

Faculty of Natural and Agricultural Sciences

Calendar 2007

Part 3: Postgraduate Programmes

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ACADEMIC STAFF

DEAN Professor H.D. van Schalkwyk

VICE DEAN Professor N.J.L. Heideman

PROGRAMME DIRECTORS

Actuarial Sciences and Risk Analysis	Mr K.N. Bekker
Agriculture	Prof. J.B. van Wyk
Architecture	Dr P.C. le Roux
Biological Sciences	Prof. J.J. Spies
Building Sciences	Mr F.H. Berry
Consumer Science	Prof. H.J.H. Steyn
Geosciences	Dr H.E. Praekelt
Information Technology	Dr L. de Wet
Mathematical Sciences	Prof. S.W. Schoombie
Physical and Chemical Sciences	Dr R.E. Kroon
Urban and Regional Planning	Ms G.M. Steenkamp

(Departmental Heads / Departmental Chairpersons / Qwaqwa Subject Heads are indicated with an asterisk)

AGRICULTURAL ECONOMICS

Professors	Prof. M.F. Viljoen, Prof. L.K. Oosthuizen
Associate Professor	*Prof. A. Jooste, Prof. B.J. Willemse
Professors Extraordinary	Prof. J.A. Groenewald, Dr C.F. le Clus
Senior Lecturer	Mr Z.G. Alemu
Lecturers	Mr B. Grové, Mr A.J. Jordaan, Mr P.R. Taljaard
Agricultural Engineering	
Senior Lecturer	Mr J.J. van Staden
Centre for Agricultural Management	
Head	Dr W.T. Nell
Lecturer	Ms N. Maine

ANIMAL, WILDLIFE AND GRASSLAND SCIENCES

Professors	*Prof. J.P.C. Greyling, Prof. G.N. Smit, Prof. H.A. Snyman, Prof. H.J. van der Merwe, Prof. J.B. van Wyk
Professors Extraordinary	Prof. A.J. Aucamp, Prof. G.J. Erasmus, Prof. J.P. Hayes, Prof. N.M. Loskutoff, Prof. M.M. Scholtz
Associate Professors	Prof. H.O. de Waal, Prof. F.W.C. Nesor
Senior Lecturer	Dr L.M.J. Schwalbach
Lecturers	Mr M.D. Fair, Ms K.C. Lehloenyana, Mr P.J. Malan
Junior Lecturers	Mr F.H. de Witt, Mr O.B. Einkamerer

ARCHITECTURE

Professor	Prof. P.G. Raman
Associate Professor	*Prof. J.D. Smit
Senior Lecturer	Ms P. Jooste-Smit
Lecturers	Dr P.C. le Roux, Mr G. Bosman, Mr J.L. du Preez, Mr J. Laubscher, Mr J.W. Ras, Mr G.P. Swart
Junior Lecturers	Mr H.B. Pretorius, Ms A. van der Merwe

CENTRE FOR CONFOCAL AND ELECTRON MICROSCOPY

Associate Professor	Prof. P.W.J. van Wyk
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CENTRE FOR ENVIRONMENTAL MANAGEMENT

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Senior Lecturer	Dr J.C. Roos
Lecturer	Ms M.F. Avenant

CENTRE FOR SUSTAINABLE AGRICULTURE

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Senior Lecturers	Dr H.G. Visser, Dr J. Conradie, Dr B.I. Kamara
Lecturers	Mr J.A. Venter, Mr E.H.G. Langner, Mr K. von Eschwege, Dr S.L. Bonnet
Subject Coordinators	Dr M. Versteeg, Ms R. Meintjes
Junior Lecturer	Mr T.N. Mtshali
Qwaqwa Campus	
Professor	Prof. A.S. Luyt
Senior Lecturer	Vacant
Lecturers	*Mr S.P. Hlangothi, Ms M.A. Mokoena, Ms B.G. Jacobs
Junior Lecturers	Ms D.G. Dikobe, Ms F.N. Stuurman, Mr R.G. Moji

COMPUTER SCIENCE AND INFORMATICS

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Senior Lecturer	Dr. L. de Wet
Lecturers	Mr D. du Plessis, Dr E. Nel, Ms E.H. Dednam, Dr A. van Biljon, Mr A.J. Burger
Junior Lecturer	Mr R.C. Fouché

Qwaqwa Campus

Junior Lecturers

*Mr B. Sebastian, Mr I. Mokhotla, Mr J. Eysele,
Mr M. Jonathan, Ms N.M. John, Mr F. Mudavandu,
Ms R. Wario**Vista Campus**

Lecturer

Junior Lecturers

Ms N. de Sousa

Mr R. Shih, Mr S.D. Ramatlotlo

GEOGRAPHY

Professor

Senior Lecturers

Lecturers

Junior Lecturer

Qwaqwa Campus

Associate Professor

Senior Lecturer

Lecturer

*Prof. P.J. Holmes

Dr C.H. Barker, Dr G.E. Visser

Ms S. Vrahimis, Ms T.C. Mehlomakhulu

Ms E. Kruger

Prof. W.F. van Zyl

*Dr J.H.D. Claassen

Mr A. Adjei

GEOLOGY

Professor-researcher

Associate Professors

Senior Lecturer

Senior Lecturer-researcher

Junior Lecturers

*Prof. W.A. van der Westhuizen

Prof. W.P. Colliston, Prof. R. Scheepers, Prof. M. Tredoux

Dr C.D.K. Gauert

Dr H.E. Praekelt

Ms A. Lombard, Mr N. Scholtz

INSTITUTE FOR GROUNDWATER STUDIES

Professor/Director

Professor

Lecturer/Researchers

*Prof. F.D.I. Hodgson

Prof. G.J. van Tonder

Dr I. Dennis, Dr B.H. Usher, Ms L. Cruywagen,

Mr P.D. Vermeulen

MATHEMATICS AND APPLIED MATHEMATICS

Professors

Senior Lecturer

Lecturers

Qwaqwa Campus

Associate Professor

Vista Campus

Associate Professor

* Prof. D.M. Murray, Prof. J.H. Meyer,

Prof. S.W. Schoombie, Prof. A.H.J.J. Clout

Dr H.W. Bargenda

Ms J.S. van Niekerk, Ms A.F. Kleynhans, Dr S. Dorfling,

Mr C. Venter

Prof J. Schröder

Prof. T. Acho

MATHEMATICAL STATISTICS

Professors	*Prof. D.J. de Waal, Prof. A.J. van der Merwe, Prof. M.S. Finkelstein
Senior Lecturers	Dr J.M. van Zyl, Dr I. Garisch
Lecturers	Mr A.M. Naudé, Ms L. van der Merwe, Mr D. Chikobvu, Ms C.S. Lombaard, Mr K.N. Bekker, Ms A. Nel, Mr M.J. von Maltitz, Mr S. van der Merwe
Vista Campus	
Professor	Prof. J.I. de Wet
Lecturer	Dr I. Kemp

MICROBIAL, BIOCHEMICAL AND FOOD BIOTECHNOLOGY

Professors	*Prof. J.C. du Preez, Prof. R.R. Bragg, Prof. S.G. Kilian, Prof. J.L.F. Kock, Prof. D. Litthauer, Prof. M.S. Smit, Prof. B.C. Viljoen
Professor Extraordinary	Prof. E. DaSilva, Prof. S. Nigam
Associate Professors	Prof. G. Osthoff, Prof. H-G. Patterson, Prof. H.J.H. Steyn
Affiliated Associate Professor	Prof. M.F. DeFlaun
Senior Lecturers	Dr J. Albertyn, Dr A. Hugo, Dr C.J. Hugo, Dr J. Myburgh, Dr E. van Heerden, Dr A. van Tonder
Affiliated Senior Lecturers	Dr C.P. Kenyon, Dr E.J. Lodolo
Lecturers	Ms C. Bothma, Dr M. de Wit, Dr L.A. Piater, Dr C.H. Pohl, Ms I. van der Merwe
Junior Lecturers	Ms J.S. van Zyl, Ms P.Z. Swart

PHYSICS

Professor	*Prof. H.C. Swart
Associate Professors	Prof. W.D. Roos, Prof. P.J. Meintjes, Prof. J.J. Terblans
Senior Lecturers	Dr M.J.H. Hoffman, Dr R.E. Kroon
Lecturer	Dr O.M. Ntwaeaborwa
Qwaqwa Campus	
Senior Lecturer	*Dr B.F. Dejene
Lecturers	Mr J.J. Dolo, Mr J.Z. Msomi, Mr R.O. Ocaya, Mr B.M. Mothudi

PLANT SCIENCES

Plant Pathology

Professors	*Prof. Z.A. Pretorius, Prof. W.J. Swart, Prof. N.W. McLaren
Lecturer	Ms W-M. Kriel

Genetics

Professor	Prof. J.J. Spies
Associate Professor	Prof. J.P. Grobler
Affiliated Associate Professor	Prof. A. Kotzé
Lecturers	Ms K. Ehlers, Dr A. Strydom

Botany

Professors	Prof. J.U. Grobbelaar, Prof. L. Scott, Prof. A.J. van der Westhuizen, Prof. R.L. Verhoeven
Senior Lecturer	Dr P.J. du Preez
Lecturers	Dr L. Mohase, Dr A.M. Venter, Dr B. Visser
Lecturer Researcher	Dr G.P. Potgieter

Plant Breeding

Professors	Prof. M.T. Labuschagne, Prof. C.S. van Deventer
Affiliated Associate Professors	Prof. R. Prins, Prof. J.B.J. van Rensburg
Senior Lecturer	Dr L. Herselman
Lecturer	Ms B.K. Mashope
Qwaqwa Campus	
Professor	Vacant
Lecturers	* Mr R. Lentsoane, Ms M.J. Moloi
Junior Lecturer	Mr T.R. Pitso

QUANTITY SURVEYING AND CONSTRUCTION MANAGEMENT

Professor	*Prof. J.J.P. Verster
Senior Lecturer	Dr H.J. Marx
Lecturers	Mr F.H. Berry, Mr B.J. Swart, Mr H.J. van Vuuren, Ms B.J. Kotzé, Mr P.M. Oosthuizen, Mr C. van Zyl

SOIL, CROP AND CLIMATE SCIENCES

Professors	*Prof. C.C. du Preez, Prof. J.C. Pretorius, Prof. L.D. van Rensburg, Prof. S. Walker
Senior Lecturers	Dr P.A.L. le Roux, Dr J. Allemann, Dr C.W. van Huyssteen
Lecturers	Ms A. Bothma-Schmidt, Dr G.M. Ceronio, Dr G.M. Engelbrecht , Ms L. de Wet, Ms E. Kotzé
Junior Lecturer	Mr A.S. Steyn

URBAN AND REGIONAL PLANNING

Professor	*Prof. J.J. Steyn
Senior Lecturer	Dr M.M. Campbell
Lecturers	Mr P.J. Potgieter, Ms E. Barclay

ZOOLOGY AND ENTOMOLOGY

Professors	*Prof. J.G. van As, Prof. O.B. Kok, Prof. S. v.d. M. Louw, Prof. T.C. de K. van der Linde, Prof. L. Basson
Professors Extraordinary	Prof. G.L. Prinsloo, Prof. L.J. Fourie
Senior Lecturer	Dr L.L. van As
Lecturers	Ms E.M.S.P. van Dalen, Mr H.J.B. Butler, Mr C.R. Haddad,
Junior Lecturer	Ms C. Jansen van Rensburg Mr J. Parau
Qwaqwa Campus	
Lecturers	*Dr M. Cunningham, Mr S. Mtshali

POSTGRADUATE PROGRAMMES

Honours Degrees (NQF level 7)

The following Honours Degrees are awarded by the Faculty:

Degree	Abbreviation	Study code
Baccalaureus Scientiae Honores	B.Sc.Hons.	4500
Baccalaureus Scientiae Honores in Home Economics	B.Sc.(Home Ec.)Hons.	4550
*Baccalaureus Honores in Spatial Planning	B.Hons.S.P.	4543
*Baccalaureus Honores in Soil and Property Development Management (Housing)	B.Hons.S.P.D.M.	4544

* For information see Calendar Part 2.

INFORMATION

1. The Honours Degree is awarded in the following fields of study:

Behavioural Genetics, Biochemistry, Biotechnology, Botany, Chemistry, Clinical Psychology, Computer Information Systems, Construction Management (See Calendar Part 2), Counselling Psychology, Entomology, Food Science, Genetics, Geography, Geohydrology, Geology, Home Economics, Limnology, Mathematics and Applied Mathematics, Mathematical Statistics, Microbiology, Plant Health, Plant Molecular Biology, Psychology, Physics, Soil Science, Statistics, Quantity Surveying (See Calendar Part 2), Wildlife, Zoology.

2. Departments may prescribe additional modules in terms of general regulation A 56(c).
3. Honours students who take more than one year to complete the degree, must register annually according to the regulations of the particular year.
4. **Departmental Prerequisites/Requirements**

A department may set prerequisites/requirements as mentioned below and the final decision regarding the application thereof rests with the Departmental Chairperson.

5. **Module codes**

It should be noted that the numerical part of the module codes for honours modules does not consistently have the same meaning as that of undergraduate modules. The alphabetical part specifies the module name. The number 6 indicates that it is an honours module, while the second and third numbers are simply linked to the particular topic. It should thus be established in consultation with the Departmental Chairperson when the examination for a specific module will take place.

Honours Degree in the subject	Prerequisite/Requirement
Behavioural Genetics	Genetics and/or Psychology at third year level.
Biochemistry	Biochemistry at third year level.
Biotechnology	Biotechnology or Biochemistry or Microbiology at third year level or else in consultation with the Departmental Chairperson.
Botany	Botany at third year level.
Chemistry	(WTW114 or WTW134) + (WTW124 or WTW144). An average pass mark of 60% in (CEM314 + CEM334 + CEM324 + CEM344).
Computer Information Systems	Computer Information Systems at third year level.
Entomology	Entomology at third year level.
Food Science	Food Science at third year level.
Genetics	Genetics at third year level or an equivalent module.
Geology	Geology at third year level, at least 64 credits. Average 60%.
Geography	Geography at third year level or equivalent Geography III at another university. 64 credits. Average of 60%.
Geohydrology	A degree in Engineering or a B.Sc. or a B.Sc. (Agric.) degree.
Grassland Science	Grassland Science at third year level.
Home Economics	B.Sc. Home Ec., B. Consumer Science or an equivalent qualification.
Limnology	A B.Sc. or B.Sc.Agric. degree with at least one of the following as major: Biochemistry, Chemistry, Zoology, Entomology, Physics, Soil Science, Microbiology, Botany, Mathematics.
Mathematics and Applied Mathematics	Mathematics and Applied Mathematics at third year level or equivalent modules.
Mathematical Statistics	Mathematical Statistics at third year level.
Microbiology	Microbiology at third year level.
Physics	An average pass mark of 60% in (FSK314 + FSK332 + FSK352 + FSK324 + FSK342 + FSK362).
Plant Health	Plant Health or equivalent modules at third year level.
Plant Molecular Biology	Appropriate Botany or equivalent modules at third year level in consultation with the Departmental Chairperson.
Soil Science	Soil Science at third year level.
Statistics	Statistics at third year level.
Wildlife	Grassland Science at third year level or equivalent modules in consultation with the Departmental Chairperson.
Zoology	Zoology at third year level.

REGULATIONS

Reg. D28 - Admission

- (a) The general regulations in respect of Honours degrees are with the necessary modifications applicable to this Faculty.
- (b) In addition to the provisions of the general regulations in respect of Honours degrees, a student must comply with the particular regulations of the Faculty.
- (c) Students also must apply to the Departmental Chairperson for admission to the Honours degree.

- (d) In addition to the stipulations of the General Regulations A56(b) a student must also pass the Agriculture Datametrics modules, DMT214 and DMT224, before receiving the degree in Soil Science, Wildlife Science and Grassland Science. Students who have applicable modules in Mathematical Statistics may be exempted by the Dean.

Reg. D29 - Presentation

The study material for the Honours degree is presented in the form of either semester modules or year modules.

Semester modules are selected in the following fields of study:

Astronomy, Behavioural Genetics, Biochemistry, Biotechnology, Botany, Chemistry, Computer Information Systems, Entomology, Environmental Management, Genetics, Geochemistry, Geography, Geohydrology, Geology, Limnology, Mathematics and Applied Mathematics, Mathematical Statistics, Microbiology, Plant Health, Plant Molecular Biology, Psychology, Physics, Statistics, Zoology.

Year modules are only presented in Home Economics.

Times at which examinations are conducted: See Reg. A63.

Reg. D30 - Curricula

(a) Behavioural Genetics - Study code 4519

This course is presented jointly by Genetics and Psychology for students who majored in these subjects. Students should apply for admittance to the Honours degree in Behavioural Genetics on the prescribed form. These forms should be completed and handed to the Programme director at the beginning of the second semester. Selection will take place during September.

The Honours degree in Behavioural Genetics comprises four compulsory modules (GEN634, GEN693, GGS693 and GGS692) and two modules of choice from the list in consultation with the Programme director.

The modules start on a date determined by the Programme director.

Compulsory modules

		Credits
GEN634	- Behavioural Genetics	16
GEN693	- Literature study	24
GGS692	- Research essay	32
GGS693	- Research: Literature study	24

Modules of Choice

SIL613	- Psychopathology	12
SIL614	- Developmental Psychology	12
XXX000	- Advanced related specialized course(s) with a similar credit value	12

(b) Biochemistry - Study code 4511

The curriculum is compiled in consultation with the Departmental Chairperson. The course commences in January or July on a date determined by the Departmental Chairperson.

The Honours degree in Biochemistry consists of modules with a total credit value of 128. In addition to BOC614, BOC622, BOC693 and BOC692 that are compulsory, the student can select BOC654

or any other equivalent (credit value) module in Microbiology, Biotechnology, Genetics, Chemistry or any other discipline, in consultation with the Departmental Chairperson.

Modules		Credits
BOC614	- Techniques in Biochemistry	16
BOC634	- Enzymology	16
BOC654	- Advanced protein structure and function	16
BOC674	- Advanced molecular biology	16
BOC622	- Oral examination in theory and practical	8
BOC693	- Research: Literature study	24
BOC692	- Research essay	32

(See syllabi for module contents.)

(c) Biotechnology - Study code 4512

The curriculum is compiled in consultation with the Chairperson. Studies commence in January or July on a date determined by the Departmental Chairperson.

The Honours degree in Biotechnology consists of modules with a total credit value of 128. Apart from BTG622, BTG693, BTG692, BTG634 and BTG614/BOC614, which are compulsory, the student must select additional honours modules from the Microbiology, Biotechnology and Biochemistry syllabi. One 16 credit module from any other discipline (e.g. Genetics, Chemistry or Food Science) may be chosen in consultation with the Departmental Chairperson.

Modules		Credits
BTG614	- Techniques in Biotechnology	16
BTG634	- Continuous and batch culture of micro-organisms	16
BTG622	- Oral exam on theory and practical work	8
BTG693	- Research: Literature study	24
BTG692	- Research essay	32
BOC634	- Enzymology	16
BOC654	- Advanced protein structure and function	16
BOC674		
or		
MKB674	- Advanced molecular biology	16
MKB634	- Microbial diversity	16
MKB654	- Applied microbial physiology	16

(For syllabus see under Microbiology.)

