>
<td>16</td>
</tr>
<tr>
<td>NML703</td>
<td>Health Systems Management</td>
<td>32</td>
</tr>
<tr>
<td>NMS701</td>
<td>Mini-dissertation</td>
<td>52</td>
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**Advanced Nursing Education**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NMD701</td>
<td>Tertiary Didactics</td>
<td>16</td>
</tr>
<tr>
<td>NMD702</td>
<td>Adult Learning</td>
<td>16</td>
</tr>
<tr>
<td>NMD703</td>
<td>Curriculum Development in Nursing</td>
<td>32</td>
</tr>
<tr>
<td>NMS701</td>
<td>Mini-dissertation</td>
<td>52</td>
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### M CUR: CLINICAL MASTERS

**Advanced Medical-Surgical Nursing**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NMG701</td>
<td>Medical-Surgical Nursing Science IV</td>
<td>16</td>
</tr>
<tr>
<td>NMG702</td>
<td>Medical-Surgical Nursing Science V</td>
<td>16</td>
</tr>
<tr>
<td>NMG703</td>
<td>Medical-Surgical Nursing Science Practice</td>
<td>32</td>
</tr>
<tr>
<td>NMS701</td>
<td>Mini-dissertation</td>
<td>52</td>
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**Advanced Community Nursing Science**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NMC701</td>
<td>Community Health Care Dynamics</td>
<td>16</td>
</tr>
<tr>
<td>NMC702</td>
<td>Community Nursing Science</td>
<td>16</td>
</tr>
<tr>
<td>NMC703</td>
<td>Community Nursing Science Practice</td>
<td>32</td>
</tr>
<tr>
<td>NMS701</td>
<td>Mini-dissertation</td>
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**Advanced Psychiatric Nursing Science**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NMP701</td>
<td>Psychiatric Nursing Science</td>
<td>16</td>
</tr>
<tr>
<td>NMP702</td>
<td>Dynamics of Psychiatric Nursing Science</td>
<td>16</td>
</tr>
<tr>
<td>NMP703</td>
<td>Psychiatric Nursing Science Practice</td>
<td>32</td>
</tr>
<tr>
<td>NMS701</td>
<td>Mini-dissertation</td>
<td>52</td>
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THE DEGREE DOCTOR OF PHILOSOPHY

S 14  Degree of Doctor of Philosophy
Please refer to the Statute and General Rules for general stipulations regarding the degree of Doctor.

S14.1  The degree of Doctor of Philosophy may be obtained in any of the following subjects:

- Applied Mathematics 43001
- Applied Statistics 43014
- Biochemistry 43012
- Biostatistics 43018
- Botany 43002
- Chemistry 43003
- Computer Science 43004
- Entomology 43005
- Epidemiology 43015
- Ethnobotany 43016
- Geography 43006
- Geology 43017
- Mathematics 43013
- Mathematical Statistics 43008
- Microbiology 43009
- Physics 43010
- Zoology 43011

S14.2  The degree of Doctor of Philosophy (PhD) may be obtained by means of research on an approved topic pursued under the guidance of a promoter appointed by Senate.

DOCTOR OF PHILOSOPHY IN APPLIED MATHEMATICS  43001

MAP 800:  Applied Mathematics PhD Thesis

Purpose:  Student will be required to plan and execute independent original research activities leading to writing up a doctoral thesis on a topic of interest with the assistance of a supervisor.

Contents:  Student will select a topic in conjunction with a supervisor, which must be approved by the Research Committee of the University.

Instruction:  Teaching of research skills through the supervision of research project.

Credit: 360

Assessment:  Candidate will be assessed (both internally and by two external examiners) on the basis of the submitted thesis. The thesis so submitted should reflect the original work of the candidate and must be seen to contribute to knowledge in the chosen area of specialization.
Prerequisite: MSc in any area of Applied Mathematics, subject to the approval of the Head of the Department of Pure and Applied Mathematics.

DOCTOR OF PHILOSOPHY IN BIOCHEMISTRY 43012

BCH 800: Biochemistry PhD Thesis
Purpose: Student will be required to plan and execute independent original research activities leading to writing up a doctoral thesis on a topic of interest with the assistance of a supervisor.
Contents: Student will select a topic in conjunction with a supervisor, which must be approved by the Research Committee of the University.
Instruction: Teaching of research skills through the supervision of research project.
Credit: 360
Assessment: Candidate will be assessed (both internally and by two external examiners) on the basis of the submitted thesis. The thesis so submitted should reflect the original work of the candidate and must be seen to contribute to knowledge in the chosen area of specialization.
Prerequisite: MSc in Biochemistry or other relevant discipline, subject to the approval of the Head of the Department of Biochemistry and Microbiology.

DOCTOR OF PHILOSOPHY IN BOTANY 43002

BOT 800: Botany PhD Thesis
Purpose: Students will be required to plan, execute, and write-up a Doctoral thesis dealing with a topic of interest, selected with the assistance of their supervisor.
Contents: The student will select a project topic in conjunction with a supervisor.
Instruction: Teaching of research skills through supervision of research project.
Credit: 360
Assessment: Learners will be assessed (both internally and by two external examiners) on the basis of their submitted thesis. The thesis must make a substantial contribution to the scientific knowledge and insight of a selected subject; as well as afford evidence of individual and original scientific thought.
Prerequisite: MSc in Botany or other relevant discipline, subject to the approval of the Botany Head of Department.

