University of Fort Hare
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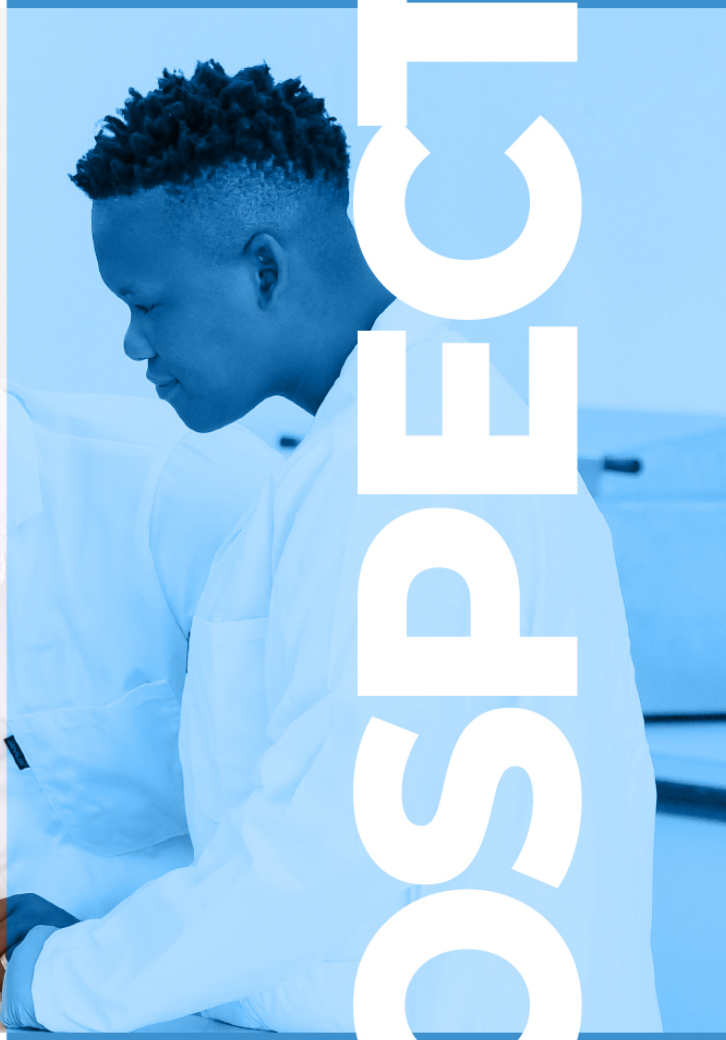

PROSPECTUS

FACULTY OF SCIENCE AND AGRICULTURE

2025

UNIVERSITY OF FORT HARE

FACULTY OF SCIENCE AND AGRICULTURE
2025

Postal Address:	University of Fort Hare Private Bag X1314 Alice, 5700	
Dean & Faculty Office:	Room No. 015 Agriculture Building, Ground Floor, Alice Campus	
Office Hours:	Monday to Thursday: Friday:	08h00 - 16h30 08h00 – 15h30
Telephones:	Dean's Office Faculty Manager's Office Accounts and Fees Student Administration Examinations & Graduation	040 602 2232 040 602 2252 043 704 7007 043 704 7139 043 704 7680
Internet:	UFH's Home Page http://www.ufh.ac.za Faculty Home Page https://www.ufh.ac.za/faculties/science/ UFH Facebook Page UFH Twitter Page UFH LinkedIn	University of Fort Hare @ufh1916 University of Fort Hare

General Enquiries offices are in the Administration Building, Alice Campus

The Student Administration and Examinations Office are in the Administration Building, Alice Campus and are open from 08h30 to 16h30.

Your student number and full names must appear on all the correspondences and remember to ALWAYS use your student email address as soon as you have been allocated one. If relevant to your query the specific course code and name of the module referred to should be included.

NB: Although the information contained in this Prospectus has been compiled as accurately as possible, the Faculty, Council and the Senate of the University of Fort Hare accept no responsibility for any errors or omissions. This Prospectus is applicable only to the 2024 academic year.

Please Note: The University reserves the right at any time, if circumstances dictate (for example, if there are not sufficient students registered, staff or other resources), to make and publish alterations to the contents of this prospectus. However, this will only be done under the most compelling circumstances. Further information on syllabus and module outcomes and other details are available on the https://www.ufh.ac.za/faculties/science/ website.

University of Fort Hare
Together in Excellence

FACULTY OF SCIENCE AND AGRICULTURE

FACULTY PROSPECTUS 2025

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.

All correspondence to be addressed to:
The Manager
Faculty of Science & Agriculture
University of Fort Hare
Private Bag X1314
ALICE
5700

TABLE OF CONTENTS

PLEASE NOTE*: 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 a copy of the Faculty Prospectus with their first registration.*

Disclaimer

This publication contains information about regulations, policies, curricula and programmes of the Faculty of Science & Agriculture applicable at the time of printing. Amendments to or updating of the information in this publication may be effected from time to time without prior notification. The accuracy, correctness, or validity of the information contained in this publication is therefore not guaranteed by the University at any given time and is subject to verification. The user is therefore requested to, at all times, verify the correctness of the published information with the University. Failure to do so will not give rise to any claim or action of any kind against the University by any party whatsoever.

MESSAGE FROM THE ACTING DEAN

Welcome to the Faculty of Science and Agriculture!

As we embark on another academic year, I am excited and proud to share with you some of our faculty's remarkable advancements and developments. Whether you are a prospective or current student, this is an exciting time to be part of the vibrant community that makes our faculty a leading institution for agriculture and scientific teaching, research and innovation.

Education should impart knowledge, foster innovation and prepare students for the dynamic and rapidly changing world. To this end, the Faculty of Science and Agriculture have been diligently working to ensure that our programmes remain cutting-edge, globally competitive, and aligned with the latest developments in science and technology. One of the key milestones we achieved recently was a thorough review and revitalisation of our academic programmes. The reviews, conducted by senior academics, industry professionals, and alums, have led to significant updates in our curriculum. Our goal is to ensure that each programme remains relevant to the industry's ever-evolving needs while fostering critical thinking, research aptitude, and innovation.

I am particularly thrilled to share a groundbreaking development that marks a new chapter for our faculty: the Department of Higher Education and Training (DHET) granted clearance for the Programme Qualification Mix (PQM) for the following new qualifications in the faculty:

- Bachelor of Science in Agriculture in Dairy Science and Technology (NQF Level 8).
- Bachelor of Science Honours in Mathematical Sciences (NQF Level 9).
- Bachelor of Science Honours in Biological Sciences (NQF Level 9).

Our Bachelor of Science in Agriculture in Dairy Science and Technology will be designed with the modern agricultural landscape in mind, combining foundational scientific principles with hands-on applications in dairy production, nutrition, animal health and entrepreneurship, which will significantly impact the tech-innovation value chain. This programme will address the needs of a rapidly expanding industry that supports our economy and directly impacts nutrition and food security. As future professionals in dairy science, our undergraduates will gain the expertise needed to innovate within this essential sector and elevate sustainable practices in dairy production from farm to table. Through field placements, research projects, and partnerships with leading dairy producers, students in this programme will be well-prepared for meaningful, impactful careers in agriculture and dairy science.

The Bachelor of Science Honours in Mathematical Sciences will equip students with advanced analytical skills that are critical for solving complex problems in fields like data science, finance, and research. With a strong foundation in applied mathematics, students will be prepared to lead in rapidly evolving industries that demand precision and innovation. Similarly, the Bachelor of Science Honours in Biological Sciences will offer an immersive exploration of life sciences, focusing on cellular and molecular biology, ecology, and biotechnology. Graduates will be empowered to drive discoveries in health, environmental conservation, and biotechnology, positioning themselves at the forefront of biological research and application.

On a different note, the Faculty of Science and Agriculture hosts one research institute and two centres approved by the University Council in the drive for standardisation, global competitiveness, research innovation and solution to contemporary problems in our society. Alongside this exciting news is the AngloGold Ashanti Endowed Chair in Dairy Science and Technology, which is the first of its kind in sub-Saharan Africa, and the faculty is also hosting the Chair. This initiative will elevate our postgraduate research and position us as a leader in advancing dairy science in Africa. The prestigious Chair is dedicated to advancing dairy science through research excellence, cutting-edge technological applications, and strategic industry collaboration. Postgraduate students and researchers associated with the Chair will have access to unparalleled resources, enabling them to drive innovation in dairy technology, nutrition, product quality, and sustainability.

As part of our continuous efforts to improve how we serve students and the broader community, we have also undertaken a significant restructuring of the faculty. This restructuring aims to enhance efficiency, improve academic and administrative service delivery, and promote a more integrated and interdisciplinary approach to teaching, learning, and research.

We have restructured the faculty into six key departments, with three departments servicing the agriculture-related disciplines and the other three servicing science and technology disciplines. Consequently, the faculty is comprised of the following departments:

- Agriculture-related disciplines: Agricultural Economics, Extension and Agribusiness; Animal and Pasture Science; Agronomy.
- Science and Technology related disciplines: Biotechnology and Biological Sciences; Computational Sciences; Earth and Chemical Science.

The restructured departments allow for optimized resource allocation and utilization, the leverage of interdisciplinary research opportunities, and a more holistic academic experience for students. In addition to the restructuring, we have introduced new administrative measures to improve student support services. These include dedicated student advisors, more efficient academic processes, and enhanced communication channels between students and faculty staff.

At the Faculty of Science and Agriculture, we are deeply committed to fostering a collaborative and dynamic environment where students and staff can thrive. Our faculty houses state-of-the-art laboratories and cutting-edge research facilities that serve as fertile ground for groundbreaking discoveries and applied research. We are working closely with industry partners, government agencies, and international research institutions to ensure that the research produced within our faculty has a real-world impact and contributes meaningfully to society. We are delighted with our digital classrooms that offer our students the ambience and convenience of remote learning.

In the coming year, we will also launch several exciting new initiatives, including an industry internship programme for final-year students. This programme will give them hands-on experience and the opportunity to apply their knowledge in real-world settings. This initiative bridges the gap between academic training and industry expectations, ensuring our graduates are industry-ready and poised to make significant contributions as they enter the workforce. Furthermore, we are enhancing our postgraduate research programmes to attract top talent and provide opportunities for in-depth research in critical areas such as

renewable energy, biotechnology, and sustainable agriculture. Our goal is to become a global hub for research and innovation, producing graduates who excel in their fields and lead with purpose and passion.

As we continue to grow and evolve, we remain committed to providing a world-class education grounded in excellence, innovation, and relevance. Whether you join us to begin your academic journey or continue your research, the Faculty of Science and Agriculture is where your potential can flourish. We invite you to explore the many opportunities our faculty offers and to contribute to our shared vision of making a meaningful and lasting impact on the world. Together, we will continue to push the boundaries of science, improve lives, and build a more sustainable future for future generations.

Welcome to a world of discovery and transformation!

Prof UU Nwodo
Acting Dean
Faculty of Science & Agriculture

FACULTY STAFF AND ACADEMIC DEPARTMENTS

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Botany

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Zoology & Entomology

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INSTITUTES AND CENTRES

FORT HARE INSTITUTE OF TECHNOLOGY (FHIT)

http://fhit/ufh.ac.za

The Fort Hare Institute of Technology (FHIT) was established in accordance with the University of Fort Hare (UFH) institutional strategic plan, UFH-SP2000 for restructuring and development of new academic programmes including the rationalization and integration of Institutes and Centers. FHIT, linked to the Faculty of Science and Agriculture, was established particularly to promote innovation and excellence in identified focus areas and produce applied scientists with the necessary skills required to participate and successfully compete in the global economic market.

In its quest to establish and nurture a culture of innovation and excellence, FHIT has identified four key research niche areas that will result in interdisciplinary programmes with both existing UFH departments and external partners. These focus areas include *Solar Energy*, *Bio Energy*, *Power Electronics*, *Smart Energy Systems* and *Sustainable Energy Studies* and provide excellent opportunities for postgraduate education, training, research and development in collaboration with other departments within and outside the Faculty. Amongst these are Chemistry, Physics, Mathematics, Statistics, Computer Science, Microbiology and the Faculty of Law. This was endorsed by the University by officially endorsing the associated activities through the allocation of the Renewable Energy Research Niche Area led by FHIT. FHIT has at its core the following statements:

Mission

The Fort Hare Institute of Technology shall be a center of excellence focusing on the most appropriate and advanced education, training, research and development of technology and related fields, thereby contributing to raising the number of Africans in particular, and South African's in general, in technical positions at all levels in the private and public sectors of the economy to a level that is proportional to the national demographics in order to contribute positively to economic growth.

Vision

The Fort Hare Institute of Technology is committed to the establishment and nurture of a culture of innovation and excellence in the promotion and development of superior technology and research capacity for the facilitation of advanced education and training in science and technology.

Values

In accordance with the above mission and vision, the Institute supports the following values:

- Professionalism
- Excellence in teaching, research and innovation
- Striving towards international standards
- Service to students and communities
- Equity
- Institutional sustainability and viability

SAMRC MICROBIAL WATER QUALITY MONITORING CENTRE

The SAMRC Microbial water Quality Monitoring Centre is a national facility established and funded by the South Africa Medical Research Council (SAMRC). It was inaugurated on 26 November 2014 at the MRC headquarters in Cape Town. This centre with a life span of 15 years and annual

subvention from the MRC of R1M in the first year (2015) and about R2.5M (capped) from the second year onwards is one of 8 such centres and units established in the country in 2014 and a veritable platform to conduct cutting edge water research in our region. The vision and mission statements of the centre are as articulated below.

Vision

The vision of the Centre is to strive to be a highly profitable center of excellence for the development of the next generation of microbial water resource specialists and to be *primus inter pares* for proffering solutions to the myriad of water related challenges in South Africa and beyond.

Mission

Our mission is to conduct high quality multi- and trans-disciplinary research in water quality and microbial genomics within the precinct of the following high impact themes: Quality indices and micro-/macro-ecology of water resources; effluent monitoring and compliance; emerging and re-emerging microbial infections; reservoirs of antibiotic resistance; and exploration for new bioactive compounds of health and biotechnological importance.

Goals & objectives of our research initiatives

This centre was established to be a hub for addressing the myriad of challenges in the water sector within the overarching aim of her research initiatives which is “evaluating some key emerging challenges in microbial water quality and safety as a vehicle for skills and capacity development in water science especially amongst the previously disadvantages demographic groups in the Province” and focusing on the following themes:

1. Quality indices and micro-/macro-ecology of water resources including effluents monitoring and compliance.

2. Emerging and re-emerging microbial pathogens and chemical pollutants in the environment with particular emphasis on the aquatic environment

3. Reservoirs of antibiotic resistance determinants – understanding their release, fate and impact on the environment.

4. Exploration for new bioactive compounds of health and biotechnological importance.

5. Development of real-time detection devices such as biosensors for the quantitation and detection of antibiotics and chlorine resistance genetic elements in water and development of guideline for such nucleic acids in water.

6. Development of innovative technologies in removal of pollutants in water.

The centre is very research intensive and publishes on the average over 45 articles per year in the last 3 years in DHET accredited journals. We have generous funding and all our students enjoy one form of bursary or the other. Key members of the centre are drawn from academics in the University of Fort Hare, Walter Sisulu University and the University of the Western Cape. In collaboration with the University of Pretoria, Rhodes University, North-West University, Water Research Commission (WRC), Amathole District Municipality, and other academics in institutions in the United Kingdom, United States of America, Russia, Tunisia, Egypt, Nigeria, United States of America and Norway. The centre is temporarily hosted in the Applied and Environmental Microbiology Research Group (AEMREG) at the University of Fort Hare while plans are ongoing for a building on its own.

Further details about the centre can be found on its official websites:
www.ufh.ac.za/centres/aemreg/
www.samrc.ac.za/extramural-research-units/microbial-water-quality-monitoring?return=research/extramural-research-units).

CENTRE FOR GLOBAL CHANGE

The Centre for Global Change (CGC) at the University of Fort Hare was established in 2011 by the Department of Science and Innovation (DSI) and the National Research Foundation (NRF) as a strategic initiative to advance research, innovation, and societal impact. These key aspects of the CGC are embedded within the DSI's 2022-2032 Decadal Plan, specifically within the Global Change Research Programme, which is embedded in the Societal Grand Challenges and is integral to the sustainable development framework in South Africa. The CGC's mandate is to:

- Conduct responsive and proactive evidence-based research in collaboration with stakeholders at local, national, and global levels.
- Promote transdisciplinary postgraduate training for the next generation of researchers and practitioners.
- Manage knowledge dissemination through community forums, scientific publications, and conference/workshop presentations to communities, government entities, NGOs, and civil society.
- Implement community engagement activities to build resilient communities capable of adapting to global changes.
- The CGC strives to achieve its goals through four key pillars: research, human capacity development, collaboration, and community engagement.

Vision

The vision is to significantly contribute to generating solution-oriented knowledge that enhances livelihood opportunities and promotes a sustainable future for society. The CGC strives to achieve this vision through innovative and socially inclusive research, training and knowledge transfer. The aim is to drive positive transformation by bridging the gap between scientific knowledge and practical, community-focused solutions.

Themes and Areas of Research

Central to the CGC is its focus on contextually relevant research, innovation, and societal impact, achieved through prioritising transformative and transdisciplinary approaches. The CGC is anchored in the Eastern Cape Province in South Africa and extends its reach through collaboration to Southern Africa. In partnership with the African Climate and Development Initiative (ACDI) at UCT, it also aims to leverage South-South and South-North collaborations beyond Africa. The underlying intention is to make the global change science and policy domain more diverse and inclusive at local, regional, and global levels. Research areas include, climate Change Risks and Vulnerability Assessment, alternative livelihoods and natural resources management.

CODES, COURSE DESCRIPTIONS, CREDITS, PRE AND CO-REQUISITES

Code	Title	Pre-req	Co-req	Credits
AGA 211	Introduction to Animal Science	BIO 111 + BIO 121 or BIO 111F + BIO 121F		16
AGA 221	Principles of Animal Nutrition	AGA 211		16
AGA 311	Monogastric Nutrition	AGA 211 + BCH 211 + AGV 221		12
AGA 322	Animal Breeding	AGC 312 / AGC 413		12
AGA 323	Ruminant Nutrition	AGA 211 + BCH 211 + AGV 221		12
AGA 406	Research project	AGB 312 + AGR 322		32
AGA 415	Pig & Poultry Production	AGA 321		16
AGA 416	Dairy Science and Technology	AGA 321 & MIC 211		16
AGA 421	Meat Science	AGA 211 + AGV 221		12
AGA 424	Seminar in Animal Science	AGA 414	AGA 422	12
AGA 425	Beef Production & Game Farming	AGA 321		12
AGB 312	Agricultural Biometry	STA 111 + STA 121		16
AGC 111	Elements of Agro-Meteorology	None		16
AGC 122	Introduction to Crop Science	AGC 111		16
AGC 122F	Introduction to Crop Science (F)	AGC 111F		16
AGC 122	Intro to Crop Science	AGC 111		16
AGC 221	Elementary Irrigation	AGC 122/ AGC 122F + AGS 211		8
AGC 222	Principles of Crop Prod	AGC 111		12
AGC 311	Water Relations	AGC 122		12
AGC 314	Agronomy of Summer Crops	AGC 222		16
AGC 315	Plant Physiology	AGC 122		16
AGC 316	Plant Pest Control	AGC 222		12
AGC 323	Agronomy of Winter Crops	AGC 222	AGC 314	12
AGC 412	Agronomy of Industrial Crops	AGC 222		16
AGC 413	Principles of Genetics	AGC 122		16
AGC414	Crop Ecology & Physiology	AGC 315		16
AGC 423	Plant Breeding	AGC 413		16
AGC 402	Seminar in Crop Science			12
AGC 403	Crops Research Project	AGB 312 + AGR 322		32
AGE 111	Introduction to Agricultural Economics	None		16

AGE 121	Marketing of Agricultural Products	None		12
AGE 211	Agricultural Production Economics	For *B Agric*: AGE 111 *BSc Agric* (Economics): ECO111		12
AGE 213	Intro to Seminar Writing	None		8
AGE 221	Farm Management	AGE 111 ***or*** AGE 211 *BSc Agric* (Economics)		12
AGE 222	Farm Accounting	AGE 111 ***or*** AGE 211 *BSc Agric* (Economics)		8
AGE 311	Advanced Farm Business Management	AGE 221		12
AGE 312	Agricultural Market Analysis	AGE 211		12
AGE 316	Analytical Techniques in Agricultural Economics	AGE221	AGE311	16
AGE 321	Agricultural Development Planning	AGE 211		12
AGE 322	Seminar in Agricultural Economics	AGW 211	AGE 321	12
AGE 326	Agricultural Policy	ECO 211 + ECO 212 + ECO 221 + ECO 222		16
AGE 401	Project in Agric Econ	AGE 316		36
AGE 402	A Seminar in Agricultural Economics	AGE 322		32
AGE 404	Agricultural Marketing	AGE 312		20
AGE 405	Agricultural Development	AGE 321		20
AGE 406	Research Methods in Agricultural Economics	AGE 316		20
AGE 408	Agricultural Research Economics	AGE 311 + AGE 326		20
AGE 409	Special Topics in Agricultural Economics	AGE 311 ***or*** AGE 321 ***or*** AGE 326	AGE405, + AGE 308	20
AGF 112	Introduction to Scientific Concepts	None		16
AGF 301	Practical Agricultural Experience (Duration as arranged by HOD)	Third year module		12
AGG 221	Introduction to Agricultural Engineering	AGF 112 or AGF 112F		16
AGG 321	Irrigation Drainage	AGC 122 + AGC 311		12
AGH 314	Elements of Horticultural Science	AGC 122		16
AGH 322	Vegetable & Herb Production	AGH 314		16
AGH 411	Citrus Fruits	AGH 314		12
AGH 414	Tropical & Subtropical Fruit	AGH 314		16
AGH 415	Ornamental, Medicinal & Aromatic Plants	AGH 314		12

AGH 416	Plant Propagation & Nursery Management	AGH 314		16
AGH 421	Temperate Fruits	AGH 314		12
AGH 427	Post-Harvest Physiology	AGH314		16
AGH 404	Research Project & Seminar	AGB 312 + AGR 322		32
AGH 423	Special Topics in Horticultural Science	AGH 321 + AGH 411		8
AGP 211	Introduction to Pasture Ecology	BIO 111 + BIO 121 or BIO 111F + BIO 121F		12
AGP 222	Veld and Cultivated Pasture Management	AGP 211		16
AGP 223	Plant Anatomy & Physiology	AGP 211		12
AGP 312	Range Management	AGP 211 + AGC 111		12
AGP 322	Fodder Production and Conservation	AGP 211 + AGP 223		8
AGP 323	Planted Pastures	AGP 211 + AGP 223		12
AGP 324	Applied Range Management	AGP 312		16
AGP 401	Research Project	AGB 312 + AGR 322		32
AGP 411	Advanced Pasture Management	AGP 311		16
AGP 412	Range Rehabilitation	AGP 312 + AGP 324		8
AGP 423	Seminar in Pasture Science	AGW 211		12
AGP 425	Apiculture	BIO 111 + BIO121		8
AGP 426	Wildlife Ecology & Mgt	AGP 312		12
AGP 424	Project in Pasture Sc	AGP 411		16
AGQ 311	Smallstock Science	AGA 211		16
AGR 322	Research Methods	AGB 312		16
AGS 211	Introduction to Soil Science	PAC 110 or PAC 119 + PAC 129 or PAC 111F + PAC 121F		16
AGS 221	Pedology	AGS 211		12
AGS 323	Plant Nutrition & Soil Fertility	AGS 211		16
AGS 324	Soil genesis, morpho-logy & classification	AGS 221		12
AGS 413	Seminar in Soil Science	AGW 211 + AGS 221		12
AGS 414	Environmental Soil Chemistry	PAC 211 + PAC 213 + PAC 222 + PAC224 + AGS211		16
AGS 415	Soil Geomorphology	AGS 324		16
AGS 416	Special Topics in Soil Health	AGS323		16
AGS 425	Soil Physics	AGS 211		16
AGS 426	Chemical Analysis of Soils & Plants	AGS 211		

AGS 402	Project in Soil Science	AGB 312 + AGR 322		32
AGV 221	Anatomy and Physiology	PAC 110 + PAC 121		16
AGV 321	Elementary Animal Health	AGA 211		12
AGV 323	Animal Health	AGV 221		16
AGX 221	Introduction to Agricultural Extension	BIO 111 + BIO 121 or BIO 111F + BIO 121F		8
AGX 321	Agricultural Extension & Human Development	AGX 221	AGX 322 AGX 323	16
AGX 322	Applied Extension and Rural Development	AGX 221	AGX 321 AGX 323	16
AGX 323	Seminars in Agricultural Extension	AGX 221	AGX 321 AGX 322	12
ALP 313	Land Use Planning	**Compulsory**: AGP 222 + AGE 221 + AGS 221. *Attendance in AGC 222*		16
ALP 322	Project in Applied Land Use Planning	ALP 313		16
BCH 211	Introductory Biochemistry	BIO 111/121 + PAC110 /121 + STA 111/121		24
BIO 111	Plant Biology			16
BIO 121	Animal Biology			16
ICC 121	Introduction to Computers and Computing Theory			8
MIC 211	Introduction to Microbiology	PAC 121, plus BIO 111 & 121		16
MIC 221	Soil and Environmental Microbiology	MIC 211		12
PAC 110 PAC 119 & 129	Basic Chemistry			16
PAC 121	Descriptive Chemistry	PAC 110		16
PAC 211	Inorganic Chemistry 1	PAC 110 + PAC 121; MAT 111/112 + MAT 121/123		16
PAC 213	Organic Chemistry 1	PAC 110 + PAC 121		16
PAC 222	Analytical Chemistry 1	PAC 211 + PAC 213		16
PAC 224	Physical Chemistry 1	PAC 211 + PAC 213		16
PHY 113	Elementary mechanics	Matric Mathematics		8
PHY 114	Heat and Modern Physics	Matric Mathematics		8
PHY 123	Electromagnetism	Matric Mathematics		8
PHY 124	Waves and Optics	Matric Mathematics		8

STA 111	Descriptive Statistics and Differentiation	Matric Mathematics with at least a level 4 pass		16
STA 121	Estimation, Hypothesis Testing and Elementary Integration	STA 111		16
STA 122	Estimation and Hypothesis Testing and Statistics for Economists	STA 111		16

LIST OF MODULES OFFERED IN OTHER FACULTIES

Code	Title	Pre-req	Co-req	Credits
BEC 111	Intro to Business Economics			16
BEC 121	Introduction to Specialised Business Econ Functions	BEC 111		16
BEC 211	Operations & Purchasing Management	BEC 121		16
BEC 221	Marketing Management	BEC 121		16
ECO 111	Intro to Micro Economics			16
ECO 121	Intro to Macro Economics			16
ECO 211	Micro Economics	ECO 111 & 121		16
ECO 212	Mathematical Economics A (Calculus, Optimization)	ECO 111 & 121		16
ECO 221	Macro Economics	ECO 111 & 121		16
ECO 222	Mathematical Economics B	ECO 111 & 121		16
ECO 311	Micro & Macroeconomic Theory	ECO 211 + ECO 221		8
ECO 312	Public Finance	ECO 211 + ECO 221		8
ECO 313	Econometrics	ECO 212 & 222 plus STA 111		8
ECO 321	International Trade Theory & Policy	ECO 211 + ECO 221		8
ECO 323	Labour Economics	ECO 211 & 221		
ECO 325	Comparative Economic Systems	ECO 211 + ECO 221		8
ECO 326	Money, Banking & International Finance	ECO 211 + ECO 221		8
EDE 211	Intro to Development Economics	ECO 111 & 121		16
EDE 221	Regional & Urban Economics 1	ECO 111 & 121		16

Lecture Groups (Below the subjects are listed according to the lecture groups).

Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H
BIO 111 CLT 111 GLG 100 MNU 100 ZOO 100	ECO 111 ECO 121 PAC 110 PAC 121 PAC 119 PAC 129	CSC 100 ICC 121	AGF 112 MAT 011 MAT 100 STA 111 STA 121 STA 122	AGC 111 AGC 122 GEG 100 PHY 100 PHY 113 PHY 114 PHY 123 PHY 124 AFA 111 AFA 121	AGE 121 BEC 111 BEC 121 BOT 111 BOT 121	AGE 111 BIO 121	AGE 121 *practical*
AGP 211 AGP 222 ECO 222 GIS 200 MAT 200 MIC 200	AGS 211 AGS 221 AGV 221 CSC 200 ZOO 223	AGC 222 ECO 211 ECO 221 GEG 200 PAC 200 PHY 200 STM 200 ZOO 212 ZOO 222	AGA 211 AGE 221 BCH 223 EDE 211 EDE 221 GLG 200 MAP 200	AGC 221 PAC 224	AGA 221 AGE 211 AGE 222 BCH 211 BCH 212	AGG 221 AGP 223 BOT 211 BOT 221	AGE 213 AGW 211 AGX 221
AGA 323 AGC 311 AGE 316 AGG 311 AGH 312 AGS 323 ALP 322 CSC300 ZOO 316 ZOO 326	AGB 312 AGC 312 AGC 413 AGE 321 AGR 322 BCH 300 MAT 300	AGA 311 AGC 314 AGC 323 AGE 312 AGE 322 AGH 314 AGP 312 AGP 322 AGX 323 GLG 300 MAP 300 MIC 300	AGA 311 AGA 322 AGB 321 AGC 321 AGC 323 AGE 326 AGG 321 AGV 321 AGH 313 AGP 312 ALP 313 GEG 300 PHY 300 STM 300 ZOO 314 ZOO 315 ZOO 324 ZOO 325	AGC 316 AGE 311 AGH 321 AGH 322 AGP 323 AGX 321 PAC 300 GIS 300	AGP 324 AGQ 311 AGS 322 AGS 324 BOT 312 BOT 313 BOT 322 BOT 323 ECO 311 ECO 312 ECO 321 ECO 322	AGC 315 AGV 323 AGX 322	AGE 312 *practical*
AGA 421	AGS 423	AGC 422 AGH 411 AGH 421 AGP 421 AGS 425	AGA 415	AGA 416 AGA 425 AGC 413 AGS 414	AGE 421 AGH 422 AGP 411	AGH 423	

QUALIFICATIONS IN THE FACULTY

Undergraduate Degrees

(*Three-year*) **Bachelor of Agriculture degrees:**		*Qualification ID*
70001	Bachelor of Agriculture	3393
70002	Bachelor of Agriculture in Agricultural Extension	100994

(*Four-year*)	**Bachelor of Science in Agriculture in:**	*Qualification ID*
71521	Agricultural Economics	100995
71522	Soil Science	100997
71523	Horticulture	100998
71524	Crop Science	101000
71525	Animal Production	100996
71526	Livestock & Pasture Science	100999

The Degree of Bachelor of Science		*Qualification ID*
40000	Bachelor of Science	19236

Post-Graduate Degrees

HONOURS

The Degree of Bachelor of Agriculture Honours in:		*Qualification ID*
70501	Agricultural Economics	15118
70502	Agricultural Extension	15120

The Degree of Bachelor of Science (Honours)
(for the Qualification ID please refer to relevant sections)

MASTERS (for the Qualification ID please refer to relevant sections)*

The Degree of Master of Agriculture	**M Agric**
The Degree of Master of Science in Agriculture	**MSc Agric**
The Degree of Master of Science	**MSc**
The Degree Master of Philosophy	**M Phil**

DOCTORAL (for the Qualification ID please refer to relevant sections)

The Degree of Doctor of Agriculture	**D Agric**
The Degree of Doctor of Philosophy	**PhD**

GUIDELINES FOR UNDERGRADUATE DEGREES

The following guidelines 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 from 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, an evaluation of the module(s) from the relevant South African body 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 Board.