(d) Botany - Study code 4530

For the Honours degree in Botany PWS614, PLK692 and PLK693 are compulsory, whereas three other modules of choice have to be selected from the list below, in consultation with the division head. An examination paper of three hours must be answered in each of the modules of choice. For PLK692 and PLK693 a written report and oral presentation is required. After completion of module PWS614 an oral examination is undertaken.

The course starts on a date as determined by the division head.

Compulsory modules			Credits
PWS614	-	Research techniques	16
PLK693	-	Research: Literature study	24
PLK692	-	Research essay	32
Modules of Choice:			
PLK614	-	Plant ecology	16
PLK624	-	Plant physiology I (Metabolism and growth)	16
PLK634	-	Algal biotechnology	16
PLK644	-	Plant physiology II (Plant defence and applications)	16
PLK654	-	Limnobotany	16
PLK664	-	Plant diversity and taxonomy of higher plants	16
PLK674	-	Micromorphology and ultrastructure	16
PLK684	-	Palynology and palaeo-environments	16
XXX000	-	Advanced specialized module in the Faculty of Natural and Agricultural Sciences	16
PWS634	-	Plant molecular applications	16

(e) Chemistry

After successful completion of the learning programme for the Honours degree. The candidates will be able to provide evidence of the acquisition of sophisticated theoretical subject knowledge as well as understanding and insight of the Chemistry discipline and also the acquisition and development of competencies with respect to experimental procedures and techniques, critical appreciation of literature and independent analysis of information and observed experimental data in support of conclusions and deductions.

1. General requirements

The student must have achieved an average mark of at least 60% for (CEM314 + CEM 334 + CEM324 + CEM 344) to qualify for admission to the Honours degree. The Departmental Management may deviate from the above conditions and grant permission for admission to the Honours degree in exceptional cases. The programme commences in middle January.

2. Curricula

2.1 Chemistry - Study code 4513

Modules		Credits
CEM614	Inorganic Chemistry	16
CEM634	Physical Chemistry	16
CEM654	Organic Chemistry	16
CEM674	Analytical Chemistry	16
Modules		
CEM624	Inorganic Chemistry	16
CEM644	Physical Chemistry	16
CEM664	Organic Chemistry	16
CEM684	Special topics in Inorganic, or Physical or Organic or Analytical Chemistry	16

2.2 Chemistry and Management - Study code 4515

Modules		Credits
CEM614	Inorganic Chemistry	16
CEM634	Physical Chemistry	16
CEM654	Organic Chemistry	16
CEM674	Analytical Chemistry	16

Modules		Credits
OBS623*	Project Management	16
OBS615*	Entrepreneurship	16
OBS611*	Advanced Strategic Management	16
OBS692*	Research essay	32

* Presented by the Faculty of Economic and Management Sciences.

2.4 Explanation

The module contents are compiled in such a way as to facilitate research activities of the department. The learning programme includes topics like reaction kinetics, crystallography, organic synthesis, computer modeling, thermodynamic applications, industrial processes, catalysis and syntheses applicable to the inorganic, organometallic, biological and medical fields. It also covers aspects from electrochemistry, macromolecular, polymer, bioinorganic, natural product and structural chemistry. Each module has a theoretical and practical component.

Assessment (Per module)

Continuuous: (40%) Progress tests, assignments and a practical mark.
Formal: (60%) A written assessment of 2 hours.

(f) Computer Information Systems - Study code 4532

N.B.: "Information Technology" will be referred to as "IT" hereafter .

The content of the degree may be compiled in two ways, namely:

- (i) Computer Information Systems, **or**
- (ii) IT Management

For both options students must have a total of 120 credits to obtain the Honours degree.

(i) Computer Information Systems

In consultation with the Departmental Chairperson, a research essay (RIS692 - 40 credits) plus **five** modules are decided upon. A maximum of two approved modules offered by other departments may be taken. It is compulsory to commence with the essay at the start of the Honours degree. In support of the essay, it may be expected of students to pass an approved module in research methodology. Students are also required to complete at least one student assistantship.

(ii) IT Management

In consultation with the Departmental Chairperson, a research essay (RIS692 - 40 credits) plus **five** modules are decided upon. The **five** modules are compiled from the three categories, IT Management, General IT and General Management, as follows:

- One module from IT Management,
- Two modules from IT and
- Any two approved modules (General Management) offered by the Department of Business Management and/or the Department of Industrial Psychology.

MODULES

The list below depicts the modules offered as well as their relative categories. Please note that all these modules are not necessarily offered every year.

IT Management

Modules		Credits
RIS601	- Network Management	16
RIS610	- Business Expert Systems	16
RIS612	- Management Information Systems	16
RIS613	- Project Management	16
RIS614	- Decision Support Systems	16
RIS625	- Data Warehousing and Mining	16
RIS627	- <i>Capita Selecta</i>	16
RIS628	- <i>Capita Selecta</i>	16
RIS629	- <i>Capita Selecta</i>	16
RIS630	- <i>Capita Selecta</i>	16

General IT

Modules		Credits
RIS604	- Security	16
RIS606	- Theory of Algorithms (prerequisite WTW224)	16
RIS608	- Artificial Intelligence	16
RIS609	- Knowledge based systems	16
RIS615	- Human-Computer Interaction	16
RIS616	- Networks	16
RIS617	- Object Design	16
RIS618	- Ethics	16
RIS619	- Internet Programming	16
RIS621	- <i>Capita Selecta</i>	16
RIS622	- <i>Capita Selecta</i>	16
RIS623	- <i>Capita Selecta</i>	16
RIS624	- <i>Capita Selecta</i>	16
RIS626	- <i>Capita Selecta</i>	16

General Management

Options from Department of Business Management		Credits
OBS634	- Project Management	16
OBS644	- International Management	16
OBS654	- Entrepreneurship	16
OBS664	- E-Commerce	16
Options from Department of Industrial Psychology		Credits
HUM644	- Human Resource Management	16
ORG644	- Organisation Psychology	16

(g) Entomology - Study code 4517

For the Honours degree in Entomology the modules ENT614, ENT622, ENT632, ENT642 and ENT692 are compulsory, whilst, in concurrence with the subject head, three other modules must be elected from the list below. An examination of three hours must be written in each of the elective modules as well as in ENT632. Continuous assessment and internal examination takes place in ENT614, ENT622 and ENT642 whilst for ENT692 a written report, oral presentation and oral examination is required.

Compulsory modules		Credits
ENT614	- Research Techniques, Scientific Methodology and Scientific Communication	16
ENT622	- Quantitative Ecology	8
ENT632	- Biodiversity (Evolution & Biogeography)	8
ENT642	- The Environment	8
ENT692	- Research essay	32
Choice Modules (Select 3)		
ENT654	- Insect - Plant Interactions	16
ENT664	- Medical and Veterinary Entomology	16
ENT674	- Forensic Entomology	16
ENT684	- Pest Management	16
ENT694	- <i>Capita selecta</i>	16
XXX000	- Related module preferably in Faculty of Natural and Agricultural Sciences. Module choice subject to approval and same number of credits	16

(h) Environmental Management - Study code 4528

Environmental Management does not offer an Honours program, but offers two courses each with Zoology (DRK622 and DRK642) and Entomology (ENT622 and ENT642) and the following module, which will be available as an option in other Honours programmes (e.g. Module 694). Presentation of this course depends on the number of applicants and selection by the Director of the Centre for Environmental Management in conjunction with the leader of the particular Honours programme. The course will normally be presented in the first semester.

Optional module		Credits
MOB614	- Water Resource Management	16

(i) Food Science - Study code 4535

Students compile their curriculum in consultation with the Departmental Chairperson, depending on the undergraduate modules completed. The Honours degree in Food Science consists of modules with a total credit value of 128. Two modules, **VWS692** and **VWS601** or **VWS602** are compulsory. The student must select a further 64 credits from modules in Food Science or any other discipline in consultation with the Departmental Chairperson.

Module		Credits
VWS601	- Food Microbiology	32
VWS602	- Food Chemistry	32
VWS603	- Dairy Science	32
VWS604	- Meat Science	32
VWS605	- Foods	32

VWS607	-	Additional Food Science topics	32
VWS692	-	Seminar and laboratory project	32

(j) Genetics - Study code 4520

Students should apply for admission to the Honours degree in Genetics on the prescribed form. These forms should be completed and handed to the subject head at the beginning of the second semester. Selection will take place at the end of August.

The Honours degree in Genetics includes three compulsory modules, GEN686, GEN693 and GEN692 and three modules of choice selected in consultation with the subject head from the list below. All modules of choice have 3 hour examination papers. A written scientific paper and an oral presentation is required for GEN692 and GEN693. GEN686 will be evaluated internally and continuously.

The courses start on a date determined by the subject head.

Compulsory modules			Credits
GEN686	-	Research Techniques	24
GEN693	-	Research: Literature study	16
GEN692	-	Research essay	32
Modules of choice			
GEN614	-	Advanced cytogenetics	16
GEN624	-	Plant improvement	16
GEN634	-	Behavioral Genetics	16
GEN644	-	Advanced molecular systematics	16
GEN654	-	Molecular ecology	16
GEN664	-	Forensic DNA typing	16
GEN674	-	<i>Capita Selecta</i> Genetics	16
MBG604	-	Diagnostic molecular biology	16
PWS674	-	Plant transformation	16
XXX000	-	Advanced related specialized course(s) in the Faculty of Natural and Agricultural Sciences with a similar number of credits	16

(k) Geography - Study code 4521

A student must achieve an average pass mark of 60% for all Geography modules (64 credits) at third year level to be admitted to the Honours degree. In exceptional cases the department may grant admission by virtue of an oral or written evaluation in which the student displays up-to-date knowledge of the theory and principles of the subject. Depending on a student's academic background additional modules may be prescribed by the department. Proof of computer literacy is a prerequisite for GIS616 and GGF656 or GGF666. A student's skills in English will be assessed. If the student does not meet the required standard, additional modules (ENG104 or ENG108) will be prescribed. For admission to the examination, a semester mark or year mark of at least 50% is required for each module.

CURRICULUM

GEO616 and GEO692 are compulsory. Three modules (72 credits) from the rest with due consideration of co-requirements:

		Credits
GEO616	- Theoretical foundations of geography	24
GEO692	- Research essay	32
GGH636	- Urban geography	24
GGH646	- Urban geography	24
GGH676	- Tourism and Recreation geography	24
GGH686	- Tourism and Recreation geography	24
GGF616	- Environmental geography	24
GGF626	- Environmental geography	24
GGF636	- Applied geomorphology	24
GGF646	- Applied geomorphology	24
GIS616	- Geographical Information Systems (Intermediate)	24
GIS626	- Geographical Information Systems (Advanced)	24
GIS646	- Spatial analysis and modelling	24
GGF656	- Remote sensing and Image processing	24
GGF666	- Remote sensing and Image processing	24
GEO606	- <i>Capita Selecta</i> in Geography	24
XXXXYY	- An examination paper in a relevant field of study, for which admission has been granted. (Use the applicable course code)	24

(For transitional regulations see Annexure B)

(l) Geohydrology - Study code 4524

The student compiles his/her curriculum in consultation with the Departmental Chairperson. The curriculum shall consist of at least six semester modules (120 credits). Additional modules of other departments may be prescribed.

Modules		Credits
GHR611	- Groundwater hydraulics	20
GHR612	- Hydrochemistry and pollution	20
GHR613	- Groundwater geophysics	20
GHR621	- Groundwater modelling	20
GHR622	- Groundwater management	20
GHR623	- Case study	20

(m) Geology - Study code 4522

For admission to the Honours degree in Geology a student must achieve a combined average pass mark of 60% in four Geology modules (64 credits) at third year level. If not, the student may be allowed to complete the Honours degree over a period of two years.

Examination papers of three hours each are written in all modules except GLG693 where examination will be by an internal as well as an external examiner. Students compile their own curricula in consultation with the programme manager to acquire 60 credits for a pass mark at the end of the semester. GLG616 and GLG626 are compulsory core modules for students following the Geology Programme. GLG636 and GLG673 are compulsory for students taking the Environmental Geology Programme, while GLG636, GLG626, OBS623, OBS615, OBS611 and OBS692 compulsory modules are for the Programme in Geology and Management. Modules marked by an asterisk contain a practical component. To obtain admission to the examination in these modules a student must acquire a semester mark of at least 50% in the practical part of the module. The study starts either in January or July on a date as determined by the Department.

First semester			
Modules			Credits
GLG616*	-	Plate Tectonics	24
GLG636*	-	Mineralogy	24
GLG653*	-	Sedimentology	12
GLG656*	-	Structural Geology	24
GLG673*	-	Environmental Geochemistry	12
Second semester			
Modules			Credits
GLG626*	-	Economic Geology	24
GLG623*	-	Igneous Geology	12
GLG643*	-	Metamorphic Geology	12
GLG663*	-	Mineral Exploration	12
GLG683*	-	Forensic Geology	12
GLG693*	-	Short research essay	24
Electives			
**OGR424	-	Environmental- and Mining Law and policy	16
***OBS611	-	Advanced strategic management	16
***OBS615	-	Entrepreneurship	16
***OBS692	-	Mini dissertation	16
***OBS623	-	Project management	16

** Presented by the Faculty of Law.

*** Presented by the Faculty of Economic and Management Sciences.

(n) Grassland Science - Study code 4536

Four examination papers of three hours each, two in the first semester and two in the second semester as well as a seminar and an assignment/project in WDK693 is required.

Modules			Credits
WDK601	-	Rangeland physiology and ecology	24
WDK602	-	Rangeland management	24
WDK603	-	Intensive pasture production	24
or			
WDK605	-	Wildlife management	24
WDK604	-	Rangeland evaluation	24
WDK693	-	Seminars and short research essay	24

Any one of the above-mentioned modules can be replaced by an appropriate honours module from another field, in consultation with the Departmental Chairperson.

(o) Home Economics - Study code 4550

Three modules of 32 credits each and a research project (also 32 credits) selected in consultation with the Departmental Chairperson. A year mark of at least 50% is required for B.Sc.(Home Econ.) Hons.

Modules		Credits
HDK602	- Clothing industry	32
HDK603	- Social aspects of clothing	32
HDK604	- Textiles (fibres)	32
HDK605	- Textiles (construction and finishes)	32
HDK606	- Textile history	32
VDG601	- Nutrition	32
VWS605	- Foods	32
VWS606	- Cereal and Vegetable science	32
VWS607	- Advanced Foods	32
HDK692	- Research essay	32

(p) Limnology - Study code 4525

Limnology (the study and science of inland waters) is an interdisciplinary field of study that is presented at a postgraduate level by different departments under control of the Limnology Committee, which consists out of:

Dean

Programme Director

Two additional members and the committee has the right to co-option.

The study commences in January on a date as determined by the Programme Director. Admission to the programme depends on the Limnology Committee and applications must be submitted before November of the next year of study. Students must obtain a minimum of 120 credits to pass the course. The composition of the modules must be done in consultation with the Programme Director.

Compulsory modules		Credits
PWS614	- Research techniques	16
LIM693	- Research: Literature study	16
LIM692	- Research essay	32
PLK654	- Limnobotany	16
DRK674	- Aquatic Parasitology/Wetland ecology	16

Choice modules		Credits
MOB614	- Water Resource Management	16
DRK622	- Quantitative Ecology	8
DRK642	- The Environment	8
GIS616	- Geographical Information Systems (Intermediate)	24
PLK614	- Plant ecology	16
XXX000	- Advanced specialized module with a credit value of	16

(q) Mathematics and Applied Mathematics - Study code 4537

For admission to an Honours degree in Mathematics or Applied Mathematics a student needs third year Mathematics or Applied Mathematics, or their equivalents. **Students may be required to take additional undergraduate courses if their background need strengthening.** The Chairperson of the Department grants admission. The Honours degree consists of modules from the following list of 32-credit modules with a total credit value of at least 120. The curriculum is compiled in consultation with the Departmental Chairperson. Appropriate modules from other disciplines may also be included.

The 16- and 24-credit modules are available as service courses for other fields of study.

Module	Codes according to credits		
	16	24	32
	Service modules for other fields	WTW Honours	of study
Algebra	WTW604	WTW606	WTW608
Galois theory	WTW614	WTW616	WTW618
Topology	WTW624	WTW626	WTW628
Modern topology	WTW634	WTW636	WTW638
Functional analysis	WTW644	WTW646	WTW648
Measure and integration theory	WTW654	WTW656	WTW658
Coding theory	WTW664	WTW666	WTW668
Discrete Mathematics	WTW674	WTW676	WTW678
Set theory	WTW684	WTW686	WTW688
Group theory	WTW694	WTW696	WTW698
Ring theory	WTX604	WTX606	WTX608
Category theory	WTX614	WTX616	WTX618
Methods of Mathematics	WTX624	WTX626	WTX628
Digital image processing	WTX634	WTX636	WTX638
Numerical linear algebra	WTX644	WTX646	WTX648
Numerical solution of differential equations	WTX654	WTX656	WTX658
Optimisation	WTX664	WTX666	WTX668
Cryptography	WTX674	WTX676	WTX678
Partial differential equations	WTX684	WTX686	WTX688
Fluid mechanics	WTX694	WTX696	WTX698
Biological modeling	WTY614	WTY616	WTY618
Financial Mathematics	WTY644	WTY646	WTY648
<i>Capita Selecta</i>	WTY664	WTY666	WTY668
<i>Capita Selecta</i>	WTY674	WTY676	WTY678
Graph theory	WTY684	WTY686	WTY688
Research essay			WTW692

With the approval of the Departmental Chairperson continuous evaluation may be used in certain modules. A student passes only if each assignment is completed satisfactorily and a final mark of at least 50% obtained.

The final mark for any module other than the mini dissertation and continuous evaluation, is the end-of-semester examination mark, or a combination of this mark with the marks of assignments and other evaluations. To pass any module the student must obtain at least 50% in the examination and 50% for the combined final mark, when applicable.

(r) Mathematical Statistics - Study code 4538

Admission to the Honours degree is subject to the approval of the Departmental Chairperson.

The student needs 120 credits which entail six papers .

Modules		Credits
ATW605	- Actuarial Mathematics I	20
ATW609	- Mathematics of Finance and Economics	20
WKS601	- Bayes Analysis	20
WKS602	- Measure and Probability Theory	20

WKS603	-	Stochastic Processes	20
WKS605	-	Multivariate Analysis II	20
WKS606	-	Multivariate Methods	20
WKS607	-	Linear Model	20
WKS608	-	Categorical Data Analysis	20
WKS609	-	Bayes Analysis II	20
WKS610	-	Time Series Analysis	20
WKS611	-	<i>Capita Selecta</i>	20
WKS612	-	Reliability theory	20
WKS620	-	Stochastic Simulation	20

Approved topics from Statistics may be chosen in consultation with the Head of the Department, as well as a maximum of two approved topics from Mathematics, Applied Mathematics and Computer Information Systems.

(s) Microbiology - Study code 4526

The curriculum is compiled in consultation with the Departmental Chairperson at the Department of Microbial, Biochemical and Food Biotechnology. Studies commence in January or July at a date determined by the Departmental Chairperson.

Honours in Microbiology consists of modules with a total credit value of 128. Apart from MKB614, MKB622, MKB692 and MKB693, which are compulsory, the student must select additional Honours modules from the Microbiology and Biotechnology Honours syllabi. One 16 credit Honours module from any other discipline (e.g. Biochemistry, Genetics, Chemistry or Food Science) may also be chosen in consultation with the Departmental Chairperson.