DOCTOR OF PHILOSOPHY IN ETHNOBOTANY 43016

BOT 801: Ethnobotany PhD Thesis
Purpose: Students will be required to plan, execute, and write-up a Doctoral thesis dealing with a topic of interest, selected with the assistance of their supervisor.
Contents: The student will select a project topic in conjunction with a supervisor.
Instruction: Teaching of research skills through supervision of research project.
Credit: 360
Assessment: Learners will be assessed (both internally and by two external examiners) on the basis of their submitted thesis. The thesis must make a substantial contribution to the scientific knowledge and insight.
of a selected subject; as well as afford evidence of individual and original scientific thought.

Prerequisite: MSc in Botany, Ethnobotany or other relevant Scientific, Agricultural or Horticultural discipline, subject to the approval of the Botany Head of Department.

**DOCTOR OF PHILOSOPHY IN CHEMISTRY  43003**

**CHE 800** Chemistry PhD thesis

**DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE  43004**

**CSC800** Computer Science PhD Thesis.
Students will be expected to carry out a project that makes an original contribution to research in the field of computer science. The work should be written up in the form of a thesis that is assessed by one internal and two external examiners. The prerequisite for admission is normally a masters degree of high quality in computer science.

**DOCTOR OF PHILOSOPHY IN ENTOMOLOGY  43005**

**ENT 800** Entomology PhD thesis

Purpose: To equip postgraduate students with the requisite skills to plan, execute and write up a research thesis dealing with a topic selected with the assistance and approval of his/her supervisor.

Instruction: Supervised self-study of a selected topic.

Credit value: 360

Assessment: The candidate’s thesis will be assessed by an internal examiner (who is not the supervisor) and two external examiners. The thesis must demonstrate the candidate’s ability to undertake independent research (including a comprehensive literature review) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must constitute an original and substantial contribution to the field.

Pre-requisite: MSc in Entomology or other relevant discipline, or an equivalent qualification with the approval of the Head of Department and the University Senate.

**DOCTOR OF PHILOSOPHY IN GEOGRAPHY 43006**

**GEG 800:** Geography PhD Thesis

Purpose: To plan and execute independent and original research culminating in the writing of a thesis on a topic of interest selected in conjunction the assistance of the Supervisor.

Contents: Undertake research and write a thesis in accordance with the Department, Faculty and University’s rules and regulations. The thesis must reflect the student’s research and contribute to the body of knowledge in the chosen field of specialization.

Instruction: Students need to meet the University’s norm of at least one meeting a month with their Supervisors. The responsibility rests with the student to ensure that s/he fulfils this requirement. The consultation dates and
times between the Supervisor and the students are normally established at the beginning of each academic Year, for the calendar Year. Each consultation normally lasts for an hour.

Credit: 360

Assessment: The University appoints – on the recommendation of the Department - three external examiners to assess the thesis. Normally two of the examiners are international, and one is South African.

Prerequisite: M Sc in Geology or other equivalent qualification, subject to the approval of the Head of Department.

DOCTOR OF PHILOSOPHY IN GEOLOGY  43017

The examination for the Ph.D. is based on the successful completion of a thesis on a topic in one of the fields of Geology and Applied Geology, and approved by the relevant Research Committee of the University. The thesis must reflect the results of independent and original research undertaken by the student and must contribute to the body of knowledge in the chosen field of specialization. Normally the choice of the research topic is contingent on the specialist areas of research of academics within the disciplines of Geology and Applied Geology.

DOCTOR OF PHILOSOPHY IN MICROBIOLOGY  43009

MIC 800  Microbiology PhD thesis

Contents: The degree is based on thesis alone. The candidate must demonstrate that he is capable of planning, instituting and executing an original scientific investigation.

Assessment: The evaluation panel shall consist of the promoter and co-promoter (if any) acting as internal examiners, and at least two external examiners. The candidate must submit at least one article to a recognized journal before or simultaneously with the submission of the thesis.

Pre-requisite:A Master’s degree or an equivalent qualification. In addition, the candidate must convince the head of the department that he has sufficient knowledge of the subject and is capable of doing the work required for the degree.

DOCTOR OF PHILOSOPHY IN ZOOLOGY  43011

ZOO 800  Zoology PhD thesis

Purpose: To equip postgraduate students with the requisite skills to plan, execute and write up a research thesis dealing with a topic selected with the assistance and approval of his/her supervisor.

Instruction: Supervised self-study of a selected topic.

Credit value: 360

Assessment: The candidate’s thesis will be assessed by an internal examiner (who is not the supervisor) and two external examiners. The thesis must demonstrate the candidate’s ability to undertake independent research (including a comprehensive literature review) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must constitute an original and substantial contribution to the field.
Pre-requisite: MSc in Zoology or other relevant discipline, or an equivalent qualification with the approval of the Head of Department and the University Senate.

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