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 Board, 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 that 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 A student shall not be eligible to write the main examination, supplementary or aegrotat examination in an examination module for which they are registered unless they have obtained ***a minimum semester mark (DP) of 40% in the module***. A student shall only be credited with a final pass mark ***in an examination*** module if they obtained ***a minimum of 40 percent*** in the main or supplementary examination.

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.

SA5 **Missed tests, practicals and examination**

SA5.1 If a student misses an ***arranged test or practical***, s/he must submit the medical certificate, death certificate or any other legitimate and valid document to the Faculty Manager (or assistants) no later than seven (7) calendar days from the date of the relevant test. If a student is absent for longer than 7 days, s/he must submit the doctor's certificate within 2 days of his/her return to classes. Extended absence

will be dealt with on an individual basis. If a student has a bereavement s/he must inform the Managers before going home, and must produce a death certificate when s/he returns.

SA5.2 In the case of a ***missed examination*** the same rules as above apply. However and in addition, it is the student's responsibility to submit a copy of the original proof to the Faculty Manager's Office; the original has to be submitted to the Examinations Office for noting and completion of the necessary Aegrotat forms.

SA6 **Academic exclusions (read in conjunction with Rule 4.15 of the General Prospectus)**

Students who have failed to obtain the minimum number of credits towards the qualification ***at each level of the study period*** for which they are registered and whose appeal have been unsuccessful, will only be re-considered for re-admission on condition that:

SA6.1 they register for the equivalent course(s)/module(s) at UNISA or any other accredited institution and pass;

SA6.2 upon receipt of the results obtained from the other institution, the student sign the letter of reversal of the exclusion in which they agree to the rest of the conditions contained in the document;

SA6.3 Should the student not meet the conditions as stated in SA6.2, s/he will be excluded again and will not be re-considered for re-admission to the Faculty.

ADMISSION REGULATIONS

STANDARD PROCEDURE FOR ADMISSION TO THE UNDERGRADUATE DEGREES

Mainstream and Extended Programmes

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

Degree name*	Degree code	SAQA ID	Subject requirements	Minimum level	APS Score
Bachelor of Science	40000	19236	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Science	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science **(Extended Programme)**	40400	19236	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Science ***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	3 (40-49%) in one and 4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Soil Science	71522	100997	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Sciences	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Soil Science	71422	100997	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Sciences	3 (40-49%) in one and	

(Extended Programme)			***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Horticulture	71523	100998	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Sciences	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59)	
Bachelor of Science in Agriculture (in) Horticulture **(Extended Programme)**	71423	100998	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Sciences ***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	3 (40-49%) in one and 4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Crops	71524	101000	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Sciences	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Crops **(Extended Programme)**	71424	101000	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Sciences ***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	3 (40-49%) in one and 4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	3X4 (50-59%)	
			Other Subjects (2)		
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Animal Production*	71525	100996	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Sciences	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Info Tech	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	

Bachelor of Science in Agriculture (in) Animal Production **(Extended Programme)**	71425	100996	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Sciences ***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	3 (40-49%) in one and 4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Pasture Science**	71526	100999	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Physical Sciences	4 (50-59%)	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Pasture Science** **(Extended Programme)**	71426	100999	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics AND Physical Sciences ***(Level 3 in either Maths or Physics, but the 2nd one must be at Level 4)***	3 (40-49%) in one and 4 (50-59%) in the other	
			Life Sciences OR Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50%-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Agricultural Economics	71521	100995	English - Home language OR English - First additional language	4 (50-59%)	28
			Mathematics	4 (50-59%)	
			Life Sciences	4 (50-59%)	
			Agriculture OR Geography OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Science in Agriculture (in) Agricultural Economics **(Extended Programme)**	71421	100995	English - Home language OR English - First additional language	4 (50-59%)	27
			Mathematics	4 (50-59%)	
			Life Sciences	3 (40-49%)	
			Geography OR Agriculture OR Information Technology	4 (50-59%)	
			Other Subjects (2)	2X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Agriculture	70001	3393	English - Home language OR English - First additional language	4 (50-59%)	28

			Mathematical Literacy OR Mathematics	5 (60-69%) OR 4 (50-59%)	(29 with ML)
			Agriculture	4 (50-59%)	
			Other Subjects (3)	3X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Agriculture **(Extended Programme)**	70401	3393	English - Home language OR English - First additional language	4 (50-59%)	27 (28 with ML)
			Mathematical Literacy or Mathematics	4 (50-59%) or 3 (40-49%)	
			Agriculture	4 (50-59%)	
			Other Subjects (3)	3X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Agriculture (in) Agricultural Extension	70002	100994	English - Home language OR English - First additional language	4 (50-59%)	28 (29 with ML)
			Mathematical Literacy OR Mathematics	5 (60-69%) or 4 (50-59%)	
			Agriculture	4 (50-59%)	
			Other Subjects (3)	3X4 (50-59%)	
			Life Orientation	4 (50-59%)	
Bachelor of Agriculture in Agricultural Extension **(Extended Programme)**	70402	100994	English - Home language OR English - First additional language	4 (50-59%)	27 (28 with ML)
			Mathematical Literacy or Mathematics	4 (50-59%) or 3 (40-49%)	
			Agriculture	4 (50-59%)	
			Other Subjects (3)	3X4 (50-59%)	
			Life Orientation	4 (50-59%)	

FOUNDATION/EXTENDED PROGRAMME

ML: *Mathematical Literacy*

The extended programme follows the same structure as the mainstream programme, but its curriculum is extended over a longer period and there is additional academic support. Extended Programme students must take one more year to complete their degree than mainstream students. These students must register for Social Transformation (STF) which is a value-addition course in their first year of registration. This course assists students in developing their academic skills towards their qualification.

HIGH SCHOOL LEAVERS / FIRST TIME ENTERING STUDENTS
(ADMISSION INTO THE B AGRIC, 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 BACHELOR PASS (B PASS) BUT WHO DO NOT MEET THE RATINGS

Standard admission

Students who have obtained a Bachelor's pass, and who do not meet the Selection Rating requirements for normal registration may apply to register under The Faculty's Extended Programme (SAEP). The extended programme is a combination of two parts (PART 1 & PART 2) which is done over two years. The latter is the equivalent of Year 1 of the mainstream programmes.

Students who completed their NSC and got admission to a "***Diploma pass (D pass)***" do not qualify to enrol for any of the mainstream or extended programmes in the Faculty.

Such students will be admitted into the Faculty's SAEP Unit based on the ***limited quota*** as prescribed by the Faculty in consultation with the University's Planning & Quality Assurance Unit.

STUDENTS WHO QUALIFY FOR MATURE AGE EXEMPTION (MAE)

Mature Age Exemption students (23 years and above) may be admitted for the B Agriculture degree programmes if they have a Senior Certificate. Admission into the BSc or BSc Agriculture degree programmes is on condition that a student has Matriculation Mathematics and Physical Science as required under Standard Admissions. The number of modules that a MAE student may register for is determined by their rating. The student must apply for Mature Age Exemption to the Matriculation Board ***before*** enrolling at the University and upload the certificate with the rest of the supporting documents when applying to the University.

STUDENTS WHO QUALIFY ON THE BASIS OF "RECOGNITION OF PRIOR LEARNING"

Recognition of prior learning means the comparison of the previous learning and experience of a student, however obtained, against the outcomes required for a specific qualification, and the acceptance for purposes of qualification of that which meets the requirements. The University (i.e. Institutional Teaching & Learning Centre) makes a judgment about the extent to which prior learning or prior experience may be accepted in fulfilment of admission requirements. Applicants seeking admission into undergraduate qualifications may also do so through the Recognition of Prior Learning (RPL) by consulting the RPL Officer in the Teaching and Learning Centre. The University Policy and Procedures for the Recognition of Prior Learning regulates the process for the admission of students through RPL.

MATURE AGE EXEMPTION

Mature Age Exemption candidates who do not meet the Bachelor's requirements but will be turning **23 years or above** in their first year of registration may be considered provided they produce a USAf letter or Certificate of Exemption.

INTERNATIONAL STUDENTS

Applicants are responsible for the evaluation of their qualifications by the South African Qualifications Authority (SAQA) and USAF (Matriculation Board). Certified copies of qualifications and the relevant Certificate of Evaluation or Exemption Certificate must be submitted to the Faculty Manager.

No person shall be registered as a student at the University for a programme unless that person meets the general entrance requirements for admission and the entrance requirements as stipulated in the rules for a particular programme.

The minimum entry requirement into undergraduate qualifications is the National Senior Certificate (NSC) and the National Certificate Vocational (NCV) with appropriate subject combinations and levels of achievement specified for entry into the Higher Certificate, Diploma and Bachelor' degree programmes.

An Admission Point Score (APS) is calculated as part of the minimum requirement for entry into each undergraduate qualification as per Table 1 below. A point value is allocated to the level of achievement for each of seven subjects taken in the NSC; and the values are then added to obtain an Admission Point Score.

Table 1: University Admission Point Score (APS) and NSC Achievement Levels

NSC	NSC Percentage	University APS	APS Percentage
		8	90 -100 %
7	80 -100 %	7	80 -89 %
6	70 -79 %	6	70 -79 %
5	60 -69 %	5	60 -69 %
4	50 -59 %	4	50 -59 %
3	40-49%	3	40-49%
2	30-39%	2	30-39%
1	0-29%	0	0-29%

Faculties may prescribe higher minimum requirements and specify the subjects with their respective minimum pass level requirements for different programmes and qualifications.

The minimum requirements for admission to undergraduate Bachelor' Degree programmes for holders of the NCV or Senior Certificate (i.e. prior to NSC) are set out in the University Policy and Procedures for Undergraduate Admissions and Selection and in the respective Faculty Prospectus or may be obtained from the Office of the Registrar.

An applicant may be considered for admission into a Bachelors' degree if they have successfully completed an appropriate NQF level 6 qualification or obtained a complete full exemption certificate from the Matriculation Board (applicable to International applicants).

All applications for admission who meet the minimum requirements are subject to a selection process. Applicants must comply with the general University admission requirements and any other specific requirements as prescribed by the respective Faculty. An applicant may be expected to attend an interview, undergo a selection test, submit a portfolio and/or make a written presentation to the Faculty and/or Department.

TRANSFERRING STUDENTS AND RECOGNITION OF CREDITS:

Credit recognition and transfer applies to:

- A student of the University who is registered for, but has not completed a programme, and who wishes to change to a different programme linked to the same qualification or a different qualification;
- A student registered at another recognised higher education institution who has not completed the programme at that institution, and who wishes to register for the same or a different programme at the University; and
- A student who has completed a qualification at the university or at another recognised higher education institution who wishes to enrol for a programme leading to another qualification at the University.
- Senate may exempt a student from attendance and assessment in a module on the grounds of their having obtained credits for the same or equivalent NQF level modules prescribed for another qualification of the University.
- Students who are already in possession of a first qualification may be granted recognition towards a second qualification at the same or at a lower NQF level in respect of modules previously completed only up to a maximum of half of the prescribed credits required for a second qualification provided the modules are at the same or equivalent NQF level.
- Credit recognition and transfer can only be granted to a student who meets the minimum admission requirements of the qualification and programme for which the student wishes to register.
- A student who is eligible to make an academic credit transfer application must do so before or within the first year of their registration for the qualification. Failure to submit the said application within the period contemplated by this rule shall render the application irregular. It shall be the responsibility of the student eligible to make the application, to acquaint themselves with the time requirements and consequences of this rule.

SESSIONAL DATES 2025

FIRST SEMESTER	:	Monday, 03 February – Fri, 27 June
MID-TERM BREAK	:	Fri, 28 March – Sun. 06 April
WINTER VACATION	:	Fri, 27 – Fri, 11 July
MID-TERM BREAK	:	Fri, 26 Sept – Mon, 06 Oct
SECOND SEMESTER	:	Mon, 14 July – Fri, 29 November

PRE-SEMESTER		
Mon, 06 Jan – Fri, 10 Jan	Thu, 02 Jan	University offices open
	Mon, 06 Jan	Deadline for submission of Exclusion Appeal applications (Nursing & Rehab)
	Tues, 07 Jan	Academic Exclusion Appeals Meeting (Nursing & Rehabilitative Sciences)
	Fri, 10 Jan	Deadline for submission of Exclusion Appeal applications
Mon, 13 – Fri, 17 Jan	Mon, 13 – Fri, 17 Jan	Registration for continuing students in Nursing and Rehabilitative Sciences commences
	Thu, 16 Jan	Academic Exclusion Appeals meetings
Mon, 20 – Fri, 24 Jan	Mon, 20 Jan	Registration commences (all campuses and all levels)
Mon, 27 Jan – Fri, 31 Jan	Mon, 27 Jan – Fri, 31 Jan	Orientation (new students)
	Fri, 31 Jan	Registration ends – (Undergrad, Honours, Masters Coursework)

SEMESTER 1			
1	Mon, 03 – Fri, 07 Feb	Mon, 03 Feb	Official Opening of the Academic Year (Alice & EL)
			First Semester commences
			Lectures Commences
		Mon, 03 to Thu, 20 Feb	Late Registration: UnderGrad, Honours, and Masters by Coursework Programmes
			Addition & Cancellation of Modules cycle
2	Mon, 10 - Fri, 14 Feb		Lecture week
3	Mon, 17 – Fri, 21 Feb		Lecture week
4	Mon, 24 Feb – Fri, 01 Mar		Lecture week
5	Mon, 04 – Fri, 28 Feb		Lecture week
6	Mon, 03 – Fri, 07 Mar		Lecture week
7	Mon, 10 – Fri, 14 Mar		Lecture week
8	Mon, 17 – Fri, 21 Mar		Lecture week
		Fri, 21 Mar	***Human Rights Day (Public Holiday)***
9	Mon, 24 – Fri, 28 Mar		Lecture week
		Fri, 28 Mar Sun, 30 Mar	Deadline for Term Marks upload and identification of modules and students at risk Deadline for Registration in PostGraduate Research Programmes: Masters and Doctoral Studies
	Fri, 28 – Sun, 06 Apr	**STUDENT MID-TERM BREAK** (10 days)	
10	Mon, 07 – Fri, 11 Apr		Lecture week
11	Mon, 14 – Fri, 18 Apr		Lecture week
		Fri, 18 Apr	***Good Friday (Holiday)***
12	Mon, 21 – Fri, 25 Apr		Lecture week
		Mon, 21 April 2025	***Family Day (Public Holiday)***
		Fri, 25 April	Deadline for submission of externally moderated exam papers

		Sun, 27 April	***Freedom Day***
13	Mon, 28 Apr – Fri, 02 May		Lecture week
		Mon, 28 April	***Freedom Day (Public Holiday)***
		Thu, 01 May	***Workers Day (Public Holiday)***
14	Mon, 05 – Fri, 09 May	Mon, 05 – Fri, 09 May	Graduation (Ceremony for all campuses held in Alice)
		Mon, 05 May	Deadline for submission of internally moderated exam papers
15	Mon, 12 – Fri, 16 May		Lecture Week
		Tue, 13 May	Second Term Marks uploads and DPs Submission of 1st Semester and identification of modules and students at risk
		Fri, 16 May	Lectures end
		Sat, 17 May -Wed, 21 May	Study Period
16	Mon, 19 – Fri, 23 May	Thur, 22 May	1st Semester Main Exams Commence (incl. Online Exams)
17	Mon, 26 May – Fri, 30 May		1st Semester Main Exams (cont'd)
18	Mon, 02 – Fri, 06 Jun		1st Semester Main Exams (cont'd)
19	Mon, 09 – Fri, 13 Jun	Thu, 12 Jun	1st Semester Main Exams end
			1st Semester Cont. Assessments end
		Thu, 12 – Tues, 17 Jun	Break between exams
20	Mon, 16 – Fri, 20 Jun	*Mon, 16 Jun*	***Youth Day (Public Holiday)***
		Tue, 17 – Fri, 20 Jun	Supplementary exams commence (incl. Online Exams)
21	Mon, 23 – Fri, 27 Jun	Mon, 23 - Thu, 26 Jun	Supplementary exams commence (incl. Online Exams) (cont'd)
		Thu, 26 Jun	1st Sem. Supplementary exams end
		Fri, 27 Jun	First Semester ends/Mid-Term Break (Winter Vacation) start
Semester 1 • Lecture days = 65 days • Study Period = 5 days • Main Exams = 17 days • Supplementary Exams = 08 days			

Fri, 27 June – Fri, 11 July	**MID-YEAR BREAK (Winter vacation)** 12 days

	Mon, 30 Jun, Fri, 04 July	Mon, 30 Jun Thur, 03 Jul Fri, 04 Jul	Mid-Term Break (Winter Vacation) (cont'd) Exam Boards Publication of Results
	Mon, 07 – Fri, 11 July	Mon 07 Jul Fri, 11 July	Online applications for Special Supplementary Mid-Term Break (Winter Vacation) Ends
SEMESTER 2			
1	Mon 14 – Fri, 18 July	Mon, 14 Jul	Second Semester Commences Special Supplementary
			Lectures commences
			2nd Semester Module additions and cancellations
2	Mon, 21 – Fri, 25 Jul	Fri, 25 Jul	Lecture Week Deadline for 2nd Sem. Module additions & cancellations
3	Mon, 28 Jul – Fri, 01 Aug		Lecture week

4	Mon, 04 – Fri, 08 Aug	*Sat, 09 August*	*Lecture Week* ***National Women's Day (Public Holiday)***
5	Mon, 11 – Fri, 15 Aug		Lecture week
6	Mon, 18 – Fri, 22 Aug		Lecture week
7	Mon, 25 – Fri, 29 Aug		Lecture week
8	Mon, 01 – Fri, 05 Sep		Lecture week
9	Mon, 08 – Fri,12 Sep		Lecture week
10	Mon, 15 – Fri, 19 Sep		Lecture week
11	Mon, 22 – Fri, 26 Sep	Wed, 24 Sep Thu, 25 Sep Fri, 26 Sep	Lecture Week ***Heritage Day (Public Holiday)*** Deadline for Third Term Marks upload and Identification of modules and students at risk
12	Mon, 29 – Mon, 06 Oct	Fri, 26 Sep - Mon, 06 Oct	STUDENT MID-TERM BREAK
		Mon 29 Sep	Deadline for submission of externally moderated exam papers
		Fri, 03 Oct	Graduation (Ceremony for all campuses held in Alice)
13	Mon, 06 – Fri, 10 Oct		Lecture week
		Fri, 10 Oct	Deadline for submission of internally moderated exam papers
14	Mon, 13 – Fri, 17 Oct	Tue, 15 Oct	Forth Term Marks uploads and DPs Submission of 2st Semester and identification of modules and students at risk
		Fri, 17 Oct	Lectures end
		Sat, 19 – Wed, 23 Oct	Study Period
15	Mon, 20 – Fri, 24 Oct	Thu, 23 Oct	2nd Semester Main Exams Commence (incl. online exams)
16	Mon, 27 Oct – Fri, 31 Oct		2nd Semester Main Exams (cont'd)
17	Mon, 02 – Fri, 07 Nov		2nd Semester Main Exams (cont'd)
18	Mon, 10 – Fri, 14 Nov	Thu, 13 Nov	2nd Semester Main Exams end
			2nd Sem. Cont. Assessments end
		Fri, 14 – Tue, 18 Nov	Break between exams
19	Mon, 17 – Fri, 21 Nov	Wed, 19 Nov	2nd Sem. Supplementary Exams commence (incl. Online Supp. Exams)
20	Mon, 24 – Fri, 28 Nov	Fri, 28 Nov	Supplementary Exams end
			2nd Semester ends
Semester 2:	Lecture days - 65 days Study Period - 05 days Main Exams - 16 days Supplementary Exams - 09 days		
YEAR-END BREAK			
Mon, 01 – Fri, 05 Dec			
Mon, 08 – Fri, 12 Dec		*Tues, 09 Dec*	*Exam Boards*
		Fri, 12 Dec	*Publication of Results*
		Mon, 15 Dec	*University Offices Closes*
Mon, 16 – Fri, 20 Dec		*Tues, 16 Dec*	***Day of Reconciliation (Public Holiday)***

EXTENDED PROGRAMMES

AGRICULTURE QUALIFICATIONS

Background and Entry Requirements

The Science & Agriculture Extended Programme (SAEP) is an entrance programme intended to provide a strong Science and Agriculture extended to students who do not meet the standard Faculty entry requirements. The SAEP is an extended programme which involves the spread of the 1st year level modules over 2 years. This is a mechanism of giving support to students who did not meet the requirements needed to do the mainstream programme. This therefore means SAEP 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.

Extended Programmes for 3-year Qualifications

First year *(Curriculum for B Agric students)*

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 111F / PAC 121F Basic Chemistry	8	5	8	5
BIO 111F / BIO 121F Biology	16	5	16	5
AGF 112F Introduction to Scientific Concepts	16	5		
AGC 111F Elements of Agro Meteorology	16	5		
AGC 122F Introduction to Crop Science			16	5
ICC 121F Intro to Computers and Computing Theory			8	5
Total per Semester	56		48	
Total per Year	104			

Agricultural Economics Option (70401)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGE 111 Intro to Agric Econ	16	6		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
AGE 213 Introduction to Seminar Writing	8	6		
AGE 121 Marketing of Agric Products			12	6
AGE 221 Farm Management			12	6
AGP 222 Veld & Cultivated Pasture Management			16	6
AGS 221 Pedology			12	6
Total per Semester	**52**		**52**	
Total per Year	104			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGA 211 Introduction to Animal Science	16	7		
AGE 211 Agric Production Economics	12	7		
AGH 314 Elements of Horticultural Science	16	7		

AGC 222 Principles of Crop Production			12	7
AGE 321 Agric Development Planning			12	7
AGE 222 Farm Accounting			8	7
AGF 301 Practical Agricultural Experience	6	7	6	7
AGX 221 Introduction to Agricultural Extension			8	7
Electives of at least 24 credits approved by the Programme Coordinator of Agric Economics and Extension	12	7	12	7
Total per Semester	**62**		**58**	
Total per Year	120			

Fourth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
Electives of at least 12 credits approved by the Programme Coordinator of Agric Economics and Extension		8	12	8
AGE 311 Adv Farm Bus Management	12	8		
AGE 312 Agric Market Analysis	12	8		
ALP 313 Land Use Planning	16	8		
AGC 314 Agronomy of Summer Crops	16	8		
AGE 322 Seminar in Agric Economics			12	8
ALP 322 Project in Land Use Planning			16	8
Total per Semester	**56**		**40**	
Total per Year	96			

Agricultural Extension (70402)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGE 111 Intro to Agricultural Economics	16	6		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
AGE 213 Introduction to Seminar Writing	8	6		
AGE 121 Marketing of Agric Products			12	6
AGS 221 Pedology			12	6
AGE 221 Farm Management			12	6
AGP 222 Veld & Cultivated Pasture Management			16	6
Total per Semester	**52**		**52**	
Total per Year	104			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
Electives of at least 24 credits approved by the Programme Co-ordinator of Agric Economics and Extension	12	7	12	7
AGA 211 Introduction to Animal Science	16	7		
AGC 222 Principles of Crop Production			12	7
AGH 314 Elements of Horticultural Science	16	7		
AGA 221 Principles of Animal Nutrition			16	7
AGG 221 Introduction to Agric Engineering			16	7
AGX 221 Introduction to Agricultural Extension			8	7
AGV 321 Elementary Animal Health			12	7
AGF 301 Practical Agricultural Experience	6	7	6	7
Total per Semester	50		82	

Total per Year	132

Fourth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 316 Plant Pest Control	16	8		
AGC 314 Agronomy of Summer Crops	16	8		
ALP 313 Land Use Planning	16	8		
AGQ 311 Small-stock Production	16	8		
AGH 322 Vegetable and Herb Production			16	8
AGX 321 Agricultural Extension & Human Dev			16	8
AGX 322 Applied Extension & Rural Development			16	8
AGX 323 Seminar in Agricultural Extension			12	8
ALP 322 Project in Land Use Planning			16	8
Total per Semester	64		76	
Total per Year	140			

Extended Programmes for 4-year Qualifications

NEW CURRICULUMS

First year curriculum for BSc Agric students **except** those for students registered for the **BSc Agric (Agric Economics – Code 71421)**

COMMON FIRST YEAR

(except for Agricultural Economics)

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 111F / PAC 121F Basic Chemistry	8	5	8	5
PHY 115F,114F / 125F,124F Physics	8 + 8	5	8 + 8	5
BIO 111F / 121F Biology	16	5	16	5
Total per Semester	40	5	40	5
Total per Year	80			

Horticulture Option (71423)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 111 Elements of Agrometeorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
PAC 113F / 123F Chemistry	8	5	8	5
STA 111 / 121 Statistics	16	5	16	5
AGC 122 Introduction to Crop Science			16	5
AGC 222 Principles of Crop Production			12	6
AGG 221 Intro to Agric Engineering			16	6

Total per Semester	56	68
Total per Year	124	

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGH 314 Elements of Horticultural Science	16	7		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGE 221 Farm Management			12	6
AGH 322 Vegetable & Herb Production			16	7
AGS 221 Pedology			12	6
AGS 323 Plant Nutrition & Soil Fertility			16	7
Total per Semester	64		56	
Total per Year	120			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
AGC 315 Plant Physiology	16	7		
AGC 316 Plant Pest Control	16	7		
AGR 322 Research Methods in Agriculture			16	7
AGG 321 Irrigation Drainage			12	7
AGH 427 Post Harvest Physiology			16	8
AGF 301 Practical Agricultural Vacation	6		6	7
Total per Semester	66		50	
Total per Year	116			

Fifth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 413 Principles of Genetics & Plant Breeding	16	8		
AGH 411 Citrus Fruits	12	8		
AGH 414 Tropical & Subtropical Fruit	16	8		
AGH 415 Ornamental, Medicinal & Aromatic Plants	12	8		
AGH 416 Plant Propagation & Nursery Management	16	8		
AGC 423 Plant Breeding			16	8
AGH 404 Research Project & Seminar	16		16	8
AGH 421 Temperature Fruits			12	8
Total per Semester	88		44	
Total per Year	**132**			

Crop Science Option (71424)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 111 Elements of Agrometeorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
PAC 113F / 123F Chemistry	8	5	8	5
STA 111 / 121 Statistics	16	5	16	5

AGC 122 Introduction to Crop Science			16	5
AGC 222 Principles of Crop Production			12	6
AGG 221 Intro to Agric Engineering			16	6
Total per Semester	56		68	
Total per Year	124			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 314 Agronomy of Summer Crops	16	7		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGC 323 Agronomy of Winter Crops			12	7
AGE 221 Farm Management			12	6
AGS 221 Pedology			12	6
AGS 323 Plant Nutrition & Soil Fertility			16	7
Total per Semester	64		52	
Total per Year	116			

Fourth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
AGC 315 Plant Physiology	16	7		
AGC 316 Plant Pest Control	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGG 321 Irrigation Drainage			12	7
AGR 322 Research Methods in Agriculture			16	7
Total per Semester	66		34	
Total per Year	**100**			

Fifth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 412 Agronomy of Industrial Crops	16	8		
AGC 413 Principles of Genetics & Plant Breeding	16	8		
AGC 414 Crop Ecology & Physiology	16	8		
AGS 416 Special Topics on Soil Health	16	8		
AGC 403 Crops Research Project	16	8	16	8
AGC 423 Plant Breeding			16	8
AGS 426 Chemical Analysis of Soil & Plants			16	8
Total per Semester	80		48	8
Total per Year	**128**			

Soil Science Option (71422)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 111 Elements of Agrometeorology	16	5		
AGE 111 Intro to Agric Economics	16	5		
PAC 113F / 123F Chemistry	8	5	8	5
MAT 112 / 123 Mathematics	16	5	16	5

AGC 122 Introduction to Crop Science			16	5
Total per Semester	56		40	
Total per Year	96			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGS 211 Introduction to Soil Science	16	6		
MIC 211 Introduction to Microbiology	16	6		
STA 111 Statistics	16	5		
PAC 211 Inorganic Chemistry 1	16	6		
PAC 222 Analytical Chemistry 1			12	6
AGS 221 Pedology			12	6
MIC 221 Soil & Environmental Microbiology			12	6
STA 121 Statistics			16	5
Total per Semester	64		52	
Total per Year	116			

Fourth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
PAC 213 Organic Chemistry	16	7		
AGC 222 Principles of Crop Production			12	7
AGG 321 Irrigation Drainage			12	7
AGR 322 Research Methods in Agriculture			16	7
PAC 224 Physical Chemistry 1			16	7
AGS 324 Soil Genesis, Morphology & Classification			16	7
Total per Semester	44		72	
Total per Year	**116**			

Fifth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 412 Agronomy of Industrial Crops	16	8		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGS 323 Plant Nutrition & Soil Fertility			16	7
AGS 414 Environmental Soil Chemistry	16	8		
AGS 415 Soil Geomorphology and Mapping	16	8		
AGS 416 Special Topics in Soil Health	16	8		
AGS 402 Project in Soil Science	16	8	16	8
AGS425 Soil Physics		8	16	8
AGS 426 Chemical Analysis of Soils & Plants		8	16	8
Total per Semester	86		70	
Total per Year	**156**			