Modules			Credits
MKB614	-	Techniques in Microbiology	16
MKB634	-	Microbial diversity	16
MKB654	-	Applied microbial physiology	16
MKB674	-	Advanced molecular biology	16
MKB622	-	Oral exam on theory and practical work	8
MKB693	-	Research: Literature study	24
MKB692	-	Research essay	32

(t) Physics

A student must have achieved an average mark of at least 60% in (FSK314 + FSK332 + FSK352 + FSK324 + FSK342 + FSK362) to qualify for admission to the Honours degree. The Departmental Chairperson may grant permission for admission to the Honours degree in exceptional cases. The programme commences in middle January and students must apply for admission with the Departmental Chairperson before that date.

(i) Physics - Study Code 4518

The curriculum is composed in consultation with the Departmental Chairperson from the modules listed below. The complete curriculum must consist of at least eight modules, plus the practical module FSK692 which is compulsory. Each module must be independently passed.

The degree can be offered over more than one year. Postgraduate modules from other subject disciplines can also be offered in consultation with the Departmental Chairperson.

Modules		Credits
FSK601	- Quantum Mechanics*	16
FSK602	- Solid State Physics I*	16
FSK603	- Research Techniques*	16
FSK604	- Mathematical Methods of Physics	16
FSK605	- Solid State Physics II*	16
FSK606	- Semi-conductors*	16
FSK607	- Statistical Physics	16
FSK608	- Electrodynamics	16
FSK609	- Materials Science I*	16
FSK610	- Materials Science II*	16
FSK611	- Electronics*	16
FSK612	- Astrophysics	16
FSK613	- <i>Capita Selecta I</i>	16
FSK614	- <i>Capita Selecta II</i>	16
FSK692	- Research essay*	32

Not all these topics are necessarily offered in a given year.

* Students wanting to do an M.Sc. in surface physics are strongly recommended to register for these courses.

(ii) Physics and Management - Study code 4545

Students who have completed the B.Sc. programme in Physics and Management (study code 4373) take in consultation with the Departmental Chairperson modules to a minimum of 80 credits from the Honours programme in Physics plus the following courses presented by the Faculty of Economic and Management Sciences:

Modules		Credits
OBS611	- Advanced strategic management	16
OBS615	- Entrepreneurship	16
OBS692	- Research essay	32
OBS623	- Project management	16

(u) Plant Health - Study Code 4529

For the honours course in Plant Health PPG692, PPG693 and PWS614 are compulsory, whereas three other modules have to be selected, in consultation with the division head, from PPG614, ENT654, PLK654 and PLK664. An examination paper of three hours must be answered in each of those selected from the latter modules. After completion of module PWS614 an oral examination is undertaken. Continuous assessment takes place in PPG696 and a project report is required for PPG692.

Compulsory modules		Credits
PWS614	- Research techniques	16
PPG693	- Research: Literature study	24
PPG692	- Research essay	32

Modules of choice

PLK614	-	Plant ecology	16
PLK664	-	Plant diversity and taxonomy of higher plants	16
PPG614	-	Ecology and biology of disease organisms	16
ENT654	-	Insect-plant interactions	16

One of the above-mentioned elective modules may be replaced by a suitable honours module from another field, in consultation with the division head.

(v) Plant Molecular Biology - Study code 4531

For the Honours degree in Plant Molecular Biology PWS614, PLK692 and PLK693 are compulsory, whereas three other modules have to be selected from the list below, in consultation with the division head. An examination paper of three hours must be written in each of the modules of choice. For PLK692 and PLK693 a written report and oral presentation is required. After completion of PWS614 an oral examination is undertaken.

The course commences on a date as determined by the division head.

Compulsory modules			Credits
PWS614	-	Research techniques	16
PLK693	-	Research: Literature study	24
PLK692	-	Research essay	32

Modules of choice

PLK624	-	Plant physiology I (Metabolism and growth)	16
PLK634	-	Algal biotechnology	16
PLK644	-	Plant physiology II (Plant defence and applications)	16
PWS634	-	Plant molecular applications	16
PWS674	-	Plant transformation	16
XXX000	-	Advanced specialized module in the Faculty of Natural and Agricultural Sciences with the same credit value	16

(w) Psychology - Study Code 4533

Prospective students for the Honours degree in Psychology must apply for selection to the course before registering. Successful students will receive written confirmation from the Head of the Departmental Chairperson.

Application forms are available on request from the Department of Psychology, UFS.

For detailed information, see the Calendar of the Faculty of Humanities.

(x) Soil Science - Study Code 4523

An examination of three hours is written in each of GKD601, GKD602, GKD603 and GKD604. Reports on the practical assignments in these four courses and two seminars on suitable topics are required in GKD693.

Modules			Credits
GKD601	-	Soil chemical principles and applications	24
GKD602	-	Soil physical principles and applications	24
GKD603	-	Soil genesis and evaluation	24

GKD604	-	Soil fertility and fertilization	24
GKD693	-	Research: Practical reports and seminars	24

Any one of the above-mentioned modules can be replaced by an appropriate under- or postgraduate module from another discipline, in consultation with the Departmental Chairperson.

(y) Statistics - Study code 4534

Admission to the Honours degree is subject to approval by the Departmental Chairperson.

The student needs 120 credits which entails six examination papers. STK602 (Mathematical Techniques) is compulsory for students who do not have the required mathematical background (eg. WTW114, WTW124).

Modules			Credits
STK601	-	Operational Research (I)	20
STK602	-	Mathematical Techniques	20
STK603	-	Econometrics	20
STK604	-	Non-parametric Methods	20
STK605	-	Decision Theory	20
STK606	-	Regression Analysis	20
STK607	-	Contingency Tables	20
STK608	-	Quantitative Forecasting	20
STK609	-	Multivariate Analysis I	20
STK610	-	<i>Capita Selecta</i>	20
STK611	-	Statistical Computer Software	20
STK620	-	Stochastic Simulation	20

Basic computer literacy is a strong recommendation. Approved modules may be chosen in consultation with the Departmental Chairperson from Mathematical Statistics, as well as a maximum of two approved modules from Mathematics, Applied Mathematics and Computer Information Systems.

(z) Wildlife - Study code 4527

Four examination papers of three hours each are written, two in the first and two in the second semester, and an assignment/project in NLE692 is required.

Compulsory modules			Credits
NLE601	-	Habitat preferences and diet selection of game	24
NLE602	-	Habitat evaluation and monitoring	24
NLE603	-	Integrated planning and practical environmental management practices	24
NLE692	-	Research essay	32
Choose one of the following:			
DRK664	-	Animal behaviour	16
	or		
ENT694	-	<i>Capita Selecta</i>	16

Any one of the above-mentioned modules can be replaced by an appropriate Honours module from another field of study, in consultation with the Departmental Chairperson.

(aa) Zoology - Study code 4516

For the Honours degree in Zoology the modules DRK614, DRK622, DRK632, DRK642 and DRK692 are compulsory, whilst, in concurrence with the discipline head, three other modules must be elected from the list below. An examination of three hours is written in each of the elective modules, as well as in DRK632, DRK614, DRK622 and DRK642 will be continuously evaluated and an internal examination will be written, whilst for DRK692 a written report, oral presentation and oral examination is required.

Compulsory modules			Credits
DRK614	-	Research Techniques, Scientific Methodology and Scientific Communication	16
DRK622	-	Quantitative Ecology	8
DRK632	-	Biodiversity (Evolution and Biogeography)	8
DRK642	-	The Environment	8
DRK692	-	Research essay	32
Choice Modules (Select 3)			
DRK654	-	Veterinary Ectoparasitology	16
DRK664	-	Animal Behavior / Veterinary Endoparasitology	16
DRK674	-	Aquatic Parasitology / Wetland ecology	16
DRK684	-	African Ornithology / Immunology	16
DRK694	-	<i>Capita selecta</i>	16
XXX000	-	Related module preferably in Faculty of Natural and Agricultural Sciences. Module choice subject to approval and same number of credits	16

Master's degrees

Degree	Abbreviation	Study code
(i) Magister Scientiae	M.Sc.	4700
(ii) Magister in Mineral Resource Management	MRM	4705
(iii) *Magister Architecturae	M.Arch.	4710
(iv) *Magister Scientiae(Quantity Surveying)	M.Sc.(Q.S.)	4720
(v) Magister Scientiae(Clinical Psychology)	M.Sc.(Clinical Psychology)	4740
(vi) Magister Scientiae (Counselling Psychology)	M.Sc.(Counselling Psychology)	4750
(vii) *Magister in Urban and Regional Planning	M.U.R.P.	4760
(viii) *Magister in Urban and Regional Planning	M.U.R.P.	4762
(ix) Magister Scientiae in Home Economics	M.Sc.(Home Ec.)	4770
(x) * Magister Scientiae (Construction Management)	M.Sc.(Construction Management)	4780
(xi) Magister in Environmental Management	M.E.M.	4790
(xii) *Magister in Property Science	M.PROP.	4791

* For information see Calendar Part 2.

MAGISTER SCIENTIAE **Study code 4700**

M.Sc.

INFORMATION

The Master of Science degree is awarded in the following fields of study:

Applied Mathematics, Astronomy, Behavioural Genetics, Biochemistry, Biotechnology, Botany, Chemistry, Clinical Psychology, Computer Information Systems, Counseling Psychology, Entomology, Food Science, Genetics, Geography, Geohydrology, Geology (GLG), Grassland Science, Limnology, Mathematical Statistics, Mathematics, Microbiology, Mineral Resource Management (MRM), Physics, Plant Molecular Biology, Plant Pathology, Psychology, Soil Science, Statistics, Wildlife, Zoology.

- Students who enrol for the Master's degree by dissertation, register under the code 4792.
- Students who enrol for the one year structured Master's degree, register under the code 4793.
- Students who enrol for the two year structured Master's degree, register under the code 4794.

Module codes

In cases where an M.Sc. degree consists only of a dissertation (at least 120 credits), the alphabetical part which refers to the module code is followed by the number 700.

In cases where the M.Sc. degree consists of both course work and research related assignments the alphabetical part refers to the module name and the number 7 to the fact that it is a Master level module. It must be noted that the second and third numbers do not always have the same meaning as that of undergraduate modules.

REGULATIONS

Reg. D31 - Admission

- (a) Candidates have to apply to the Departmental Chairperson for admission to Master's degree studies.
- (b) The general regulations of the University in respect of Master's degrees apply with appropriate modification to this Faculty.
- (c) In addition to the provisions of the general regulations for Master's degrees, a candidate must comply with the regulations of this Faculty.
- (d) In consultation with the supervisor and on the recommendation of the supervisor(s), the Departmental Chairperson and the Research Committee of the Faculty, a candidate who has been admitted for the Master's degree in terms of Reg. A80 may, after a study and registration period of at least one year, apply to be allowed to continue his/her studies at the Ph.D. degree level. Following admission to the Ph.D. degree, at least two years must elapse before the Ph.D. degree can be conferred. The period of study for the degree will therefore be at least three years.

The M.Sc. degree may be conferred upon a candidate if:

- (i) the candidate withdraws his candidature for the Ph.D. degree, or
- (ii) his candidature for the Ph.D. degree is cancelled, or
- (iii) the candidate does not meet the requirements for the Doctor's degree.

Reg. D32 - Pass requirements

(a) Pass requirements

In addition to the general regulations, the following also applies:

The Departmental Chairperson will, in respect of each candidate, submit to the Administration the marks obtained for the examination papers as required, as well as a statement that the candidate has met all the departmental provisions. The conferment of the Master's degree will be subject to this.

(b) Relative weight per question paper

The examination papers and dissertation carry relatively the same weight, unless otherwise stated by the Departmental Chairperson.

Reg. D33 - Requirement(s)

In the following fields of study, namely Biochemistry, Biotechnology, Botany, Chemistry, Entomology, Genetics, Geology, Grassland Science, Limnology, Microbiology, Plant Molecular Biology, Plant Pathology, Psychology,* Soil Science, Wildlife and Zoology, a dissertation is required.

A candidate must do research on an approved topic for at least two semesters, in consultation with the Departmental Chairperson, in preparation for a dissertation that shall be submitted as the only requirement for the degree.

The candidate will present at least one seminar/research report in each year in accordance with departmental regulations.

* For full details consult Calendar, Faculty of Humanities.

(a) Chemistry - Study code 4792

After successful completion of the learning programme for the Master's degree the candidate will be able to provide evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate evaluation of his/her own results and as well as that of others by production of a thesis which places his/her research in broader context and which is capable of withstanding international intellectual scrutiny.

Admission to this option is a B.Sc. Honours degree in Chemistry with study code 4513.

A dissertation (subject code CEM700) (120 credits) is required for the conferment of the degree. For at least two semesters a candidate does research work on an approved topic in one of the following research areas, namely: Inorganic, Analytical, Physical, or Organic Chemistry of the department and a dissertation in which the research results are thoroughly presented, has to be submitted. An oral examination can be required after submission of the dissertation.

Information

Candidates from learning programmes 4514 and 4515 who wish to follow this option have to consult the Departmental Chairperson as it can be required that additional modules be taken.

(b) Physics

In consultation with the Departmental Chairperson, a choice may be made between the following two options:

- (i) Study code 4792: A dissertation (FSK700) (120 credits): In consultation with the Departmental Chairperson a candidate must do research on an approved topic for at least two semesters, in preparation for a dissertation that will be submitted as the only requirement for the degree. An oral examination may be required which will be arranged with the candidate after the dissertation has been submitted.
- (ii) Study code 4793: Candidates in the National Astrophysics and Space Science Programme (NASSP) must do an Extended research essay (FSK791) (80 credits) on an approved subject, in consultation with the Departmental Chairperson, after having already completed a theoretical course component (FSK725 - Astrophysics and Space Science) (80 credits) presented by the University of Cape Town (UCT), consisting of a total of 5 UCT weight points from the NASSP Master's programme (www.star.ac.za). An oral examination may be required which will be arranged with the candidate after the extended research essay has been submitted.

(c) Geography

The course requires:

GEO700 - A dissertation (120 credits) after completion of an Honours (or equivalent) degree in Geography.

(d) Geology/Mineral Resource Management

A dissertation (GLG700 or MRM700) (120 credits)

For admission candidates with a B.Sc. Honours degree or an equivalent qualification (NQF level 7) in Geology or related subjects will be considered by the Department. A suitable subject for the dissertation will be decided upon in consultation with the Departmental Chairperson.

(e) Geohydrology

Candidates in possession of a B.Sc.Hons. degree in Geohydrology or an equivalent degree may enrol for GHR700. Additional course work may be prescribed where candidates do not have the required background in geohydrology. A suitable subject for a dissertation will be decided upon in consultation with the Departmental Chairperson.

(f) Limnology

Candidates in possession of a B.Sc.Hons. degree in Limnology are admitted to this course, for which a dissertation (LIM700 - 120 credits), based on an approved research project, is required. Persons in possession of a B.Sc.Hons. or B.Sc.Agric.Hons. degree in a related field of study must, in addition to the dissertation, successfully complete theoretical work and assignments (4) in Limnology in order to gain Honours status in Limnology before the dissertation is handed in for examination.

The Limnology Committee will appoint supervisors and decide in which department a candidate will register.

(g) Computer Information Systems

N.B.: "Information Technology" will be referred to as "IT" hereafter.

The following two options apply:

- (i) A Research Master's degree, or
- (ii) An IT Management Master's degree

For both options candidates must have a total of 120 credits to obtain the Master's degree. All candidates have to pass an approved module in research methodology.

Research Master's degree

A dissertation (RIS700 - 120 credits), covering an approved subject of Computer Information Systems, is required.

Management Orientated IT Master's degree

An Honours degree in Computer Information Systems (the IT Management choice) or an equivalent thereof is a prerequisite.

In consultation with the Departmental Chairperson, **six** of the modules mentioned below are decided upon. A subject already taken at Honours level may not again be presented at Master level. Please note that all the modules are not necessarily offered every year. The **six** modules must be compiled out of the three categories, Management Orientated IT, General IT and General Management, as follows:

- Choose **two** modules from Management Orientated IT plus a short research essay. It is compulsory that RIS793 (short research essay) be taken as one of the modules. The short research essay (30 credits) represents the 25% research component of the degree.
- Choose **three** General Management modules from the School of Management's MBA-program.

The list below depicts the IT modules offered as well as their relative categories.

IT Management		Credits
RIS701	- Network Management	24
RIS710	- Business Expert Systems	24
RIS712	- Management Information Systems	24

RIS713	-	Project Management	24
RIS714	-	Decision Support Systems	24
RIS725	-	Data Warehousing and Mining	24
RIS727	-	<i>Capita Selecta</i>	24
RIS728	-	<i>Capita Selecta</i>	24
RIS729	-	<i>Capita Selecta</i>	24
RIS730	-	<i>Capita Selecta</i>	24

General IT			Credits
RIS704	-	Security	24
RIS706	-	Theory of Algorithms (prerequisite WTW224)	24
RIS708	-	Knowledge Based Systems	24
RIS709	-	Expert Systems	24
RIS715	-	Human Computer Interaction	24
RIS716	-	Networks	24
RIS717	-	Object Design	24
RIS718	-	Ethics	24
RIS719	-	Internet Programming	24
RIS721	-	<i>Capita Selecta</i>	24
RIS722	-	<i>Capita Selecta</i>	24
RIS723	-	<i>Capita Selecta</i>	24
RIS724	-	<i>Capita Selecta</i>	24
RIS726	-	<i>Capita Selecta</i>	24

(h) Statistics

Admission is subject to the approval of the Departmental Chairperson.

The following two examination possibilities exist:

- (i) A dissertation (STK700 -120 credits) on an approved topic.
or
- (ii) A written examination paper on two themes from the following and approved themes from Mathematical Statistics, as well as a mini dissertation on an approved topic.

The candidate needs 120 credits which consist of a written paper on two of the following themes plus a mini dissertation on an approved subject.

			Credits
STK701	-	Operational research (I)	40
STK702	-	Operational research (II)	40
STK703	-	Econometrics	40
STK704	-	Non-parametric methods	40
STK705	-	Decision theory	40
STK706	-	Regression analysis	40
STK707	-	Contingency tables	40
STK708	-	Quantitative forecasting	40
STK709	-	Multivariate analysis I	40
STK711	-	<i>Capita Selecta</i>	40
STK792	-	Research essay	40

In addition, any approved topics from Mathematical Statistics may be selected in consultation with the Departmental Chairperson, and no more than one approved course from Mathematics, Applied Mathematics and Computer Information Systems.

(i) Mathematics and Applied Mathematics

For admission to a Master's degree in Mathematics or Applied Mathematics the candidate needs Mathematics or Applied Mathematics, or the equivalent at Honours level. **Candidates may be required to take additional courses if their backgrounds need strengthening.** The Chairperson of the Department grants admission. The Master's degree consists of modules from the following list of 32-credit modules with a total credit value of at least 120. One of the modules must be a research essay WTW792. Alternatively, the candidate may present a dissertation WTW700 on an approved topic. The curriculum is compiled in consultation with the Departmental Chairperson. Appropriate modules from other disciplines may also be included.

The 16- and 24-credit modules are available as service courses for other fields of study.