Animal Production Option (71425)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 111 Elements of Agrometeorology	16	5		

AGE 111 Introduction to Agricultural Economics	16	5		
AGP 211 Introduction to Pasture Ecology	12	6		
PAC 113F / 123F Chemistry	8	5	8	5
STA 111 / 121 Statistics	16	5	16	5
AGC 122 Introduction to Crop Science			16	5
ICC 121 Introduction to Computers			8	5
Total per Semester	68		48	
Total per Year	116			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGA 211 Introduction to Animal Science	16	6		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGA 221 Principles of Animal Nutrition			16	6
AGP 323 Planted Pastures			8	7
AGV 221 Anatomy & Physiology			16	6
Total per Semester	64		40	
Total per Year	104			

Fourth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGA 311 Monogastric Nutrition	12	7		
AGC 413 Principles of Genetics	16	8		
AGP 312 Range Management	12	7		
AGQ 311 Small-stock Science	16	7		
AGR 322 Research Method in Agric.			16	7
AGA 322 Animal Breeding			16	7
AGA 323 Ruminant Nutrition			16	7
AGV 323 Animal Health			16	7
Total per Semester	56		64	
Total per Year	**120**			

Fifth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGA 415 Pig and Poultry Production	16	8		
AGA 416 Dairy Science & Technology	16	8		
AGB 312 Agricultural Biometry	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	
AGA 406 Project	16	8	16	8
AGA 421 Meat Science			12	8
AGA 425 Beef Production & Game Farming			12	8
AGP 425 Apiculture			8	8
AGP 426 Wildlife Ecology & Management			12	8
Total per Semester	70		66	
Total per Year	**136**			

Livestock & Pasture Option (71426)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 111 Elements of Agrometeorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
AGP 211 Introduction to Pasture Ecology	12	6		
PAC 113F / 123F Chemistry	8	5	8	5
STA 111 / 121 Statistics	16	5	16	5
AGC 122 Introduction to Crop Science			16	5
AGP 223 Plant Anatomy & Physiology			12	6
ICC 121 Introduction to Computers			8	5
Total per Semester	68		60	
Total per Year	128			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 211 Introduction to Animal Science	16	6		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGA 221 Principles of Animal Nutrition			16	6
AGP 322 Fodder Production & Conservation			8	7
AGP 323 Planted Pastures			8	7
Total per Semester	64		32	
Total per Year	96			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 311 Monogastric Nutrition	12	7		
AGC 413 Principles of Genetics	16	8		
AGP 312 Range Management	12	7		
AGQ 311 Small Stock Science	16	7		
AGR 322 Research Methods in Agric.			16	7
AGA 322 Animal Breeding			16	7
AGA 323 Ruminant Nutrition			16	7
AGP 324 Applied Range Mgt.			16	7
Total per Semester	56		64	
Total per Year	**120**			

Fifth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 415 Pig and Poultry Production	16	8		
AGA 416 Dairy Science & Technology	16	8		
AGB 312 Agricultural Biometry	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	8
AGP 401 Project	16	8	16	8
AGP 412 Range Rehabilitation	8	8		
AGP 425 Apiculture			8	8
AGP 426 Wildlife Ecology & Management			12	8
Total per semester	**70**		**38**	

Total per Year	**108**

First year curriculum for BSc Agric (Agric Economics) - 71421

(Students following the extended programme)

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ECO 111 / 121 Economics	16	5	16	5
BIO 111F / 121F Biology	16	5	16	5
AGC 111F Elements of Agro-Meteorology	16	5		
AGC 122F Intro to Crop Science			16	5
AGE 121 Marketing of Agric Products			12	5
Total per Semester	48		60	
Total per Year	108			

Agricultural Economics Option (71421)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
STA 111 Statistics	16	5		
AGE 211 Agric production Economics	12	6		
ECO 211 Micro-economics	16	6		
ECO 212 Mathematical Economics 2A	16	6		
AGC 222 Principles of Crop Production			12	6
ECO 221 Macro-economics			16	6
ECO 222 Mathematical Economics 2B			16	6
AGE 221 Farm Management			12	6
AGE 222 Farm Accounting			8	6
Total per Semester	60		64	
Total per Year	124			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 211 Intro to Animal Science	16	6		
AGE 311 Adv Farm Business Management	12	7		
AGE 312 Agric Market Analysis	12	7		
AGE 213 Intro to Seminar Writing	8	6		
STA 122 Statistics			16	5
AGE 321 Agric Development Planning			12	7
AGE 322 Seminar			12	7
AGX 221 Intro to Agric Extension			8	6
ECO 311, 313, 321, 326 Economics modules	16	7	16	7
Total per Semester	64		64	
Total per Year	128			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level

AGE 316 Analytical Techniques	16	7		
AGE 406 Research Methods	10	8	10	8
AGE 402 Seminar	16	8	16	8
AGF 301 Practical Agricultural Experience	6	7	6	7
AGE 326 Agricultural Policy			16	7
Total per Semester	48		58	
Total per Year	106			

Fifth Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGE 401 Project	18	8	18	8
AGE 408 Agricultural Resource Economics	10	8	10	8
AGE 404 Agricultural Marketing OR AGE 405 Agricultural Development OR AGE 409 Special Topics in Agric Economics	10	8	10	8
Total per Semester	38		38	
Total per Year	76			

GUIDELINES FOR AGRICULTURE UNDERGRADUATE DEGREES

The following guidelines 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.

<u>These guidelines apply to Agricultural undergraduate modules and qualifications</u>

Ag1.1 In order to obtain a degree of bachelor 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 HOD shall advise 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 relevant Faculty.

Ag3.2 The Senate may, on the recommendation of 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

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, ***at second attempt***, 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 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 BSc Agric degree, before completing B Agric (e.g. from year ll of B Agric, once matriculation Mathematics has been passed)
Ag 6.2 Complete the B Agric degree and obtain BSc Agric status for a higher degree

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.

QUALIFICATIONS: AGRICULTURE MAINSTREAM UNDERGRADUATE PROGRAMMES

Dept of Agric Economics, Extension & Agribusiness

BACHELOR OF AGRICULTURE (B Agric)

Common First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
PAC 119 / 129 Basic Chemistry	8	5	8	5
BIO 111 / BIO 121 Biology	16	5	16	5
AGF 112 Introduction to Scientific Concepts	16	5		
AGE 111 Introduction to Agric Economics	16	5		
AGC 111 Elements of Agro Meteorology	16	5		
AGC 122 Introduction to Crop Science			16	5
AGE 121 Marketing of Agricultural Products			12	5
ICC 121 Intro to Computers and Computing Theory			8	5
Total per Semester	72		60	
Total per Year	132			

Agricultural Economics (70001)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 211 Introduction to Animal Science	16	6		
AGE 211 Agric Production Economics	12	6		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
AGE 213 Introduction to Seminar Writing	8	6		
AGE 221 Farm Management			12	6
AGE 222 Farm Accounting			8	6
AGC 222 Principles of Crop Production			16	6
AGP 222 Veld & Cultivated Pasture Management			16	6
AGS 221 Pedology			12	6
AGX 221 Introduction to Agricultural Extension			8	6
Total per Semester	**64**		**72**	
Total per Year	136			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
A minimum of 36 credits approved by the Programme Coordinator of Agric Economics and Extension	12	7	24	
AGE 311 Adv Farm Business Management	12	7		
AGE 312 Agric Market Analysis	12	7		

AGC 314 Agronomy of Summer Crops	16	7		
AGH 314 Elements of Horticultural Science	16	7		
ALP 313 Land Use Planning	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGE 321 Agric Development Planning			12	7
AGE 322 Seminar in Agric Economics			12	7
ALP 322 Project in Land Use Planning			16	7
Total per Semester	**90**		**70**	
Total per Year	160			
Total for Qualification	428			

Agricultural Extension (70002)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGA 211 Introduction to Animal Science	16	6		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
AGE 213 Introduction to Seminar Writing	8	6		
AGC 222 Principles of Crop Production			12	6
AGG 221 Introduction to Agric Engineering			16	6
AGS 221 Pedology			12	6
AGE 221 Farm Management			12	6
AGX 221 Introduction to Agricultural Extension			8	6
AGP 222 Veld & Cultivated Pasture Management			16	6
AGA 221 Principles of Animal Nutrition			16	6
Total per Semester	**52**		**92**	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 316 Plant Pest Control	16	7		
AGH 314 Elements of Horticultural Science	16	7		
AGC 314 Agronomy of Summer Crops	12	7		
ALP 313 Land Use Planning	16	7		
AGQ 311 Smallstock Production	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGV 321 Elementary Animal Health			12	7
AGX 321 Agricultural Extension & Human Dev			16	7
AGX 322 Applied Extension & Rural Development			16	7
AGX 323 Seminar in Agricultural Extension			12	7
ALP 322 Project in Land Use Planning			16	7
Total per Semester	**82**		**78**	
Total per Year	160			
Total for Qualification	436			

BACHELOR OF SCIENCE IN AGRICULTURE (BSc Agric)

New curriculums *(except Agric Economics which started in 2013)*

Agricultural Economics (71521)

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 111 Elements of Ag Meteorology	16	5		
AGC 122 Introduction to Crop Science			16	5
AGE 121 Marketing of Agric Products			12	5
ECO 111 / 121 Economics	16	5	16	5
BIO 111 / 121 Biology	16	5	16	5
STA 111 / 122 Statistics	16	5	16	5
Total per Semester	**64**		**76**	
Total per Year	140			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ECO 211, 212 / 221, 222 Economics	32	6	32	6
AGE 211 Agric Production Economics	12	6		
AGA 211 Introduction to Animal Science	16	6		
AGE 213 Introduction to Seminar Writing	8	6		
AGE 221 Farm Management			12	6
AGE 222 Farm Accounting			8	6
AGX 221 Introduction to Agric Extension			8	6
AGC 222 Principles of Crop Production			12	6
Total per Semester	**68**		**72**	
Total per Year	140			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ECO 311, 313, 321, 326 Economics modules	16	7	16	7
AGE 311 Adv Farm Bus Management	12	7		
AGE 312 Agric Market Analysis	12	7		
AGE 316 Analytical Techniques in Agric Economics	16	7		
AGE 321 Agric Development Planning			12	7
AGE 322 Seminar in Agric Economics			12	7
AGE 326 Agric Policy			16	7
AGF 301 Practical Agricultural Experience	6		6	7
Total per Semester	**62**		**62**	
Total per Year	124			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGE 401 Project	18	8	18	8
AGE 402 Seminar	16	8	16	8
AGE 406 Research methods in Agric Econ	10	8	10	8
AGE 408 Agric Resource Economics	10	8	10	8
AGE 404 Agric Marketing OR AGE 405 Agric Development OR AGE 409 Special Topics in Agric Economics	10	8	10	8
Total per Semester	**64**		**64**	

Total per Year	128
Total for Qualification	532

Common First Year for all BSc Agric

Except Agricultural Economics and Soil Science

First Year

Modules		**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 110 / 121	Basic Chemistry	16	5	16	5
PHY 113,114 / 123,124	Physics	8 + 8	5	8 + 8	5
BIO 111 / 121	Biology	16	5	16	5
STA 111 / 121	Statistics	16	5	16	5
Total per Semester		64		64	
Total per Year		128			

Department of Agronomy

Horticulture (71523)

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 111 Elements of Agro-meteorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGC 122 Introduction to Crop Science			16	5
AGC 222 Principles of Crop Production			12	6
AGE 221 Farm Management			12	6
AGG 221 Introduction to Agric Engineering			16	6
Total per Semester	80		68	
Total per Year	148			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
AGC 315 Plant Physiology	16	7		
AGC 316 Plant Pest Control	16	7		
AGH 314 Elements of Horticultural Science	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGG 321 Irrigation Drainage			12	7
AGH 322 Vegetable and Herb Production			16	7
AGR 322 Research Methods in Agric			16	7
AGS 323 Plant Nutrition & Soil Fertility			16	7
Total per Semester	82		66	
Total per Year	148			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 413 Principles of Genetics & Plant Breeding	16	8		
AGH 411 Citrus Fruits	12	8		
AGH 414 Tropical & Subtropical Fruit	16	8		
AGH 415 Ornamental, Medicinal & Aromatic Plants*	12	8		
AGH 416 Plant Propagation & Nursery Mgt	16	8		
AGC 423 Plant Breeding			16	8
AGH 404 Research Project & Seminar	16	8	16	8
AGH 421 Temperate Fruits (***Elective***)*			12	8
AGH 427 Post Harvest Physiology			16	8
Total per Semester	88		60	
Total per Year	148			
Total for Qualification	588			

*NB: * Elective: A student must do either AGH415 or AGH421*

Crop Science (71524)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 111 Elements of Agro-meteorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
MIC 211 Introduction to Microbiology	16	6		
AGC 122 Introduction to Crop Science			16	5
AGC 222 Principles of Crop Production			12	6
AGE 221 Farm Management			12	6
AGG 221 Introduction to Agric Engineering			16	6
AGS 221 Pedology			12	6
Total per Semester	80		68	
Total per Year	148			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
AGC 314 Agronomy of Summer Crops	16	7		
AGC 315 Plant Physiology	16	7		
AGC 316 Plant Pest Control	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	7
AGC 323 Agronomy of Winter Crops			12	7
AGG 321 Irrigation Drainage			12	7
AGR 322 Research Methods in Agric			16	7
AGS 323 Plant Nutrition & Soil Fertility			16	7
Total per Semester	82		62	
Total per Year	144			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 412 Agronomy of Industrial Crops	16	8		

AGC 413 Principles of Genetics & Plant Breeding	16	8		
AGC 414 Crop Ecology & Physiology	16	8		
AGS 416 Special Topics on Soil Health	16	8		
AGC 403 Crops Research Project	16	8	16	8
AGC 423 Plant Breeding			16	8
AGS 426 Chemical Analysis of Soil & Plants			16	8
Total per Semester	80		48	
Total per Year	128			
Total for Qualification	564			

Soil Science (71522)

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGE 111 Introduction to Agricultural Economics	16	5		
PAC 110 / 121 Basic Chemistry	16	5	16	5
PHY 113,114 / 123,124 Physics	8 + 8	5	8 + 8	5
BIO 111 / 121 Biology	16	5	16	5
MAT 112 / 123 Mathematics	16	5	16	5
Total per Semester	80	5	64	5
Total per Year	144			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGC 111 Elements of Agro-meteorology	16	5		
AGS 211 Introduction to Soil Science	16	6		
MIC 211 Introduction to Microbiology	16	6		
PAC 211 Inorganic Chemistry 1	16	6		
STA 111 Statistics	16	5		
AGC 122 Introduction to Crop Science			16	5
AGS 221 Pedology			12	6
MIC 221 Soil & Enviro Microbiology			12	6
PAC 222 Analytical Chemistry 1			16	6
STA 121 Statistics			16	5
Total per Semester	80		72	
Total per Year	152			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
AGB 312 Agricultural Biometry	16	7		
AGC 311 Water Relations	12	7		
PAC 213 Organic Chemistry 1	16	6		
AGC 222 Principles of Crop Production			12	6
AGG 321 Irrigation Drainage			12	7
AGR 322 Research Methods in Agric			16	7
AGS 323 Plant Nutrition & Soil Fertility			16	7
AGS 324 Soil Genesis, Morphology & Classifica			16	7
PAC 224 Physical Chemistry 1			16	6
Total per Semester	44		88	
Total per Year	132			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGC 412 Agronomy of Industrial Crops	16	8		
AGF 301 Practical Agricultural Experience	6	8	6	8
AGS 414 Environmental Soil Chemistry	16	8		
AGS 415 Soil Geomorphology & Mapping	16	8		
AGS 416 Special topics in Soil Health	16	8		
AGS 402 Project in Soil Science	16	8	16	8
AGS 425 Soil Physics			16	8
AGS 426 Chemical Analysis of Soils & Plants			16	8
Total per Semester	86		54	
Total per Year	140			
Total for Qualification	584			

Dept of Animal and Pasture Science

Animal Production Option (71525)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 211 Introduction to Animal Science	16	6		
AGC 111 Elements of Agro-meteorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
AGA 221 Principles of Animal Nutrition			16	6
AGC 122 Introduction to Crop Science			16	5
AGV 221 Anatomy & Physiology			16	6
ICC 121 Introduction to Computers			8	5
Total per Semester	**92**		**56**	
Total per Year	148			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 311 Monogastric Nutrition	12	7		
AGC 413 Principles of Genetics	16	8		
AGP 312 Range Management	12	7		
AGQ 311 Smallstock Science	16	7		
MIC 211 Introduction to Microbiology	16	6		
AGR 322 Research Methods in Agric			16	7
AGA 322 Animal Breeding			16	7
AGA 323 Ruminant Nutrition			16	7
AGP 323 Planted Pastures			8	7
AGV 323 Animal Health			16	7
Total per Semester	**72**		**72**	
Total per Year	144			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 415 Pig & Poultry Production	16	8		
AGA 416 Dairy Science & Technology	16	8		
AGB 312 Agricultural Biometry	16	7		
AGF 301 Practical Agricultural Experience	6	7	6	8
AGA 406 Research Project	16	8	16	8
AGA 421 Meat Science			12	8
AGA 425 Beef Prod & Game Farming			12	8
AGP 425 Apiculture *(Elective)*			8	8
AGP 426 Wildlife Ecology & Management* *(Elective)*			12	8
Total per Semester	**70**		**66**	
Total per Year	136			
Total for Qualification	572			

Livestock & Pasture Option (71526)

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 211 Introduction to Animal Science	16	6		
AGC 111 Elements of Agro-meteorology	16	5		
AGE 111 Introduction to Agricultural Economics	16	5		
AGP 211 Introduction to Pasture Ecology	12	6		
AGS 211 Introduction to Soil Science	16	6		
BCH 211 Introduction to Biochemistry	16	6		
AGA 221 Principles of Animal Nutrition			16	6
AGC 122 Introduction to Crop Science			16	5
AGP 223 Plant Anatomy & Physiology			12	6
ICC 121 Introduction to Computers			8	5
Total per Semester	**92**		**52**	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 311 Monogastric Nutrition	12	7		
AGC 413 Principles of Genetics	16	8		
AGP 312 Range Management	12	7		
AGQ 311 Smallstock Science	16	7		
MIC 211 Introduction to Microbiology	16	6		
AGR 322 Research Methods in Agriculture			16	7
AGA 322 Animal Breeding			16	7
AGA 323 Ruminant Nutrition			16	7
AGP 322 Fodder Production & Conservation			8	7
AGP 323 Planted Pastures			12	7
AGP 324 Applied Range Management			16	7
Total per Semester	**72**		**84**	
Total per Year	156			

Fourth Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
AGA 415 Pig & Poultry Production	16	8		
AGA 416 Dairy Science & Technology	16	8		
AGB 312 Agricultural Biometry	16	7		

AGF 301 Practical Agricultural Experience	6	7	6	8
AGP 401 Research Project	16	8	16	8
AGP 412 Range Rehabilitation	8	8		
AGP 425 Apiculture			8	8
AGP 426 Wildlife Ecology & Management		8	12	8
Total per Semester	70		50	
Total per Year	120			
Total for Qualification	564			

DESCRIPTION OF UNDERGRADUATE MODULES

Department of Agricultural Economics, Extension & Agribusiness

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, tests and tutorials.

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.

Content: The marketing problem. Analysing agricultural markets. Agricultural production characteristics and marketing. Food consumption and marketing. Agricultural price formation and price discovery. Cost of marketing. Marketing institutions and the Marketing Act. Co-operatives. Marketing and agricultural development

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, and 2 major tests

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
For BSc Agric (Eco) ECO 111

AGE 213 : 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.

Content: Scientific literature and its use. Science writing. Methods of seminar preparation and presentation.

Instruction: Contact (1 hour/week)
Assessment: Tests and assignments
Credits: 8
Pre-requisite: None

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 analysing 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 (BSc Agric Eco)

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.

Content: Introduction to the Cash Analysis Book, Trading Account and Balance Sheet. Financial analysis of accounts. Credit management. Capital budgeting. Controlling the use of depreciable assets.

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 (BSc Agric Eco)

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.

Content: The agricultural marketing system. Agricultural product and input markets. Estimation of agricultural demand and supply functions and their analytical uses. Market prices and price variations. Markets over space and time and

quality. Market structure analysis. Government intervention and price policy. Marketing schemes. Marketing boards. Cooperatives: development and role in product and input markets. Co-operatives in economic development.

Instruction: Lectures (2 hours/week); Practical Work (1 per week) - Analysis of prices of agricultural products. Case studies of marketing boards and agricultural co-operatives. Visits to local co-operatives. 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

AGE 316: Analytical Techniques in Agricultural Economics *(was AGE 411)*

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 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: 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 326: Agricultural Policy *(was AGE422)*

Purpose: To assist students to understand what agricultural policy is and the processes and institutions through which it is made, and to familiarise students with a range of South Africa's agricultural policies by means of a structured experience in analysing these policies.

Content: The first part of the course exposes students to the basic principles and realities of policy-making and policy analysis; it covers a number of analytical tools and theoretical models/concepts that are helpful for policy analysis. The course is also structured around actual South African policies relating to imperatives such as agricultural development, rural development, food security and land reform. Students are formed into small groups, each of which will have a turn in playing part of a "departmental policy unit" in respect of one particular policy, as well as a member of a parliamentary portfolio committee in respect of another particular policy.

Instruction: Lectures (2.5 hours/week)

Assessment: Presentations, policy analyses and short written assignments, 1 major test and examination (1 x 3hr paper)

Credits: 16

Pre-requisite: ECO 211 + ECO 212 + ECO 221 + ECO 222

AGE 401: Project in Agricultural Economics *(Curriculums 71501, 71401)*

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 316

AGE 401: Project in Agricultural Economics *(Curriculums 71521, 71421)*

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
Pre-requisite: AGE 316

AGE 402: 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.
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
Pre-requisite: AGE 322

AGE 404 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
Pre-requisite: AGE 312

AGE 405 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
Pre-requisite: AGE 321

AGE 406 Research Methods in Agricultural Economics
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.

Contents: Methods of acquiring knowledge. The difference between the natural and social sciences: absolute statements versus probability statements. Review of relevant research literature. The relationship between theory, hypotheses, observation and empirical generalization. Variables and the development of hypotheses. The use of probability sampling in social research. Methods of data collection. Questionnaire construction. Checking validity and reliability in the measurement of social variables. Interpreting research results and report writing.

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

Pre-requisite: AGE 316

AGE 408 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

Pre-requisite: AGE 311 + AGE 326

AGE 409 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

Pre-requisite: AGE 311 or AGE 321 or AGE 326

Co-requisites: AGE 405 + AGE 308

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/ week), assignments

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

Credits: 8

Pre-requisite: BIO 111 + BIO 121

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

ALP 313: (B Agric 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.

Content: Introduction: Motivation, constraints, influence of economic factors. Basic concepts regarding ecosystems of different agricultural potential. Collection of physical data: climate, erosion vegetation, soil, topography, water resources, present land use, and social and economic conditions. Economic considerations. Integration of physical data and evaluation of potential. Planning, consideration of the following aspects: economics, soil conservation, irrigation, pastures, horticulture, animals, crops, social factors. Farming systems and change in agriculture. Relative to option taken.

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: Compulsory: AGP 222 + AGE 221 + AGS 221
Must have attended AGC 222 and obtained DP

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

Department of Animal and Pasture 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 311: Monogastric Nutrition

Purpose: To provide learners with knowledge concerning nutrition of horses, pigs and poultry; digestive and metabolic development and nutrient requirements; relationships of genetics, endocrinology, immunology and environment to nutrition.
Content: Comparative feed intake, digestive physiology, metabolism and growth in monogastric animals; feed processing techniques; evaluation and anti-nutrient analysis of feedstuffs; protein quality; nutritional roles of water, carbohydrates, proteins and lipids; minerals and vitamins; ecological factors in trace element deficiency; diet formulation; estimation of nutrient requirements of specific monogastric animals, eg poultry, pigs, horses
Instruction: Lectures (2 hours/week), Practical (3 hrs every 2 weeks)
Prac work: Field trips to commercial feed companies; feedstuffs collection and Identification; laboratory nutrient analysis of feeds; digestibility studies and mainly animal experimentation related to production.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGA 211, BCH211
Co-requisite: AGV221

AGA 323: Ruminant Nutrition

Purpose: Train students on the different ruminant feeds, their nutrient content, feed degradability and digestibility, and feed formulation.
Content: Classification of ruminant feeds; review of digestive system and rumen ecology; feed evaluation and anti-nutrient analysis; digestive physiology of dietary nutrients; feed degradability and digestibility assessment; metabolic diseases; feed additives; feed formulation.
Instruction: Lectures (2 hours/week), Practical (3 hrs/week)

Prac work: Ruminant feed collection and identification; laboratory nutrient analysis of feeds; *in vivo & in vitro* studies; feed formulation and assignments.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Examination: 3 hr exam
Credits: 12
Pre-requisite: AGA 211, AGV221, BCH211
Co-requisite: AGV221

AGA 322 Animal Breeding
Purpose: To provide learners with the necessary knowledge base and insight on how to design a breeding plan.
Content: Breeding background: genotypic and phenotypic variation, heritability, and repeatability. Selection and selection techniques and factors affecting the efficiency of selection. Mating systems. Breeding plans for dairy and beef cattle and pigs and other species.
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 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
Content: The pig & poultry industry in Southern Africa. Establishment of pig and poultry enterprises. The evolution and classification of breeds together with characteristics and utility value. Management of piglets, sows, boars and farrowing sows. Rearing systems. Management of chicks, laying birds, broilers and marketing of poultry products. Health considerations.
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.
Content: The dairy industry in South Africa. Dairy breeds. Management of lactating cows, dry cows, heifers and calves. Artificial insemination. Establishment of dairy enterprises. Health considerations. Clean milk production. Composition of milk and dairy by-products and handling considerations. Dairy chemistry, microbiology, technology and production hygiene in the manufacture of dairy products.

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: 16
Pre-requisite: AGA 321 & MIC 211

AGA 421: Meat Science

Purpose: To provide learners with an understanding of the quality requirements of meat.
Content: Production and consumption of meat. Structure of meat; Histology; colour and chemistry. Quality requirements and standards with factors influencing quality; tenderness, colour, fat colour, hardness of fat, marbling, flavour, growth and carcass ratios. Carcass evaluation and dressing percentage. Treatment of meat and meat animals; meat as a human food, slaughter methods. Seedy, cut in pork. Skinning and treatment of hides and skins.
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 425: Beef Production, Animal Traction and Game Farming

Purpose: To provide learners with an understanding of beef production, animal traction and game farming.
Content: The beef industry of Southern Africa. Production systems. Cattle production in rural areas. Cow-calf unit. Management of bulls, cows and calves. Beef breeds and selection. Management of lactating cows, dry cows, heifers and calves. Training and management of work animals: oxen, cows, equines Role of animal traction in developing countries. Establishment of beef enterprises. Health considerations. Game farming. Marketing and trophies. Management of game reserves.
Assessment: Practical reports, assignments, 2 major tests, one seminar and examination (1 x 3hr paper)
Credits: 12
Pre-requisite: AGA 321

AGA 406: Project in Animal Science

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). 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.
Content: 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.
Assessment: Assessment of written project proposal and its oral presentation, as well as assessment of the final project write-up and its oral presentation.

Credits: 32
Pre-requisite: AGB312 and AGR322

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 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 323: Animal Health

Purpose: To give learners an understanding of disease causation, signs and appropriate interventions, animal welfare issues and the legal implications within the South African context.

Content: Introduction to health and disease, Definitions of some important medical terms with emphasis on pathology. Clinical examination of animals and some normal parameters. Postmortem procedure. Basic immunology, the importance of vaccination and use of colostrum. Major viral, bacterial, fungal, parasitic, prion diseases with a brief introduction to pharmaciology of drugs for each causative organism. Importance of drug resistance. Controlled, notifiable and zoonotic diseases; animal welfare issues and government regulations. An overview of toxicology (plant poisoning, pesticides, heavy metals, venom, stings, etc.) Nutritional and metabolic diseases. A very brief summary of routine on farm surgical intervention such as dehorning, castration, branding, vaccination, dosing, dipping, handling and the most basic obstetrical manipulations and wound management.

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

Prac work: Clinical examination. Post-mortem procedures. Routine biosecurity measures; handling drugs and treating simple conditions. Identification of some important toxic plants. Identification of some major agrochemicals

(arsenicals, organophosphates, rodenticides). Routine on-farm surgical operations including animal restraint. Wound management.
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 16
Pre-requisite: AGV 221

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.
Content: Grass taxonomy. Grass morphology. Practical plant ecology. Veld burning. Effect of grazing animals on veld.
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 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

AGP 223: Plant Anatomy & Physiology

Purpose: Students will study the processes and resources required for plant growth and development from cells and tissues to plant communities; the functional anatomy and adaptations of plants; eco-physiology of natural and managed Australian ecosystems. Students will gain an understanding of the vital link between the function of a plant and its anatomy and morphology, and the transfer processes of the soil-plant atmosphere system.
Content: Introduction; definition of terms and concepts in plant anatomy and physiology; organs and tissue systems; root anatomy; stem anatomy; leaf anatomy; architectural organization – phytomers – tillers –tiller demography – tillering – tiller recruitment – tiller longevity; meristems and growth; benefits of vegetative growth; physiological aspect of pasture plants; growth requirements; photosynthesis; respiration; photorespiration; water absorption and transpiration; translocation and nutrient storage; seasonal development of growing points; shoot development, flower formation, seed production, growth reserves.
Instruction: Lectures (3 hours/week), Practical (1 per week).
Assessment: Practical reports, assignments, 2 major tests and examination (1 x 3hr paper)
Credits: 12

Pre-requisite: AGP 211

AGP 312: Range 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 211 + AGC 111

AGP 322: Fodder Production and Conservation

Purpose: To train learners on fodder crops, their establishment and management; fodder conservation techniques and the nutritional qualities of conserved fodder.

Content: Perennial and annual fodder species; drought tolerant fodder crops and fodder trees: their role and purpose in the farming system; establishment and management of fodder crops; fodder conservation through silage, hay, haylage and foggage; cereal residues as fodder and their quality improvement through chemical treatment; nutritional quality assessment of fodder crops; metabolic diseases; fodder production planning.

Instruction: Lectures (2 hours/week), Practical (3 hrs/week)

Prac work: Field establishment and management of fodder crops, silage and hay making; chemical treatment of cereal stovers; nutritive analysis of conserved fodders.

Assessment: Practical reports, assignments, 2 major tests.

Examination: 3 hr exam

Credits: 8

Pre-requisite: AGP 211, AGP223

AGP 323: Planted Pastures

Purpose: To train learners on the different planted tropical and temperate pasture species, their establishment and management, and their nutritional characteristics.

Content: Types of planted pastures; soil and environmental requirements of cultivated pastures; establishment methods of planted pastures; pasture management principles; weed, pest and disease control; irrigation management; grazing management; metabolic diseases in animals from planted pastures; pasture seed production

Instruction: Lectures (2 hours/week), Practical (3 hrs/week)

Prac work:

Assessment: Practical reports, assignments, 2 major tests.
Examination: 3 hr exam
Credits: 12
Pre-requisite: AGP 211, AGP223

AGP 324: Applied Range 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 312

AGP 412: Range Rehabilitation

Purpose: Training learners in the assessment and rehabilitation of degraded rangelands in the context of dynamic global climate.
Content: Changes that have occurred in the vegetation of SA. Characteristics of a degraded veld – the agricultural context. Introduction to different types and causes of encroachment by undesirable plants. Methods to control and eradicate encroachment by undesirable plants. Range management practices pertinent to reclamation and rehabilitation; Re-seeding of degraded rangelands, with emphasis on objectives, factors determining the success of re-seeding, choice of species, water-harvesting and management of re-seeded areas. Insect pest control in rangelands: The harvester/anthill termites. Types, causes and control of soil erosion in rangelands. Causes of global climate change. Effects of climate change on crop, animal and range productivity. Mitigation measures (global, regional, national and local)
Instruction: Lectures (4 hrs/wk), Practicals (3 hrs/wk)
Prac works: Field assessment of degraded areas, practical demonstrations of encroachments and application of different methods in the eradication of undesirable plants in the Eastern Cape. Demonstrations using experimental trials at Fort Hare research farm. Field visits to rehabilitation trials, experiments/demonstrations of re-seeding and termite control.
Assessment:
Examination: 3 hr exam
Credits: 16
Pre-requisite: AGP312 & AGP324

AGP 423: Seminar in Pasture Science

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 401: Project in Pasture Science

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). 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.

Content: 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.

Assessment: Assessment of written project proposal and its oral presentation, as well as assessment of the final project write-up and its oral presentation.

Credits: 32

Pre-requisite: AGB312 and AGR322

AGP 425: Apiculture

Purpose: To enable learners to identify honey bees including workers, drones and queen. To have knowledge on the biology and behaviour of honey bees. To apply principles taught in the course to honey-bee management. To acquire competence in rearing and establishing a bee colony, and in managing honeybee colonies. Learners should also acquire competence in identification of diseases and enemies of honey bees, and in the processing and marketing of hive products.

Content: Introduction to beekeeping: Biology of a honeybee and it's behaviour; most important honey bee species; Bee colony and establishment: Bee colony: worker, drones, queen. Forage plants of honey bees, establishment of apiary. Site selection for apiary and factors for consideration; Beekeeping equipment; Transfer of colony, transportation of colonies, rearing bee colony; Management of honeybees and hives; Inspecting beehives, opening beehives, lighting the smoker, feeding/watering, bee absconding and prevention; Diseases, pests and treatments; Processing and marketing of honeybee products

Instruction: Lectures (3 hrs/week), Practicals (3 hrs every 2 weeks)

Prac works:

Assessment:

Examination: 3 hr exam

Credits: 12

Pre-requisite: BIO 111 & BIO 121

AGP 426: Wildlife Ecology & Management

Purpose: The course introduces learners to wild and game animal species and production systems. The course teaches wildlife habitats, and animal behaviour; and provides practical exposures to game/wildlife management and utilization.

Content: Definitions of terms and concepts: what is wildlife and wildlife management and a brief history of wildlife management in Southern Africa; Wild animal production systems: wildlife conservation, game ranching, game farming; Wildlife habitats and feeding habits; Identification of suitable wild species and habitats, factors to consider; Range use, feeding behaviour and nutrition of

game herbivores; Feed selection; dispersal, dispersion and distribution of populations; Animal management; Animal behaviour in management; Population growth and regulation: analysis of stage and age structured populations and population viability analyses, methods for estimating animal abundance; Hunting, harvesting and analysis of harvest rates for sustainable off-take; Diseases and enemies of wild animals; Experiments in wildlife management; Conservation in theory and practice.

Instruction: Lectures (3 hrs/week), Practicals (3 hrs every 2 weeks)

Prac works:

Assessment: At least 2 theory tests, practical test and reports and assignments

Examination: 3 hr exam

Credits: 12

Pre-requisite: AGP312

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 adaptibility, 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

Department of Agronomy

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 basis for most crop production courses.

Content: Agricultural climatology, climate and weather, the water factor, evaporation from a free water surface, rainfall and seasonal distribution. 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. Plants and water use, temperature, radiation, wind, integration of climatic data.

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

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: None

AGC 111F: ***Refer to AGC 111 for information***

AGC 122: Introduction to Crop Science

Purpose: To introduce all agriculture learners to the basic principles of crop science. The information presented will assist learners understand some of the practices undertaken in producing crops.

Content: Plant and animal gametogenesis and life cycles; Mendelian principles of inheritance; gene interactions; sex determination and sex linkage; nucleic acids, the genetic code and protein synthesis; origin, classification and nomenclature of economic crops; germination and seed quality; vegetative growth; root growth; flowering and seed formation; photoperiodism.
Practicals involving identification of seeds of agronomic crops grown in South Africa; identification of crop plants: cereals, legumes and other families of agronomic importance; seed and seedling development: germination (types, percent); asexual propagation

Instruction: Lectures (3 hours/week), Practical (every second week) - Visits to the experimental farm.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 111

AGC 222: Principles of Crop Production

Purpose: To introduce learners to the underlying production principles for major crops produced in South Africa.

Content: Importance of crop plants in human welfare and the SA economy; cropping systems in SA; objectives of crop production; tillage principles; principles of crop rotation; quality in crop products; fertilizers and fertilize; organic production; conservation agriculture; green revolution.
Practicals include laboratory calculations of nutrient content of fertilizers; review of research findings; fiels demonstration of tillage equipment, rotations and conservation agriculture practices

Instruction: Lectures (3 hours/week), Practical (1 per week) - Visits to the experimental farm.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGC 111

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 extended for studying the Principles of Irrigation (AGC 321) and Crop Physiology.

Content: The water factor in Southern African agriculture. National water resources. Measurement of soil moisture. Use of soil moisture. Evapotranspiration: Environmental and plant factors determining the rate of evapotranspiration. Transpiration ratio or relative water requirement: Factors affecting transpiration ratio. Water use efficiency. Effect of moisture deficit in plants:

Effects on growth; effects on photo-synthesis; respiration; successive wetting and drying cycles; mineral nutrition. Water budgeting.

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

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGC 122

AGC 314: Agronomy of Summer Crops

Purpose: To introduce the learner to the major summer field crops, consisting of cereals, pulses and potatoes.

Content: The morphology, physiology and management practices of maize, sorghum, pearl millet, groundnut, soybeans, sunflower, bean, potatoes, cowpea, pigeon pea.

Instruction: Lectures (3 hours/week), Practical (3 hrs every 2nd week)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC222

AGC 315: Plant Physiology

Purpose: To introduce learners to the study of life processes of plants.

Content: Photosynthesis, carbon fixation by crops, assimilate portioning, plant growth and development, growth analysis, plant growth regulators, biological nitrogen fixation

Instruction: Lectures (3 hours/week), Practical (3 hrs every 2nd week)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 122

AGC 316: Plant Pest Control

Purpose: This course covers important theoretical and practical aspects of crop protection in the areas of weed science, entomology and plant pathology. The learner should acquire knowledge about the various methods of controlling and managing pests, and be able to apply these concepts in crop production.

Content: General introduction to crop protection: definition of terms used in crop protection, identification of major groups of agricultural prsts and introduction to crop protection methods. Weed science: definition of weeds and weed characteristics, classification of weeds, importance of weeds in agriculture (losses and beneficial effects), weed reproduction, weed ecology, methods for weed management and control. Entomology: importance of insects, general classification and anatomy of insects, life cycles of insects, diet and feeding, insect ecology, reproduction, insect pest control and management. Plant pathology: overview of the causes of plant diseases, classification of plant diseases, plant disease diagnosis, pathogen survival and dispersal

mechanisms, describing the infection processes, effects of plant pathogens on crop physiological processes, control of plant pathogens.

Instruction: Lectures (3 hours/week), Practical (3 hrs every 2nd week)

Prac work: 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: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 222

AGC 323: Agronomy of Winter Crops

Purpose: To introduce the learner to the major winter field crops, consisting of wheat, barley, tricale, oats and lucerne.

Content: The morphology, physiology and management practices of wheat, barley and oats

Instruction: Lectures (3 hours/week), Practical (3 hrs every 2nd week)

Prac work: Growth analysis of a wheat crop, irrigation scheduling in wheat, integrated pest management, yield assessment.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGC 222

Co-requisite: AGC 314

AGC 412: Agronomy of Industrial Crops

Purpose: To expose learners to the theoretical and practical management strategies associated with the production of major industrial crops grown in SA (cotton, tobacco, sugar cane, sunflower and flax)

Content: The production of specialized crops: Morphology, physiology, quality and yield criteria in relation to the production of cotton, tobacco, sugar cane, sunflower and flax. Challenges and production constraints, value chains and agronomic research programmes to address current challenges.

Instruction: Lectures (3 hrs/week), Practical (3hrs every 2 weeks)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 314 & AGC 323

AGC 413: Principles of Genetics

Purpose: To provide students with an understanding of the principles of genetics and plant breeding, that is, the scientific basis upon which plant breeding options are made. The actual procedures and practices of plant breeding will be covered in AGC423.

Content: Linkage analysis and gene mapping; modes of reproduction and pollination control; hybridization in crop plants; inbreeding and heterosis; polyploidy and plant breeding; population genetics; quantitative or polygene inheritance;

principles of disease resistance in plants; principles of mutation breeding; biotechnology and plant breeding.

Instruction: Contact (3 hours/week), Practical (3 hr every 2nd week

Prac work: Practicals involving crossing procedures for a self-pollinated crop (tomato) and a cross-pollinated crop (maize)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 122

AGC 414: Crop Ecology and Physiology

Purpose: This module is aimed at giving learners a more advanced knowledge of crop physiology and adaptation of crop plants, in order to equip them for research in crop science. Learners are expected to develop skills required for analysis of mechanisms controlling and co-ordinating plant growth and development. They should also gain an understanding of agricultural ecosystems, as well as factors and strategies contributing to productivity and sustainability in the face of global climate change.

Content: Physiological basis of crop yield, plant adaptation to stress, physiology of a cereal, root and tuber and legume crops, plant interaction (competition, population ecology, community ecology, ecosystems); goals of agro-ecosystem management; strategies for meeting future food demand, climate change and climate smart agronomic practices; Tropical agro-ecosystems and resources; Sustainable agricultural systems and threats to sustainability.

Instruction: Lectures (3 hrs/week), Practical (3 hr every 2 weeks)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC315

AGC 423: Plant Breeding

Purpose: To provide a strong background in the principles and practices of crop improvement for BSc Agric learners.

Content: Introduction to plant breeding, domestication plant introduction and acclimatization; breeding self-pollinated, cross-pollinated and vegetatively propagated crops, application of breeding methods to improvement of wheat, maize, potatoes, as examples; breeding for tolerance to abiotic stresses, breeding for quality, maintenance and seed production of improved varieties.

Instruction: Lectures (3 hrs/week), Practical (3 hrs every 2 weeks)

Prac works: Practical experience with techniques employed in the breeding of self-pollinated field crop plants. Group assignment on designing a breeding programme to be presented in both written and verbal form. Glasshouse screening of genotypes for tolerance to selected stresses at seedling stage.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 413

AGC 403: Crop Science Research 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). 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.

Content: The learner is required to identify the problem and develop a research topic, do extensive literature review, write a convincing proposal, conduct research on the identified problem, write a dissertation and give oral presentation.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous 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: 32

Pre-requisite: AGB 312 & AGR 322

AGH 314: Elements of Horticultural Science

Purpose: To introduce the learners to fundamental principles and practical aspects of horticultural science and the cultivation of horticultural crops as a extended for other modules in horticultural science.

Content: A brief survey of the horticultural industry in Southern Africa; Horticultural terminologies; overview of vegetable crops: classification, nutritional value and economic importance, production and production systems, and harvesting and marketing: Fruit and nut tree crops; origin of climate and classification of fruit and nut tree crops according to climatic requirement; Plant propogation with special reference to the principles and practices of seedling raising from seed and asexual propagation techniques. Introduction to plant growth and development, natural and synthetic growth substances; juvenility and senescence; flowering and flower physiology; fruit set and development; overview of tropical, subtropical and temperate fruit crops; soil and site selection, orchard layout, spacing, irrigation, fertilization, crop covering, mulching and weed control; Introduction to floriculture.

Instruction: Lectures (4 hours/week), Practical (2 hrs every week)

Prac works: Laboratory, filed and greenhouse practicals on seedling raising, sowing/transplanting, asexual propagation (cutting, grafting, budding and layering), and crop diseases and pest control measures. Visiting commercial greenhouses and seedling nurseries.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGC 122

AGH 322: Vegetable and Herb Production

Purpose: The module provides a general background to vegetable crops and their production systems (field and greenhouse or protected production). The learners will also be familiarized with general principles and production practices and physiology of selected vegetables and herbs.

Content: Brief survey of the vegetable industry in Southern Africa; economic and importance and food value of vegetable crops; classification of vegetable crops; climate and soil as factors in vegetable growing; seeds, production, seed certification and testing; seedbed preparation, sowing and transplanting; raising of seedlings in cavity trays; nutrient requirements of vegetable crops: types of nutrients and fertilizer application; management of vegetable crops in different growing systems: open-field and greenhouse growing systems and hydroponic techniques; vegetable and herb harvesting, storage and marketing process; economic importance, nutritional value, production areas, climatic requirements and other selected aspects of the major vegetable crops.

Instruction: Lectures (4 hours/week), Practical (3 hrs per week) –

Prac works: Laboratory, field and greenhouse practicals on seedling raising sowing/transplanting, nutrient deficiency and correction, constriction of cost-effective greenhouses and hydroponics, and crop diseases and pest control measures. Visit commercial greenhouses and hydroponics vegetable production systems

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGH 314

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: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGH 311 + AGH 313

AGH 414: Tropical & Subtropical Fruit

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

Content: Origin of climate and characteristics and agricultural potential of tropical and subtropical climatic zones, and climatic zones of SA. Classification of fruit

crops in relation to climatic requirements; Explore production and export potential of major tropical and subtropical fruits in SA (bananas, pineapples, mangoes, guavas, papayas, avocados, pecan, macadamia and lich) with specific reference to varieties, climate and soil requirements, propagation techniques, planting density, orchard management, training and pruning, water and fertilizer application, growth regulators application, important diseases and pests and physiological disorders. Harvest indices, harvesting methods, grading, packaging and storage.

Instruction: Lectures (4 hrs/week), Practicals (3 hrs/week)

Prac works: Description and identification of varieties of fruit crops. Applying training and pruning techniques. Identify fruit harvesting indicators, and practice harvesting, ripening and grading techniques. Visit to commercial orchards and packaging and storage facilities. Trip to Fort Beaufort or Port Elizabeth areas. Students will be given questions that need to be clarified by experts in the facilities. Student will write a report that discusses all their observations and the responses they get from experts, relating these issues (observations and explanation obtained) with what they are taught is class. The reports will be marked and captured as part of practicals.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGH314

AGH 415: Ornamental, Medicinal & Aromatic Plants. (Elective)

Purpose: To introduce the learner to the importance, and principles and practices of production of ornamental, medicinal and aromatic plants.

Content: Introduction: economic importance and cultural values of ornamental, medicinal and aromatic plants in SA: Identification of major ornamental, medicinal and aromatic: origin, distribution, domestication level, climatic requirements: Production practices: growing system and production scale, propagation, sole preparation, growing media, fertilizer application, plant growth manipulation; Harvesting and storage: harvesting techniques, packing of cut flower herbs: Physiology of medicinal and aromatic plants: biosynthesis, concentration of active compounds of medicinal plants, drying and/or distillation/extraction of active ingredients.

Instruction: Lectures (3 hrs/week), practicals (3hrs every 2nd week)

Prac works: Laboratory, field and greenhouse practical on propagation, cultivation, distillation (of aromatic plants); visiting commercial nurseries, production farms, processing and packhouse.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGH314

AGH 416: Plant Propagation & Nursery Management

Purpose: This module is intended to give the learner a greater insight into plant propagation techniques, physiology of propagules and nursery management.

Content: Introduction: history of plant propagation, biology of plant propagation, plant propagation environment; asexual (seed) propagation: seed development,

seed selection and handling, principles of propagation by seed; vegetative propagation: principles and techniques of propagation by cutting propagation, principles and techniques of grafting and budding propagation, layering propagation and it's natural modification, its principles and techniques, propagation by specialized (modified) plant organs, principles of clonal selection; tissue culture: principle of tissue culture and micropropagation, techniques of micropropagation; nursery management: containers, growing media, fertilize application, irrigation management, control of environmental factors, nursery hygiene.

Instruction: Lectures (4 hrs/week), practicals (3 hrs/week)

Prac works: Laboratory, field and greenhouse practicals on different propagation techniques and nursery management practices; visiting commercial nurseries, micropropagation and seedling marketing outlets.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGH 314

AGH 421: Temperate Fruits (Elective)

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 (1per week) - Production practices including propagation, pruning, training, fruit thinning, harvesting, grading and packing. Identification and control of pests and diseases

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGH 311 + AGH 313

AGH 427: Post Harvest 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: Survey on post-harvest horticultural product losses: Pre- and post-harvest 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 pre-storage treatment; different systems of storage, packaging methods; recent advances in packaging storage systems. Physiology of stored fruits and vegetables. Post-harvest treatments of fruits and vegetables; pre-harvest factors responsible for deterioration of horticultural produce; physiological and bio-chemical changes in fresh fruits and vegetables; pre-harvest treatment:

hormonal fruit hardening and delaying ripening process; quality parameters and specification.

Instruction: Lectures (4 hrs/week), Practicals (2 hrs/week)

Prac works: Laboratory, field and greenhouse

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGH 314

AGH 404: Horticulture Project and Seminar

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). 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.

Content: The learner is required to identify the problem and develop a research topic, do extensive literature review, write a convincing proposal, conduct research on the identified problem, write a dissertation and give oral presentation.

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. The report is also presented orally, preferably with the aid of Powerpoint.

Credits: 32

Pre-requisite: AGB 312 & AGR 322

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: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGF 112

AGG 321: Irrigation drainage

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

Content: Introduction: irrigated areas of the world, productivity and value of irrigated land, importance and scope of irrigation in Southern Africa. The soil-plant-atmosphere system: 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 with 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; design, implementation and efficiency assessment of surface and overhead systems. Agricultural land drainage: problems and causes; importance of drainage. Methods for land drainage. Steady stat equations designing a relief drainage system.

Instruction: Lecture (3 hours/week), Practical (3 hr prac every 2nd week)

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGC 122 and AGC 311

AGR 322: Research Methods in Agriculture

Purpose: To provide learners an understanding of different aspects associated with the research process relating to agricultural sciences and develop an understanding of how to conduct research in terms of producing research problems and questions, proposal writing, writing a mini-dissertation, literature reviews, research methods and specific ethical issues

Content: Literature review; formulation of research questions, hypotheses and research objectives; selecting a research topic and crafting methodologies to answer different research questions; basic statistical concepts and principles; selection of appropriate statistical tests to look for differences in data, format and requirements for writing different sections of a research proposal, data presentation, interpretation of results, ethical issues

Instruction: Lectures (3 hours/week), Practical (3 hrs every 2 weeks) -

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGB 312

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.

Content: The origin of soils, types of parent materials, mineral and rock types, geological formations of South Africa, rock weathering. Soil formation and classification: the soil profile, horizons, nomenclature; factors of soil formation; classical soil types, e.g. podzol, latosol, chernozem. SA soil classification, most important soil series. Physical properties of soils: texture, structure, moisture properties, soil air, soil temperature, soil colour. Chemical properties of soils: chemical composition, clay minerals, cation exchange, pH, soil acidity, liming, brack soils. Biological properties of soils: organisms, organic matter, ammonification and nitrification. Soil fertility and fertilizers:

fertility indicators, types and sources of N, P, K fertilizers, fertilizer mixtures, principles of fertilizer recommendation.

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: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: PAC 110 or PAC 119 & 129

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 and interpret soil maps for agricultural purposes.

Content: Introduction: Definition, motivation. The soil profile, horizons, nomenclature. Soil genesis: factors of soil formation, geomorphology and the accumulation of parent material, process of soil formation, horizon differentiation. Soil classification: why?, some classical systems, S.A. system in some detail. Soil mapping, aerial photographs, land capability/soil suitability assessment.

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: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGS 211

AGS 323: Plant Nutrition & 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.

Content: Historical introduction; plant growth and factors affecting it; growth expression: Mitscherlich and Quadratic equations; processes and mechanisms controlling nutrient bioavailability and acquisition; soil fertility evaluation; soil test calibration and plant analysis; external and internal nutrient requirements; fertilizer recommendations and nutrient management strategies including precision agriculture; environmental effects of fertilizer use; soil fertility management for organic farming; fertigation and foliar fertilization.

Instruction: Lectures (3 hours/ week), Practical (3 hrs/ week), Tutorials (3hrs/week)

Prac work: Weekly laboratory practicals.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGS 211

AGS 324: Soil Genesis, Morphology & Classification

Purpose: To teach students with a background in pedology details on soil formation / genesis and classification to enable them to describe soils in the field as well as to interpret the potential and behavior of these soils.

Content: Soil formation / genesis: factors of soil formation, processes of soil formation; Soil morphology: mottling, structure, macropores, carbonates, etc. The soil profile, horizons, nomenclature: SA Soil Taxonomic System in detail; USDA Soil Taxonomy and World Reference Base of Soil groups in some detail. Interpretation of soil maps and land evaluation.

Instruction: Lectures (3 hours/ week), Practical (3 hrs every 2nd week)

Prac work: Field visits, identification, description and classification of representative soils

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGS 221

AGS 414: Environmental Soil Chemistry

Purpose: To empower learners with knowledge on: (i) important chemical reactions that take place in soils and their practical implications on soil fertility and it's management, and (ii) causes and consequences of contamination and buffering by soils.

Content: Clay mineralogy; Surface chemistry of the soil matrix; Colloid stability and double layer theory; Redox: oxidation and reduction phenomena; Adsorption; Organic matter: composition and fractionation; Saline and sodic soils; Sources and nature of major soil contaminants added to soils: reactions of organic and inorganic contaminants with soils and soil components; Factors affecting mobility and/or degradation of organic contaminants in soils.

Instruction: Lectures (3 hrs/week) Topics will be presented by experts in the different areas from within and outside the Department. Practicals (1/week)

Prac works: Weekly laboratory practicals

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: PAC211 & PAC213 & PAC222 & PAC224 & AGS211

AGS 415: Soil Geomorphology and Mapping

Purpose: To teach learners, with a background in soil formation and classification, about soil distribution patterns and advanced techniques for soil surveying and mapping.

Content: Soil and landforms; hydropedology and hillslope hydrology; kinds and levels of soil surveys; application of GIS, GPS and remote sensing in soil surveys to facilitate digital and predictive soil mapping. Purposes, characteristics and identification of mapping legends, mapping and taxonomic units; interpretation and use of soil survey reports. Land capability and soil suitability assessments

Instruction: Lectures (3 hrs/week), Practicals (3 hrs every 2 weeks)

Prac works: Farm visits, identification and classification of representative soils, mapping of soils using advanced technology and interpretation of existing soil information.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 12

Pre-requisite: AGS 324

AGS 416: Special Topics in Soil Health

Purpose: To equip learners with knowledge on the impact of soil management practices and soil contaminants on soil health and quality. The course is meant to raise student awareness on the link between soil management and soil health through covering topics that don't feature in other courses of their degree programmes.

Content: Carbon sequestration; Biological mediators of soil organic matter transformation; Soil enzymes and organic matter transformation; Land use and soil carbon stocks; Greenhouse gas emissions and climate change; impact of conventional and conservation farming practices on soil health; Soil quality evaluation; Composting and vermicomposting; Effects or organic and inorganic contaminants on soil organisms and processes; Management and amelioration of contaminated soils

Instruction: Lectures (3hrs/week) Topics will be presented by experts in the different areas from within and outside the Department. Practicals (1/week)

Prac works: Weekly laboratory practicals

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGS323

AGS 425: Soil Physics

Purpose: To provide learners with fundamental understanding of soil physical properties and processes; practical experience in the measurement and analysis of soil physical processes; and present methods of analysis applicable to solving practical agricultural, hydrological and environmental problems.

Content: Mechanical properties of soils which influence plant root penetration and growth; processes for water, air, solutes, and heat in soils that influence the physical environment of the root zone for plant growth; Laboratory and field experiments to measure selected physical properties of soils and appropriate fate and transport parameters of agrochemicals in soils.

Instruction: Lectures (3 hrs/week), Practicals (3 hrs every 2 weeks)

Prac works: Laboratory and field experiments to measure selected physical properties of soils and appropriate fate and transport parameters of agrochemicals in soils.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGS 211

AGS 426: Chemical Analysis of Soils & Plants

Purpose: To prepare learners majoring in soil science for analytical work relating to soils, plants and water in relation to agricultural and environmental issues.

Content: Quality assurance and safety measures in the laboratory; Use of basic laboratory equipment, e.g. Balances, ovens, incubators, muffle furnaces, desiccators; Analytical techniques (principles and instrumentation); Potentiometry; Emission spectroscopy; Absorption spectroscopy; Plasma spectroscopy, and scanning electron microscopy; Extraction, digestion and dry ashing; Analysis of soils, plants and water: sampling and storage of samples, analysis of important parameters, interpretation of results.

Instruction: Lectures (3 hrs/week), Practicals (3 hrs/week), Tutorials (3 hrs/week)

Prac works: Weekly laboratory practicals

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: AGS 211

AGS 402: Project in Soil Science

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). 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.

Content: The learner is required to identify the problem and develop a research topic, do extensive literature review, write a convincing proposal, conduct research on the identified problem, write a dissertation and give oral presentation.

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. The report is also presented orally, preferably with the aid of Powerpoint.

Credits: 32

Pre-requisite: AGB 312 & AGR 322

ADDITIONAL COURSES

AGB 312: 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.

Content: Basic and derived isometric units. Multiples and submultiples. Computations using a scientific pocket calculator, indices, scientific notation and standard form. Significant figures, decimal places, rounding off and rough checks. Mensuration. Scientific concepts and related formulae. Averages, ratios and proportion, percentages, percentage error and percentage change. Logarithms. Elements of geometry and trigonometry. Presenting numerical

data, graphs and tables. Mathematical background and skills, to the arithmetic concepts indicated above.

Instruction: Contact (3 hours/week), Practical (1 per week) - The use of the scientific pocket calculator in applying the above techniques.

Assessment: **CASS** based on theory tests and practical sessions, as approved by Senate and reflected in the learning guide. There will be no final examination as assessment is based on continuous assessment.

Credits: 16

Pre-requisite: None

AGF 112 F: ***Refer to AGF 112 for information***

AGF 301: Practical Agricultural Experience

Purpose: To provide all third-year agricultural students with practical hands-on experience of on-farm activities to enable them to apply their theoretical knowledge practically. In their final two years of study, students will be required by the Faculty Board of the Faculty of Science and Agriculture to register for and attend to specified periods of practical work under the guidance of an approved person or at an approved institution or in an approved project.

1. All students doing agricultural studies are required to take part in Practical Agricultural Experience Programmes.
2. Students may also be required to attend practical sessions related to the degree options for which they are registered.

Instruction: Contact (During specified times in the Academic Recess period)

Assessment: Formative and summative assessments of participation in and outcomes from practical hands-on training activities

Credits: 12

Pre-requisite: None

POST GRADUATE STUDIES IN AGRICULTURE

(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)

Department of Agric Economics, Extension and Agribusiness

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.

Ag7.2 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 Faculty and Senate:

70501	in Agricultural Economics
70502	in Agricultural Extension

Ag 8 Admission:

Ag8.1 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.

Ag8.2 A student may be required to make up such deficiencies as deemed necessary by the Head of Department.

Ag 9 Examinations:

Ag9.1 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.

Ag9.2 The examinations in Agricultural Extension shall consist of three written papers, a dissertation and seminars presented during the module.

Ag9.3 In order to pass the Honours examination a candidate must obtain an aggregate of at least 50% of the marks in all the papers.

Ag9.4 There shall be a sub-minimum of 40% for each paper.

Ag9.5 The degree shall be conferred with distinction on a candidate who obtains a final mark of not less than 75%.

AGRICULTURAL ECONOMICS - 70501

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

***Duration*:** The programme can be done full time over the period of one year, or part time over a period of 2 years

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

Modules	NQF Level	Credits
AGE 501 Project	8	36
AGE 502 Seminars	8	32
AGE 506 Methods of Agric Eco & Farm Management Research	8	20
Any 2 of the following:	8	
AGE 504 Agricultural marketing	8	20
AGE 505 Agricultural Development	8	20
AGE 507 Special Topics In Agricultural Economics	8	20
Total for Qualification	8	**128**

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

AGE 501: Project

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: Seminar

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 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.
Contents: Methods of acquiring knowledge. The difference between the natural and social sciences: absolute statements versus probability statements Review of relevant research literature. The relationship between theory, hypotheses, observation and empirical generalization. Variables and the development of hypotheses. The use of probability sampling in social research. Methods of data collection. Questionnaire construction. Checking validity and reliability in the measurement of social variables. Interpreting research results and report writing.
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 507 Special Topics in Agricultural Economics *(former AGE409)*
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
Pre-requisite: AGE 311 or AGE 321 or AGE 326
Co-requisites: AGE 405 + AGE 308

AGRICULTURAL EXTENSION - 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 only 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.