Module name	Codes according to credits		
	16	24	32
	Service modules for other fields of study		WTW Master
Algebra	WTW704	WTW706	WTW708
Galois theory	WTW714	WTW716	WTW718
Topology	WTW724	WTW726	WTW728
Modern topology	WTW734	WTW736	WTW738
Functional analysis	WTW744	WTW746	WTW748
Measure and integration theory	WTW754	WTW756	WTW758
Coding theory	WTW764	WTW766	WTW768
Discrete Mathematics	WTW774	WTW776	WTW778
Set theory	WTW784	WTW786	WTW788
Group theory	WTW794	WTW796	WTW798
Ring theory	WTX704	WTX706	WTX708
Category theory	WTX714	WTX716	WTX718
Methods of Mathematics	WTX724	WTX726	WTX728
Digital image processing	WTX734	WTX736	WTX738
Numerical linear algebra	WTX744	WTX746	WTX748
Numerical solution of differential equations	WTX754	WTX756	WTX758
Optimisation	WTX764	WTX766	WTX768
Cryptography	WTX774	WTX776	WTX778
Partial differential equations	WTX784	WTX786	WTX788
Fluid mechanics	WTX794	WTX796	WTX798
Biological modeling	WTY714	WTY716	WTY718
Financial Mathematics	WTY744	WTY746	WTY748
<i>Capita Selecta</i>	WTY764	WTY766	WTY768
<i>Capita Selecta</i>	WTY774	WTY776	WTY778
Graph theory	WTY784	WTY786	WTY788
Research essay			WTW792

With the approval of the Departmental Chairperson continuous evaluation may be used in certain modules, provided that a candidate only passes if each assignment is completed satisfactorily and a final mark of at least 50% is obtained.

The final mark for any module other than the research essay and continuous evaluation, is the end-of-semester examination mark, or a combination of such mark with the marks of assignments and other evaluations. To pass any module the candidate must obtain at least 50% in the examination and 50% for the combined final mark, when applicable.

(j)(1) Mathematical Statistics

Admission is subject to the approval of the Departmental Chairperson.

The following two examination possibilities exist:

- (i) A dissertation (WKS700 - 120 credits) on an approved topic
or
- (ii) A written examination paper on two of the following themes, and a mini dissertation on an approved topic.

The candidate needs 120 credits which consist of a written paper on two of the following themes plus a mini dissertation on an approved subject.

Modules		Credits
WKS701	- Bayes analysis	40
WKS702	- Measure and probability theory	40
WKS703	- Stochastic processes	40
WKS704	- Stochastic simulation	40
WKS705	- Multivariate analysis II	40
WKS706	- Multivariate methods	40
WKS707	- Linear model	40
WKS708	- Categorical data analysis	40
WKS709	- Bayes analysis II	40
WKS710	- Time series analysis	40
WKS711	- <i>Capita Selecta</i>	40
WKS712	- Reliability theory	40
WKS792	- Research essay	40

In addition, any approved topics from Statistics may be selected in consultation with the Head of the Department, and no more than one approved module from Mathematics, Applied Mathematics or Computer Information Systems.

(j)(2) Mathematical Statistics (Risk Analysis)

Reg. D35 - Admission requirements

A person will be allowed entrance to the programme if he/she is in possession of a degree with Mathematical Statistics or Statistics as major subject.

Candidates from other universities who are interested in the programme have to provide the contents of their courses to the Departmental Chairperson for approval.

A candidate with the above qualifications will not automatically be allowed admission to the program. Admission is subject to the approval of the Departmental Chairperson.

An Honours degree is not a requirement for admission to the program.

Reg. D36 - Course Composition and Contents

The programme extends over two academic years. The objective of the programme is to train persons with mathematical and management skills to handle financial risks, industrial risks, risks in nature and urban risks.

The programme is presented interdisciplinary by the Faculty of Natural and Agricultural Sciences and the Faculty of Economic and Management Science, under the supervision of the Department of Mathematical Statistics. The certificate will be issued with an endorsement: Risk Analysis.

The composition of each candidate's curriculum will be discussed beforehand with the department at the beginning of the year.

The programme consists of ten semester modules and a mini dissertation on a selected topic.

An Honours degree, including six of the ten modules, can be obtained after one year.

Practical experience in Banking/Assurance during the period of study is recommended.

The candidate needs 240 credits which consists of 10 compulsory modules plus a mini dissertation. The programme includes a 25% research component as part of the mini dissertation and assignments in modules.

Semester modules

MRA707 (Mathematical Techniques) is compulsory for candidates who do not have the necessary mathematical background (eg. WTW114, WTW124).

Modules		Credits
MRA701	- Bayes Statistics	20
MRA702	- Econometrics	20
	or	
MRA705	- <i>Capita Selecta</i>	20
MRA703	- Stochastic processes	20
MRA704	- Stochastic simulation	20
MRA706	- Modelling extremal events	20
MRA707	- Mathematical Techniques	20
MRA708	- Statistical Computer Software	20
WTY746	- Financial Mathematics	24
GEB624	- Bank management	20
GEB707	- Derivative markets	20
MRA793	- Short research essay	20
RIS712	- Informatics	20

Reg. D37 - Examination and qualification requirements

A written exam will be taken on each of the subjects taken during a semester at the end of that semester. A minimum pass requirement of 50% has to be obtained for each question paper.

The degree will be awarded with distinction if a candidate has an average of 75% for all ten subjects and the mini dissertation.

In addition to the written examination mentioned above, a candidate has to submit an approved mini dissertation at the end of the second year of study. An external examiner will take part in the evaluation of the mini dissertation. A pass mark of 50% is required to succeed.

Effective mining and mineral beneficiation is dependant on functional integrated management practices that include aspects such as geology, mining, mineral processing, financial management and mining-related legislation, among other.

Mining has traditionally consisted of various disciplines, which have been managed, in a fragmented fashion. The result of fragmented management led to task duplication and non-co-ordination of activities that span the whole spectrum of mining functions. These actions invariably resulted in the development of a high cost structure.

The main objective of mineral resource management is to effectively integrate the relevant fields of expertise so as to manage mining activities in the most cost effective manner possible.

- Students who enrol for the Master's degree by dissertation, register under the code 4707.
- Students who enrol for the one year structured Master's degree, register under the code 4708.
- Students who enrol for the two year structured Master's degree, register under the code 4709.

Reg. D38 - Admission requirements

An honours degree or an equivalent qualification (NQF level 7) with appropriate experience will be considered by the University for admission. Depending on the academic background of the candidate additional courses may be prescribed.

Where a candidate with merit does not comply fully with the admission requirements, the Dean, in conjunction with the course co-ordinator, may recommend that the requirements be lifted, with the final decision being taken by the Executive Committee of Senate.

As only a limited number of candidates can be accepted for the theoretical MRM, an application form available from the Department of Geology must be handed in before 31 May of the preceding year, whereafter selection will take place.

The programme consists of compulsory courses, selectable courses and an extended essay.

Reg. D39 - Course composition and contents

The programme will consist of four separate parts taken over a period of at least two years. In phase one candidates will be exposed to basic Geology, Mining, Metallurgy and Business Principles as an introduction before being exposed to more detail in the applied modules. Phase two modules will contain more detail and will also address other skill deficiencies of the candidates. Some of the modules have compulsory contact time used for lectures, case studies, practicals, tasks and tutorials, while others will be interactive internet based. The fourth phase comprises the completion of an extended research essay.

Upon the successful completion of phase one, five modules from phase two, two modules from phase three and phase four, the candidate will obtain a Master in Mineral Resource Management.

Code Course modules

Phase 1

GLG711 Overview of Geology, Mining, Metallurgy and Business Processes
GLG712 Mineral Resource Management I (Methodology)
GLG713 Applied Geology
GLG714 Applied Mining
GLG715 Applied Metallurgy

Phase 2

GLG721 Project Management and Financial Management
GLG722 Information Architecture: Methods and Processes Business Analysis; Benchmarking
GLG723 Change Management: Organisational, Process, Behavioural, Culture
GLG724 "Virtual Mining" Simulation and Optimisation
GLG725 Mineral Resource Management II (Advanced): Grade Control, Ore Balance Sheets, Ore Utilisation
GLG726 Geological Modelling and Applied Geostatistics

Phase 3

GLG731 Technology training: Mine modelling simulation systems; *XPAC or related mining package
GLG732 Technology training: Cost modelling simulation; *XERAS or related package
GLG733 Technology training: Load, haul, and logistics modelling simulation; *TALPAC or related package
GLG734 Technology training: modern mining supply chain principles
GLG735 Technology training: the role of enterprise management systems in resource management
GLG736 Risk management in the mining and minerals industry

* Description of abbreviations:

XPAC Scheduling system for reserve data base management and scheduling

XERAS Economic and financial modelling of mining operations

TALPAC Truck and loader productivity analysis and costing

Phase 4

GLG791 Extended research essay. Subject chosen in consultation with course co-ordinator. The candidate must carry out a research task under supervision and present an extended research essay. The extended essay must be submitted for formal examination.

All the modules comprise 15 credits each while the extended research essay counts 60 credits. Modules GLG712, GLG713, GLG714, GLG715, GLG725 and GLG726 serve as background to the extended research essay.

Reg. D40 - Organisation of course

Dates during which modules will be presented will be announced at the beginning of each year.

Reg. D41 - Examination

Continuous evaluation of assignments and tutorials will contribute to the course aggregate, which together with the formal examination, in June and November, will make up the final mark. Modules GLG721, GLG724, GLG725 and GLG726 will, however, be examined only by means of continuous evaluation of assignments and tutorials.

The extended research essay (GLG791) will be evaluated by the supervisor(s) and an external moderator. To obtain the Postgraduate Diploma or Master in Mineral Resource Management, a minimum pass mark of 50% in each module, including the extended research essay, is required.

INFORMATION

For regulations regarding undermentioned fields of study consult Calendar Part 2: Architecture, Quantity Surveying and Construction Management and Urban and Regional Planning.

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MAGISTER ARCHITECTURAE [M.ARCH.]	Study code 4710	57
MAGISTER SCIENTIAE IN QUANTITY SURVEYING [M.Sc.(Q.S.)]	Study code 4720	58
MAGISTER SCIENTIAE IN CONSTRUCTION MANAGEMENT [M.Sc.(Construction Management)]	Study code 4780	59
MAGISTER IN PROPERTY SCIENCE [M.PROP.]	Study code 4797 or 4798	59
MAGISTER IN URBAN AND REGIONAL PLANNING [M.U.R.P.]	Study code 4760	63
DOCTOR ARCHITECTURAE [D.Arch.]	Study code 4910	74
PHILOSOPHIAE DOCTOR [Ph.D.]	Study code 4920	74

MAGISTER SCIENTIAE (CLINICAL PSYCHOLOGY)**Study code 4740**

- Students who enrol for the Magister Scientiae (Clinical Psychology) by dissertation, register under the code 4741.
- Students who enrol for the Structured Magister Scientiae (Clinical Psychology), register under the code 4742.

AND

MAGISTER SCIENTIAE (COUNSELLING PSYCHOLOGY)**Study code 4750**

- Students who enrol for the Magister Scientiae (Counselling Psychology) by dissertation, register under the code 4751.
- Students who enrol for the Structured Magister Scientiae (Counselling Psychology), register under the code 4752.

For detailed information, see Calendar, Faculty of the Humanities.

MAGISTER SCIENTIAE IN HOME ECONOMICS
Study code 4770

- Students who enrol for the Magister Scientiae (Home Economics) by dissertation, register under the code 4771.
- Students who enrol for the structured Magister Scientiae (Home Economics), register under the code 4772.

CURRICULUM**Reg. D42 - Requirements**

- a) A dissertation (HDK700 - 128 credits) is required
or
- b) VWS701, VWS702 and VWS703 or HDK701 or VDG701 (60 credits) applicable to the theme of research and an extended research essay (HDK791 - 68 credits).

MAGISTER IN ENVIRONMENTAL MANAGEMENT
Study code 4790

M.E.M.
Course code 700

- Students who enrol for the Magister Scientiae (Environmental Management) by dissertation, register under the code 4795.
- Students who enrol for the structured Magister Scientiae (Environmental Management), register under the code 4796.

Reg. D43 - Entrance requirements

A three-year degree or an equivalent qualification with appropriate experience will be considered by the University for admission. Depending on the academic background of the candidate additional modules may be prescribed.

Where a candidate with merit does not comply fully with the admission requirements, the Dean, in conjunction with the Management Committee, may recommend that the requirements be partially waived.

As only a limited number of candidates can be accepted, an application form available from the Centre for Environmental Management must be handed in before 15 October of the preceding year, whereafter selection will take place.

The programme consists of compulsory modules, choice modules and an extended research essay.

Reg. D44 - Course composition and content

The programme is offered interdisciplinary and will be presented by the Faculty of Natural and Agricultural Sciences in conjunction with the Faculties of Health Sciences, Economic and Management Sciences, Law and Humanities under the control of the Centre for Environmental Management and a Management Committee.

The programme will consist of four separate modules, each taking six months. In the first two modules the basic principles and concepts of the natural environment, as well as planning and management aspects will be covered, the third will be a speciality module and the fourth a

Semester 4
Compulsory module

MOB791 (96 credits) - Extended research essay and specialisation development

Candidates must carry out a research task under supervision and submit it for examination in the form of extended research essay. The subject and supervisor(s) will preferably be linked to the module chosen from among MOB741-744.

Reg. D45 - Organisation of course

At the start of each semester candidates will spend two weeks at the campus in Bloemfontein where the introductory lectures, tutorials, practicals and discussions will take place and the work programme finalised.

Upon completion of all four modules in the programme the candidate should, in summary, have the following knowledge and skills:

- A basic knowledge of resources and processes in ecosystems and the role of influences upon ecosystems.
- Analytical skills to determine impacts and the state of the environment.
- An ability to provide solutions to environmental problems.
- Research skills in a speciality direction.
- Be able to carry out impact analyses and have knowledge of legal aspects affecting the environment.
- An understanding of resource conservation, specific political and sociological tendencies where they affect the environment, including ecotourism.

Reg. D46 - Examination

Continuous evaluation of work and assignments will contribute to the semester mark, which together with formal examination (MOB707, MOB708 and MOB741-744), will make up the combined mark. Examination will take place at the end of each semester. To obtain the Master's degree the candidate will be required to obtain at least 50% in each of the assignments, orals, formal examinations and extended research essay.

Formal examinations will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%, of MOB707, MOB708 and MOB741-744. MOB707, MOB708 and MOB741-MOB744 each contribute 20% and MOB791 40% to the final course mark. In order to obtain the Master's degree with distinction a mark of 75% should be obtained.

The extended research essay (MOB791) will be evaluated by the assessor(s) and a moderator.

Doctor's degrees

The following Doctor's degrees are conferred in this Faculty:

Degree	Abbreviation	Study code	Course code
(i) Doctor Scientiae	D.Sc.	4900	900
(ii) Doctor Architecturae	D.Arch.	4910	900
(iii) Philosophiae Doctor	Ph.D.	4920	900

The degree of Philosophiae Doctor is conferred in the following fields:

Applied Mathematics, Architecture, Astronomy, Behavioural Genetics, Biochemistry, Biotechnology, Botany, Chemistry, Computer Information Systems, Entomology, Environmental Management, Food Science, Genetics, Geochemistry, Geography, Geology (GLG), Geohydrology, Grassland Science, Home Economics, Limnology, Mathematics and Mathematical Statistics, Microbiology, Mineral Resource Management (MRM), Plant Molecular Biology, Psychology, Physics (an oral examination on the thesis can be required), Property Science, Quantity Surveying and Construction Management, Soil Science, Statistics, Urban and Regional Planning, Wildlife, Zoology.

REGULATIONS

Reg. D47 - Admission

- (a) The general regulations regarding Doctor's degrees apply to this Faculty *mutatis mutandis*.
- (b) Candidates have to apply to the Departmental Chairperson for admission to the Doctor's degree study.
- (c) **Limnology**

To be admitted to the Ph.D. a candidate must be in possession of an M.Sc. in Limnology. Persons in possession of an M.Sc. degree in a related field of study will, in addition to the dissertation, have to complete theoretical work and assignments (4) in Limnology before the thesis can be handed in for examination. Two assignments shall take the form of presentations, and examination takes place orally.

The Limnology Committee will appoint supervisors and decide in which department a candidate will register.

- (d) **Psychology**

As far as the Ph.D. degree in Psychology is concerned, a thesis (SIL900) is compulsory or one of the following two taught courses can be followed:

- Ph.D. degree in Psychology on: Child psychology and related fields.
- Ph.D.-degree in Psychology on: Clinical Hypnosis.

(See Calendar Part 6, Faculty of Humanities, for further details.)

(e) Environmental management

To comply with the admission requirements a candidate must possess a MEM degree before registering for the Ph.D. degree. Individuals holding another Master's degree may be considered for admission. In such instances the Management Committee of the Centre for Environmental Management may supplement the thesis with assignments, taken from the MOB700 course, which must be completed prior to the thesis being submitted for examination. The Management Committee of the Centre for Environmental Management will assign promoters and decide upon which department a candidate should register in.

(f) Biotechnology

A candidate must be in possession of a Master's degree in Microbiology, Biochemistry, Food Science, Biotechnology or related discipline. Candidates in possession of a Master's degree in related subjects (e.g. Botany, Zoology, Chemistry, Chemical Engineering) can be requested by the Biotechnology Committee to complete theoretical work, work assignments and/or modules additionally to the thesis before the thesis is submitted for examination.

Reg. D48 - Requirements

A candidate does research for at least four semesters on an approved topic selected in consultation with the Departmental Chairperson in preparation of a thesis which serves as the only requirement for the degree. The candidate will present at least one seminar/research report in each year of study in accordance with departmental regulations.

DOCTOR OF ARCHITECTURAE
Study code 4910

Reg. D49 - Regulations as for Ph.D.

DOCTOR SCIENTIAE
Study code 4900

Reg. D50 - A candidate for the D.Sc. degree must consult the General Regulations.

SYLLABI

Behavioural Genetics

GG692 (32 credits) - Research essay

This course stretches over the whole year and involves a research project under the guidance of two lecturers (one from Genetics and one from Psychology). The choice of a subject for the project is done in consultation with Programme Leader. The results of the project must be submitted in the form of a typed scientific paper for examination. An oral presentation of 15 minutes with 5 minutes for questions on the research project is required.

After the successful completion of the module, the student should be skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

GG693 (24 credits) - Research: Literature study

A review paper on a psychological subject is written and presented orally on a date determined by the Programme Leader.

The subject of the review paper should differ from that of the research project and is selected in consultation with the Programme Leader. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

GEN634 (16 credits) - Behavioural Genetics

Class discussion for three hours and a six-hour practical per week.

One examination paper of four hours.

Determination of the inheritance of behavior, single gene vs. polygenic inheritance, allelism, pleiotropy, epistasis; studies of twins; pedigrees; experimental design; gene frequencies in populations.

After the successful completion of the module, the student should be able to plan and execute a behavioural genetic study, identify factors influencing behaviour and determine the influence of inheritance on behaviour.

GEN693 (24 credits) - Research: Literature study

A review paper is written and presented orally on a date determined by the division head.