Modules	NQF Level	Credits
AGX 501 Basis & Philosophy of Agric Ext & Rural Dev.	8	20
AGX 502 Communication, Leadership & Management	8	20
AGX 503 Evaluation & Research	8	20
AGX 504 Dissertation	8	36
AGX 506 Seminars	8	32
Total for Qualification	8	**128**

AGX 501 Basis and philosophy of agricultural extension and rural development:

Contents: A general study of the principal 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: The planning, aims, objectives and evaluation of extension and rural development programmes Concepts, principles and theories of agricultural production behaviour in the development, design and implementation of agricultural extension programmes and agricultural development strategies. Monitoring and evaluation of agricultural extension interventions in agricultural development strategies and programmes. Methods and theories of research in extension projects and agricultural extension interventions. Methods of data collection in agricultural extension and rural development research. Aspects of project appraisal and evaluation of extension and development organisations and activities.

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 20 000 to 25 000 words

using one and a half (1.5) line spaced typing, excluding footnotes, bibliography, illustrative material and appendices.
Credits: 36

AGX 506 Seminars
Content: Seminars presented during the module of the year.
Credits: 32

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 Faculty and Senate: Total credits for the programme is 180 credits'

			Qualification ID
71000	M Agric in Agricultural Economics	(AGE 700)	15182
71001	M Agric in Agricultural Extension	(AGX 700)	15184

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)

Qualification ID - 96544

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 Faculty and Senate: Total credits for the programme is 180 credits.

Department of Agric Economics, Extension & Agribusiness

72500	MSc (Agric) Agricultural Economics	(AGE 701)

Department of Agronomy

72502	MSc (Agric) in Crop Science	(AGC 701)
72504	MSc (Agric) in Soil Science	(AGS 701)
72505	MSc (Agric) in Horticultural Science	(AGH 701)

Department of Animal & Pasture Sciences

72503	MSc (Agric) in Animal Science	(AGA 701)
72506	MSc (Agric) in Pasture Science	(AGP 701)

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

Ag18.1 A person shall not be admitted as a candidate for the degree unless s/he holds a qualification in Agriculture at NQF level 8 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

Ag19.1 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 Faculty Board.

Ag19.2 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.

Ag19.3 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 AGRICULTURE (D Agric)

Ag 20 Study programme

Ag20.1 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.

Ag20.2 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 Faculty and Senate:

			Qualification ID
Department of Agricultural Economics, Extension & Agribusiness			
73001	Doctor of Agriculture in Agricultural Economics	(AGE 800)	96586
73002	Doctor of Agriculture in Agricultural Extension	(AGX 800)	96536

Department of Agronomy

73003	Doctor of Agriculture in Crop Science	(AGC 800)	96538
73005	Doctor of Agriculture in Soil Science	(AGS 800)	96541
73006	Doctor of Agriculture in Horticultural Science	(AGH 800)	96539

Department of Animal and Pasture Sciences

73004	Doctor of Agriculture in Animal Science	(AGA 800)	96537
73007	Doctor of Agriculture in Pasture Science	(AGP 800)	96540

INTRODUCTION TO THE DEGREE BACHELOR OF SCIENCE (BSc)

Guidance to the Selection of Courses and Curricula

The Faculty offers a three-year degree in pure Science with specializations and combinations in various disciplines. To follow a BSc degree it is compulsory to have passed Matric Mathematics and Physical Science at least level 4. 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 Faculty 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 Science Section:

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.

Geographical Information Systems (GIS): essentially the study of computer-based mapping, manipulation and interpretation of geospatial information; **Remote Sensing** is the study of satellites and processing of satellite images; 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 spatial relations and the interlinkages, involving both the physical and human elements of the earth; 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. The learners can choose among two curricula: Zoology option and, Entomology option. For the Entomology option, Chemistry 100 is required at third-year level.

PLEASE NOTE:

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.

A student must attain a minimum total of 384 credits. This implies that a student must take 4 first year subjects (4 x 32 = 128), 2 second year subjects (2 x 48 = 96) and 2 third year subjects (2 x 64 = 128), PLUS an extra first or second year subject over the three year period.

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.)

Subject	***Course Codes***	***Pre-requisites***
Applied Mathematics	MAP 211, 221	MAT 100 *plus* PHY 121/123
	MAP 311, 312, 321, 322	MAP 200 *plus* MAT 211 & MAT 223
Biochemistry	BCH 211, 212, 223	PAC100 *plus* MAT 111 or 112 or equivalent or STA 111/121, *plus either* BOT 100 *or* ZOO 100 *or* BIO 100
	BCH 313, 314, 321, 323	BCH 200
Botany	BOT 211, 221	BOT 100
	BOT 312, 313, 322, 323	BOT 200 *plus* PAC 100
Chemistry	PAC 200	PAC 100 *plus* MAT 111 or 112 or equivalent
	PAC 300	PAC 200
Computer Science	CSC 211, 212, 224	CSC 121
	CSC 223	CSC 211
	CSC 312, 323	CSC 212
	CSC 313, 324	CSC 211
Geography	GEG 211, 221	GEG 100
	GEG 312, 313, 322, 323	GEG 200
Geographic Information Systems	GIS 212, 222	GLG 100 ***or*** GEG 100 *plus* any CSC 100.
	GIS 314, 315, 324, 325	GIS 200
Geology	GLG 211, 221	GLG 100
	GLG 312, 313, 322, 323	GLG 200, PAC 100
Mathematics	MAT 211, 212, 223, 224, 225	MAT 100
	MAT 311, 322, 303, 304	MAT 200
Microbiology	MIC 211, 212, 221, 222	PAC 100 *plus* either BOT 100 ***or*** ZOO 100 ***or*** BIO 100
	MIC 311, 312, 321, 322	MIC 200

Subject	Course Codes	Pre-requisites
Physics	PHY 211, 212, 221, 222	PHY 100 *plus* MAT 100 Co-requisites: MAT 200 ***or*** MAP 200
	PHY 311, 312, 321, 322	PHY 200 *plus* MAT/MAP 200
Statistics	STM 211, 212, 221, 222	STA 111&121 ***or*** MAT111 & MAT121 ***or*** MAT112 & MAT122 ***or*** MAT113 & MAT123 Co-requisite: MAT200
	STM 312, 313, 322, 323	STM 200
Zoology (*Zoology option*)	ZOO 212, 222	ZOO 100
	ZOO 314, 315, 324, 325	ZOO 200
Zoology (*Entomology option*)	ZOO 212, 223	ZOO 100
	ZOO 314, 316, 324, 326	ZOO 200 *plus* PAC 100

Meaningful Combinations

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

Biotechnology and Biological Sciences

Botany
Biochemistry
Microbiology
Zoology
Entomology

Computational Sciences

Mathematics
Applied Mathematics
Statistics
Physics
Computer Science

Chemical and Earth Sciences

Chemistry
Geography
Geology
GIS and Applied Remote Sensing

Lecture Groups

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

Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H
BIO 111 CLT 111 GLG 100 MNU 100 ZOO 100	ECO 111 ECO 121 PAC 110 PAC 121 PAC 119 PAC 129	CSC 100 ICC 121	AGF 112 MAT 100 STA 111 STA 121 STA 122	AGC 111 AGC 122 GEG 100 PHY 100 PHY 113 PHY 114 PHY 123 PHY 124 AFA 111 AFA 121	AGE 121 BEC 111 BEC 121 BOT 100	AGE 111 BIO 121	AGE 121 *Practical*
AGP 211 AGP 222 ECO 222 GIS 200 MAT 200 MIC 200	AGS 211 AGS 221 AGV 221 CSC 200 ZOO 223	AGC 222 ECO 211 ECO 221 GEG 200 PAC 200 PHY 200 STM 200 ZOO 212 ZOO 222	AGA 211 AGE 221 BCH 223 EDE 211 EDE 221 GLG 200 MAP 200	AGC 221 PAC 224	AGA 221 AGE 211 AGE 222 BCH 211 BCH 212	AGG 221 AGP 223 BOT 200	AGE 213 AGW 211 AGX 221
AGA 323 AGC 311 AGE 316 AGG 311 AGH 312 AGS 321 AGS 323 ALP 322 CSC300 ZOO 316 ZOO 326	AGB 312 AGC 312 AGC 413 AGE 321 AGR 322 BCH 300 MAT 300	AGA 311 AGC 314 AGC 323 AGE 312 AGE 322 AGH 314 AGP 312 AGP 322 AGX 323 GLG 300 MAP 300 MIC 300	AGA 311 AGA 322 AGB 321 AGC 321 AGC 323 AGE 326 AGG 321 AGV 321 AGH 313 AGP 312 ALP 313 GEG 300 PHY 300 STM 300 ZOO 314 ZOO 315 ZOO 324 ZOO 325	AGC 316 AGE 311 AGH 321 AGH 322 AGP 323 AGX 321 PAC 300 GIS 300	AGP 324 AGQ 311 AGS 322 AGS 324 BOT 300 ECO 311 ECO 312 ECO 321 ECO 322	AGC 315 AGV 323 AGX 322	AGE 312 *Practical*

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 also have 1 practical per week.

Attendance of all lectures, practicals and tutorials is compulsory.

SCIENCE AND AGRICULTURE EXTENDED PROGRAMME (SAEP)

SCIENCE - 40400

1. Background and Entry Requirements

The Science and Agriculture Extended Programme (SAEP) is intended to provide a strong Science extended to students who do not meet University and/or Faculty of Science and Agriculture entry requirements. The SAEP 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 SAEP (note: all SAEP courses are derived from regular University courses that fulfil SAQA regulations) are for tracking purposes. The minimum entrance requirements for the SAEP 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 SAEP is 4 years (384 credits).

2. SAEP Course Structure

The SAEP Year One and Two is a fixed curriculum and students will register for the courses as illustrated in Table 1. In Year Two SAEP students must first register for the course(s) they have failed during their Year One of the programme.

2.1 For the SAEP 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).

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

Year One *(Fixed Curriculum)*

Semester 1	**NQF Level**	Semester 2	**NQF Level**	Credits
Computer Literacy for Science (CSC 111) **CSC 111F**	5	Computer Literacy for Science (CSC 112) **CSC 121F**	5	8 + 8
Chemistry (PAC 110) **PAC 111F**	5	Chemistry (PAC 110) **PAC 121F**	5	8 + 8
Physics (PHY 111) **PHY 111F**	5	Physics (PHY 112) **PHY 122F**	5	8 + 8
Mathematics (MAT 111) **MAT 111F**	5	Mathematics (MAT 111) **MAT 121F**	5	8 + 8
TOTAL				**64**

Year Two

Semester 1	**NQF Level**	Semester 2	**NQF Level**	Credits
Mathematics (MAT 121) **MAT 113F**	5	Mathematics (MAT 121) **MAT 123F**	5	8 + 8
Physics (PHY 121) **PHY 113F**	5	Physics (PHY 122) **PHY 123F**	5	8 + 8
Descriptive Chemistry (PAC 121) **(PAC 113F)**	5	Descriptive Chemistry (PAC 121) **(PAC 123F)**	5	8 + 8
Elementary Computer Programming (CSC 121) **CSC 113F**	5	Elementary Computer Programming (CSC 121) **CSC 123F**	5	8 + 8
Any first-year course of the student's choice	5	Any first or second* year course of the student's choice	5	16 + 16
TOTAL (Year 2)				96
TOTAL				**144**

***** *Provided a student has obtained 96 credits at the end of the first semester of year two.*

NB: SAEP Year 2 students will be allowed to register as such under the following conditions:

- ✓ For **Physics (PHY 113F and PHY 123F**), SAEP student in Year 2 may register for these modules even if s/he has failed one or both Year 1 modules (i.e. PHY 111F and PHY 122F). The student must, however, re-register for the module(s) he has failed in Year 1.

- ✓ For **Chemistry (PAC 113F and PAC 123F**), SAEP student in Year 2 may register for this course if he has passed **both** Year 1 modules (PAC 111F and PAC 121F).

- ✓ For **Mathematics (MAT 113F and MAT 123F**), SAEP student in Year 2 may register for this course if he has passed **both** Year 1 modules (MAT 111F and MAT 121F).

- ✓ For **Computer Science (CSC 113F and CSC 123F**), SAEP student in Year 2 may register for this course if he has passed **both** Year 1 modules (CSC 111F and CSC 121F).

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

A student must complete ALL their extended modules (Year 1 & 2) BEFORE they can proceed with second and third year mainstream modules.

GUIDELINES FOR THE BACHELOR OF SCIENCE (BSc) DEGREE

The following rules and regulations 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 (Qualification Code 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.

S2 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
Biology
Biochemistry
Botany
Chemistry
Computer Science
Geographical Information Systems
Geography
Geology
Mathematics
Mathematical Statistics
Microbiology
Physics
Statistics
Statistical Methods
Zoology

S 3 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 pre-requisite and co-requisite 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 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)

6.1 **Examination admission requirement (DP mark)** A student shall not be eligible to write the main examination, supplementary or aegrotat examination in an examination module for which they are registered unless they have obtained a minimum DP mark of 40% in the module.
6.2 **Requirement of an examination sub-minimum:** A student shall only be credited with a final pass mark in an examination module if they obtained a minimum of 40 percent in the main or supplementary examination.

COMBINATIONS AND MAJORS

PLEASE NOTE: The description of the course & module codes are given on page 150

APPLIED MATHEMATICS AND MATHEMATICS

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 111 / 121	16	5	16	5
PHY 111, 112 / 121, 122	8+8	5	8+8	5
CSC 113 / 121	16	5	16	5
MNU 111 / 121, 122	16	5	8 + 8	5
Total per semester	**64**		**64**	
Total per year	128			

Second year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 211, 212 / 223, 224	16+8	6	12+12	6
PHY 211, 212 / 221, 222	12+12	6	12+12	6
MAP 211 / 221	24	6	24	6
Total per semester	**72**		**72**	
Total per year	144			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAP 311, 312 / 321, 322	16+16	7	16+16	7
MAT 311, 303 / 303, 322	22+11	7	11+22	7
Total per semester	**65**		**65**	
Total per year	130			
Total for Qualification	402			

APPLIED MATHEMATICS AND STATISTICS

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 111 / 121	16	5	16	5
PHY 111, 112 / 121, 122	8+8	5	8+8	5
CSC 113 / 121	16	5	16	5
MNU 111 / 121, 122	16	5	8 + 8	5
Total per semester	**64**		**64**	
Total per year	128			

Second year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 211, 212 / 223, 224	16+8	6	12+12	6
STM 211, 212 / 221, 222	24	6	24	6
MAP 211 / 221	24	6	24	6
Total per semester	72		72	
Total per year	144			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAP 311,313 / 321, 322	22+11	7	11+22	7
STM 312, 313 / 322, 323	16+16	7	16+16	7
Total per semester	**65**		**65**	
Total per year	130			
Total for Qualification	402			

APPLIED MATHEMATICS AND PHYSICS

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 111 / 121	16	5	16	5
PHY 111, 112 / 121, 122	8+8	5	8+8	5
CSC 113 / 121	16	5	16	5
MNU 111 / 121, 122 (***or*** PAC 110 / 121)	16	5	8 + 8	5
Total per semester	64		64	
Total per year	128			

Second year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 211, 212 / 223, 224	16+8	6	12+12	6
PHY 211, 212 / 221, 222	12+12	6	12+12	6
MAP 211 / 221	24	6	24	6
Total per semester	72		72	
Total per year	144			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAP 311,313 / 321, 322	22+11	7	11+22	7
PHY 311, 312 / 321, 322	16+16	7	16+16	7
Total per semester	65		65	
Total per year	130			
Total for Qualification	402			

BIOCHEMISTRY AND MICROBIOLOGY

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BOT 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5
ZOO 111 / 121	16	5	16	5
Total per Semester	**64**		**64**	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BCH 211, 212 / 223	24	6	24	6
BOT 211 / 221 **OR** ZOO 212/ (222 or 223)	24	6	24	6
MIC 211, 212 / 221, 222	16 + 8	6	12 + 12	6
Total per Semester	**72**		**72**	
Total per Year	144			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BCH 313, 314 / 321, 323	16 + 16	7	16 + 16	7
MIC 311, 312 / 321, 322	16 + 16	7	16 + 16	7
Total per Semester	**64**		**64**	
Total per Year	144			
Total for Qualification	416			

BIOCHEMISTRY AND CHEMISTRY

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BOT 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5
ZOO 111 / 121	16	5	16	5
Total per Semester	**64**		**64**	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BCH 211, 212 / 223	24	6	24	6
PAC 211, 213 / 222, 223 and 224	16 + 16	6	16 + 16 + 16	6
Total per Semester	**56**		**72**	
Total per Year	128			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
BCH 313, 314 / 321, 323	16 + 16	7	16 + 16	7
PAC, 312, 314 / 321, 323, 324	16 + 16	7	16 + 16 + 16	7
Total per Semester	**64**		**80**	
Total per Year	144			
Total for Qualification	400			

BIOCHEMISTRY AND COMPUTER SCIENCE

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level

CSC 113 /121	16	5	16	5
PAC 110 / 121	16	5	16	5
MAT 111 / 121	16	5	16	5
BOT 111 / 121 (***or*** ZOO 111 / 121)	16	5	16	5
Total per Semester	**64**		**64**	
Total per Year	128			

Second Year

Modules	**Semester 1**	**NQF Level**	**Semester 2**	**NQF Level**
BCH 211, 212 / 223	24	6	24	6
CSC 211,212 / 223, 224	12 + 12	6	12 + 12	6
MAT 211,212 / 223, (225 or 224)	16 + 8	6	12 + 12	6
Total per Semester	**72**		**72**	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BCH 313, 314 / 321, 323	16 + 16	7	16 + 16	7
CSC 312, 313 / 323, 324	16 + 16	7	16 + 16	7
Total per Semester	**64**		**64**	
Total per Year	128			
Total for Qualification	400			

BOTANY AND ZOOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
Total per Semester	64	5	64	5
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 211 / 221	24	6	24	6
ZOO 212 / 222	24	6	24	6
MIC 211, 212 / 221, 222 (***or*** BCH 211, 212 / 223)	16 + 8 24	6	12 + 12 24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 312, 313 / 322, 323	16 + 16	7	16 + 16	7
ZOO 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	

Total per Year		128	
Total for Qualification		400	

BOTANY AND ENTOMOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 211 / 221	24	6	24	6
ZOO 212 / 223	24	6	24	6
MIC 211, 212 / 221, 222 or BCH 211, 212 / 223	16 + 8 24	6	12 + 12 24	6
Total per Semester	72		72	
Total per Year		144		

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 312, 313 / 322, 323	16 + 16	7	16 + 16	7
ZOO 314, 316 / 324, 326	16 + 16	7	16 + 16	7
Total per Semester	64	7	64	7
Total per Year		128		
Total for Qualification		400		

BOTANY AND MICROBIOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 211 / 221	24	6	24	6
ZOO 212 / (222 or 223) or BCH 211, 212 / 223	24	6	24	6

MIC 211, 212 / 221, 222	16 + 8	6	12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 312, 313 / 322, 323	16 + 16	7	16 + 16	7
MIC 311, 312 / 321, 322	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

BOTANY AND BIOCHEMISTRY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 211 / 221	24	6	24	6
BCH 211, 212 / 223	24	6	24	6
ZOO 212 / (222 or 223) or MIC 211, 212 / 221, 222	24 16 + 8	6	24 12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 312, 313 / 322, 323	16 + 16	7	16 + 16	7
BCH 313, 314 / 321, 323	16 + 16	7	16 + 16	7
Total per Semester	64	7	64	7
Total per Year	128			
Total for Qualification	400			

BOTANY AND CHEMISTRY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5

ZOO 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 211 / 221	24	6	24	6
PAC 211, 213 / 222, 223, 224	16 + 16	6	16 + 16 + 16	6
Total per Semester	56		72	
Total per Year	128			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 312, 313 / 322, 323	16 + 16	7	16 + 16	7
PAC 312, 314 / 321, 323, 324	16 + 16	7	16 + 16 + 16	7
Total per Semester	64		80	
Total per Year	144			
Total for Qualification	400			

CHEMISTRY SINGLE MAJOR

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 110 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5
PHY 113, 114 / 123, 124	8 + 8	5	8 + 8	5
MNU 111 / 121, 122	16	5	8 + 8	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 211, 213 / 222, 223	16 + 16	6	16 + 16	6
PAC 216 / 224, 225	16	6	16 + 16	6
PAC 218, 227	16	6	16	6
Total per Semester	64	6	80	6
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
PAC 312 / 321	16	7	16	7
PAC 314 / 323	16	7	16	7
PAC 315 / 324	16	7	16	7
PAC 317 / 326	16	7	16	7
PAC 328			16	7
Total per Semester	64		80	

Total per Year	144
Total for Qualification	416

CHEMISTRY AND GEOLOGY

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
PAC 110 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5
PHY 111, 112 / 121, 122	8 + 8	5	8 + 8	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
PAC 211, 213 / 222, 223 and 224	16 + 16	6	16 + 16 + 16	6
GLG 211 / 221	24		24	6
Total per Semester	56		72	
Total per Year	128			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
PAC, 312, 314 / 321, 323 and 324	16 + 16	7	16 + 16 + 16	7
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	80		64	
Total per Year	144			
Total for Qualification	400			

COMPUTER SCIENCE AND APPLIED MATHEMATICS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 113 / 121	16	5	16	5
MAT 111/ 121	16	5	16	5
MNU 111 / 121, 122	16	5	8 + 8	5
PHY 113, 114 / 123, 124	8 + 8	5	8 + 8	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
MAT 211, 212 / 223, 224	12 + 12	6	12 + 12	6
MAP 211 / 221	24	6	24	6
Total per Semester	72	6	72	6
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 312, 313 / 323, 324	32	7	32	7
MAP 311, 312 / 321, 322	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

COMPUTER SCIENCE AND PHYSICS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 113 / 121	16	5	16	5
PHY 111, 112 / 121, 122	8 + 8	5	8 + 8	5
PAC 110 / 121	16	5	16	5
MAT 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
PHY 211, 212 / 221, 222	12 + 12	6	12 + 12	6
MAT 211, 212 / 223, 224	12 + 12	6	12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 312, 313 / 323, 324	16 + 16	7	16 + 16	7
PHY 311, 312 / 321, 322	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

COMPUTER SCIENCE AND STATISTICS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 113 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
PHY 113, 114 / 123, 124	8 + 8	5	8 + 8	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 211, 212 / 223, 224	12 +12	6	12 +12	6
STM 212 / 222	24	6	24	6
BCH 211, 212 / 223	16 + 8	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
CSC 312, 313 / 323, 324	16 +16	7	16 + 16	7
STM 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOGRAPHY AND GEOLOGY

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 111 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
CSC 113 /121	16	5	16	5
PAC 110 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 211 / 221	24	6	24	6
GLG 211 / 221	24	6	24	6
GIS 212 / 222	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOGRAPHY AND GIS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5

Any 2 of the following modules, both semesters: GLG, BOT, ZOO 100 or PAC if continuing with GLG 200	16 16	5	16 16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 211 / 221	24	6	24	6
GIS 212 / 222	24	6	24	6
Any 1 of the following modules, both semesters: GLG, CSC, BOT or ZOO 200	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
GIS 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOGRAPHY AND COMPUTER SCIENCE

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
MAT 112 / 123	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 211 / 221	24	6	24	6
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
GIS 212 / 222	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
CSC 312, 313 / 323, 324	16 + 16	7	16 + 16	7

Total per Semester	64	64
Total per Year	128	
Total for Qualification	400	

GIS AND COMPUTER SCIENCE

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 111 / 121 **or** GLG 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
Any 2 of the following modules, both semesters: PHY, STA, MAT, BOT, Z00 100 or PAC *if continuing with GLG 200*	16 16	5 5	16 16	5 5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GEG 211 / 221 **or** GLG 211 / 221	24	6	24	6
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
GIS 212 / 222	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GIS 314, 315 / 324, 325	16 + 16	7	16 + 16	7
CSC 312, 313 / 323, 324	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOLOGY AND COMPUTER SCIENCE

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GLG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
MAT 112 / 123 or PHY 113, 114 / 123, 124	16 8 + 8	5	16 8 + 8	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
GLG 211 / 221	24	6	24	6

CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
GIS 212 / 222	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
CSC 312, 313 / 323,324	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOLOGY AND GIS

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
Any 1 of the following modules, both semesters: GEG, PHY, STA, MAT, BOT or ZOO 100	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 211 / 221	24	6	24	6
GIS 212 / 222	24	6	24	6
CSC 211, 212 / 223, 224 or GEG 211 / 221	12 + 12 24	6	12 + 12 24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
GIS 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

GEOLOGY AND PHYSICS

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
PHY 111, 112 / 121, 122	8 + 8	5	8 + 8	5
MAT 111 / 121	16	5	16	5

Total per Semester	64	64
Total per Year	128	

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 211 / 221	24	6	24	6
PHY 211, 212 / 223, 224	24	6	24	6
MAT 211, 212 / 223, (224 or 225)	16 + 8	6	12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
PHY 311, 312 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

MATHEMATICS and PHYSICS

First year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MAT 111 / 121	16	5	16	5
PHY 111,112 / 121,122	8 + 8	5	8 + 8	5
CSC 113 / 121	16	5	16	5
MNU 111 / 121, 122 or PAC 110 / 121	16 16	5	8 + 8 16	5
Total per semester	64		64	
Total per year	128			

Second year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MAT 211,212 / 223,224	16 + 8	6	12 + 12	6
PHY 211,212 / 221,222	12 + 12	6	12 + 12	6
CSC 211,212 / 223, 224 or MAP 211 / 221	12 + 12 24	6	12 + 12 24	6
Total per semester	72		72	
Total per year	144			

Third year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MAT 311,303 / 303, 322	22 + 11	7	11 + 22	7
PHY 311,312 / 321, 322	16 + 16	7	16 + 16	7
Total per semester	65		65	
Total per year	130			
Total for Qualification	402			

MATHEMATICS and COMPUTER SCIENCE

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 111 / 121	16	5	16	5
PHY 113, 114 / 123, 124	8 + 8	5	8 + 8	5
CSC 113 / 121	16	5	16	5
MNU 111 / 121,122	16	5	8 + 8	5
Total per semester	64		64	
Total per year	128			

Second year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 211, 212 / 223, 224	16 + 8	6	12 + 12	6
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
MAP 211 / 221	24	6	24	6
Total per semester	72		72	
Total per year	144			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 311, 303 / 303, 322	22/22/22	7	11 + 22	7
CSC 311, 313 / 323, 324	16 + 16	7	16 + 16	7
Total per semester	65	7	65	7
Total per year	130			
Total for Qualification	402			

MATHEMATICS and CHEMISTRY

First year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 111 / 121	16	5	16	5
PHY 113, 114 / 123, 124	8 + 8	5	8 + 8	5
PAC 110 / 121	16	5	16	5
MNU 111 / 121, 122	16	5	8 + 8	5
Total per semester	64		64	
Total per year	128			

Second year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 211, 212 / 223, 224	16 + 8	6	12 + 12	6
PAC 211, 213 / 222, 223, 224	16 + 16	6	16+16 + 16	6
Total per semester	56		72	
Total per year	128			

Third year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MAT 311 ,303 / 303, 322	22 + 11	7	11 + 22	7

PAC 312, 314 / 321, 323, 324	16 + 16	7	16 + 16 + 16	7
Total per semester	65		81	
Total per year	146			
Total for Qualification	402			

MICROBIOLOGY AND ZOOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
BOT 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MIC 211, 212 / 221, 222	16 + 8	6	12 + 12	6
ZOO 212 / 222	24	6	24	6
BCH 211, 212 / 223	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MIC 311, 312 / 321, 322	16 + 16	7	16 + 16	7
ZOO 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

STATISTICS AND MATHEMATICS

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
MAT 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**

STM 211 / 221	24	6	24	6
MAT 211, 212 / 223, 224	16 + 8	6	12 + 12	6
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
STM 312, 313 / 322, 323	16 + 16	7	16 + 16	7
MAT 311 / 322	22	7	22	7
MAT 303	11	7	11	7
Total per Semester	65		65	
Total per Year	130			
Total for Qualification	402			

STATISTICS AND GEOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
STA 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
STM 212 / 222	24	6	24	6
GLG 211 / 221	24	6	24	6
CSC 211, 212 / 223, 224	12 + 12	6	12 + 12	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
STM 312, 313 / 322, 323	16 + 16	7	16 + 16	7
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64	7	64	7
Total per Year	128			
Total for Qualification	400			

ZOOLOGY AND GEOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 111 / 121	16	5	16	5

GLG 111 / 121	16	5	16	5
GEG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 212 / 222	24	6	24	6
GEG 211 / 221	24	6	24	6
GLG 211 / 221	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 314, 315 / 324, 325	16 + 16	7	16 + 16	7
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64	7	64	7
Total per Year	128			
Total for Qualification	400			

ENTOMOLOGY AND GEOLOGY

First Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 111 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
GEG 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 212 / 223	24	6	24	6
GEG 211 / 221	24	6	24	6
GLG 211 / 221	24	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	**Sem 1**	**NQF Level**	**Sem 2**	**NQF Level**
ZOO 314, 316 / 324, 326	16 + 16	7	16 + 16	7
GLG 312, 313 / 322, 323	16 + 16	7	16 + 16	7
Total per Semester	64	7	64	7
Total per Year	128			
Total for Qualification	400			

ENTOMOLOGY AND MICROBIOLOGY

First Year

Modules	Sem1	NQF Level	Sem 2	NQF Level
BOT 111 / 121	16	5	16	5
ZOO 111 / 121	16	5	16	5
PAC 110 / 121	16	5	16	5
STA 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
MIC211, 212 / 221, 222	16 + 8	6	12 + 12	6
ZOO 212 / 223	24	6	24	6
BCH 211, 212 / 223	16 + 8	6	24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	
MIC311, 312 / 321, 322	16 + 16	7	16 + 16	7
ZOO 314, 316 / 324, 326	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

ZOOLOGY AND GIS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
GEG 111 / 121 (or GLG 111 / 121)	16	5	16	5
Any 1 of the following modules, both semesters: PHY, STA, MAT, BOT 100 or PAC if continuing with GLG200	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 212 / 222	24	6	24	6
GIS 212 / 222	24	6	24	6
Any 1 of the following modules, both semesters: CSC, GEG, GLG BOT, MAT, STM or PHY 200	24	6	24	6
Total per Semester	72		72	
Total per Year		144		

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 314, 315 / 324, 325	16 + 16	7	16 + 16	7
GIS 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

ENTOMOLOGY AND GIS

First Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 111 / 121	16	5	16	5
CSC 113 / 121	16	5	16	5
GEG 111 / 121	16	5	16	5
GLG 111 / 121	16	5	16	5
Total per Semester	64		64	
Total per Year	128			

Second Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 212 / 223	24	6	24	6
GIS 212 / 222	24	6	24	6
GEG 211 / 221 or CSC 211, 212 / 223, 224 or GLG 211 / 221	24 12 + 12 24	6	24 12 + 12 24	6
Total per Semester	72		72	
Total per Year	144			

Third Year

Modules	Sem 1	NQF Level	Sem 2	NQF Level
ZOO 314, 316 / 324, 326	16 + 16	7	16 + 16	7
GIS 314, 315 / 324, 325	16 + 16	7	16 + 16	7
Total per Semester	64		64	
Total per Year	128			
Total for Qualification	400			

DESCRIPTION OF MODULES IN SCIENCE CURRICULA

Department of Computational Science

APPLIED MATHEMATICS

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

Summary of Undergraduate Applied Mathematics Modules

Semester 1	Semester 2
MAP 211	MAP 221
MAP 311	MAP 321
MAP 312	MAP 322

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: DP + Final Exam (DP = Average of tests)
Credits: 24
Prerequisite: MAT 111 and 121; *or* at least 60% final mark for MAT 112 (MAT 122) *and* MAT 123 (MAT 113).