The subject of the dissertation should differ from that of the research project and is selected in consultation with the division head. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

SIL613 (12 credits) - Psychopathology

See Dept. Psychology (Faculty of Humanities)

SIL614 (12 credits) - Developmental Psychology

See Dept. Psychology (Faculty of Humanities)

XXX000 - Advanced specialised course

A combination of advanced courses or topics in Genetics, Psychology or an Honours course from a suitable subject area, which can meaningfully compliment the field of study.

Biochemistry

BOC614 (16 credits) - General analytical and chromatographic techniques in Biochemistry

Research techniques in biochemistry: serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of biomolecules and products.

BOC634 (16 credits) - Enzymology

Rate equations: single and dual substrate reactions, allosteric enzymes. theory of catalysis: thermodynamic and kinetic principles, mechanisms applied in catalysis. Enzyme reaction mechanisms. Application of principles of catalysis in selected reaction mechanisms e.g. serine esterases, dehydrogenases, lysozyme, etc. Enzyme applications in organic chemistry.

BOC654 (16 credits) - Advanced protein structure and function

Protein homogeneity, amino acid analysis, preparation of proteins for sequence determination, handling glycoproteins, fragmentation of proteins and separation of fragments, N-terminal and C-terminal sequencing, secondary structure prediction, tertiary structure prediction, quaternary structure, physical methods for determining secondary and tertiary structure: circular dichroism, NMR, mass spectrometry, X-ray diffraction.

BOC674 (16 credits) - Advanced molecular biology

Training in the reading and interpretation of publications in molecular biology and the presentation of a seminar on a current molecular biology topic. The use of advanced molecular biology techniques as well as training in computer software associated with the analysis of DNA information. Students will also be expected to do selfstudy on selected topics that are related to molecular biology.

BOC622 (8 credits) - Oral examination of theory and practical

The oral examination is normally scheduled for November. A panel consisting of lecturers from the Department of Microbiology and Biochemistry, and including an external examiner, is convened for this purpose. It is expected of students to answer questions relating to aspects of the Biochemistry Honours course.

BOC693 (24 credits) - Research: Literature study

Students carry out a literature survey on a topic supplied to them by a lecturer acting as mentor. A literature review covering the chosen topic is written and also presented orally. The written portion of the module is evaluated by the mentor as well as an external examiner and marks are allocated as set out in the course guidelines.

BOC692 (32 credits) - Research essay

Students conduct research on a topic supplied to them during the first semester by a lecturer acting as mentor, and in consultation with the Departmental Chairperson. A written research report is prepared and also presented orally. The written portion of the module is evaluated by the mentor as well as an external examiner and marks are allocated as set out in the course guidelines.

Biotechnology

BTG614 (16 credits) Research techniques in Biotechnology

Handling and preservation of micro-organisms, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, shake flask cultivation, GC & HPLC analysis, cell breaking, bioreactor cultivation, advanced techniques in molecular biology,

centrifugation, pH measuring, microscopy, philosophy of science, project proposal writing, chemical principles for biologists,

BTG634 (16 credits) - Continuous and batch cultivation of microorganisms

Growth kinetics of batch cultures. Oxygen as substrate: volumetric oxygen transfer coefficient; critical dissolved oxygen concentration. Chemostat theory: material balances; Monod model; autoregulation; determination of kinetic and stoichiometric parameters. Deviations from the Monod model: maintenance energy; double substrate-limited growth; growth on mixtures of carbon substrates. Effect of growth rate on cell composition and size. Product formation: kinetics; effect of environmental factors. Complex chemostat systems and applications. Kinetics of fed-batch cultures. Degree of reduction and carbon balances.

BTG622 (8 credits) - Oral examination of theory and practical

The oral examination is normally scheduled for November. A panel consisting of lecturers from the Department of Microbiology and Biochemistry, and including an external examiner, is convened for this purpose. It is expected of students to answer questions relating to aspects of the relevant Biochemistry, Biotechnology and Microbiology Honours modules.

BTG693 (24 credits) - Research: Literature study

Students carry out a literature survey on a topic supplied to them by a lecturer acting as mentor. A literature review covering the chosen topic is written and also presented orally. The written portion of the module is evaluated by the mentor as well as an external examiner and marks are allocated as set out in the course guidelines.

BTG692 (32 credits) - Research essay

Second semester.

Students conduct research on a topic supplied to them during the first semester by a lecturer acting as mentor, and in consultation with the Departmental Chairperson. A written research report is prepared and also presented orally. The written portion of the module is evaluated by the mentor as well as an external examiner and marks are allocated as set out in the course guidelines.

Botany

PWS614 (16 credits) - Research techniques

Full day lectures and practicals for the first three weeks of the honours study.
An oral examination will be undertaken on completion of the module.
Lectures and practical sessions pertinent to techniques and skills.

PLK693 (24 credits) - Research: Literature study

A dissertation must be written and presented on a date determined by the Departmental Chairperson.

The student compiles a review of a specific subject and delivers a presentation on the topic.
On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

PLK692 (32 credits) - Research essay

Research project stretches over the whole year.
An oral presentation and a project report are required.
The student completes a research project under the guidance of a supervisor.

On completion of this module the student is acquainted with problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

PLK614 (16 credits) - Plant ecology

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

The nature of quantitative plant ecology and vegetation science, the description of vegetation in the field, the nature and properties of vegetation data, basic statistical analysis of vegetation and environmental data, ordination methods, phytosociology and the Zürich-Montpellier school of subjective classification, numerical classification and phytosociology, computer programs for vegetation and environmental data, quantitative plant ecology, vegetation science and the future, applications in the South African situation.

After the successful completion of the module the student should be able to manage some vegetation analysis techniques as well as some data managing techniques applicable to plant ecology

PLK624 (24 credits) - Plant physiology I (Metabolism and growth)

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Mitochondrial electron transport in plants: - cyanide sensitive electron transport, alternative oxidase pathway, rotenone non-sensitive complex, exogenous NADH oxidase pathway and oxidative phosphorylation.

Secondary metabolism related to lipid mobilization in plants.

Hydroponics as an alternative plant cultivation and research technique: - systems, importance of different nutrient media, sterilization, pH, conductivity, pest control, etc. Hydroponics versus organic versus conventional cultivation practices.

After completion of the module the student will be able to do research related to respiratory and lipid metabolism in plants. Furthermore, the student will be able to cultivate plants hydroponically and apply hydroponics as a research technique in plant physiology.

PLK634 (16 credits) - Algal biotechnology

Four hours preparation, one hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Introduction to algal biotechnology, student organisms, factors which influence algal growth, photobioreactors, turbulence, photosynthesis in high density media, process management, product handling, products, markets and financial considerations. During practicals processing and quality aspects will receive special attention.

After the successful completion of the module the student will be able to manage an algal biotechnological pilot plant and be able to optimize production processes.

PLK644 (16 credits) - Plant physiology II (Plant defence and applications)

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

The plant's defence mechanisms in relation to biotic stress factors such as injury, insects and pathogens. Resistance and susceptibility are explained in terms of defence mechanisms. Constitutive versus induced defence mechanisms, eliciting and signal transduction mechanisms, secondary defence reactions, plant activators, manipulation of resistance, relation to new alternative, but very exciting, uses of plants.

After completion of the module the student should be able to get innovatively involved in the manipulation of resistance in plants.

PLK654 16 credits) - Limnobotany

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Introduction to limnology, physical characters of water environment, morphological and morphometric characteristics of the water environment, plant communities, production and productivity, water ecosystems.

After the successful completion of the module the student will be able to study the functioning of fresh water ecosystems and enter into research that can lead to an M.Sc. degree.

PLK664 (16 credits) - Plant diversity and taxonomy of higher plants

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Nomenclature, plant structure and taxonomy, floral diversity and pollinators, origin and classification of the angiosperms, sources of taxonomic evidence, cladistics and herbarium management.

On completion of the module a student will be able to identify and classify flowering plants, have a working knowledge of taxonomic literature, be able to apply basic taxonomic principles in the description and nomenclature of plant species, be familiar with the functioning, basic management and use of the herbarium.

PLK674 (16 credits) - Micromorphology and ultrastructure

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

The module deals with the study of taxonomic useful characteristics with the aid of a light microscope (LM), scanning electron microscope (SEM) and transmission electron microscope (TEM). Emphasis is laid on pollen morphology, reproductive biology and the leaf surface (stomata, trichomes, secretory structures, cuticle and epicuticular wax).

After completion of the module the student ought to be familiar with the techniques used to do a microscopic investigation, interpret and use characteristics for taxonomic purposes.

PLK684 (16 credits) - Palynology and palaeoenvironments

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Stratigraphic units, dating, palynology, Quaternary and recent pollen analysis, palaeontology and archaeology, stable isotopes, Milankovitch cycles (orbital changes), palaeoclimate of Africa.

After completion of this module the student will be able to identify pollen types in connection with research on environmental processes or atmospheric allergens, and will be able to act as consultant in connection with eco-tourism, conservation, and the determination of environmental conditions relating to deposition of fossil material.

XXX000 - Advanced specialized module

A combination of advanced modules or subjects from Botany or a honours module from an appropriate discipline, which would be a meaningful supplement to the student's field of study.

PWS634 (16 credits) - Plant molecular applications

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Immunological characterization of plant gene products, the analysis of gene expression on both single and multiple gene level by using Southern and Northern blots, RT-PCR, antisense technology, DNA micro and macro arrays, expressed sequence tags (ESTs), serial analysis of gene expression (SAGE), 2-D protein gel analysis, protein-protein interaction using yeast two-hybrid analysis.

After the successful completion of the module, the student should be able to characterize plant proteins using the relevant immunological techniques and be able to determine the expression of plant genes under different growth conditions.

Entomology

ENT614 (16 credits) - Research Techniques, Scientific Methodology and Scientific Communication

After completion of this module the student will be familiar with selected techniques applicable in Entomology, as well as accessing scientific literature, organizing and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills.

ENT622 (8 credits) - Quantitative Ecology

This module will be presented jointly by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem.

ENT632 (8 credits) - Biodiversity (Evolution & Biogeography)

Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences.

ENT642 (8 credits) - The Environment

This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarize students in the latest developments regarding environmental sustainability and the role of man in this regard.

ENT654 (16 credits) - Insect - Plant Interactions

Upon completion of this module students will be familiar with the close association that exists between plant-feeding insects and their host plants. Knowledge of this has a strong application value in investigations where natural vegetation and cultivated plants are concerned.

ENT664 (16 credits) - Medical and Veterinary Entomology

This module deals with the bio-ecology, vector potential, disease transmission and parasite-host relationships of insects of medical and veterinary importance.

After completion of this module the student will have a fundamental knowledge of insects of medical and veterinary importance and the diseases they transmit. The person will be able to work as a research assistant at a research institute.

ENT674 (16 credits) - Forensic Entomology

This module deals with the use of insects in criminal investigations of crime, especially violent crime such as murder, homicide, suicide and the neglect of children and elderly people.

After completion of this module the student will have a fundamental knowledge of insects of forensic entomological importance and he/she will be able to determine the *postmortem interval* of a corpse. The person will be able to assist as a team member in a forensic science investigation team.

ENT684 (16 credits) - Pest Management

After completion of this module students will have attained knowledge regarding the modern approaches towards all facets of pest management on plants and animals.

ENT692 (32 credits) - Research essay

The research project extends over the whole year.

An oral examination and project report is required.

The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analyzing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies.

XXX000 - Advanced related module

This module is selected from an applicable course outside Entomology and offers the opportunity for a sensible supplement to the field of study of the student.

Environmental Management

MOB614 (16 credits) - Water Resource Management

Introduction to the principles and protocols of aquatic resource management, which relate mainly to the functional ecology of water bodies. Stress will be laid on biomonitoring protocols related to the national River Health Programme. Biological indices of water quality will be covered. The identification and ecology of mainly animal communities in rivers, lakes and temporary waters will be examined. This is a practical and tutorial-based course, which may be presented as a short block of intensive study.

The class will be required to attend tutorials and practicals for which preparation will be necessary.

Assessment via practical work, one written assignment, one oral assignment, and one three hour examination.

Genetics

GEN686 (24 credits) - Research Techniques

Two days per week for the first semester.

An oral examination will be undertaken on completion of the module.

Lectures and practicals on selected techniques and competencies as applied in genetics. On completion of this module the student should have the necessary skills to apply certain laboratory techniques.

GEN614 (16 credits) - Cytogenetics

Class discussion for three hours and a six-hour practical per week.

One examination paper of three hours.

Cytotaxonomy, chromosome numbers, chromosome morphology, meiotic chromosome behaviour, hybrid swarms, structural chromosome evolution, numeric chromosome evolution, phylogeny, *in situ* hybridization.

After the successful completion of the module, the student should be able to plan and execute a cytotaxonomic study and analyse the results.

GEN624 (16 credits) - Plant improvement

Full time one week during the second quarter.

One exam paper of three hours.

Overview of floriculture in South Africa, determination of breeding objectives, planning of a breeding program, importance of cytogenetic studies in breeding, mutation breeding, storage and

fertility of pollen, incompatibility, selection methods, recording of breeding programs, cultivar registration and breeder's rights, disease resistance, gene banks.

After the successful completion of the module, the student should be able to plan and execute a breeding program for several flower varieties, and should know the bottlenecks of the industry.

GEN634 (16 credits) - Behavioural Genetics

Class discussion for three hours and a six-hour practical per week.

One examination paper of four hours.

Determination of the inheritance of behaviour; monogenic vs. polygenic inheritance; allelism, pleiotropy, epistasis; twin studies; pedigrees; experimental design; gene frequencies in populations. After the successful completion of the module, the student should be able to plan and execute a behavioural genetic study, identify factors influencing behaviour, and determine the influence of inheritance on behaviour.

GEN644 (16 credits) - Molecular systematics

Class discussion for three hours and a six-hour practical per week.

One examination paper of three hours.

Genomes, nucleotide sequencing, mutation rates, cladistics, the use of molecular data for determining phylogenetic relationships and parenthood, species identification, computer programs used in molecular analyses: PAUP, CLUSTAL W/G and MacClade. After the successful completion of the module, the student should be able to plan and execute molecular studies and analyse the results.

GEN654 (16 credits) - Molecular ecology

Three hour lecture and a six-hour practicum per day for one week (First semester).

One exam paper of three hours and a written report that will contribute 20% of your final mark.

The emphasis of this course is how to interpret results generated by DNA markers by using various relevant computer programmes such as, Popgene, GeneClass, Population and Treeview. Population genetics concepts, maintenance of genetic diversity and effects of population size reduction will be discussed.

After completing the module successfully, the student should

- a) be able to analyse molecular data with various computer programmes,
- b) implement molecular data results in such a way that it can contribute to the conservation of biodiversity,
- c) understand the contribution of genetics to conservation and ecology.

GEN664 (16 credits) - Forensic DNA typing

Three hour lecture and a six hour practical per week.

One examination paper of three hours.

After the completion of this module, a student will be familiar with the sampling and handling of DNA evidence, without disrupting the chain of custody. Various methods of DNA extractors, pipeting, real-time PCR techniques, as well as the maintenance and loading of samples on the ABI3100 and/or ABI377 and the analysis of DNA profiles using GeneScan, Genotyper and GeneMapper software will be discussed. Assignments form an integral part of the module, both for the theory and the practical work. Developing skills in pipeting, PCR, loading and maintenance of the ABI377 and/or ABI3100. Analyzing the interpreting DNA profiles with GeneScan and Genotyper software.

GEN674 (16 credits) - *Capita Selecta* Genetics

Three hour lecture and a six hour practical per week.

One examination paper of three hours.

Capita Selecta from advanced aspects of Genetics with a view to the expansion of knowledge of the subject in the educational situation. Assignments from an integral part of the module, both for the theory and the practical work.

GEN692 (32 credits) - Research essay

This course stretches over the whole year and involves a research project under the guidance of a lecturer. The project is selected in consultation with the division head. The results of the project must be submitted in the form of a typed scientific paper for examination. An oral presentation of 15 minutes with 5 minutes for questions on the research project is required.

After the successful completion of the module, the student should be skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

GEN693 (16 credits) - Research: Literature study

A review paper is written and presented orally on a date determined by the division head.

The subject of the dissertation should differ from that of the research project and is selected in consultation with the division head. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

MGB604 (16 credits) - Diagnostic molecular biology

See Department of Haematology and Cell Biology (Faculty of Health Sciences).

PWS674 (16 credits) - Plant transformation

Class discussion for three hours and a six-hour practical per week during the second quarter.

One exam paper of three hours.

During the course, the latest developments in plant transformation will be discussed: vectors used for transformation, selectable marker genes, screenable marker genes, promoter regions, *Agrobacterium* mediated transformation, particle bombardment, electroporation, overexpression and antisense technology, the analysis of transgenic plants, the uses and applications of gene transfer to plants.

After the successful completion of the course, the student should understand the general concepts of transformation, should be able to describe each individual protocol and also be able to discuss the relevance of this technology in certain research articles.

XXX000 - Advanced specialized course

A combination of advanced courses in Genetics or a honours course from an appropriate discipline, which would be a meaningful supplement to the student's field of study.

Limnology

PWS614 (16 credits) - Research techniques

Full time lectures and practicals for the first three weeks of the honours study.

An oral examination will be undertaken on completion of the module.

Lectures and practical sessions pertinent to techniques and skills.

LIM693 (24 credits) - Research: Literature study

A dissertation must be written of a specific subject and delivers a presentation on the topic.

On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

LIM692 (32 credits) - Research essay

Research project stretches over the whole year.

An oral presentation and a project report are required.

The student completes a research project under the guidance of a supervisor and is acquainted with problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

PLK654 (16 credits) - Limnobotany

See Botany

MOB614 (16 credits) - Water Resource Management

See Environmental Management

DRK674 (16 credits) - Aquatic Parasitology

See Zoology

DRK622 (8 credits) - Quantitative Ecology

This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem. Evaluation on written and oral tasks.

DRK642 (8 credits) - The Environment

This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarize students in the latest developments regarding environmental sustainability and the role of man in this regard. Evaluation on written and oral tasks.

GIS616 (24 credits) - Geographical Information Systems (Intermediate)

See Geography

PLK614 (16 credits) - Plant ecology

See Botany

LIM694 (16 credits) - Advanced specialized module

A combination of advanced modules or subjects from [Botany or] a honours module from an appropriate discipline, which would be a meaningful supplement to the student's field of study.

Microbiology

MKB614 (16 credits) - Advanced techniques in Microbiology

Research techniques in Microbiology: handling and preservation of micro-organisms, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, Shake flask cultivation, GC & HPLC analysis, cell breaking, bioreactor cultivation, advanced techniques in molecular biology, centrifugation, pH measuring, microscopy, philosophy of science, project proposal writing, chemical principles for biologists.

MKB634 (16 credits) - Microbial diversity

Yeasts: Identification of yeasts as required for quality assurance in the brewing and wine industry. Yeast taxonomy.

Fungi: Ecological concepts in mycology, endophytes, ecological succession, mating types and vegetative compatibility. Taxonomy, collection, preservation and description of fungi. Mycological techniques and the use of identification keys.

Bacteria: Bacterial nomenclature and classification. Numerical taxonomy. Serology and chemotaxonomy. Nucleic acids in bacterial classification. Putative taxa of prokaryotes. Polyphasic taxonomy. Chemical ecology.

Viruses: Practical aspects of the propagation of viruses and the use of PCR for the identification of viruses.

MKB654 (16 credits) - Applied microbial physiology

Food Microbiology: Physiology of food spoilage microorganisms. The application of microorganisms in biological control. Food spoilage and its prevention. Mycotoxins. The application of microorganisms in food processing.

Microbial product formation: Principles and application of fermentative metabolism. Metabolic regulation and its implication for microbial product formation. Industrial processes based on microbial physiological activities.

MKB674 (16 credits) - Advanced molecular biology

Training in the reading and interpretation of publications in molecular biology and the presentation of a seminar on a current molecular biology topic. The use of advanced molecular biology techniques as well as training in computer usage that are associated with the analysis of DNA information. Students will also be expected to do self-study on selected topics that are related to molecular biology.

MKB622 (8 credits) - Oral examination in theory and practicals

The oral examination is taken in November. A panel consisting of lecturers of the Department of Microbiology and Biochemistry and which includes an external examiner, is constituted for this purpose. Students are expected to answer questions about microbiology in general and evaluation is not limited to completed course contents.

MKB693 (24 credits) Research: Literature study

Students conduct literature research on a topic supplied in the first semester by a lecturer who serves as their mentor. A literature report is written on the topic, which is also presented orally. The mentor as well as the external examiner for the module evaluate the written report and both allocate marks as will be explained to students.

MKB692 (32 credits) Research essay

Students complete a research project on a topic supplied in the first semester by a lecturer who serves as their mentor, in collaboration with the Departmental Chair. Students write a report on their results and also present their work as an oral presentation. The mentor as well as the external examiner for the module evaluates the written report and both allocate marks as will be explained to students.

Plant Health

PWS614 (16 credits) - Research techniques

Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted. On completion of the module the student will have the knowledge to perform certain techniques and laboratory skills used in plant biology.

PPG693 (24 credits) - Research: Literature study

The student compiles a review of a specific subject and delivers presentations of selected articles in plant pathology journals. On completion of this module the student is acquainted with literature

searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

PPG692 (32 credits) - Research essay

The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

PPG614 (16 credits) - Ecology and biology of disease organisms

On completion of this module the student is acquainted with the various disease causing organisms on plants. Their role in the environment and biological cycles, including infection, reproduction, dispersal and survival of fungi, bacteria and viruses will receive special attention.

PLK614 (16 credits) - Plant ecology

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

The nature of quantitative plant ecology and vegetation science, the description of vegetation in the field, the nature and properties of vegetation data, basic statistical analysis of vegetation and environmental data, ordination methods, phytosociology and the Zürich-Montpellier school of subjective classification, numerical classification and phytosociology, computer programs for vegetation and environmental data, quantitative plant ecology, vegetation science and the future, applications in the South African situation. After the successful completion of the module the student should be able to manage some vegetation analysis techniques as well as some data managing techniques applicable to plant ecology.

PLK664 (16 credits) - Plant diversity and taxonomy of higher plants

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Nomenclature, plant structure and taxonomy, floral diversity and pollinators, origin and classification of the angiosperms, sources of taxonomic evidence, cladistics and herbarium management. On completion of the module a student will be able to identify and classify flowering plants, have a working knowledge of taxonomic literature, be able to apply basic taxonomic principles in the description and nomenclature of plant species, be familiar with the functioning, basic management and use of the herbarium.

ENT654 (16 credits) - Insect - Plant Interactions

Upon completion of this module students will be familiar with the close association that exists between plant-feeding insects and their host plants. Knowledge of this has a strong application value in investigations where natural vegetation and cultivated plants are concerned.

Plant Molecular Biology

PWS614 (16 credits) - Research techniques

Full day lectures and practicals for the first three weeks of the honours study.

An oral examination will be undertaken on completion of the module.

Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted.

After completion of the module the student will have the knowledge to perform certain techniques and laboratory skills used in plant biology.

PLK693 (24 credits) - Research: Literature study

The student compiles a review of a specific subject and delivers a presentation on the topic. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

PLK692 (32 credits) - Research essay

Research project stretches over the whole year.

An oral presentation and a project report are required

The student completes a research project under the guidance of a supervisor.

On completion of this module the student is acquainted with problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

PLK624 (16 credits) - Plant physiology I (Metabolism and growth)

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

1. Mitochondrial electron transport in plants: - cyanide sensitive electron transport, alternative oxidase pathway, rotenone non-sensitive complex, exogenous NADH oxidase pathway and oxidative phosphorylation.
2. Secondary metabolism related to lipid mobilization in plants.
3. Hydroponics as an alternative plant cultivation and research technique: - systems, importance of different nutrient media, sterilization, pH, conductivity, pest control, etc. Hydroponics versus organic versus conventional cultivation practices.

After completion of the module the student will be able to do research related to respiratory and lipid metabolism in plants. Furthermore, the student will be able to cultivate plants hydroponically and apply hydroponics as a research technique in plant physiology.

PLK644 (16 credits) - Plant physiology II (Plant defence and applications)

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

The plant's defence mechanisms in relation to biotic stress factors such as injury, insects and pathogens. Resistance and susceptibility are explained in terms of defence mechanisms. Constitutive versus induced defence mechanisms, eliciting and signal transduction mechanisms, secondary defence reactions, plant activators, manipulation of resistance, relation to new alternative, but very exciting, uses of plants.

After completion of the module the student should be able to get innovatively involved in the manipulation of resistance in plants.

XXX000 - Advanced specialized module

A combination of advanced modules or subjects from Botany or a honours module from an appropriate discipline, which would be a meaningful supplement to the student's field of study.

PWS634 (16 credits) - Plant molecular applications

A three hour discussion and equivalent of a six hour practical per week.

One examination paper of three hours.

Immunological characterization of plant gene products, the analysis of gene expression on both single and multiple gene level by using Southern and Northern blots, RT-PCR, antisense technology, DNA micro and macro arrays, expressed sequence tags (ESTs), serial analysis of gene expression (SAGE), 2-D protein gel analysis, protein-protein interaction using yeast two-hybrid analysis.

After the successful completion of the module, the student should be able to characterize plant proteins using the relevant immunological techniques and be able to determine the expression of plant genes under different growth conditions.

PWS674 - Plant transformation

Class discussion for three hours and a six-hour practical per week during the second quarter.

One exam paper of three hours.

During the course, the latest developments in plant transformation will be discussed: vectors used for transformation, selectable marker genes, screenable marker genes, promoter regions, *Agrobacterium* mediated transformation, particle bombardment, electroporation, overexpression and antisense technology, the analysis of transgenic plants, the uses and applications of gene transfer to plants.

After the successful completion of the course, the student should understand the general concepts of transformation, should be able to describe each individual protocol and also be able to discuss the relevance of this technology in certain research articles.

Statistics

GHR628 (32 credits) - Statistical Analyses

Matrix computations. Multiple regression and correlation. Variance analysis. Time series. Markov models. Simulation models of hydrological data. Practical work.

Zoology

DRK614 (16 credits) - Research Techniques, Scientific Methodology and Scientific Communication

After completion of this module the student will be familiar with selected techniques applicable in Zoology, as well as accessing scientific literature, organizing and evaluating scientific information, compilation of information according to scientific standards and format, and written and oral scientific communication skills.

DRK622 (8 credits) - Quantitative Ecology

This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and upon completion students will be familiar with the measurement of the biotic components of an ecosystem.

DRK632 (8 credits) - Biodiversity (Evolution & Biogeography)

Upon completion of this module students will be familiar with evolutionary change as the cornerstone of biological sciences.

DRK642 (8 credits) - The Environment

This module will be jointly presented by lecturers of Zoology & Entomology and Environmental Management and will familiarize students in the latest developments regarding environmental sustainability and the role of man in this regard.

DRK654 (16 credits) - Veterinary Ectoparasitology

The course focuses on the occurrence, biology and control of selected ectoparasites associated with domesticated animals and pets. Specific attention will be given to the role of these

ectoparasites in the transmission of pathogens to the animal hosts and humans. The course includes both theoretical and practical components.

This course will contribute to the student's ability to following a career in research, developing and marketing divisions of pharmaceutical companies. It could further contribute to the ability of a student to become involved in contract research.

DRK664 (16 credits) - Animal Behaviour / Veterinary Endoparasitology

Animal Behaviour: A holistic approach is followed in order to understand and explain vertebrate animal behaviour under natural conditions. Attention is given to the basic principles of ethology, ecology and evolution. A sound knowledge of behavioural studies prepares students for a career in nature conservation, agriculture, academic institutions and for consulting work.

Veterinary Endoparasitology. The course focuses on training the students in aspects of biology, epidemiology, diagnosis, treatment and control of veterinary important helminthes, protozoa and rickettsia parasites, as well as zoonoses of economical importance in South Africa. The practical aspects of this course include laboratory diagnostics and molecular parasitological techniques.

DRK674 (16 credits) - Aquatic Parasitology / Wetland ecology

Aquatic Parasitology: This course deals with water borne parasites, which spend at least a part of their lifecycle in water. It includes taxonomy, ecology, pathology, parasite host associations, epizootiology and control of parasites.

Wetland Ecology: The course will include the following topics: Wetlands in southern Africa, chemical and physical conditions in wetlands, biotic community of wetlands, wetlands as biological filters, threats to wetlands, production and productivity, as well as wetlands in arid environments.

DRK684 (16 credits) - African Ornithology / Immunology

African Ornithology: A comprehensive course dealing with the occurrence, distribution and behaviour of birds in an African context. Special attention will be given to factors regulating distribution and behaviour of birds. The course is a valuable addition to an ecological background, forming the basis for a wide spectrum of disciplines.

Immunology: The course focuses on aspects of innate and specific immunology, and cell mediated and humoral immunity. It also includes antibody structure, biological characteristics of immunoglobulins, transfusion-immunology and immunological aspects of HIV-Aids. The practical aspects include an introduction to serological testing, immuno-diagnostics and immunological research techniques.

DRK692 (32 credits) - Research essay

The research project extends over the whole year.

An oral examination and project report is required.

The student completes a project under the supervision of a supervisor and is introduced to problem identification, hypothesizing, planning, executing, analyzing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies.

XXX000 - Advanced related module

This module is selected from an applicable course outside Zoology and offers the opportunity for a sensible supplement to the field of study of the student.

Annexure A: Transitional Regulations

Previous course	New module
BOC601	BOC622
BOC602	BOC614
BOC603	BOC634
BOC604	BOC654
BOC605	BOC674
BOC691	BOC626
BOC692	BOC628
BTG626	BTG693
BTG628	BTG692
CEM601	CEM614 and CEM624 (Anorganic Chemistry)
CEM602	CEM654 and CEM664 (Organic Chemistry)
CEM603	CEM634 and CEM644 (Physical Chemistry)
CEM604	CEM674 and CEM684 (Analytical Chemistry)
CEM691	Practical in CEM614 and CEM624
CEM692	Practical in CEM654 and CEM664
CEM694	Practical in CEM634 and CEM644
DRK601	DRK614 and DRK632
DRK602	DRK654 and/or DRK674
DRK603	DRK622 and DRK642; DRK664 and/or DRK684
DRK691	DRK698
ENT601	ENT614 and ENT632
ENT602	ENT654 and/or ENT674
ENT603	ENT622 and ENT642; ENT664 and/or ENT684
ENT691	ENT698
GEN696	GEN693
GEN698	GEN692
GG608	GG692
GG616	GG693
GLG683	GLG653
LIM696	LIM693
LIM608	LIM692
MKB626	MKB693
MKB628	MKB692
PLK696	PLK693
PLK698	PLK692
PPG696	PPG693
PPG698	PPG692

POSTGRADUATE PROGRAMMES IN AGRICULTURE

In addition to the degrees and diplomas the University might institute in future, the following degrees can be conferred in the Faculty:

Degree	Minimum study period	Abbreviation
Honours degree		
Baccalaureus Scientiae Agriculturae Honores	1 year	B.Sc.Agric.Hons.
Baccalaureus Agriculturae Honores	1 year	B.Agric.Hons.
Master's degrees		
Magister Scientiae in Agriculture	1 year	M.Sc.Agric.
Magister in Sustainable Agriculture	2 years	M.S.A.
Magister Agriculturae	1 year	M.Agric.
Magister in Disaster Management	2 years	M.Disaster Management
Doctor's degrees		
Philosophiae Doctor	2 years	Ph.D.
Doctor Scientiae	See regulations	D.Sc.

The B.Sc.Agric.Hons. degree can be obtained in the following fields of study:

Agricultural Economics, Agrometeorology, Agronomy, Animal Science, Food Science, Grassland Science, Horticulture, Irrigation Science, Plant Breeding, Plant Pathology and Soil Science,

The B.Agric.Hons. degree can be obtained in the following interdisciplinary fields of study:

Irrigation Management, which is co-ordinated by the Department of Soil, Crop and Climate Sciences, Agricultural Management, which is co-ordinated by the Department of Agricultural Economics and Wildlife Management which is co-ordinated by the Department of Animal, Wildlife and Grassland Sciences.

Honours degrees

BACCALAUREUS SCIENTIAE AGRICULTURAE HONORES
Study code 5500

B.Sc.Agric.Hons.

INFORMATION

STUDY AIMS

The objectives of the study for this degree are:

- (a) to deepen and extend the student's knowledge in subjects of their choice in the context of research and extension;
- (b) to prepare the student for further post-graduate study;
- (c) to develop independent study capability in the student;
- (d) to train the student how to collect, compile, collate, interpret and report subject literature and the effective communication thereof.

Module codes

The meaning of the numerical part of the module code for the honours degree modules differs from that of undergraduate module codes. The alphabetical part specifies the subject name. The number 6 typify it as an honours degree, while the second and third digits are exclusive to the specific subject. The time of examination in any specific module must therefore be determined in consultation with the head of the department concerned. If, however, the second digit is a 9, it refers to a seminar/short dissertation/essay/assignment.

REGULATIONS

Nota Bene: The general regulations for honours degrees (General Regulations A55 to A78) are *mutatis mutandis* applicable to this faculty.

Reg. H14 - Admission

- (a) See General Regulation A56.
- (b) Students must apply to the Departmental Chairperson on the prescribed form for admission to the Honours degree studies.
- (c) A deserving student in possession of a B.Sc. degree with the required major subjects may be permitted by the Departmental Chairperson and with the recommendation of the Dean, to receive post-graduate training in Agriculture. Such a student registers for B.Sc.Agric.Hons., during which prescribed honours modules as well as certain additional undergraduate Agriculture modules may be taken in consultation with the Departmental Chairperson.
- (d) Main subjects Agronomy, Agrometeorology, Grassland Science, Horticulture and Soil Science lead to, not only the post-graduate study of the concerned main subject, but also the inter-departmental study of Irrigation Science.
- (e) Deserving students that obtained a B.Agric. degree according to the Regulations of the 2000 or following Calendars, may be allowed by the Faculty Committee, to register for a B.Sc.Agric.Hons. degree, that will be done over a period of 2 years. During this period the final year B.Sc.Agric. major modules for which the student qualifies, plus the prescribed honours modules must be presented in consultation with the Departmental Chairperson.

Reg. H15 - Semester and year marks and pass requirements

- (a) See General Regulation A65.
- (b) No semester mark/year mark is required for admission to examination in Honours modules in this faculty.

Reg. H16 - Compulsory modules

In addition to the stipulations of the General Regulations A56(b) a student must also pass the following Agriculture Datametrics modules, DMT214 and DMT224, before receiving the degree, providing that:

- (a) students who passed the modules BMT218 and BMT228 in 1987 or earlier, be exempted; and
- (b) that students who have applicable modules in Mathematical Statistics and/or Computer Usage or who took Agricultural Economics as major subject, may be exempted by the Dean.

Reg. H17 - Curricula for the degree B.Sc.Agric.Hons.

Nota Bene: Modules must be chosen in consultation with the particular Departmental Chairperson.

(a) AGRICULTURAL ECONOMICS - B.Sc.Agric.Hons. - Study code 5517

Compulsory module (15 credits)

Module code	Subject
LEK601	Quantitative techniques

One of the following fields

Three modules are compulsory for each field, all modules are 15 credits each.

Field 1

Agricultural financing and derivative markets

Module code	Subject
LEK605	Agricultural financing
ECO621	Financial systems and monetary policy
ECO724	Derivative instruments

Field 2

Agricultural policy and development

Module code	Subject
LEK606	Agricultural policy
LEK607	International agricultural trade
LEK608	Agricultural development

Field 3

Agricultural marketing and international trade

Module code	Subject
ECO724	Derivative instruments
LEK607	International agricultural trade
LEK609	Agricultural marketing and price analysis

Field 4**Resource and environmental economics**

Module code	Subject
LEK608	Agricultural development
LEK610	Advanced resource and environmental economics
LEK611	Project planning and analysis

Field 5**Farm management**

Module code	Subject
LEK609	Agricultural marketing and price analysis
LEK612	Advanced farm management
LEK605	Agricultural financing

Field 6**Food and agribusiness management**

Module code	Subject
AGB605	Agribusiness management
AGB604	Technology management: Value adding
LEK609	Agricultural marketing and price analysis

Choose any **four** additional modules from the list below that do not form part of your field choice.

Module code	Subject
LEK602	Production and consumer economics
LEK603	Operational research
LEK604	Agricultural econometrics
LEK605	Agricultural financing
LEK606	Agricultural policy
LEK607	International agricultural trade
LEK608	Agricultural development
LEK609	Agricultural marketing and price analysis
LEK610	Advanced resource and environmental economics
LEK611	Project planning and analysis
LEK612	Advanced agricultural management
AGB604	Technology management: Value adding
AGB605	Agribusiness management
ECO621	Financial systems and monetary policy
ECO724	Derivative instruments

According to General Regulation A57(b) a subject/module in the foregoing list may be replaced with an alternative module if approved by the Departmental Chairperson.

(b) AGRONOMY - B.Sc.Agric.Hons. - Study Code 5515**DIVISION AGRONOMY**

All modules are 24 credits each.

A seminar and four examination papers of three hours each - two in the first semester and two in the second semester - in one of the following three fields:

GENERAL FIELD

Module code	Subject
AGR601	Crop physiology
AGR602	Stress physiology
AGR603	Plant nutrition
AGR606	General Agronomy
AGR693	Research: Seminar

WEED CONTROL FIELD

Module code	Subject
AGR601	Crop physiology
AGR602	Stress physiology
AGR604	Weed control
AGR606	General Agronomy
AGR693	Research: Seminar

IRRIGATION FIELD

Module code	Subject
AGR601	Crop physiology
AGR602	Stress physiology
AGR605	Water relations and irrigation
AGR606	General Agronomy
AGR693	Research: Seminar

DIVISION HORTICULTURE

All modules are 24 credits each.

A research project and four examination papers of three hours each - two in the first semester and two in the second semester - in one of the following three fields:

VEGETABLE PRODUCTION

Module code	Subject
HRT601	Crop and stress physiology
HRT602	Plant propagation
HRT603	Vegetable production
AGR605	Water relations and irrigation
HRT693	Short research essay

FRUIT PRODUCTION

Module code	Subject
HRT601	Crop and stress physiology
HRT602	Plant propagation
HRT604	Fruit production
AGR605	Water relations and irrigation
HRT693	Short research essay

ORNAMENTAL PLANT PRODUCTION

Module code	Subject
HRT601	Crop and stress physiology
HRT602	Plant propagation
HRT606	Floriculture
HRT607	Ornamental plant production and turf management
HRT693	Short research essay

(c) AGROMETEOROLOGY - B.Sc.Agric.Hons. - Study Code 5518

A practical project, report and oral presentation are required for LWR601 and two seminars for LWR693. Students must choose three of the following four modules. Examination can be written (three hours each) and/or an oral examination. All modules are 24 credits each.