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: DP + Final Exam (DP = Average of tests)
Credits: 24
Pre-requisites: MAT 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: DP + Final Exam (DP = Average of tests)

Credits: 16

Pre-requisites: MAP 211 & MAT 211: MAP 221 & MAT 223

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: DP + Final Exam (DP = Average of tests)

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: DP + Final Exam (DP = Average of tests)

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: DP + Final Exam (DP = Average of tests)

Credits: 16
Prerequisite: MAP 312

MATHEMATICS

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>
<tr><th></th><th>First Semester</th><th>Second Semester</th></tr>
<tr><td rowspan="2">Calculus for non-majors
(register for the modules in bold)

Repeat modules</td><td>MAT 112</td><td>MAT 123</td></tr>
<tr><td>MAT 113
(= MAT 123)</td><td>MAT 122
(= MAT 112)</td></tr>
<tr><td rowspan="4">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 or MAT 225</td></tr>
<tr><td>MAT 311</td><td>MAT 322</td></tr>
<tr><td colspan="2">MAT303 or MAT 304</td></tr>
</table>

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 Mathematics Education, (iii) pursue careers in Physics, Mathematical Statistics, Computer Science, Engineering, Surveying, Actuarial Science, Financial Mathematics and Business Mathematics.

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.*
Contents: Induction; the binomial theorem; radian measure; limits and continuity; exponential, logarithmic and inverse functions
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)

MAT 121F
Contents: Differential calculus with applications; indeterminate forms, the Mean Value theorem; elementary integration.
Instruction: Lectures, tutorials, assignments and group discussions
Assessment: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)
Credits: 16

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: DP + Final Exam: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)
Credits: 16
Prerequisite: Matriculation Mathematics with NSC a Level 4 pass or equivalent

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: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)
Credits: 16
Prerequisite: A minimum final mark of 40% for MAT 111, or 60% in MAT112

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: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)

Credits: 16

Prerequisite: A minimum final mark of 40% for MAT 112 *or* MAT 111.

MAT 113F

Contents: Further integration; first order differential equations; partial derivatives; infinite series; Taylor's theorem

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)

Credits: 8

Prerequisite: A pass in MAT100F or at least 40% of MAT111F or MAT121F

MAT 123F

Contents: Hyberbolic functions; Conic sections; polar coordinates; vectors; determinants and matrices with applications; complex numbers.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam: (DP = 70% of tests + 30% of tutorials)

Credits: 8

Prerequisite: A pass in MAT113F

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 MAT113) 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: DP + Final Exam: (DP = Average of tests)

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: DP + Final Exam: (DP = Average of tests)

Credits: 8

Pre-requisites: MAT 111 and 121; *or* at least 60% final for MAT 112 (MAT 122) and MAT 123 (MAT113).

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: DP + Final Exam: (DP = Average of tests)

Credits: 12

Pre-requisites: A minimum final mark of 40% for MAT212

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; convergence; Riemann integration. [Optional module.]

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam: (DP = Average of tests)

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: DP + Final Exam: (DP = Average of tests)

Credits: 12

Pre-requisites: MAT 111 and 121; *or* at least 60% final for MAT 112 (MAT 122) and MAT 123 (MAT113)

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: DP + Final Exam: (DP = Average of tests)

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.

Assessment: DP + Final Exam: (DP = Average of tests)

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: DP + Final Exam: (DP = Average of tests)

Credits: 22

Pre-requisites: MAT 224.

MAT 304: History and Fundamental Concepts of Mathematics.

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 extendeds of mathematics; philosophies of mathematics.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam: (DP = Average of tests)

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 3-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 3-hour paper

Pre-requisites: STA 114

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 3-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 3-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 3-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).
Co-requisite: MAT 200

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.

Contents : Theory and Applications of interval estimation. Statistical hypothesis testing. Simple and composite hypotheses. Uniformly most powerful tests and likelihood ratio tests. Analysis of Variance. The general linear model. Chi-squared tests and tests of independence. Sufficiency. The Rao-Cramer lower bound

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.

Contents : Correlation Analysis: Pearson's coefficient of simple correlation. Spearman's coefficient of simple correlation. Partial correlation. Simple Linear Regression: Simple linear regression parameter estimation and interpretation. Tests for significance of a regression. Relationship with correlation analysis. Response prediction. Multiple Linear Regression Analysis: Parameter estimation and interpretation. Variable selection procedures. Pearson's coefficient of multiple determination. Adjusted coefficient of determination. Multicollinearity. Handling Problem Data: Missingness. Outlying values. Violation of statistical assumptions. Diagnostic and remedial measures.

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

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, counting techniques, probability theory, independence, independent trials, and random variables; introduction to computers; elementary programming.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam (DP = 70% of tests + 30% of tutorials)

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.

Content: Markov Chains; Linear Programming and the Theory of Games.

Instruction: Lectures, tutorials, assignments and group discussions

Assessment: DP + Final Exam (DP = 70% of tests + 30% of tutorials)

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: DP + Final Exam (DP = 70% of tests + 30% of tutorials)

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: Matriculation Mathematics and Physical Science

Co-requisite: MAT 111

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: Matriculation Mathematics and Physical Science

Co-requisite: MAT 111

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 121

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
Pre-requisites: Matriculation Mathematics and Physical Science
Co-requisite: MAT 121

PHY 122F *Refer to PHY 112 for information*
PHY 113F *Refer to PHY 121 for information*
PHY 123F *Refer to PHY 122 for information*

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 111 *and* MAT 121

Co-requisite: MAT 211 and MAT 212

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 121 *and* MAT 121

Co-requisite: MAT 211 and MAT 212

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 122

Co-requisite: MAT 224 (MAT 225)

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
Pre-requisites: PHY 121 and MAT 121
Co-requisite: MAT 223

PHY 223: Analogue Electronics (Elective)
Purpose: To equip the students with basic components in electronics, identifying and testing them, to familiarize with various measuring and testing instruments, assembling of electronic circuits and basic techniques of troubleshooting.
Content: Fundamental of AC: current, voltage and power relationship, Principle of transformers, Rectifiers, half wave and full wave, ripple factor, Efficiency, Filters, Capacitor filter LC, CLC, induction filter, voltage regulators. BJT amplifier: Concept of amplification, Biasing circuits and Hybrid equivalent circuits, RC coupled amplifier, frequency response, Calculation of voltage and current gain, input and output impedances, concept of gain, band width product, emitter follower, typical circuits and application. FET amplifiers: Principle of operation, biasing circuits, FET small signal model, comparison BJT and FET. Feedback amplifier: Concept of positive and negative feedback in amplifiers, characteristic of negative feedback amplifier, different types of feedback, applications of typical feedback amplifier circuits. Large signal amplifier: Concept of power amplification, Class A, Class B, Class C and Class AB amplifiers, types of distortions in power amplifiers, Typical power amplifier circuits, principles of operation, transistor rating, Use of heat sinks. Oscillator: Principle of sinusoidal oscillation, Barkhausen criteria, RC oscillators, LC oscillators, Crystal oscillators, typical circuits, principle of operation and derivation of equation for frequency of oscillation, Application. Pulse and wave shaping circuit: Differentiating and integrating circuits, sweep circuit, Miller and Boot Strap sweep circuits, clipping and clapping circuit, multivibrators, principle of operation, output wave forms and applications.
Assessment**:** DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).
Credits: 12
Pre-requisite**:** PHY 111, 112, 121, 122

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 3 hour exam paper.
Pre-requisites: PHY 211 & PHY 221 and MAT223 & MAT224 (MAT225)

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.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 211, PHY 221 plus MAT 223 & MAT 224 (MAT 225)

PHY 313: Digital Electronics (Elective)

Purpose: To equip the students with the fundamental components in digital electronics and to equip students with the skills to construct, analyze, verify, and troubleshoot digital circuits using appropriate techniques and test equipment**.**

Content: Number systems – Decimal, Binary, Octal and Hexadecimal conversions, Digital codes – BCD, Excess 3, Gray code, ASCI Code - Error detection codes, conversions, Boolean algebra and theorems, SOP and POS, De Morgan's theorem, simplification of Boolean Algebra and K Map, Logic gates. Comparison of Logic families - TTL, CMOS, ECL and its characteristics study, combinational circuits - Adders, Subtractors, comparators, De-coders, En–coders, MUX & De-MUX, parity generators – Familarisation of popular ICs . Sequential circuits - Flip–flop [R-S latch, clocked R-S, D, J-K, T, Master slave], Shift registers and applications, Asynchronous counter, synchronous counter, Ring counter, ripple counters, counter design and sequence generator. Converters -ADC & DAC [Different types], Parameters, performance comparison and Application, Display – LED (seven segments) and LCD.

Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Credits: 16

Pre-requisite**:** PHY223

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: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 211, PHY 221 plus MAT 223 & MAT 224 (MAT 225)

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 student's 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; Legendré polynomials.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests, assignments and practicals).

Pre-requisites: PHY 211, PHY 221 plus MAT 223 & MAT 224 (MAT 225)

COMPUTER SCIENCE

ICC 121 & ICC 121F are offered in our Faculty by the Extended Programme.
These courses are identical, but the Extended students receive additional tutorials.

ICC 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

ICC121F: *Refer to ICC 121*

CSC111F: **Computer Literacy for Science**

Purpose: Intended for first year extended 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

Practical: Use of the operating system, the file system, word processing, spreadsheets and other applications, the World Wide Web and electronic mail.

Pre-requisites:

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, MS Access, 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: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final 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; Selfstudy

Credits: 16

Assessment: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final 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: 180 minutes per week of lectures; 120 minutes per week of formal practicals; Laboratory demonstrations; Self study

Credits: 12

Assessment: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final examination as summative assessment.

CSC 212: Computer Architecture and Organisation

Purpose: This module is 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: 180 minutes per week of lectures. A total of 180 minutes of formal practicals. Laboratory demonstrations. Self study and assignments

Credits: 12

Assessment: Continuous assessment based on tests and assignments, as well as one three-hour final 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, dequeues, hash tables. Binary trees. Introduction to algorithmic complexity

Pre-requisites: CSC 211

Instruction: 180 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations. Self-study and assignments.

Credits: 12

Assessment: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final 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: 180 minutes of lectures per week. 60 minutes of practical work per week. Self-study and assigned project work.
Credits: 12
Assessment: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final examination as summative assessment.

CSC 312: Operating Systems
Purpose: Understanding of the interface between the user and the hardware, i.e. 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: CSC 212
Instruction: 180 minutes of lectures per week; 4 sessions of 60 to 90 minutes of practical work in Linux per week; 4 sessions of 60 minutes of tutorials per week. One workshop on Open Source Software. Self-study.
Credits: 16
Assessment: Continuous assessment based on tests and assignments, as well as one three-hour final 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: 180 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations. Self-study and assignments
Credits: 16
Assessment: Continuous assessment based on tests, assignments and monitored practical work, as well as one three-hour final 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 especially in a computers network as well as the physical topologies and soft topologies (protocols).
Content: Networks categories, data transmission, media, interfaces, signalling, 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: CSC 212

Instruction: 180 minutes of lectures per week. Workshops (2) on Departmental networks.
Credits: 16
Assessment: Continuous assessment based on tests and assignments, as well as 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: CSC 211
Instruction: 180 minutes per week of lectures. 120 minutes per week of formal practicals. Laboratory demonstrations.
Credits: 16
Assessment: Continuous assessment based on tests, group projects, and assignments, as well as one three-hour final examination as summative assessment.

Department of Biotechnology and Biological Science

BIOCHEMISTRY

BCH 211: Introductory Biochemistry
Purpose: Introduction to Biochemical Concepts
Contents: Cell types, structural and functional organization, structure and basic chemistry of amino acids, peptides, and proteins, carbohydrates, lipids, nucleic acids and vitamins.
Instruction: Lectures: 180 minutes per week. Practicals: Minimum of 1 x 3-hour session per week. Tutorials: 90 minutes per week.
Credits: 16
Assessment: Tests, examinations and continuous assessment of tasks, assignments and practicals.
Pre-requisites: PAC110 and PAC121, plus BOT111 and BOT121 or ZOO111 and ZOO121 or BIO111 and BIO121, plus MAT112/MAT 122 and MAT 123/MAT 113, or MAT111 and MAT 121 or STA111 and STA121.

BCH 212: Physical Biochemistry
Purpose: Study practical aspects and elementary theory of biochemical techniques.
Contents: Water as biological solvent, pH, acids and bases, buffers, various chromatographic and electrophoretic techniques, centrifugation and spectrophotometry.
Instruction: Lectures: 180 minutes per week. Practicals: Minimum of 1 x 3-hour session per week. Tutorials: 90 minutes per week.
Credits: 8
Assessment: Tests, examinations and continuous assessment of tasks, assignments and practicals.
Pre-requisites: PAC110 and PAC121, plus BOT111 and BOT121 or ZOO111 and ZOO121, plus MAT112/MAT 122 and MAT 123/MAT 113, or MAT111 and MAT 121 or STA111 and STA121.

BCH 214 *Students must register for both BCH 211 and BCH 212*

BCH 223: Metabolism and Enzymology

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.

Contents: Gluconeogenesis. Synthesis of complex carbohydrates, fatty acids, glycerides, phosphatides, sphingolipids, steroids. Cholesterol metabolism. Control mechanisms. The biosynthesis of selected amino acid familes and of the nucleotides. Integration of metabolic processes including hormoneactions. The nitrogen and sulphur cycles. Structure and composition of plant cell walls. Plant cell wall components.

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

MICROBIOLOGY

MIC 211: Introduction to Microbiology

Purpose: Introduce the learner to the microbial world and the techniques used in studying microorganisms, thus laying a extended 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: 1 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: PAC121 plus BOT 111 or ZOO 111 or BIO111 and BIO121

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 121, 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 biogeocycles.

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

BOTANY

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 extended 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

Assessment: CASS – Continuous assessment of practicals, assignments and tests.

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: 3-hour sessions as per the learner guide; tutorials 45-90 minutes per week.

Credits: 16

Assessment: CASS – Continuous assessment of practicals, assignments and tests.

Pre-requisites: None

BIO 121F *Refer to BIO 121 for information*

BIOMETRY

AGB 312: Agricultural Biometry

Purpose: To equip the learner with knowledge and skills to design and execute experiments; collect and analyse data and draw conclusions and recommendations based on experimental results.

Contents: History of biometry; principles of experimental design; treatment, replication, randomization, statistical inference; probability sampling; surveys, analysis of variance for completely randomized design – with replication; completely randomized design with subsamples; randomized complete block design; latin square design; nested designs; Changeover and cross-over designs. Factorial and split plot arrangements; animal/statistical models; principal component analysis; non-parametric tests; repeat measures; analysis of covariace; linear regression and correlation; enumeration data; chi-square and contingency tables; means separation techniques; multiple comparisons; least significant difference; Duncan multiple range; Dunnett's and Scheffe's tests; Bonferroni correction; contrasts.

Instructions: Three lectures and one compulsory practical per week; taught by the Department of Statistics.

Credits: 16

Assessment: one 3-hour examination paper

Pre-requisites: STA 111 plus either STA 121 or STA 122.

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 extended 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: CASS – Continuous assessment of practicals, assignments and tests.

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.

Credits: 16

Assessment: CASS – Continuous assessment based on theory tests, assignments and practical sessions.

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: EXAM – DP marks made up of continuous assessment based on theory tests, assignments and practical sessions. 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 ‘pleitrophy'. 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 extended 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: CASS – Continuous assessment based on theory tests, assignments and practical sessions.

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 (analomous) 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: EXAM – DP marks made up of continuous assessment based on theory tests, assignments and practical sessions. Summative assessment one 3-hour 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.

Credits: 16

Assessment: EXAM – DP marks made up of continuous assessment based on theory tests, assignments and practical sessions. Summative assessment one 3-hour 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, CO_2-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: EXAM – DP marks made up of continuous assessment based on theory tests, assignments and practical sessions. Summative assessment one 3-hour 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: EXAM – DP marks made up of continuous assessment based on theory tests, assignments and practical sessions. Summative assessment one 3-hour 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

ZOOLOGY

Zoology is a three-year major course. After passing common, grounding ZOO 100 courses (ZOO 111 and 121), students are offered two different options at both ZOO 200 and 300 levels, depending on whether they want to include Entomology courses in their curriculum. Hence, students will have to choose one of the two following curricula:

1. **Zoology Option:** ZOO 111, 121, 212, 222, 314, 315, 324, 325
2. **Entomology Option:** ZOO 111, 121, 212, 223, 314, 316, 324, 326

ZOO111: 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 min per week. Practicals: one 3-hour session per week

Credits: 16

Assessment: DP made up of continuous assessment based on theory tests, practical sessions and tutorials. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: None.

ZOO121: 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 min per week. Practicals: one 3-hour session per week

Credits: 16

Assessment: Continuous assessment based on theory tests, practical sessions and tutorials.

Pre-requisites: ZOO111

ZOO212: 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 min per week. Practicals: one 3-hour session per week

Credits: 24
Assessment: DP made up of continuous assessment based on theory tests, practical sessions and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO111 and ZOO121

ZOO222: 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: Special topics in ichtyology. Freshwater ecology. Special topics in mammalogy. Marine biology and ecology.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 24
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO111, ZOO121 and at least 50% DP for ZOO212

ZOO223: Insect Biology, Diversity and Ecology
Purpose: Introduces learners to the biology and ecology of insects (Class Insecta), the most diverse group of animals inhabiting the Earth's multiple ecosystems. Also discusses the relevance of insects to society. It is designed for majors in Zoology with specialization in Entomology, other life science majors, Livestock and plant sciences.
Contents: The importance and conservation of insects. External anatomy, development and life histories. Diversity: Systematics, classification, phylogeny, radiations and evolution. Insect societies: ground-dwelling, aquatic insects and insects as vectors and causes of diseases. Insect-plants interactions, ecophysiology, population and community ecology.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 24
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO111, ZOO121 and at least 50% DP for ZOO212

ZOO314: 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: Systematics, biogeography and evolution. Biodiversity and conservation.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 16
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO212 and ZOO222 / ZOO223

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: Ecophysiology. Primate biology and behaviour.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 16
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO212 and ZOO222

ZOO 316: Insect Physiology
Purpose: This module is a detailed study of the physiology and biochemistry of insect organ systems. It explains the biochemical and physiological adaptations that have allowed insects and their relatives to become extremely successful in most habitats, ways in which insect functions differ from those of other animals and use of insect models for general physiological and biochemical research.
Contents: Integumentary systems and their functions. Nitrogenous excretion, salt, and water balance. The digestive system, food uptake and utilization. The insect circulatory system. Nervous system and chemical integration. Muscles and locomotion. Respiration in insects. Reproduction.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 16
Assessment: Continuous assessment based on theory tests, practical sessions and tutorials.
Pre-requisites: ZOO212, ZOO223 and PAC100

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 modeling. Behavioural ecology.
Instruction: Lectures: 180 min per week. Practicals: one 3-hour session per week
Credits: 16
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO212, ZOO222 / ZOO223, and a semester mark of at least 50% for both ZOO314 and ZOO315 / ZOO316

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 min per week. Practicals: one 3-hour session per week
Credits: 16
Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.
Pre-requisites: ZOO212, ZOO222, and a semester mark of at least 50% for both ZOO314 and ZOO315

ZOO 326: Pest Management

Purpose: This module exposes students to the theories, principles and practices of pest management. It covers general concepts of pests, their economic importance, the biology of major groups of insect pests, diagnosis of major pests of field and horticultural crops, pest management principles and techniques, pesticide application equipment and integrated pest management.

Contents: General concept of pests and their importance in agriculture. Morphology, anatomy and life cycle of major groups of insect pests of agricultural importance. Diagnosis of insect attack in forest, field and horticultural crops. Principles of pest management and pest control tactics. Pesticide application equipment. Integrated Pest Management (IPM). Plant Pests (invasive alien plant/ weeds), control measures for invasive alien plants/weeds, biological control of alien plants/weeds, factors affecting biological control, key stages in biological control programmes

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

Credits: 16

Assessment: DP made up of continuous assessment based on theory tests, practical sessions, assignments and tutorials. Summative assessment: one 3-hour theory examination paper.

Pre-requisites: ZOO212, ZOO223, PAC100, and a semester mark of at least 50% for both ZOO314 and ZOO316

Department of Chemical and Earth Sciences

CHEMISTRY

All the BSc students majoring in Chemistry (single and double majors) and BSc Agric students register for PAC110 and are examined at the end of the first semester. They can then proceed to PAC121 and are examined in November. B Agric students register for PAC 119 and are examined at the end of the first semester. They may also register PAC129 and are examined in November. BSc students majoring in Chemistry must 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 119 plus 129)*

Purpose: To lay the extended 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 extended 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

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 111 & PAC121, MAT111 & MAT112 and MAT121 & MAT123
Target group: Students majoring in Chemistry and Applied Chemistry, Chemistry and related Science discipline. May be a service course for BSc. 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 216: Environmental Chemistry 1

Purpose: To lay extendeds of general environmental science and environmental health.
Contents: Analysing 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 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.

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 BSc. 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 BSc. 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 BSc. 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 227: Materials Chemistry 1
Purpose: To give comprehensive knowledge of modern inorganic materials the student must have passed all pre-requisites.
Contents: Electrical properties of materials; magnetic materials and superconductors; optical properties; intercalation compounds; biogenic compounds.
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.

3rd Year: Option 1. Chemistry / Applied Chemistry majors must have passed all pre-requisite courses, as well as MAT 111 (or MAT 112) and MAT 121 (or MAT123). They register for all the courses listed.

3rd Year: Option 2. Chemistry / Other Branch of Science double majors must have passed all pre-requisite courses, i.e. PAC 211, PAC 222, PAC 213, PAC 223, PAC 224, MAT 111 (or MAT 112) and MAT 121 (or MAT123). They must register for PAC 321, PAC 312, PAC 323, PAC 314, and PAC 324.

PAC 312: Analytical Chemistry 2

Purpose: To give profound knowledge of instrumental methods of chemical analysis and industrial control.

Contents: Spectroscopy. Principles, instrumentation and application of spectroscopic techniques (molecular and atomic spectroscopic methods). Electromagnetic radiation. Electronic spectra and molecular structure. UV–visible spectroscopy. IR Spectroscopy. Molecular fluorescence. Atomic emission and absorption spectroscopy. Atomic fluorescence spectroscopy. Electroanalytical methods. Electrochemical cells and electrode potential. Potentiometry and potentiometric titrations. Coulommetry. Voltammetry. Voltammetric cell. Amperometry. Polarography. Anodic and cathodic stripping voltammetry. Special Topics. Principles of organization of the research and industrial chemical laboratory. Interfacing and relevant software. Data acquisition block. Unification of physical methods. Spectro-electrochemistry as an illustration. Web-assisted experimentation.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.

Pre-requisites: PAC 222, MAT121 & MAT123.

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.

Contents: Chemical kinetics. Order and molecularity. Formal kinetics. Complex reactions. Reaction mechanisms. Temperature dependence of reaction rates. Active collisions and transition state theory. Chain reactions. Photochemistry. Catalysis. Quantum chemistry. Postulates of quantum mechanics. Exact solutions of Schrödinger equation. Variation principle and perturbation theory. Many-electron atoms. Molecules. Simple Hückel theory. Molecular spectroscopy. General principles. Their application to rotational, vibrational and electronic spectra of molecules. Resonance. Nuclear magnetic and electronic paramagnetic resonance.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.

Pre-requisites: PAC222, PAC224, MAT 121 & MAT123

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.

Contents: Technological schemes for the production of inorganic and organic compounds. Food chemistry. Plastic manufacture and processing. Detergents. Dyes. Organic pigments. Fluorescent brighteners. Photographic sensitizers. Coatings, inks and related products. Cellulose. Lignin. Paper and other wood products. Industrial carbohydrates. Industrial organic chemicals, leather, fats, and waxes.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.
Pre-requisites: PAC225, MAT121 & MAT123.
Target group: Students majoring in Chemistry and Applied Chemistry.

PAC 317: Materials Chemistry 2

Purpose: To provide knowledge of modern organic and organometallic materials.

Contents: Crystalline and amorphous solids; Space lattice/crystalline lattice/3D lattice; Unit cell of the crystalline substance; Coordination number of that crystalline substance; Packing efficiency or packing density (P.E.); Geometry of a cube; Close packing of identical solid spheres; Interstices or voids or holes in crystals; Limiting radius ratios; Defects or imperfections in solids; Electrical and magnetic properties of solids; physical methods for characterization of solids.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.

Pre-requisites: PAC223, MAT121 & MAT123

Target group: Students majoring in Chemistry and Applied Chemistry.

PAC 321: Inorganic Chemistry 2

Purpose: To give profound knowledge of modern principles of inorganic, organometallic, and coordination chemistry.

Contents: Deviation of properties. Periodic table revisited. Mono- and polyatomic elements.

Thermodynamic stability. Solid state. Types of solids and basic crystallography, Semi- and superconductivity, stoichiometric and non-stoichiometric compounds. Chemistry of p-, d- and f-block elements. Organometallic and coordination chemistry. Structural studies by physical methods. Radiochemistry. Radioactive decay and decay series. Kinetics of radioactive decay, half-life of isotopes, carbon dating, measurement of activity, scintillation detector (Ge - Li and Si - Li detectors). Nuclear binding energy. Mass defect and packing fraction. Stability and transformation, fission and fusion reactions. Applications of radioisotopes. Organometallic compounds. Nomenclature, classification, and coordination modes. Basic synthetic methods. Elucidation of structure. Theoretical modeling of organometallic compounds and reactions. *Ab initio* approach, density functional theory and molecular mechanics. Reactivity of organometallic compounds. Types of reactions and their mechanism. Organometallic catalysis. Homogeneous and heterogeneous catalysis. Surface immobilized organometallic functional groups. Applied aspects. Hydrodesulfurization and hydrodenitrification. Utilization of carbon monoxide. Organometallic polymers.

Instruction: Lectures, laboratory course, and tutorials.

Credits: 16

Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.

Pre-requisites: PAC312

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.

Contents: Nomenclature of polyfunctional groups. Alkyl halides and the ozone hole. Ethanol as a chemical drug and poison. Nylons – step-growth polymers (polyamides). Thiol esters – biological carboxylic derivatives. Alicyclic compounds. Fused ring aromatic heterocyclics. Pericyclic reactions and naturally occurring amines (morphines, alkaloids). Spectroscopy. Chemistry of synthetic high polymers. Physical properties. Plastic manufacture and processing. Plastic fabrication and uses. Synthetic elastomers and natural rubber. Textiles and fibers.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.
Pre-requisites: PAC 223, PAC 312
Target group: Students majoring in Chemistry and Applied Chemistry as well as in Chemistry and related Science discipline.

PAC 324: Physical Chemistry 3. Surface and colloid chemistry
Purpose: To give advanced knowledge of disperse systems, surface phenomena, and catalysis.
Contents: Scope and variables. Sedimentation and diffusion. Solution thermodynamics (osmotic and Donnan equilibria). Rheology of dispersions. Radiation scattering. Surface tension and contact angle. Adsorption from solution and monolayer formation. Colloidal structures in surfactant solutions. Adsorption at gas-solid interfaces. Van der Waals forces. Electrical double layer and its interactions. Electrophoresis and other electrokinetic phenomena. Colloid stability.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, 3 hour exam 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 326: Environmental Chemistry 2
Purpose: To provide knowledge of environmental pollution and monitoring.
Contents: Renewable resources. Soil, fresh water and marine systems, plants and wild life. Non-renewable Resources. Terrestrial and offshore minerals. Pollution and Effects. Air pollution. Water pollution. Soil pollution. Mining and air pollution. Environmental Concerns of oil exploration. Pesticides. Radiation. Advanced Techniques in Environmental Monitoring. Extractive concentration techniques. Spectroscopic methods. Electro-analytical methods. Application of GC, GC-MS and GC/MS –MS in environmental analysis. XRF and instrumental NAA techniques.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.
Pre-requisites: PAC216, PAC 312
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.

Contents: Numerical integration. Trapezoidal rule. Simpson's rule. Cotes numbers. Gaussian quadrature. The Monte-Carlo method. Statistical treatment of data. Fugacity. Analysis of mixtures by gas chromatography. Heat capacity. Electronic energy levels. Differential equations. Euler's method. The Runge-Kutta method. The predictor-corrector method. Systems of differential equations. Higher-order differential equations. The Monte-Carlo method. Kinetic schemes. Ecosystems. Eigenvalues and eigenvectors. Evaluation by determinants. The Jacobi method. Simulation of NMR spectra. Hückel molecular orbital theory. Special software. Mathcad, Scientific Word and Maple. Interrelation between them. Mathematica. Hyperchem. Moby. Gaussian. Internet. Web page. Search engines. Chemical and applied chemical sites. Communication. Overview of the information systems in chemistry. Hardware, input, processing, and output devices. Software: programming, operating systems and applications. Organizing data and information: files and databases. Telecommunications: media and devices, networks and applications. Chemical information systems. Processing, artificial intelligence and expert systems. Systems development, analysis, design, acquisitions, implementation, maintenance and review. End-user computing concepts and tools.
Instruction: Lectures, laboratory course, and tutorials.
Credits: 16
Assessment: Major tests, laboratory reports, assignments, 3 hour exam paper.
Pre-requisites: PAC 312, PAC 314
Target group: Students majoring in Chemistry and Applied Chemistry.