Module code	Subject
LWR601	Specialised study assignments
LWR693	Research:Seminar

Choose three of the following:

LWR602	Agrometeorology
LWR603	Meteorology
LWR604	Mathematical simulation of meteorological and biotical phenomena and their applications
LWR605	Specialised instrumentation

(d) ANIMAL SCIENCE - B.Sc.Agric.Hons. - Study Code 05521

Honours modules consist of advanced self-study, discussion classes and reporting in the form of seminars of study themes and subjects. Practical research projects, critical evaluation of literature and writing articles can be part of certain modules. Examinations are written and/or oral.

To meet the requirements for an Honour study, a student must pass five modules, of which VKD693 is compulsory. VKD693 is taken in one of the study themes as described, in consultation with the Departmental Chairperson. All modules are 24 credits each.

Main fields of study

Animal Physiology	DAF601, DAF602, DAF603, DVL603
Animal Breeding	DTL601, DTL602, DTL603, DAF603
Animal Nutrition	DVL601, DVL602, DVL603, DVL604

Module code	Subject
DAF601	General Animal Physiology
DAF602	Endocrinology
DAF603	Applied Reproduction Physiology
DTL601	Fundamental Animal Breeding
DTL602	Experimental Animal Breeding
DTL603	Applied Animal Breeding
DVL601	Fundamental Animal Nutrition
DVL602	Experimental Animal Nutrition
DVL603	Applied Ruminant Nutrition
DVL604	Applied Monogastic Nutrition
VKD693	Research: Seminar and/or project with a management, discipline, species, or system specialisation theme.

(e) BIOCHEMISTRY (Study code 5511), BIOTECHNOLOGY (Study code 5512), ENTOMOLOGY (Study code 5513) AND GENETICS (Study code 5514)

For more information consult the calendar for Natural Sciences (Part 3)

(f) FOOD SCIENCE - B.Sc.Agric.Hons. - Study Code 5522

Four examination papers of three hours each and a seminar and project report in VWS693. All modules are 24 credits each.

Module code	Subject
VWS601	Food microbiology
VWS602	Food chemistry
VWS693	Research: Seminar and laboratory project

And two of the following:

VWS603	Dairy science
VWS604	Meat science
VWS605	Food science
VWS606	Grain and vegetable science
VWS607	Food Science (only for B.Sc.Agric.Hons. in Food Chemistry)
VWS608	Supplementary Food Science electives (only for B.Sc.Hons. in Food Chemistry)

(g) GRASSLAND SCIENCE - B.Sc.Agric.Hons. - Study Code 5523

Four examination papers of three hours each - two in the first semester and two in the second semester in one of the following fields as well as seminars and a practical project in WDK693. All modules are 24 credits each.

GENERAL FIELD

Module code	Subject
WDK601	Rangeland physiology and ecology
WDK602	Rangeland management
WDK603	Intensive pasture production
WDK604	Rangeland evaluation
WDK693	Seminars and short research essay

WILDLIFE MANAGEMENT

Module code	Subject
WDK601	Rangeland physiology and ecology
WDK602	Rangeland management
WDK604	Rangeland evaluation
WDK605	Wildlife management
WDK693	Seminars and short research essay

Any one of the above-mentioned modules can be replaced by an appropriate Honours module from the animal science field, in consultation with the Departmental Chairperson.

(h) PLANT BREEDING - B.Sc.Agric.Hons. - Study Code 5519

For the Honours course in Plant Breeding PLT693, PLT692 and PWS614 are compulsory, whereas three other modules have to be selected, in consultation with the division head, from PLT614, PLT624, PLT634 and PLT644. An examination paper of three hours must be answered in each of PLT614, PLT624 and PLT634. For PLT644, PLT693 and PLT692 a practical report, oral presentation and a project report are required, respectively. After completion of module PWS614 an oral examination is undertaken.

Module Code	Credits	Subject
PLT614	16	<p>Estimates of heritability</p> <p>In this module the student is familiarized with the estimation of genetic variances and co-variances as used to determine heritabilities. The estimates are done for vegetatively propagated, cross-pollinating and self-pollinating species in one and more environments. Hierarchical, factorial and diallel designs are also included. After completion of this module students should have extensive knowledge on estimates of variances and heritability for different plant species and statistical designs.</p>
PLT624	16	<p>Marker-assisted breeding</p> <p>The aim of this module is to expose the student to techniques used for marker-assisted breeding, and application of these techniques in breeding programs. RFLP (restriction fragment length polymorphism), PCR (polymerase chain reaction), RAPD (random amplified polymorphic DNA), AFLP (amplified fragment length polymorphism), SSR (single sequence repeats), SDS-PAGE (sodium dodecyl sulphate polyacrylamide gel electrophoresis), isozymes and HPLC (high performance liquid chromatography) are studied theoretically and carried out in the laboratory. After completing this module the student should be able to apply these techniques in plant breeding.</p>
PLT634	16	<p>Applied Plant Breeding</p> <p>In this module the student acquires knowledge on applications in plant breeding. The student studies breeding for insect and disease resistance, temperature and moisture stress, quality and adaptation in a specific crop. On completion of the module the student should be able to successfully initiate a breeding program for the crop studied.</p>
PLT644	16	<p>Breeding Program Management</p> <p>In this module the student learns how to manage a breeding program by using Agrobase computer software. This includes the design and randomization of trials, compilation of field books, printing of labels, management of nurseries, hybridization, managing segregating and pure breeding generations, and the processing and interpretation of data. On completion of this module the student should be able to manage a breeding program using appropriate computer software.</p>
PLT693	24	<p>Research: Literature study</p> <p>The student compiles a review of a specific subject and delivers a presentation on the topic. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.</p>
PLT692	32	<p>Research essay</p> <p>The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.</p>

PWS614	16	Research techniques Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted.
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Any of the abovementioned elective modules may be replaced by a suitable Honours module from another field, in consultation with the division head.

(i) PLANT PATHOLOGY - B.Sc.Agric.Hons. - Study Code 5520

For the Honours course in Plant Pathology PPG693, PPG692 and PWS614 are compulsory, whereas three other modules have to be selected, in consultation with the division head, from PPG614, PPG624, PPG634 or PPG644. An examination paper of three hours must be written in each of those selected from the latter modules. Continuous assessment takes place in PPG693 and a project report is required for PPG692. After completion of module PWS614 an oral examination is undertaken.

Module code	Credits	Subject
PPG614	16	Ecology and biology of disease organisms On completion of this module the student is acquainted with the various disease causing organisms on plants. Their role in the environment and biological cycles, including infection, reproduction, dispersal and survival of fungi, bacteria and viruses will receive special attention.
PPG624	16	Plant/Pathogen interactions On completion of this module the student is acquainted with critical interactions that take place between plant pathogens, their hosts and the biotic and abiotic environment. The influence of environmental factors and agricultural practices on disease development and the opportunities they present for disease control are dealt with in a holistic context.
PPG634	16	Epidemiology and control of diseases On completion of this module the student is acquainted with the practical assessment of disease and pathogen populations, temporal and spatial aspects of epidemiology, crop losses, and selected subjects relating to selection for disease resistance.
PPG644	16	Diagnosis of plant diseases On completion of this module the student is acquainted with advanced diagnostic techniques and methods according to which disease causing organisms are identified. The module includes advanced aspects of fungal, bacterial and viral taxonomy with special emphasis on fungi.
PPG693	24	Research: Literature study The student compiles a review of a specific subject and delivers presentations of selected articles in plant pathology journals. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

PPG692	32	Research essay The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.
PWS614	16	Research techniques Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted. On completion of the module the student will have the knowledge to perform certain techniques and laboratory skills used in plant biology.

One of the above-mentioned elective modules may be replaced by a suitable Honours module from another field, in consultation with the division head.

(j) SOIL SCIENCE - B.Sc.Agric.Hons. - Study Code 5516

An examination of three hours to be written in each of GKD601, GKD602, GKD603 and GKD604. Reports on the practical assignments in these four modules and two seminars on suitable topics are required in GKD693. All modules are 24 credits each.

Module code	Subject
GKD601	Soil chemical principles and applications
GKD602	Soil physical principles and applications
GKD603	Soil genesis and evaluation
GKD604	Soil fertility and fertilisation
GKD693	Research: Practical reports and seminars

Any one of the above-mentioned modules can be replaced by an appropriate under- or post-graduate module from another discipline, in consultation with the Departmental Chairperson.

(k) INTERDEPARTMENTAL POST-GRADUATE TRAINING IN IRRIGATION SCIENCE - B.Sc.Agric.Hons. - Study code 5524

Only curricula with irrigation provide admission to this study that is co-ordinated by the Department of Soil Science. An examination of three hours in each of AGR602, GKD602 and LWR604, as well as in one of AGR605, GKD604, LWR602 or WDK603 is written, while a mini dissertation on a project in BSB693 is required. All modules are 24 credits each.

Module code	Subject
AGR602	Stress physiology
AGR605	Water relations and irrigation
BSB693	Research: Integrated planning of an irrigation farm and taking in account the soil, climate, agronomy, economy and engineering aspects.
GKD602	Soil physical principles and applications
GKD604	Soil fertility and fertilisation
LWR602	Agrometeorology
LWR604	Mathematical simulation of meteorological and biotical phenomena and their applications
WDK603	Intensive Pasture Production

INFORMATION

STUDY AIMS

The aims of this degree are:

- (a) to give the student the opportunity to do in-depth specialisation of his/her choice to broaden his/her knowledge with respect to agriculture, rural development and agricultural management;
- (b) to prepare the student for further post-graduate study;
- (c) to lead the student in independent study of the main subject or field of specialisation; and
- (d) to develop, through the Honours degree in Agricultural Management, the student's managerial skills in a variety of functional areas in agricultural enterprise management and development and the management of agricultural businesses.

Module codes

Attention is drawn to the fact that the numerical parts of the course codes for Honours modules do not have the same meaning as for the undergraduate modules. The alphabetical part indicates the specific subject name. The digit 6 indicates that it is an Honours module and the second and third numbers indicate the specific subject. The date of examination in the specific module will have to be determined after consultation with the specific Departmental Chairperson. When the second digit is a 9, it indicates a seminar/mini dissertation/assignment.

REGULATIONS

Nota Bene: The general regulations for Honours degrees (General Regulations A55 to A78) apply *mutatis mutandis* to this faculty.

Reg. H18 - Admission

- (a) See General Regulation A56.
- (b) A student must have a B.Agric. degree on the condition that he/she can also, with permission of the Dean be allowed, with a qualification that is regarded of equal value to the degree by the Senate, or a qualification that has been achieved on the grounds of a standard of competence or other means regarded as adequate by the dean for the aims of the study; and
- (c) the student must prove to the departmental/centre head that he/she has adequate knowledge to justify admission to this study.
- (d) Apart from the above-mentioned requirements for admission to the degree course, the head of department can also, with written confirmation from the Director: Student Administration, expect a student to complete certain additional courses before the student will be admitted to the study or the degree is awarded.

Reg. H19 - Pass requirements

As specified in the different curricula.

Reg. H20 - Compulsory modules

Apart from the requirements of General Regulation A56 (b), a student will also have to acquire the under-mentioned qualifications before he/she will be admitted to the Honours degree in Agricultural Management:

- (a) basic efficiency in the use of the computer, more specifically in spreadsheet and word processing programmes, and
- (b) students who do not have this efficiency, may simultaneously with the commencement of the study on recommendation of the departmental/centre head and with approval of the Dean of the Faculty, take such a course.

Reg. H21 - Curricula for the B.Agric.Hons. degree

(a) Specialisation in Agricultural Management - Study code 5531

An essay and seven examination papers of two hours each, of which four are written in the first semester and six oral examinations in the second semester - two (LBB601 and LBB602) in the first semester and four (LBB605, LBB606, LBB607 and LBB693) in the second semester. All modules are 15 credits each.

Module Code Subject

LBB601 Advanced Agricultural Management - management styles, approaches and analysis of the environment, the organisation of information, as well as the organisation and control of enterprises.

COMPULSORY TOUR: VISIT TO FARMING ORGANISATIONS

LBB602 Financial Agricultural Management - the influence of risks on management decisions, the evaluation of economic and financial viability of capital projects and the effect of income tax thereon, the strategic financial management of an agricultural business.

LBB603 Plant Production Management - physical, economic and financial planning of all cash crops, fruit, vegetables and perennial cultivated (planted) pastures for an agricultural business.

LBB604 Animal Production Management - physical, economic and financial planning of all livestock (including wildlife), as well as a fodder-flow planning for an agricultural business.

LBB605 Strategic Agricultural Marketing Management - the development of marketing strategies for successful farming.

LBB606 Strategic Human Resources Management in Agriculture - the development of strategies to improve productivity of human resources on farming level.

LBB607 Association Agreements and Agribusiness Management - an evaluation of different association agreements that can be used in agriculture; much attention is given to agribusiness management of a farming operation in a changing environment.

LBB693 Integrated Agricultural Planning - it focuses on the integration of all aspects of an agricultural business where a farm planning module must be developed in a mini-project.

COMPULSORY TOUR: VISIT TO AGRIBUSINESSES

Specialisation in Irrigation Management

An examination of three hours in each of LBB609, BSB601, BSB602 and BSB603 must be written, while a mini dissertation on a project assignment in BSB693 is compulsory. All modules are 24 credits each.

Module Code	Subject
LBB609	Management style and Financial Agricultural Management - the identification of management styles; approaches and analysis of the environment; the organisation of information as well as the organisation and management of branching. The student will be able to determine the risk of the managing decisions, the evaluation of economic and financial vitality of capital projects, the determination of the effect of income tax on it and the strategic financial management of an agricultural organisation in practise.
BSB601	Evaluation of soil and water for irrigation suitability. Knowledge on the influence of the climate on the selection of irrigated crops. Management of the soil water balance. The student must be familiar with the soil-plant-atmosphere continuum under irrigation and the effect of irrigation on the environment.
BSB602	Knowledge on the maintenance of soil fertility, integrated pest control and rotation of crops under irrigation. Quantification of water requirements and usage of irrigated crops and the identification of methods for irrigation scheduling.
BSB603	The student must be familiar with making choices, design, installation, evaluation and management of irrigation systems. Analysis and evaluation of electrical motors and electrical usage of irrigation systems.
BSB693	Research: Integrated planning of irrigation farming, and taking in account the soil, climate, agronomy, economy and engineering aspects.

(c) Specialisation in Wildlife Management

Four papers of three hours in LBB609, NLB601, NLB602 and NLB603, as well as the integrating of the theoretical principles of wildlife management in a practical assignment/project (NLB693) is required. All modules are 24 credits each.

Module Code	Subject
LBB609	Management styles and Financial Agricultural Management - the identification of management styles; approaches and analysis of the environment; the organisation of information as well as the organisation and management of branching. The student will be able to determine the risk of the managing decisions, the evaluation of economic and financial vitality of capital projects, the determination of the effect of income tax on it and the strategic financial management of an agricultural organisation in practise.

- NLB601** **Veld and Game Ecology** - the identification and analysis of ecological game farming areas and familiarity with ecosystem characteristics. The student must be adjusted to physiological, phenological and ecological principles of the management of the grassland ecosystem. Population dynamics of game, including aspects such as knowledge of game species, social behaviour, reproduction, habitat preferences, diet selection and grazing habits.
- NLB602** **Applied Habitat Evaluation** - the student must have knowledge of the principles, applications and limitations with regard to important wildlife management and research techniques. Practical skills on techniques to determine primary production, veld condition and grazing capacity of the grass and tree layer. The student must be familiar with techniques to determine fodder intake and feeding preferences of game species.
- NLB603** **Applied Wildlife Management** - the student must have knowledge of the physical planning of a game farm, including fencing requirements, handling facilities, minimum farm sizes and legal aspects. The student must also be familiar with game capture, immobilisation, transport and handling of stress, game diseases and parasitology. The evaluation and analysing of game-utilisation, including all aspects of hunting and life sales, as well as processing of game-products.
- NLB693** **Short research essay** - Integrated planning of a game farm/reserve where various aspects of wildlife management will be applied practically. Its objective is to solve management problems and to ensure the sustainable utilisation of the natural resources.

MASTER'S DEGREES

Degrees

The following Master's degrees are awarded in the Agriculture Programme:

Degree	Minimum study period	Abbreviation	Study code
Magister Scientiae Agriculturae	1 year	M.Sc.Agric.	5700
Magister in Sustainable Agriculture	2 years	M.S.A.	5710
Magister in Disaster Management	2 years	M.Disaster Management	5701
Magister Agriculturae	1 year	M.Agric	5720

MAGISTER SCIENTIAE AGRICULTURAE
Study Code 5700

M.Sc.Agric.

INFORMATION

STUDY AIMS

The aims of this degree study are:

- to offer the candidate the opportunity of increasing his/her knowledge of a specific field within the discipline concerned;
- to guide the candidate in the planning and execution of a research programme;
- to train the candidate in the collection, and interpretation of research results and writing of scientific papers;
- to guide the candidate towards conducting independent research and communicating research results; and
- to develop the candidate's management skills concerning integrated application of acquired knowledge and skills in actual situations, namely the running of farming enterprises and processing of agricultural products.

- Students who enrol for the Master's degree by dissertation, register under the code 5722.
- Students who enrol for the one year structured Master's degree, register under the code 5723.
- Students who enrol for the two year structured Master's degree, register under the code 5724.

Module codes

A candidate who registers for the M.Sc.Agric. degree and who plans to submit a dissertation (120 credits), uses one of the following codes:

For the M.Sc.Agric. in:

Agricultural Economics	LEK700
Agricultural Management	LBB700
Agrometeorology	LWR700
Agronomy	AGR700
Animal Science	VKD700
Biochemistry	BOC700
Biotechnology	BTG700
Entomology	BTG700

Food Science	VWS700
Genetics	GEN700
Grassland Science	WDK700
Horticulture	HRT700
Irrigation Science	BSD700
Plant Breeding	PLT700
Plant Pathology	PPG700
Soil Science	GKD700

A candidate must do research on an approved topic for at least two semesters, in consultation with the Departmental Chairperson, in preparation for a dissertation that shall be submitted as the only requirement for the degree.

The candidate will present at least one seminar/research report in each year in accordance with departmental regulations.

REGULATIONS

Nota Bene: The general regulations regarding Master's degrees (General Regulations A79 to A107) apply to this faculty *mutatis mutandis*.

Reg. H22 - Admission

- (a) See General Regulation A80.
- (b) According to General Regulation A80, a candidate, in order to qualify for admission to the M.Sc.Agric. studies, has to
 - (i) have a B.Sc.Agric.Hons. degree; and
 - (ii) convince the head of the department/centre concerned that he/she has adequate knowledge of the subject to justify admission to the studies.
- (c) In consultation with the Departmental Chairperson, candidates in possession of an appropriate B.Sc.Agric. degree or an equivalent qualification will be admitted to an M.Sc.Agric. study (240 credits) in Agrometeorology, Agronomy, Animal Science, Biochemistry, Biotechnology, Entomology, Genetics, Horticulture, Irrigation Science, Plant Breeding, Plant Pathology, Soil Science or Grassland Science, provided that the degree is presented over two years.
 - (i) additional to the dissertation (AGR700, BSD700, BOC700, BTG700, ENT700, GEN700, GKD700, HRT700, LWR700, PLT700, PPG700, VKD700, VWS700 or WDK700) of 120 credits, supplementary modules in each field of study (an examination paper of three hours) must also be completed:

Agronomy

HRT701 (60 credits each, two examination papers of three hours) and AGR702 and AGR703 or AGR704 (30 credits each, one examination papers of three hours in each module).