GEOGRAPHICAL INFORMATION SYSTEMS

GIS 212: GIS and Remote Sensing - Introduction and Principles
Purpose: To familiarise students in detail with fundamentals of Geographic Information Systems (GIS) such as GIS data models, datum, projection and coordinate systems, and aerial photography technology. To introduce students to the principles of Remote Sensing basics.
Contents: Spatial data sources – Interpretation & measurements; Data transformation; GIS Components; Fundamentals of Remote Sensing.
Instruction: Lectures, practicals.
Credits: 24
Assessment: Continuous assessment of assignments, practicals and tests.
Pre-requisites: Any CSC 100
Target group: Students from any department with the prerequisites wishing to do GIS at second year level.

GIS 222: GIS Techniques
Purpose: To familiarise students with the techniques performed during a GIS project.
Contents: Data collection, quality evaluation, editing, transformation, models, conversion, management, exploration, analysis and output.
Instruction: Lectures, practicals.
Credits: 24
Assessment: Continuous assessment of assignments, practicals and tests.
Pre-requisites: GIS 212

Target group: Students from any department with the prerequisites wishing to do GIS at second year level.

GIS 314: GIS Database Design & Management

Purpose: To familiarise students with the more complex design, functions, and implementation of GIS Databases (DB) and queries. To familiarise students with Web-GIS.
Contents: Data models; Geodatabase design, implementation, management; Spatial queries; Geodatabase enterprising.
Instruction: Lectures, practicals.
Credits: 16
Assessment: Continuous assessment of assignments, practicals and tests and projects.
Pre-requisites: GIS 200.
Co-requisites: GIS 315.
Target group: BSc students with the prerequisites wishing to major in GIS.

GIS 315: Spatial Analysis

Purpose: To familiarise students with the more complex analytical functions of GIS. To enable students to perform GIS analysis, to plan, implement and manage GIS projects with quality results and outputs.
Contents: Geocoding and dynamic segmentation; Network applications and path analysis. Raster analysis; Spatial interpolation construction and derivatives; GIS case studies.
Instruction: Lectures, practicals, project.
Credits: 16
Assessment: Continuous assessment of assignments, practicals and tests and projects.
Pre-requisites: GIS 200.
Co-requisites: GIS 314.
Target group: BSc students with the prerequisites wishing to major in GIS.

GIS 324: Remote Sensing Fundamentals and Techniques

Purpose: To equip learners with a working knowledge of Remote Sensing, satellite imagery, image processing techniques, applications, and uses of Remote Sensing.
Contents: Image pre-processing; spectral signatures; image processing and interpretation, remote sensing applications; spectral signatures; interpretation; remote sensing applications.
Instruction: Lectures, practicals.
Credits: 16
Assessment: Continuous assessment of assignments, practicals and tests and projects.
Pre-requisites: GIS 314 and GIS 315.
Co-requisites: GIS 325.
Target group: BSc students with the prerequisites wishing to major in GIS.

GIS 325: GIS Project Management

Purpose: To equip learners with the practical Project Management (PM) skills to initiate, plan and execute GIS Projects.
Contents: Project Management Techniques; Project Lifecycle; Application of PM Planning Techniques & Tools in GIS Projects.
Instruction: Lectures, practicals.
Credits: 16

Assessment: Continuous assessment of assignments, practicals and tests and projects.
Pre-requisites: GIS 314 and GIS 315.
Co-requisites: GIS 324.
Target group: BSc students with the prerequisites wishing to major in GIS.

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) per week
Credits: 16
Assessment: Continuous assessment of practicals, assignments and tests.
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) per week

Credits: 16

Assessment: Continuous assessment of practicals, assignments and tests.

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 counter-urbanisation, 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, inter-disciplinarity, 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) per week

Credits: 24
Assessment: Continuous assessment of practicals, assignments and tests.
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: Continuous assessment of practicals, assignments and tests.
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. This module includes a study of 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. In addition, a detailed study is undertaken of policies and programmes that the South African government

has adopted in the post-1994 period to stimulate economic development (including RDP, GEAR, ASGISA, the NGP and the role of the National Planning Commission). Special attention is also given to the economic development of rural areas in South Africa. 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 second 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 including assignments and practicals.

Pre-requisites: GEG 211 and GEG 221

Co-requisite: GEG 313

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 including assignments and practicals.
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 including assignments and practicals.
Pre-requisites: GEG 211 and GEG 221
Co-requisite: GEG 323

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: Continuous assessment including assignments and practicals.

Pre-requisites: GEG 211 and GEG 221

Co-requisites: GEG 322

GEOLOGY

GLG 111: Introduction to Geology, Mineralogy, Petrology and Geohydrology.

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 mineralogy, petrology, geohydrology; earth materials and the physical environment.

Instruction: Lectures; Practical laboratory and field instruction.

Credits: 16

Assessment: Continuous assessment of assignments, practicals and tests.

Pre-requisites: None

Target group: Natural Science and Soil Science students in the Faculty of Science and Agriculture. May also be taken as ancillary course by other agricultural students

GLG 121: Introduction to Structural Geology and South African Geology

Purpose: To expand on the basic concepts of physical geology and on the objectives of GLG111, with the focus on earth structures, sedimentary surface processes and South African geological occurrences.

Contents: South African Geology; Structural Geology; and Sedimentology
Instruction: Lectures; practical instruction; field excursion(s).
Credits: 16
Assessment: Continuous assessment of assignments, practicals and tests.
Prerequisite: None
Target group: Natural Science and Soil Science students in the Faculty of Science and Agriculture. May also be taken as ancillary course by other agricultural students.

GLG 211: Crystallography, Mineral Optics, Igneous Petrology and Sedimentary Petrology

Purpose: To equip students with adequate knowledge of crystallography, mineralogy, igneous and sedimentary required for studies in advanced geology.
Contents: Crystallography and Mineralogy; Mineral Optics; Igneous Petrology and Sedimentary Petrology.
Instruction: Lectures, tutorials, practical instruction, microscopy; field excursions.
Credits: 24
Assessment: Major tests, class tests, assignments, practical projects, three-hour examination.
Pre-requisites: GLG111 & PAC110
Target Group: Natural Science and Soil Science students of the Faculty of Science and Agriculture wishing to major in Geology, and other students wishing to do Geology at second year level.

GLG 221: Structural Geology, Geochemistry and Economic Geology

Purpose: To further prepare students for studies in advanced geology with emphasis on geochemistry, economic and structural geology, and on the geology of South Africa.
Contents: Structural Geology, South African Stratigraphy; Geochemistry, Economic and Mining 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 & PAC121
Target Group: Natural Science and Soil Science students of the Faculty of Science and Agriculture wishing to major in Geology, and other students 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.
Content: Geochemistry; Hydrogeology
Instruction: Comprehensive lectures, complemented by extensive practical and field instruction.
Credits: 16
Assessment: One three hour examination constituting 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).
Prerequisite: GLG 211 & PAC110

GLG 313: Structural Geology and South African 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 Southern African geological occurrences and examines their origin and development.

Content: Structural Geology, South African Geology

Instruction: Comprehensive lectures, complemented by extensive practical and field instruction

Credits: 16

Assessment: One three hour examination constituting 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisite: GLG 221 & PAC110

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: Metamorphic Petrology; Engineering Geology

Instruction: Comprehensive lectures, complemented by practical microscopy.

Credits: 16

Assessment: One three hour examination constituting 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisites: GLG 211, GLG221 & PAC121

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 for evaluating and analysing geo-data.

Content: Economic Geology; Statistics and data analysis

Instruction: Comprehensive lectures, complemented by practical instruction.

Credits: 16

Assessment: One three hour examination constituting 50% of the module mark. The other 50% is comprised of tests (25%), assignments and practical reports (25%).

Prerequisites: GLG 211, GLG221 & PAC121

POSTGRADUATE STUDIES IN THE SCIENCES

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 and Senate:

		Qualification ID
Department of Biotechnology & Biological Sciences		
41002	in Botany	19262
41005	in Entomology	19252
41009	in Microbiology	19242
41011	in Zoology	19233
41016	in Biochemistry	19265
Department of Computational Sciences		
41001	in Applied Mathematics	19267
41004	in Computer Science	19254
41008	in Mathematical Statistics	19238
41010	in Physics	19234
41013	in Mathematics	19237
41014	in Applied Statistics	19266
Department of Chemical and Earth Sciences		
41007	in Applied Remote Sensing and GIS	19269
41003	in Chemistry	19261
41006	in Geography	19245
41012	in Geology	19240

S9 Admission

S9.1 A learner shall be admitted to the Honours programme in a subject only with the permission of the Faculty of Science and Agriculture. 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 pass mark of at least **50 percent in each module** of the programme; a **subminimum DP mark of 40%** where applicable in order to qualify to write the main examination; a **sub-minimum of 40 percent examination mark** in each module; **and a pass mark in every examination** (ancillary modules, language tests etc.) as may be specified in the programme description and/or as required by Senate.

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 Faculty Board, 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.

Department of Biotechnology and Biological Sciences

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 6 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: Advanced methods in Protein Purification and Characterisation; Advanced enzyme kinetics; Analysis of Protein Purity using Electrophoresis, Activity Assays and Purification Tables and Western Blots

Instruction: Formal Lectures, 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 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: 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 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, Proteomics/Genomics, Micro-Arrays, Protein-Protein Interactions, GC/MS and LC/MS and the application of these methods in Modern Biochemistry etc..

Instruction: Formal Lectures, 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: Research project in Biochemistry

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: 32

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). In addition, the student must complete three compulsory modules (BOT 506, 507 and 508). Prerequisite for Botany Honours is a BSc degree in Botany, with at least an aggregate of 60% in BOT 300 level modules, or at the discretion of the HOD.

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: CASS - Continuous assessment through participation in discussions, assignments and tests.

BOT 503: Plant Physiology

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: CASS - Continuous assessment through participation in discussions, assignments and tests.

BOT 504: Plant Systematics
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: CASS - Continuous assessment through participation in discussions, assignments and tests.

BOT 505: Horticultural Sciences
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: CASS - Continuous assessment through participation in discussions, assignments and tests.

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: CASS - Continuous assessment through participation in discussions, assignments and tests.

BOT 507: Module work
Purpose: To train the learner to access and analyse 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.

ENTOMOLOGY OPTION 41005

The Honours programme in Entomology allows the learner to begin a research project under the supervision of a research leader. The research topic will be determined based on current research programmes within the department. There are six compulsory modules, namely ENT 501-506. **A pass mark of 50% in all the six modules must be achieved in order to obtain the Honours degree.** Total credits are 120. Prerequisites: a BSc degree in Entomology, Zoology (with an Entomology component) or a related field (with corresponding courses). Other Faculty rules apply.

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: 40

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: 16

Assessment: Continuous Assessment in the form of Seminars presentation presented to

the staff and students; seminar in the form of a major research essay.

ENT 503: Field research methodology

Purpose: To acquaint the learner with general entomological field techniques, including insect collection, trapping, 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: 16

Assessment: Continues assessment in the form of major 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.

Credits: 16

Assessment: Continuous assessment through participation in discussions; practical reports, assignments and tests**.**

ENT 505: Anatomy, Physiology and Biochemistry of Insects

Purpose: To introduce students to critical and higher level scientific and topical issues under the course theme. To foster students' critical analysis of topics and concepts under the above themes, and engagement of material on a higher cognitive level.

Contents: The content is sourced from accredited research material is based on various scientific, topical and fundamental aspects of insect anatomy, physiology and biochemistry.

Instruction: Lectures, interactive discussions, self-study and use of multimedia.

Credits: 16

Assessment: Continuous assessment based on theory tests, practical sessions and tutorials.

ENT 506: Taxonomy, Biogeography, Behaviour and Ecology

Purpose: To introduce students to critical and higher level scientific and topical issues under the course theme. To foster students' critical analysis of topics and concepts under the above themes, and engagement of material on a higher cognitive level.

Contents: The content is sourced from accredited research material and is based on various scientific, topical and fundamental aspects of insect taxonomy, biogeography, behavior and ecology.

Instruction: Lectures, interactive discussions, self-study and use of multimedia.

Credits: 16 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 that make up the semester mark (DP).

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 511-514) of three hours each, and two additional modules: practical & project presentations and seminars (MIC 525 & 526).

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 Research project in Microbiology
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: 32
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.

ZOOLOGY OPTION 41011

The Honours programme in Zoology allows the learner to begin a research project under the supervision of a research leader. The research topic will be determined based on current research programmes within the department. There are six compulsory modules, namely ZOO 501-504, 511 and 521. **A pass mark of 50% in all the six modules must be achieved in order to obtain the Honours degree.** Total credits are 120. Prerequisites: a BSc degree in Zoology or a related field (with corresponding courses). Other Faculty rules apply.

ZOO 501: Honours research project
Purpose: To cultivate research skills in Zoology with respect to designing and completing a research project; analysing 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: 40
Assessment: The written project proposal, 1st draft of final project report and the Final project report – in the form of a mini-dissertation – will all be assessed. The final project report will be assessed by both internal and external examiners.

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: 16
Assessment: Continuous assessment in the form of seminars presented to staff and students; a seminar in the form of a major research essay.

ZOO 503: Field research methodology
Purpose: To acquaint the learner with general zoological terrestrial and aquatic 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 (or appropriate equivalent) approximately one week in duration.
Instruction: Self-study, including practical work, under the supervision of a study leader.
Credits: 16
Assessment: Continuous assessment in the form of major 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: 16
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: 16

Assessment: Continuous assessment through participation in discussions, seminar reports, review essay and final assessment at the end of the course.

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: 16

Assessment: Continuous assessment through participation in discussions, seminar reports, review essay and final assessment at the end of the course.

Department of Computational Sciences

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 (150 credits), including a compulsory research project, selected from the following papers in consultation with the Head of Department. A maximum of two topics (60 credits) may be selected from the Honours modules in Mathematics, Mathematical Statistics, Physics, and Computer Science, in consultation with the Head of Department.

MAH 501: Mathematics Research Project

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: 30

Assessment: Assignments and essay, seminar presentations

Prerequisites: MAP 300

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, and 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 eigen values and eigen functions.
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.
Contents: Topological spaces, exotic topologies, construction (Cartesian products, quotient space, metric compatible with topology, etc.). Differentiable mappings of the Euclidean n-space. Diffeomorphism. Definition of smooth manifold, matrix manifolds, partitions of unity. Whitney weak embedding theorem. Vector fields as differential operators, differential identities. Commutator as a differential operator.
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 STATISTICS 41014

Prerequisite: Normally 60% in STM 312, 313, 322 and 323. The examination consists of six papers. 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 *(Compulsory*)
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 *(Compulsory)*
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 *(Elective)*
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 *(Elective)*
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 *(Compulsory)*
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 *(Elective)*

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 *(Compulsory)*

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 *(Compulsory)*

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.

STM 506: Research Project *(Compulsory)*

Purpose : To acquaint students with thorough understanding and knowledge of research techniques such as proposal writing, data collection, data analysis, scientific writing etc. of research reports in Statistics.

Contents: Introduction: Design and analysis of an experiments; Sample-size calculations; Questionnaire design; Sampling techniques; Literature searches.

Students will be expected to choose a topic in consultation with his/her supervisor.

Credits: 30

MATHEMATICAL STATISTICS 41008

Prerequisite: Normally 60% in STM 312, 313, 322 and 323. The examination consists of five papers. 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 (Compulsory)

Contents: Introduction to stochastic models and processes. Introduction to Markpov Chain theory.

Introduction to point processes and Brownian Motion

Credits: 22

STM 502: Multivariate Statistical Analysis (Compulsory)

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 (Compusory)

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 (Elective)

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 (Compulsory)

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 (Compulsory)

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 (Elective)

Contents: Introduction to the fundamentals of Bayesian statistics; Subjective probability; Representing prior knowledge; Conjugate priors; Improper priors; Markov chain simulation.

Credits: 22

STM 506: Research Project (Compulsory)

Purpose : To acquaint students with thorough understanding and knowledge of research techniques such as proposal writing, data collection, data analysis, scientific writing etc. of research reports in Statistics.

Contents: Introduction: Design and analysis of an experiments; Sample-size calculations; Questionnaire design; Sampling techniques; Literature searches.

Students will be expected to choose a topic in consultation with his/her supervisor.

Credits: 30

COMPUTER SCIENCE OPTION 41004

Prerequisite: BSc in Computer Science or in a related field. 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: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC 513: Distributed and Parallel Computing

Purpose: This course describes a variety of distributed, parallel and client server system development options, from formal specifications to practical implementations. It will focus on the basic architectural, programming, and algorithmic concepts in the design and implementation of parallel and distributed applications.

Content: Understanding parallel processors and distributed programming, models of parallel programming, middleware terms and concepts, low level synchronisation and communication, designing parallel algorithms, introduction to OpenMP and MPI, clusters, middleware in the world of distributed computing and some promising future architecture.

Instruction: 20 hours of lectures. Assignments (individual and group), practical work

Credits: 15

Assessment: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC 515: Advanced Java

Purpose: The module builds on the Object Oriented Programming undergraduate module by introducing advanced features of the three Java software development platforms, namely the Java Standard Edition, the Java Enterprise Edition (JEE) and the Java Micro Edition (JME)

Content: Advanced features of Graphical User Interfaces (GUI) design, abstract classes and interfaces, IO with binary files, multithreading, database connectivity, introduction to servlets and web application development, android application development, etc.

Instruction: 20 hours of lectures. Self-study and programming assignments

Credits: 15

Assessment: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC 516: E-business Fundamentals

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: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC517: Theory of Computing

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: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC518: Intelligent Systems

Purpose: This module provides an introduction to applied Intelligent Systems exposing students to a wide range of machine learning tools. The module assists learners with techniques for optimization and handling of large data sets. It also assists learners in identifying and applying the concepts, steps, algorithms and techniques of machine learning to the planning and implementation of a real-life solution, which is integrated with other disciplines within the course. The module 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, types of learning problems, Performance measures, machine learning algorithms, Hadoop's Architecture and Ecosystem, Machine learning and Large-scale datasets, Machine Learning Tools, Libraries, and Frameworks, New generation data architectures for machine learning.

Instruction: 20 hours of lectures

Credits: 15

Assessment: Continuous assessment based on tests, assignments and 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: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC 522: Human Computer Interaction
Purpose: This module assists learners to develop skills needed to produce usable and safe computer systems. The module further assists learners to understand the factors that determine how people can use computer systems easily and with joy. Furthermore, learners acquire the art of identifying and applying the concepts, steps, functions and techniques of computer interaction design.
Content: A selection of topics from overview of human-computer interaction, design processes, interaction styles and design issues.
Instruction: 20 hours of lectures. Group presentations. Practical assignments
Credits: 15
Assessment: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final examination as summative assessment.

CSC 523: Distributed Web Computing
Purpose: The course addresses some of the issues and the basic principles and practices of distributed computing over the Internet.
Content: The course contains four major topics: Web Technologies and Protocols, Web Security, Web Services, and Semantic Web. In addition there will be discussion on other topics such as Multi Agent Systems.
Instruction: 20 hours of lectures. Case studies and practical work
Credits: 15
Assessment: Continuous assessment based on tests, assignments and practical work, as well as one three-hour final 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: Continuous assessment based on tests, assignments and practical work, as well as one three-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, assignments and practical work, as well as one three-hour final examination as summative assessment.

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 four papers (each worth 25 credits) and a project (30 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 or preferably MAT 511 and goes deeper into some aspects of rings that were treated superficially previously.
Contents: Rings, Ideals, Rings of Quotients and Localization, Rings of Polynomials and Formal Power Series, UFDs and Euclidean Domains. Noetherian and Artinian Rings, Prime and Primary
Ideals, The nil Radical, Primary Decomposition, Ring Extensions, Dedekind Domains. Simple and Primitive Rings, The Jacobson Radical, Semi-simple Rings, The Prime Radical.
Instruction: Lectures, Seminars and assignments.
Credit Value: 25
Assessment: Assignments, Class Tests, Examinations
Prerequisite: MAT 311

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 Analysis
Purpose: Core in Mathematical and Physical Sciences Programmes.
Contents: Theoretical and Abstract approach to the Complex Analysis Course given in MAT 322. Analytic Functions, Cauchy's Theorems, Maximum Modulus

Theorem and Harmonic Functions. Power and Laurent's Series. Residue Theory, Theory of Conformal Mappings and Applications. Analytic Continuation, Riemann Surfaces, Mapping Properties of Analytic Functions. Infinite Products, the Gamma Function and Asymptotic Expansions. The Laplace Transform and Applications. Application of Complex Analysis to Theoretical Physics.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisite: 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.
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.
Prerequisite: MAT 303

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, Permutations, Combinations, Generating functions, Partitions and Bell Polynomials, Principle of inclusion and exclusion, Mobius function and Inversion..
Instruction: Lectures, Seminars and assignments.
Assessment: Assignments, Class Tests, Examination.
Credits: 25
Prerequisite: MAT 311

MAH 501: Mathematics Research Project
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: 30
Assessment: Assignments and essay, seminar presentations
Prerequisites: MAT 303 or MAT 515 AND MAT 311 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.
Contents: Groups, Isomorphism Theorems, Permutation Groups, Direct Products, The Fundamental Theorem of Finite Abelian Groups, The Remak-Krull Schmidt

Theorem. The Sylow Theorems and Applications. Extensions, Infinite Abelian Groups: Free, Torsion and Torsion-free Groups. Homological Algebra. Free Groups.

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 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 311 AND MAT 312

MAT 508: Measure and Integration Theory

Purpose: For further Application in Mathematical and Physical Sciences.

Content: Measure on the Real Line: Lebesgue Outer Measure, Measurable Sets, Regularity, Measurable Functions, Borel and Lebesgue Measurability. Integration of Functions of a Real Variable, Integration of Series, Riemann and Lebesgue Integrals, Differentiation, Functions of a Bounded Variation. Abstract Measure Spaces and Integration.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAT 303 or MAT 515

PHYSICS OPTION 41010

NB: *The offer of some modules and electives under this option may depend on the availability of external collaborators. Students should consult the HODs before registration.*

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 506) (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.

Contents: Survey of Elementary Particles. Mechanics of a particle, system of particles. Constraints. D'Alembert's principle and Lagrange's equation. Velocity-dependent potentials and the dissipation function. Lagrangian formulation. Lagrangian and Hamiltonian Dynamics.

Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours

Credits: 22

Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests and assignments).

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: DP (50%) + Final Exam (50%): (DP = Average of tests and assignments).

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.
Contents: Dualistic Theory of Matter. Dualistic theory of radiation. Geometrical optics and classical mechanics. Wave packets and group velocity. Schrödinger equation for single and system of particles. Restricted relativity principle. Physical interpretation of the wave function.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.
Credits: 22
Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests and assignments).

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.
Contents: Statistical Methods. Binomial distribution. Probability distribution. System of Particles. Statistical formulation of the mechanical problem. Interaction between macroscopic systems. Statistical Thermodynamics. Irreversibility and the attainment of equilibrium. Thermal interaction between macroscopic systems. General interaction between macroscopic systems.
Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 105 hours.
Credits: 22
Assessment: DP (50%) + Final Exam (50%): (DP = Average of tests and assignments).

PHY 506: 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: 30
Assessment: Mini-dissertation (project) weighing 100%

ELECTIVES *(total of 24 credits)*

PHY 512: Introductory Solid State Physics
Purpose: To provide a comprehensive introductory to Solid State Physics and understanding the different structural aspects and various properties of crystalline solids.
Contents: Atomic structure: Periodicity in Crystals, Symmetry elements, Bravais Lattice in Two and Three Dimensions, Rational Feature of a Crystal and Miller Indices, Interplanar Spacing, Density of Atoms in a Crystal Plane. Atomic

Bonding: Ionic Bonding, Madelung Constant and Potential, The Born-Haber Cycle, Covalent Bonding, Metallic Bonding, Hydrogen Bonding and Van der Waals Bonding. Atomic Packing: Packing of Spheres in 2 and 3-Dimenssions, Axial Ratio and Lattice Constant, Pauling's Rule. Atomic Shape and Size of the Atom: Bohr Model and Hydrogen Atom, Wave Mechanical Approach to Atomic Structure, Ionic Radii, Covalent Radii, Metallic Radii and Van der Waals Radii. Crystal Imperfections (defects), Burgers Vector and Circuit, Dislocation Motion. Atomic Diffusion: Fick's Law, Application of Diffusion and the Kirkendall effect.

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 513: Nuclear Physics

Purpose: To provide introduction to Nuclear Science and Technology.

Contents: Basic Nuclear Structure: Nuclear sizes and shapes, Nuclear Models (the liquid drop and Shell Models), Nuclear Binding Energy. Nuclear Decay and Radioactivity: Radioactive decay law, Types of Decay, Natural Radioactivity, Radioactive Dating, Medical Application of Radiation. Nuclear Reactions. Nuclear Fusion and Fission. Accelerators: Cyclotron, Synchrotron and Electrostatic Accelerator.

Instruction: 5 lectures and 1 tutorial (270 minutes) per week, practical session and visit to research laboratories (3 weeks). 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 515: Laser Technology

Purpose: To introduce students to laser technology in the field of communication, industry, health and research.

Content: Introduction: What's inside a laser? What are lasers used for? A survey of laser applications in the twenty-first century, The nature of light: Photons and electro-magnetic waves, Refractive index: Dispersion, Polarization, Birefringence, Optical interference: Young's experiment, Fabry-Perot, laser mirrors, Laser light: The characteristics of coherent radiation, Quantum mechanics: Energy levels and transitions, Population inversions and L.A.S.E.R., Laser resonators: Gain and loss, intra-cavity dynamics, Transverse and longitudinal resonator modes; Gaussian beams, Reducing laser bandwidth: homogeneous and inhomogeneous broadening, techniques of limiting bandwidth, Q-switching: power and energy, types of Q-switches, Cavity dumping and mode locking: Ultra short pulses, Nonlinear optics: second-harmonic generation, phase matching, Laser safety: Optical hazards, skin hazards, and other hazards (e.g., electrical shock), Survey of lasers: Gas lasers, solid-state lasers, fiber lasers and semiconductor laser

Instruction: 5 lectures and 1 tutorial (270 minutes) per week, plus one practical session (3 hours) per week. Total 240 hours. Tutorial 1 hour per week.
Credits: 12
Assessment: Weekly pre-laboratory and tutorial tests.

- Two tests based on tutorial and lecture materials.
- Final assessment (3 hour examination moderated externally) is based on the understanding of theoretical concepts and the ability to apply them in practical computations and measurements

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 517: Nuclear Safety & Security
Purpose: To provide training on fundamental matters associated with nuclear safety and security in nuclear research laboratories for academic purposes, nuclear test areas, nuclear reactors, power stations and other national key points that need nuclear safety and security expertise. Also to recognize potential nuclear security threats in organizations and acquire expertise to mitigate them.
Contents: Factors affecting nuclear safety and security; nuclear fission and radiological materials; nuclear safety and security culture; nuclear security threats and risk management; nuclear legislative and regulatory framework; nuclear policy making in South Africa and international perspectives.
Prac work: Visits to nuclear power stations and nuclear reactors; analysis of table tops of various case studies; practical assignments
Contact 120 hours (2 hrs per week plus 3 hrs practical sessions)
Credits: 12
Assessment: 1 x 3hr paper

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
Contents: Crystal Structures. Periodic arrays of atoms. Fundamental types of lattices. Index system for crystals. Simple crystals structures. Direct imaging of atomic structure. Non-ideal crystal structures. Reciprocal Lattice. Diffraction of Waves by crystals. Scattered wave amplitude. Brillion zones. Fourier analysis of the basis. Quasi-crystals. Crystal Binding and Elastic Constants.

Crystals of inert gases. Ionic crystals. Covalent crystals. Metals. Hydrogen bonds. Atomic radii. Analysis of elastic strains. Elastic compliance and stiffness constants. Elastic waves in cubic crystals. Phonons: Crystal vibrations. Vibrations of crystals with monatomic basis. Two atoms per primitive basis. Quantization of elastic waves. Phonon momentum. Inelastic scattering by phonons.

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 527: Nuclear Energy & Cyber Security

Purpose: The module follows PHY517 and aims at enabling students to understand basic nuclear technologies and their applications. Students will be able to outline the main physical principles and processes used in nuclear energy, nuclear reactors, nuclear fuel cycle and applications. Students will also understand cyber security and controls that could adversely impact nuclear security if compromised. The module also provides necessary guidance and external expertise to support the direction of, and response to, criminal or intentional cyber-attacks involving or directed at nuclear material, other radioactive material, associated facilities or associated activities.

Contents: Nuclear energy, nuclear reactors, nuclear reactor safety, nuclear fuel cycle; non-power application of nuclear technologies and nuclear energy development; computer and information security; the Nuclear Security; cyber security for nuclear Industrial Control Security (ICS) and identifying vulnerable nuclear power plants.

Prac work: Visits to nuclear power stations and nuclear reactors; table-top analysis of various case studies and practical assignments.

Contact: 120 hrs (2 hrs lectures per week plus 3 hr practical sessions)

Credits: 12

Assessment: 1 x 3hr paper

Pre-requisite: PHY517

Department of Chemical and Earth Sciences

APPLIED REMOTE SENSING AND GIS OPTION 41007

The Honours Programme consists of four compulsory modules, including a compulsory research project, as described below. In consultation with the Head of Department, credits from modules in other Honours Programmes may be accepted as alternative to those listed below, provided a minimum sum of 120 credits, with at least 100 from the Applied Remote Sensing and GIS Programme.

Prerequisites for the Honours programme: BSc with a minimum of 60% average for all GIS300 modules, or equivalent, accredited modules from other Higher Education Institutions.

GIS 511: Advanced Remote Sensing

Purpose: To provide a solid understanding of the advanced remote sensing procesing and the application of remotely-sensed data via satellite image processing techniques. To develop both a strong theoretical knowledge of the subject area and build confidence and experience in the practical implementation of this theory utilising relevant professional GIS/Image Processing software.

Contents: Radiation and the atmosphere; Reflectance signatures; Platforms and sensors; Image pre-processing; Image enhancement; Image transformations; Image classifications; Radio Detection and Ranging (RADAR); Synthetic Aperture RADAR (SAR); Spectroscopy; Multispectral analysis; Hyperspectral analysis; Landcover classification.

Instruction: Lectures, practicals, projects.

Credits: 25

Assessment: Continuous assessment of assignments, practicals, tests and projects.

Prerequisites: GIS 300

Target group: Students having successfully completed a BSc degree with the prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

GIS 512: Advanced Spatial Modelling and Analysis

Purpose: To equip students with knowledge in the application of GIS to solve real-world problems. To expose them to the process and practical and theoretical issues involved in utilising GIS for decision support and problem solving.

Contents: Fundamentals of simulation and modelling; Advanced spatial pattern analyis; basic and advanced analysis techniques in GIS. Introduction to advanced spatial analysis; Multi-criteria evaluation (MCE); Geo-simulation analysis; Temporal simulation of spatial patterns; spatial relationship modelling.

Instruction: Lectures, practicals

Credits: 25

Assessment: Practicals, presentations, assignments, tests, one 3-hour exam paper

Prerequisites: GIS 300

Target group: Students having successfully completed a BSc degree with the prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

GIS 521: Quantitative Techniques in Remote Sensing of the Environment

Purpose: To expose, inform and instruct students in the application of remote sensing and statistical methods and techniques that are applied in both GIS and Remote Sensing to solving real-world environmental problems.

Contents: Remote sensing applications in various fields such as natural resource management, agricultural crop monitoring and hydrological modelling. In addition, basic statistics: mean, mode, median, sum, etc.; Estimation: kriging; Simulation: Gaussian, Markov, Boolean and Genetic; Variance; Accuracy Assessments; Image Training.

Instruction: Lectures, practicals

Credits: 25

Assessment: Practicals, presentations, assignments, tests, one 3-hour exam paper

Prerequisites: GIS 300

Target group: Students having successfully completed a BSc degree with the prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

GIS 522: Environmental Geographical Research Methodology

Purpose: To train students to conduct GIS and/or Remote Sensing research projects that utilize scientific theory, methodology, and techniques learnt during the Honours Programme.
Contents: Project planning; Project proposal; Project execution (fieldwork, practical work, analysis, and interpretation); Interim and final project report writing processes and structures; Project presentation development and execution.
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 seminar.
Prerequisites: GIS 300
Target group: Students having successfully completed a BSc degree with the prerequisites wishing to pursue an Honours degree in Remote Sensing and GIS.

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.

Prerequisite: A minimum aggregate final mark of 60% in PAC 312, PAC314, PAC321 and PAC323.

CHE 511 Analytical Chemistry

Purpose: To develop an indepth 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.
Instruction: Formal lectures and assignments
Credits: 22
Assessment: Tests and a 3-hour externally moderated examination at the end of the year

CHE 522: 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 523 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
Credits: 22
Assessment: Tests and a 3-hour externally moderated examination at the end of the year

CHE 514 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 , 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. 30 credits.
CHE 506: Seminar (on an approved research project). 22 credits.

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 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 at least 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 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 while delving into research techniques to cement crucial concepts and paradigms in research practice at Honours level.

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: Continuous assessment through participation in discussions, assignments and tests.
Co-requisite: GEG 502/GEG 502E

GEG 502/GEG 502E: Mini 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, analyse 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: Continuous assessment through participation in discussions, assignments and tests

Credits: 20

GEG 515/ Physical Geography: Climatology
GEG 515E

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, inter-annual variability of the atmosphere-ocean system, dynamics of tropical climates, and planetary micro-scale boundary layer climates.

Instruction: 3 hours per week

Assessment: Continuous assessment through participation in discussions, assignments and tests.

Credits: 20

GEG 517/ Human Geography: Economic Geography
GEG 517E:

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: Continuous assessment through participation in discussions, assignments and tests.

Credits: 20

GEG 523/ Integrated Environmental Management

GEG 523E

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: Continuous assessment that comprises of class attendance and participation in discussions. Written assignments, tests and a practical group analysis of an environmental problem that is undertaken as a case study.

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: Continuous assessment through participation in discussions, assignments and tests

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: Continuous assessment through participation in discussions, assignments and tests

GEOLOGY OPTION 41012

Purpose: 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 GLG511, GLG512, GLG521 and GLG522. Assignments and practical reports to be submitted for evaluation.

Prerequisite: BSc degree with Geology major/Applied Geology.

Target Group: Geology graduates

GLG 505: Honours Research Project

Purpose: To expose students to research methodology, impart skills in designing a research project, fieldwork, analysis and presenting the research results in a written format.

Contents: The candidate to select a research topic under the guidance of a supervisor.

Instruction: Self-study, fieldwork and laboratory work under guidance of a supervisor.

Assessment: Seminar assessment and project report bound in hard cover submitted for examination.

Credits: 40.

GLG 511: Economic Geology, Mining and Exploration Geology, and Geophysics

Purpose: To expose students to advanced level studies in these sub-disciplines.

Contents: Topics in Economic Geology, Mining and Exploration Geology, and Geophysics.

Instruction: Seminars/lectures; practical instruction; geological field work.

Assessment: Seminar assessment, practical assessment, class tests, one three-hour Examination.

Credits: 25.

GLG 512: Advanced Crystallography, Mineralogy and Petrology

Purpose: To expose students to advanced level studies in these sub-disciplines.

Contents: Explorations methods. Topics in advanced crystallography, mineralogy and petrology.

Instruction: Student presentations/lectures; practical instruction; geological field work.

Assessment: Student presentations/lectures, practical assessment, class tests, one three-

hour examination
Credits: 25.

GLG 521: Hydrogeology, Environmental Geology, and Environmental Geochemistry.
Purpose: To expose students to advanced level studies in these sub-disciplines.
Contents: Selected topics in Hydrogeology, Environmental Geology and Environmental Geochemistry.
Instruction: Student presentations/lectures; practical instruction; geological field work.
Assessment: Seminar assessment, practical assessment, class tests, one three-hour Examination.
Credits: 25.

GLG 522: Structural Geology, Sedimentology and Applied Geophysics
Purpose: To expose students to advanced level studies in these sub-disciplines.
Contents: Selected topics in Structural Geology, Applied Geophysics; Sedimentology and Mining Geology.
Instruction: Student presentations/lectures; practical instruction; geological field work.
Assessment: Seminar assessment/lectures, practical assessment, class tests, one three-hour examination
Credits: 25.

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:

		Qualification ID
Department of Biotechnology and Biological Sciences		
41502	in Botany (Research)	16233
41505	in Entomology (Research)	16237
41509	in Microbiology (Research)	19155
41512	in Biochemistry (Research)	16232
41516	in Ethnobotany (Research)	115326
41511	in Zoology (Research)	19153
Department of Computational Sciences		
41501	in Applied Mathematics (***Coursework***)	
41504	in Computer Science (Research)	16235
41508	in Mathematical Statistics (***Coursework***)	
41510	in Physics (Research)	19154
41513	Mathematics (***Coursework***)	
41514	in Applied Statistics (***Coursework***)	
41515	in Biostatistics (***Coursework***)	115325
41520	in Applied Mathematics (Research)	19198
41521	in Applied Statistics (Research)	19197

41522	in Mathematical Statistics (Research)	16240
41523	in Physics (***Coursework***)	
41524	in Mathematics (Research)	16241

Department of Chemical and Earth Sciences

41503	in Chemistry (Research)	19190
41506	in Geography (Research)	16238
41507	in Applied Remote Sensing and GIS (Research)	115324
41517	in Geology (Research)	16239
71002	in Environmental Studies (MPhil) (***Coursework***)	113640

S12 Admission

S12.1 A learner shall be admitted to the Masters' degree in a subject only with the permission of the Faculty of Science and Agriculture. 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.

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 Masters' 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 BIOCHEMISTRY (41512)

The pre-requisite for admission into this programme is a BSc Honours in Biochemistry or an equivalent qualification obtained with an aggregate of at least 60%. In exceptional cases where a candidate did not score the minimum 60% requirement, a motivation could be made by the Head of Department to the Dean of the Faculty for a waiver of the rule. The Masters' programme is by dissertation only, on a suitable topic in Biochemistry approved by the Head of Department. A full-time Masters' student is expected to complete the requirements for the qualification within two years of first registration.

BCH 700: Biochemistry Masters' Dissertation

Purpose: Students will be required to plan, execute, and write-up a Masters' 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 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 Masters' Dissertation

Purpose: Students will be required to plan, execute, and write-up a Masters' 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 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 recommendation by the Head of the Botany Head and approval by the Faculty.

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 Masters' Dissertation

Purpose: Students will be required to plan, execute, and write-up a Masters' 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 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 recommendation by the Botany Head of Department and approval of the Faculty and Senate.

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 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 other relevant discipline, or an equivalent qualification with the approval of the Faculty and the Senate.

MASTER OF SCIENCE IN MICROBIOLOGY (41509)

The pre-requisite for admission into this programme is a BSc Honours in Microbiology or an equivalent qualification obtained with an aggregate of at least 60%. In exceptional cases where a candidate did not score the minimum 60% requirement, a motivation could be made by the Head of Department to the Dean of the Faculty for a waiver of the rule. The Masters' programme is by dissertation only, on a suitable topic in Microbiology approved by the Head of Department. A full-time Masters' student is expected to complete the requirements for the qualification within two years of first registration

MIC 700 Masters Research Project

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 ZOOLOGY (41511)

A Master of Science degree in Zoology can be obtained by means of an approved dissertation.

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 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 other relevant discipline, or an equivalent qualification with the approval of the Faculty and the Senate.

Department of Computational Sciences

MASTER OF SCIENCE IN APPLIED MATHEMATICS
Coursework (41501) / Research (41520)

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**, 175 credits), plus three papers (each carrying 25 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 Theory.
Purpose: Fundamental in Applied Mathematics and Physics.
Contents: Error function, exponential integral, elliptic integrals. The Dirac Delta function. Polar and cylindrical co-ordinates, spherical co-ordinates, curvilinear co-ordinates. Orthogonal and unitary transforms. Diagonolization of matrices. Quadratic forms. Sturm-Liouville Theory. Green's function. Orthogonal polynomials. Integral transforms- Laplace transforms and partial differential equations. Fourier transforms and partial differential equations.
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.
Contents: Absolute Extremum, conditional Extremum. Functional. The variation of a Functional and its properties. Euler's equations. Generalization of the elementary problems of the Calculus of variations. Sufficient conditions for the Extremunm of a Functional. Moving boundary problems. The Hamilton-Jacobi Theory. The variational Principles of Mechanics. Euler's Finite Difference Method. Ritz Method. Variational Methods for finding Eigenvalues and Eigenfunctions.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 500.

MAQ 703: Numerical Analysis.
Purpose: Essential in Applied Mathematics.
Contents: Finite Difference and Finite Element methods for solving Parabolic, Hyperbolic and Elliptic
partial differential equations.
Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Prerequisites: MAP 500.

MASTER OF SCIENCE IN APPLIED STATISTICS

Coursework (41514) / Research (41521)

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 (**STA 701**, 256 credits); *OR*
A dissertation of limited scope (**STA 702,** 128 credits) plus *three* papers (each carrying 40 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.

STA 702: A half dissertation (128 credits) - (***Compulsory***)

STA 704: Advanced Multivariate Statistical Analysis
(Compulsory)
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: 40

STA 709: Advanced Experimental Design *(Compulsory)*
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: 40
Prerequisites: STS 504, STM 506.

STD 701: Generalised Mixed Models *(Elective*)
Contents: Linear Models. Generalised Linear Models. Mixed Models. Generalised Mixed Models.
Credits: 40

STD 702: Applied Non-parametric Statistics *(Elective)*
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: 40

STD 703: Advanced Time Series Analysis *(Elective)*
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: 40

STD 704: Applied Statistical Decision Theory *(Elective)*
Contents: Introduction to loss function and risk, conditional Bayesian decision principle, Frequentist Decision theory, Discision between Bayesian and frequentist, sufficient statistic, convexity
Credits: 40

NB: *and any of the modules listed under Applied Statistics Honours not already offered by the candidate*.

MASTER OF SCIENCE IN MATHEMATICAL STATISTICS
Coursework 41508 Research 41522

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 (**STA 700**, 256 credits); *OR*

A dissertation of limited scope (**STA** 702, 128 credits), plus *three* papers (each carrying 40 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.

STA 702: A half dissertation (128 credits) - *(Compulsory)*

STA 704: Advanced Multivariate Statistical Analysis *(Compulsory)*
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: 40

STA 705: Advanced Regression Theory *(Elective)*
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: 40

STA 707: Methods of Multivariate Statistics *(Compulsory)*
Contents: Principal Components; Graphing Principal Components; Factor Rotation and Factor Scores; Discrimination; Classification; Classification with two Multivariate Normal Populations; Clustering.
Credits: 40

STA 708: Advanced Non-Parametric Statistics *(Elective)*
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: 40

STA 709: Advanced Experimental Design *(Compulsory)*
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: 40
Prerequisites: STS 504, STM 506.

STD 701: Generalised Mixed Models *(Elective)*
Contents: Linear Models. Generalised Linear Models. Mixed Models. Generalised Mixed Models.
Credits: 40

STD 702: Applied Non-parametric Statistics *(Elective)*
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: 40

STD 703: Advanced Time Series Analysis *(Elective)*
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: 40

STD 704: Advanced Statistical Decision Theory *(Elective)*
Contents: Introduction to loss function and risk, conditional Bayesian decision principle, Frequentist Decision theory, Decision between Bayesian and frequentist, sufficient statistic, convexity
Credits: 40

STD 705: Graphical Modelling *(Elective)*
Contents: Introduction to Theory of Graphs. Discrete Models. Continuous Models. Mixed Models, Hypothesis testing. Model Selection and Criticism.
Credits: 40

MASTER OF SCIENCE IN BIOSTATISTICS (41515)

Normally a learner shall not be admitted to the Masters programme in Biostatistics unless he/she has obtained an aggregate of at least 60% for the Honours degree. This qualification comprises four modules (three compulsory and one elective) and a mini-

dissertation (128 credits) of limited scope to be decided in consultation with the Head of Department.

STE 701: Half dissertation (Biostatistics) *Compulsory*
Contents: Experimental Design; Data Collection; Data Analysis; Correct reporting of results.
Credits: 128

STE 702: Survival Analysis *(Compulsory)*
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: 40

STE 703: Clinical Epidemiology *(Elective)*
Contents: Clinical Epidemiology; Diagnostic and Screening Tests; Randomized Controlled Trials;
Non-randomized Studies; Therapeutic Safety.
Credits: 40

STE 704: Epidemiology *(Compulsory)*
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**:** 40

STE 705: Design of Clinical Trials *(Compulsory)*
Contents: Research Designs; Randomization; Case-Control Studies; Cohort Studies; Diagnostic Tests; Methods of Regression.
Credits**:** 40

STE 706: Categorical Data Analysis *Elective)*
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: 40

STE 707: Biostatistics *(Compulsory)*
Contents: Estimation; Hypothesis testing; Inference; Non-Parametric statistics; Analysis of Variance and Covariance; Robustness; Discrimination and Classification; Principle Component Analysis.
Credits: 40

MASTER OF SCIENCE IN COMPUTER SCIENCE (41504)

The Masters' 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 Masters' student is expected to complete the requirements for the qualification within two years of first registration.
Credits: 256

CSC 700: Master of Science in Computer Science

Purpose: The qualification enables students to gain in-depth knowledge in specialised areas of computer science, such as artificial intelligence, machine learning, cybersecurity, data science, and software engineering.
Contents: This is a research-based qualification. Students may select their topics of research after contacting a supervisor of their choice in the department.
Instruction: Teaching of computing related research skills through supervision of the research project and series of lectures on research chapters to offer guidance.
Credit: 256
Assessment: The student will be assessed by two external examiners based on their submitted dissertation. The dissertation must contribute to the scientific knowledge within computer science discipline and insight of the selected subject; as well afford evidence of individual and original scientific thought
Prerequisite: BSc Honours in Computer Science or equivalent qualification.

MASTER OF SCIENCE IN MATHEMATICS
Coursework 41513 / Research 41524

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**, 256 credits); OR

A dissertation of limited scope (**MAH 701**, 128 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.
Contents: Groups, Isomorphism Theorems, Permutation Groups, Direct Products, The Fundamental Theorem of Finite Abelian Groups, The Remak-Krull Schmidt

Theorem. The Sylow Theorems and Applications. Extensions, Infinite Abelian Groups: Free, Torsion and Torsion-free Groups. Homological Algebra. Free Groups.

Instruction: Lectures, Seminars and assignments.
Credits: 25
Assessment: Assignments, Class Tests, Examination.
Pre-requisites: 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.

Contents: Rings, Ideals, Rings of Quotients and Localization, Rings of Polynomials and Formal Power Series, UFDs and Euclidean Domains. Noetherian and Artinian Rings, Prime and Primary Ideals, The nil Radical, Primary Decomposition, Ring Extensions, Dedekind Domains. Simple and Primitive Rings, The Jacobson Radical, Semi-simple Rings, The Prime Radical.

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 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 Analysis

Purpose: Core in Mathematical and Physical Sciences Programmes.

Contents: Theoretical and Abstract approach to the Complex Analysis Course given in MAT 312/322: Analytic Functions, Cauchy's Theorems, Maximum Modulus Theorem and Harmonic Functions. Power and Laurent's Series. Residue Theory, Theory of Conformal Mappings and Applications. Analytic Continuation, Riemann Surfaces, Mapping Properties of Analytic Functions. Infinite Products, the Gamma Function and Asymptotic Expansions. The Laplace Transform and Applications. Application of Complex Analysis to Theoretical Physics.

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 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.

Contents: Measure on the Real Line: Lebesgue Outer Measure, Measurable Sets, Regularity, Measurable Functions, Borel and Lebesgue Measurability. Integration of Functions of a Real Variable, Integration of Series, Riemann and Lebesgue Integrals, Differentiation, Functions of a Bounded Variation. Abstract Measure Spaces and Integration.

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, Permutations, Combinations, Generating functions, Partitions and Bell Polynomials, Principle of inclusion and exclusion, Mobius function and Inversion.

Instruction: Lectures, Seminars and assignments.

Credits: 25

Assessment: Assignments, Class Tests, Examination.

Prerequisites: MAT 500.

MAH 701: Mini-dissertation

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: 128

Assessment: Assignments and essay, seminar presentations

Prerequisites: MAT 303 or MAT 515 and MAT 500.

MASTER OF SCIENCE IN PHYSICS
Coursework (41523) / Research (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.

Contents: Semiconductor Physics. Physics and properties of semiconductors. Bipolar Devices. p-n junction diode. Bipolar transistor. Thyristor. Unipolar Devices. Metal-semiconductor contacts. JFET and MESFET devices. MIS diode and charge-coupled devices. MOSFET. Photonic Devices. LED and semiconductor lasers. Photo detectors. Solar cells. Renewable Energy. Solar energy, wind energy, biomass. Viability and sustainability of renewable energy.

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

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

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%)

Department of Chemical and Earth Sciences

MASTER OF SCIENCE IN APPLIED REMOTE SENSING AND GIS (41507)

A Master of Science Degree in Applied Remote Sensing and GIS can only be obtained by means of an approved dissertation. Admission to the programme is dependent on the candidate's academic background, as well as the availability of adequate supervision in the candidate's chosen study area.

GIS 700: Applied Remote Sensing and GIS
Purpose: Students at this level will be required to plan, execute, and write a Masters' dissertation 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 and series of lectures on research chapters to offer guidance.
Credits: 256
Assessment: The student will be assessed by two external examiners based on their submitted dissertation. The dissertation must contribute to the scientific knowledge and insight of the selected subject; as well afford evidence of individual and original scientific thought.
Prerequisites: BSc Honours in Applied Remote Sensing and GIS or equivalent qualification.
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 CHEMISTRY (41503)

The Department of Pure and Applied Chemistry offers a Masters' degree by full dissertation only. Normally a student shall not be admitted to the Masters' programme unless he or she has satisfied the Department's requirements for admission to postgraduate studies and has obtained an aggregate of at least 60% for the Honours degree. The Masters' degree comprises 256 credits. The Statute and the General Rules for the award of a Masters' degree apply.

Entry is through an approved BSc Honours degree in which Chemistry is 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 externally). 256 credits.

Guidelines for applicants: Prospective candidates should contact a member of the academic staff under whose supervision they would like to pursue a dissertation. Alternatively, applicants could approach the Head of Department that best suits their research interests and request contact with prospective supervisors. Only upon acceptance by a prospective supervisor, will candidates then submit their applications for admission via the University Admissions Office for approval and acceptance by the Head of the Department. The candidates will then be required to complete a memorandum of understanding (MoU), between them and their supervisor(s) for approval by the Dean (through the Head). Candidates will be required, after consultation with the prospective supervisor(s), to draw up a more detailed project proposal that will be presented to the Department in the presence of other Faculty Departments. The proposal must be approved before a candidate is allowed to progress with any research activities.

MASTER DEGREE STUDIES IN GEOGRAPHY

The Department of Geography and Environmental Science 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 Department of Geography and Environmental Science offers Masters' degrees by full dissertation, and by course-work and mini-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 post-graduate studies and has obtained an aggregate of at least 60% for the Honours degree at the first attempt. The Masters' degree comprises 256 credits. The Statute and the General Rules for the award of a Masters' degree apply.

MASTER OF SCIENCE IN GEOGRAPHY (41506)

GEG700 Master of Science in Geography (*Full Research*)

Purpose: To undertake and present independent research on a selected topic in Geography and Environmental Science

Students with a BSc Honours degree in Geography or an equivalent degree may be admitted to the MSc 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 final date for submission of the dissertation for examination is 30 November of each year, thereafter the student will be required to register for the subsequent year. 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, submission and passing 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: 256

THE MASTER OF PHILOSOPHY 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, and who have a BSc Honours degree or similar qualification. Students registered for the M Phil degree are required to successfully complete a coursework dissertation [(GEG 705/GEG 705E) (136 credits)], the Research Methodology and Research Report module [(GEG 701/GEG 701E) (40 credits)], plus two other modules (40 credits each). The GEG 701/GEG 701E and GEG 705/GEG 705E modules are compulsory. Total of 256 credits.

The M Phil programme is designed to run over a 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 (GEG701/GEG701E 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 any given year.

To graduate, students must successfully complete each of the four modules that they are registered for (including the dissertation).

The final date for the submission of the dissertation (GEG705/GEG705E) for examination is 30 November of each year, thereafter the student will be required to register for the subsequent 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 mini dissertation for the course-work Masters' Degree in Environmental Studies.

Contents: Analyze 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. Lectures extend over 13 weeks.

Credits: 40

Assessment: Continuous assessment through participation in discussions, assignments and tests

Co-requisite: GEG 707/GEG 707E

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 continuous 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 tests.

Credits: 40

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 continuous 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 tests.

Credits: 40

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: 40

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, analysing, 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.

Credits: 136

MASTER OF SCIENCE IN GEOLOGY (41517)

The Department of Geology offers Master degrees by full dissertation in:

Geology
Applied Geology
Engineering Geology
Geochemistry
Geophysics
Hydrogeology
Petroleum Geology,
Sedimentology,
Stratigraphy

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 or Applied 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: Students will be required to plan, execute and write-up a Masters' dissertation dealing with a topic of interest, selected with the assistance of their supervisor.
Contents: The student will select a project topic with the assistance of the supervisor.
Instruction: Teaching of research skills through supervision of a research project.
Credits: 256
Assessment: The candidate's dissertation will be assessed by two external examiners. The dissertation must make a contribution to the scientific knowledge and show evidence of individual and original scientific thought.
Prerequisite: An Honours qualification in Geology, Applied Geology or in a relevant discipline, subject to the recommendation of the Geology Head of Department and the Faculty.
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.

THE DEGREE DOCTOR OF PHILOSOPHY

S 14 Degree of Doctor of Philosophy (PhD)

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 disciplines:

		Qualification ID
Department of Biotechnology and Biological Sciences		
in Botany	43002	20685
in Entomology	43005	19218
in Microbiology	43009	19203
in Zoology	43011	3443
in Biochemistry	43012	20684
in Ethnobotany	43016	115319
Department of Computational Sciences		
in Applied Mathematics	43001	19232
in Computer Science	43004	80666
in Mathematical Statistics	43008	19205

in Physics	43010	19202
in Mathematics	43013	19212
in Applied Statistics	43014	20682
in Epidemiology	43015	115318
in Biostatistics	43018	115317

Department of Chemical and Earth Sciences

in Chemistry	43003	20687
in Geography	43006	20689
in Geology	43017	115320

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.

Department of Biotechnology and Biological Sciences

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 by three 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 recommendation the Head of the Depat of Biochemistry & Microbiology, and approval by the Faculty.

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 by three 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 recommendation of the Botany Head of Department and approval of the Faculty and Senate.

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 by three 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 recommendation of the Botany Head of Department and the approval by the Faculty.

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 three 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 subject to the recommendation of the Head of Department with the approval of the Faculty and the Senate.

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 Masters' 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 three 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 recommendation of the Head of the Department and approval of the Faculty and Senate.

Department of Computational Sciences

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 by three 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 recommendation of the Head of the Department and the Faculty.

DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE (43004)

CSC 800 Computer Science PhD Thesis.

Purpose: Students will be required to plan and execute independent original computing research activities leading to writing up a doctoral thesis on a topic of interest with the assistance of a supervisor.

Contents: Student chooses a modern computing research topic in conjunction with a supervisor, which must be approved by the Research Committee of the University after presentation in the department.
Instruction: Teaching of research skills through the supervision of research project.
Credit: 360
Assessment: The Candidate will be assessed by three external examiners on the basis of the submitted thesis. The thesis submitted should demonstrate the candidate's ability to undertake independent research (including a comprehensive literature review on the chosen computing topic) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must reflect the original work of the candidate and must also contribute to knowledge in the chosen area of computer science specialisation.
Prerequisite: MSc in any area of Computer Science or other equivalent qualification, subject to the recommendation of the Head of Department and approval of the Faculty and Senate.

DOCTOR OF PHILOSOPHY IN MATHEMATICAL STATISTICS (43008)

STM 800: Mathematical Statistics PhD Thesis
Purpose: Students 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: The Candidate will be assessed by three external examiners on the basis of the submitted thesis. The thesis submitted should demonstrate the candidate's ability to undertake independent research (including a comprehensive literature review on the chosen topic) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must reflect the original work of the candidate and must also contribute to knowledge in the chosen area of specialization.
Prerequisite: MSc in any area of Mathematical Statistics or other equivalent qualification, subject to the recommendation of the Head of Department and approval of the Faculty and Senate.

DOCTOR OF PHILOSOPHY IN APPLIED STATISTICS (43014)

STA 800: Applied Statistics PhD Thesis
Purpose: Students 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: The Candidate will be assessed by three external examiners on the basis of the submitted thesis. The thesis submitted should demonstrate the candidate's ability to undertake independent research (including a comprehensive literature review on the chosen topic) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must reflect the original work of the candidate and must also contribute to knowledge in the chosen area of specialization.

Prerequisite: MSc in any area of Applied Statistics or other equivalent qualification, subject to the recommendation of the Head of Department and approval by the Faculty.

DOCTOR OF PHILOSOPHY IN EPIDEMIOLOGY (43015)

STE 800: Epidemiology PhD Thesis

Purpose: Students 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: The Candidate will be assessed by three external examiners on the basis of the submitted thesis. The thesis submitted should demonstrate the candidate's ability to undertake independent research (including a comprehensive literature review on the chosen topic) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must reflect the original work of the candidate and must also contribute to knowledge in the chosen area of specialization.

Prerequisite: MSc in any area of Epidemiology or other equivalent qualification, subject to the recommendation of the Head of Department and approval by the Faculty.

DOCTOR OF PHILOSOPHY IN BIOSTATISTICS (43018)

STB 800: Biostatistics PhD Thesis

Purpose: Students 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: The Candidate will be assessed by three external examiners) on the basis of the submitted thesis. The thesis submitted should demonstrate the candidate's ability to undertake independent research (including a comprehensive literature review on the chosen topic) and his/her grasp of the research methods and analytical techniques of the chosen field. In addition, the thesis must reflect the original work of the candidate and must also contribute to knowledge in the chosen area of specialization.

Prerequisite: MSc in any area of Biostatistics or other equivalent qualification, subject to the recommendation of the Head of Department and approval by the Faculty.

DOCTOR OF PHILOSOPHY IN MATHEMATICS (43013)

MAT 800: 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 by three 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 Mathematics, subject to the recommendation of the Head of the Department and approval by the Faculty.

DOCTOR OF PHILOSOPHY IN PHYSICS (43010)

PHY 800: **Physics PhD Thesis**

Purpose: Students will be required to plan and carry out research work to generate original data, new knowledge and novel findings in the field of Physics.

Contents: Students will liaise with the supervisor to select a research topic in the Field of Physics.

Instruction: Students will liaise with the supervisor to select a research topic in the Field of Physics.

Credit: 360

Assessment: The research work will be compiled in the form of a thesis that will be assessed by at least three external examiners.

Prerequisites: Master of Science in Physics or any other related discipline subject to the recommendation of the Head of the Department and by Faculty approval.

PHY 800: Physics PhD Thesis

Purpose: Students will be required to plan and carry out research work to generate original data, new knowledge and novel findings in the field of Physics.

Contents: Students will liaise with the supervisor to select a research topic in the Field of Physics.

Instruction: Students will liaise with the supervisor to select a research topic in the Field of Physics.

Credit: 360

Assessment: The research work will be compiled in the form of a thesis that will be assessed by at least three external examiners.

Prerequisites: Master of Science in Physics or any other related discipline subject to the recommendation of the Head of the Department and by Faculty approval.

DOCTOR OF PHILOSOPHY IN CHEMISTRY (43003)

CHE 800 Chemistry PhD thesis

Purpose: Students 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 by three external examiners on the basis of the submitted thesis. The thesis 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 Chemistry with weighted average of 65% or higher in the final MSc result, subject to the recommendation of the Head of the Department of Chemistry and approval by the Faculty. Candidates who are in possession of Master of Technology (M Tech) will not be considered for PhD program; instead, they will be encouraged to apply for Master of Science (MSc).

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 with 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: MSc in Geography or other equivalent qualification, subject to the recommendation of the Head of Department and approval of the Faculty and Senate. A minimum mark of 60% achieved for the master's degree would normally apply.

DOCTOR OF PHILOSOPHY IN GEOLOGY (43017)

GLG 800 Geology PhD thesis

Purpose: The student will be required to plan and execute independent original research activities leading to writing up a doctoral thesis on a topic of interest on one of the fields of Geology and Applied Geology

Contents: The student will select a topic with the assistance of a supervisor, which must be approved by the Research Committee of the University. Normally the choice of research topic is contingent on the specialist areas of research of academics.

Instruction: Teaching of research skills through the supervision of research project.

Credit: 360

Assessment: The candidate's thesis will be assessed by three 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. 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.

Prerequisites: MSc in any area of Geology, Applied Geology or other equivalent qualification, subject to the recommendation of the Head of Department and approval by the Faculty.

NOTES

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