Agrometeorology

Choose three (3) of the following modules: LWR701; LWR702; LWR703; LWR704; LWR705 (40 credits each and one examination paper of three hours, or an oral examination, in each module).

Animal Science

DAF701 and DAF702; or DTL701 and DTL702; or DVL701 and DVL702 (60 credits each, two examination papers of three hours in each module)

Food Science

VWS701 and VWS702, or VWS703 (60 credits each, two examination papers of three hours in each module).

Grassland Science

WDK701 and WDK702 (60 credits each, two examination papers of three hours, practical report and seminar in each module).

The contents of these modules are compiled within the separate departments. In Biochemistry, Biotechnology, Entomology and Genetics the additional modules will be determined in consultation with the Departmental Chairperson.

- (ii) two courses in Agricultural Datametrics, DMT214 and DMT224 must be passed;
- (iii) candidates who have successfully completed applicable modules in Mathematical Statistics or Biometry, or who can provide evidence of a proficiency in experimental design and data analysis, may be exempted from DMT214 and/or DMT224 by the Departmental Chairperson.
- (iv) candidates that passed the course work, but did not fulfil in the requirements of the dissertation, can apply for the B.Sc.Agric.Hons. degree to be awarded if sufficient credits at the 600-level have been attained.

Horticulture

HRT701 (60 credits each, two examination papers of three hours) and HRT702 and HRT703 or HRT704 (30 credits and one examination paper of three hours in each module).

Irrigation Science (coordinated by Soil Science)

BSD701 and BSD702 (60 credits each, two examination papers of three hours each, practical report and seminar in each module).

Plant Breeding

PLT701; PLT702 (40 credits each, one examination paper of three hours in each module) and PLT792 (40 credits, research essay).

Plant Pathology

PPG701 (Research skills in Plant Pathology; 48 credits; continuous assessment and two examination papers of three hours).

PPG702 (Advanced Plant Pathology; content determined by a choice of one or more of the following fields of specialisation: Disease control, Disease ecology, Epidemiology, Host-pathogen interactions, Plant pathogenic organisms; 48 credits; continuous assessment and two examination papers of three hours), and

PPG703 (Seminar and Tutorials; 24 credits; continuous assessment).

In consultation with the Departmental Chairperson, PPG702 can be replaced by any appropriate and equivalent module(s) from another discipline.

NB: In consultation with the Departmental Chairperson, PPG702 can be replaced with an appropriate and equivalent module(s) from another discipline.

Soil Science

GKD701 and GKD702 (60 credits each, two examination papers of three hours, practical report and seminar in each module).

Reg. H23 - Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a B.Sc.Agric.Hons.-degree. A dissertation is required, except in the Departments of Agricultural Economics, and the Centre for Agricultural Management where a dissertation or a mini dissertation and examination papers, may be required.
- (c) Candidates must please pay attention to General Regulation A89 regarding the dissertation requirements.
- (d) Candidates with a B.Sc.Agric. or equivalent qualification follow the curricula described under Regulation H22(c) or H25.
- (e) Candidates will present at least one research report seminar in each year of study in accordance with departmental regulations.

Reg. H24 - Year mark/semester mark/pass requirements

- (a) See General Regulation A92.
- (b) No year mark/semester mark is required for the mini dissertation and examination papers.
- (d) When considering the final mark for purpose of a degree, the weight of each module will be calculated according to the percentage of it's credits relative to the total for the degree.

Reg. H25 - Curricula for the Master's degree in the Department of Agricultural Economics

M.Sc.Agric. - Study code 5700

Admission to the study is subject to the approval of the Departmental Chairperson, which will be based on a satisfactory study record and appropriate qualification already obtained. The Departmental Chairperson may require additional subjects/modules to be completed before the admission to the M.Sc.Agric. study.

Requirements for M.Sc.Agric. in Agricultural Economics:

Candidates with an applicable Baccalaureus degree:

Option 1 At least ten post graduate modules and an extended research essay (LEK791, 90 credits).

Option 2 At least eight post graduate modules and a dissertation (LEK700, 120 credits).

Candidates with an applicable Honours degree:

Option 3 A dissertation (LEK700, 120 credits) or at least two modules and an extended research essay (LEK791, 90 credits).

Candidates in possession of an appropriate three year qualification must in the first year of study register in accordance with the honours codes as contained in the B.Sc.Agric.Hons. - study code 5517.

In order to comply with the compulsory core as set out in Regulation H25 a student has to register for LEK601, LEK602, LEK703 and LEK704.

Post graduate modules (15 credits each)

Compulsory core

Module code	Subject
LEK701	Quantitative techniques
LEK702	Production and consumer economics

LEK703	Operational research
LEK704	Agricultural econometrics

One of the following fields

Three modules are compulsory for each field.

Field 1

Agricultural financing and derivative markets

Module code	Subject
LEK705	Agricultural financing
GEB708	Financial systems and monetary policy
GEB707	Derivative markets

Field 2

Agricultural policy and development

Module code	Subject
LEK706	Agricultural policy
LEK707	International agricultural trade
LEK708	Agricultural development

Field 3

Agricultural marketing and international trade

Module code	Subject
LEK709	Agricultural marketing and price analysis
LEK707	International agricultural trade
GEB707	Derivative markets

Field 4

Resource and environmental economics

Module code	Subject
LEK708	Agricultural development
LEK710	Advanced resource and environmental economics
LEK711	Project planning and analysis

Field 5

Farm management

Module code	Subject
LEK709	Agricultural marketing and price analysis
LEK712	Advanced farm management
LEK705	Agricultural financing

Field 6

Food and agribusiness management

Module code	Subject
AGB705	Agribusiness management
AGB704	Technology management: Value adding
LEK709	Agricultural marketing and price analysis

For **Option 1** choose any **three**, and for **Option 2** any **one** of the following modules that do not form part of the core of your field choice.

Module code	Subject
LEK705	Agricultural financing
LEK706	Agricultural policy
LEK707	International agricultural trade
LEK708	Agricultural development
LEK709	Agricultural marketing and price analysis
LEK710	Advanced resource and environmental economics
LEK711	Project planning and analysis
LEK712	Advanced agricultural management
AGB704	Technology management: Value adding
AGB705	Agribusiness management
GEB708	Financial systems and monetary policy
GEB707	Derivative markets

According to General Regulation A57(b) a subject/module in the foregoing list may be replaced with an alternative module if approved by the Departmental Chairperson.

- (i) In calculating the final pass mark for the degree, for:
 - Option 1:** All modules have the same weight, namely, **fifteen** credits each and the mini dissertation is **ninety** credits; and
 - Option2:** All modules have the same weight, namely, **fifteen** credits and the dissertation is one **hundred and twenty** credits.
- (ii) Candidates who have passed LEK701 and seven or more modules on the M.Sc.Agric. level, can apply for a B.Sc.Agric.Hons.-degree to be awarded.

INFORMATION

STUDY AIMS

The aim of this multi- and interdisciplinary postgraduate degree in Sustainable Agriculture course is to present training in the development, maintenance and management of sustainable agricultural production systems. This process involves the sustainable utilisation of natural, economic and human resources for the production of sufficient and safe food and fibre products in all the climatic conditions of Southern Africa, but particularly the high-risk semi-arid regions. Applicable research will stimulate analytical and critical thought.

REGULATIONS

Nota Bene: The general regulations in respect of Master's degrees (General Regulations A79 to A107 applies *mutatis mutandis* to this faculty.

Reg. H26 - Admission

- (a) See General Regulation A80.
- (b) In addition to the provisions of General Regulation A80, a candidate who wishes to enrol for the M.S.A., must have one of the following:
 - (i) an applicable three-year degree plus applicable practical experience and/or applicable preparatory studies;
 - (ii) an applicable four-year degree plus applicable practical experience and/or applicable preparatory studies; or
 - (iii) an applicable honours degree or an honours degree and applicable studies and/or practical experience.

Nota Bene: The scope, nature and applicability of practical experience and preparatory study in (a) and (b) above will be determined by the Director of the Centre for Sustainable Agriculture.

Reg. H27 - Method of presentation, evaluation and examination

- (a) See General Regulations A86, A94, A95 and A96.
- (b) Modules are presented with limited contact by means of assignments and residential sessions.
- (c) This training programme consists of five compulsory modules, three optional modules and an extended research essay consisting of a module on research methodology, a complete research project proposal and a final research report in the form of an extended research essay or article.
- (d) Examination (written and/or oral) is done by means of a formal examination as well as the assignments of each theoretical module. The extended research essay is presented and examined under supervision of a supervisor and supervision committee.
- (e) Modules will be offered as year or semester modules as indicated in the different study guides.

Reg. H28 - Year mark and pass mark

- (a) See General Regulations A92 and A93.
- (b) A year mark for admission to the examination is required for all the modules.
- (c) The manner in which a year mark and pass mark is calculated and whether a sub-minimum is required for parts of a module are contained in the respective study guides for each module.

Reg. H29 - Duration of study

The study is presented over a minimum period of two years, during which 240 credits must be earned.

Reg. H30 - Learning programme contents**Schematic representation of learning programme content****Core modules**

Module code	Module theme	Credits
MVL720	Introduction to sustainable agriculture and rural development	12
MVL721	Research methodology	12
MVL722	Natural agricultural resources and the environment	24
MVL723	Sustainable utilisation of natural agricultural resources	24
MVL724	Resource and environmental economics	24

Choice modules: Three modules (24 credits each) from any focus area**Focus areas**

Rural development	Value added	Agribusiness management	Plant production	Animal production
MVL730	MVL740	MVL750	MVL760	MVL770
MVL731	MVL741	MVL751	MVL761	MVL771
MVL732	MVL752	MVL752	MVL762	
MVL733				

Extended research essay

MVL791 extended research essay (72 credits) or MVL7923 Short research essay (24 credits) + MVL792 research essay/article (48 credits)

- (i) **Compulsory modules (MVL720, MVL721, MVL722, MVL723 and MVL724 as well as the extended research essay as research component with credits as indicated separately:**

Module Code	Module Theme	Module Contents
MVL720	Introduction to Sustainable Agriculture and Rural Development	After completing this course the student will be able to understand and evaluate the dynamics of Sustainable Agriculture and Rural Development.

MVL721	Research Methodology	Students will be equipped with knowledge and skills to formulate a research project, to unravel it in components, to gain various techniques to gather data and, as a result, deliver a significant report.
MVL722	Natural Agricultural Resources and the Environment	After completing this module the student will be able to evaluate the characteristics of soils and pastures, which serves as indicators of the quality of the resources, to select sustainable agricultural systems, as well as to explain climate, vegetation and energy as natural resources.
MVL723	Sustainable Utilization of Natural Agricultural Resources and the Environment	Students will gain knowledge and insight into the sustainable utilization of natural resources, climate, soil, pastures and energy to the efficient use for people without damaging the resources.
MVL724	Resource and Environment Economy	After completing this module, students will be able to handle and apply resource and/or environment economy aspects of an agricultural problem, of their own choice.

(ii) Choice modules (24 credits each): [three modules out of any focus area]

(a) Focus area 1: Rural development

MVL730	Rural Economic Development	Student will gain insight into the rural characteristics of poverty and decay. Students will be able to select and evaluate alternative strategies to develop and increase food security and economic growth under limited circumstances.
MVL731	Rural Sociology	Students will be able to understand the dynamics of population growth and pressure as variability's in a sustainable community structure and to integrate it with social poverty and sustainable rural development.
MVL732	Agriculture Technology for Developing Countries	Students will be able, among other things, to design and develop different irrigation-practices, to evaluate technology in developing regions and to suggest suitable adjustments.
MVL733	Communication and Technology transfer for Sustainable Agriculture	After completing this module, students will have confidence in the principles of communication and technology transfer, the context of communication and communication strategies in respect of technology transfer.

(b) Focus area 2: Value adding and marketing

MVL740	Agricultural Product Processing and Preserving	After completing this module the students will be able to understand the physical methods of food processing and to be able to apply the principles of processing dairy and meat products, vegetables, fruit, as well as cereals, legumes and grains in the practice.
MVL741	National and International Agricultural Marketing	Students will be able to understand the marketing environment where-in agriculture operates, as well as the national and international contexts. The student will acquire skills that relates to the analysis of markets and trades, as well as the composition of marketing strategies.
MVL752	Strategic Management and Planning in Agriculture	After completing this module the students will be able to understand the principles and processes of strategic management, marketing and planning and to develop a strategic marketing plan.

(c) Focus area 3: Agribusiness management

MVL750	Farm Management for Sustainable Agriculture	The students will be able to implement financial and risk management systems and analyse and interpret management information systems. Skills in terms of the manager, the management process and personnel management will be acquired.
MVL751	Integrated Sustainable Agricultural Production Systems	The students will be equipped for the use of model simulation for decision-making in agriculture sustainable production systems.
MVL752	Strategic Management and Planning in Agriculture	After completing this module, students will be able to apply the principles and processes of strategic management, marketing and planning to develop such a plan for an agricultural enterprise.

(d) Focus area 4: Plant production

MVL760	Horticultural Plant Production Systems	Students will acquire skills to production principles, including crop and cultivars choices, crop rotation, soil tillage and conservation, as well as post-harvest handling of important fruit and vegetable crops in South Africa.
MVL761	Agronomical Plant Production Systems	This module will enable the student to implement sustainable crop succession practices through strategic crop and cultivar choices, soil tillage, plant nutrition and water management and utilization.

MVL762	Integrated Pest Management	After completing this module the student will be able to apply the principles and to implement control strategies for an integrated and sustainable management of pests and diseases with crops.
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(e) Focus area 5: Animal production

MVL770	Sustainable Livestock Production Systems	This module will enable the student to apply the three dimensions of livestock production namely nutrition, reproduction physiology and animal breeding within an intensives and extensive production system.
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MVL771	Sustainable Wildlife Production Systems	Students will be able to gather knowledge regarding the specific nutrition needs of different wildlife species and to learn skills and to develop and sustain such a production systems on a sustainable way.
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(iii) Compulsory dissertation or alternative option (60 credits)

Candidates have a choice between undermentioned alternatives in order to complete their studies obtaining 72 credits

(a) Alternative 1: Extended research essay

MVL791	Extended research essay	With the script the students will illustrate the skills they have acquired, and the competence and proficiency to determine, identify and integrate all the factors of sustainability in an agriculture system.
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(b) Alternative 2: Research project proposal (24 credits) and research report or research article (48 credits)

MVL792	Short research essay/Proposal	By the means of the four themes within this module, students will acquire skills to formulate a significant project proposal, which will lead to the accomplishment of a research report.
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MVL793	Research essay/Article	The final output of the research project will be covered through a scientific report in the form of a research essay or article.
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EQUIVALENT MODULES

MVL701 equivalent to MVL720 and MVL722
MVL702 equivalent to MVL723
MVL703 equivalent to MVL770
MVL704 equivalent to MVL724 or MVL730
MVL705 equivalent to MVL731
MVL706 equivalent to MVL740
MVL707 equivalent to MVL770
MVL708 equivalent to MVL761
MVL709 equivalent to MVL750
MVL710 equivalent to MVL751
MVL711 equivalent to MVL752
MVL712 equivalent to MVL733
MVL713 equivalent to MVL721
MVL714 equivalent to MVL762
MVL791 class attendance gives recognition to MVL721

INFORMATION

STUDY AIMS

The main aim of the programme is to provide disaster management practitioners, or those who may have future disaster management responsibilities, training in a holistic approach towards disaster management to enable them to manage all kinds of disasters by implementing proactive disaster management strategies in terms of relevant legislation, policies and directives, and effectively co-ordinate relief and recovery programs

REGULATIONS

Nota Bene: The general regulations in respect of Master's degrees (General Regulations A79 to A107 applies *mutatis mutandis* to this faculty).

Reg. H26(a) - Admission

- (a) See General Regulation A80.
- (b) In addition to the provisions of General Regulation A80, a candidate who wishes to enrol for the Master in Disaster Management, must have one of the following:
 - (i) an appropriate three-year degree plus appropriate practical experience and/or preparatory studies, or
 - (ii) any other relevant degree, e.g. four-year and/or Honours degree or a relevant professional qualification equivalent with practical and/or preparatory experience will also allow candidates to read for the Master' in Disaster Management degree.

Nota Bene: An Executive Committee of DiMTEC would assess the extent, nature and suitability of experience and preparatory studies mentioned above.

Reg. H27(a) - Method of presentation, evaluation and examination

- (a) See General Regulations A86, A94, A95, A96.
- (b) Candidates will have three formal contact sessions of five days each year. During the first contact session, candidates will be orientated and will receive all module material for the first year.
- (c) The programme consists of eight compulsory modules, two electives and a research project reported in an extended research essay format.
- (d) The programme will be structured in modules and will require practical assignments to be completed by candidates and submitted at predetermined dates. Assignments will be marked and graded by the lecturers, who will give candidates feedback in a written format and also orally during contact sessions. Assignments will be part of a continuous evaluation process. Apart from the assignments a formal evaluation (written or oral) will take place at the end of each semester, normally during June and November.

Candidates who are unable to successfully complete the second year of the Master in Disaster Management will be able to exit the course with an **Advanced Diploma in Disaster Management**, under the precondition that the candidate has successfully completed the eight compulsory modules for the first year of the Master in Disaster Management.

Reg. H28(a) - Year mark and pass mark

- (a) See General Regulations A92 and A93.
- (a) A year mark for admission to the examination is required for all the theoretical modules.
 - (b) The way in which a year mark and pass mark is calculated and whether a sub-minimum is required for parts of a course is contained in the respective study guides for each module.

Reg. H29(a) - Duration of study

The module can be offered over a minimum period of two years (full time). However, candidates will be allowed to take the module over a three-year period (part time) by registering for fewer subjects per year. Prospective part-time candidates need to clarify their part-time studies with the Director of DiMTEC.

Reg. H30(a) - Learning programme

First Semester

Module Code	Subject
DIM601	Research Methodology
DIM602	Hazards and Disaster Management
DIM603	Strategic Disaster Management
DIM604	Disaster Management principles and practices

Second Semester

Module Code	Subject
DIM605	Disaster Risk Management
DIM606	Information Technology in Disaster Management
DIM607	Public Health
DIM608	Management of natural and human-made disasters

SECOND ACADEMIC YEAR

Compulsory

DIM791	Extended research essay
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Electives (choose any two):

Module Code	Subject
DIM701	Trauma Management
DIM702	Political Strategic Planning
DIM703	Information Management
DIM704	Ethnic and Cultural Conduct
DIM705	Management of media relations
DIM706	Environmental risk and impact assessment
DIM707	Disaster vulnerability and risk assessment

CONTENTS OF MODULES

DIM601 - Research Methodology (15 credits)

Development of knowledge and skills of candidates to conduct qualitative and quantitative research. Planning, design and management of practical research. Understanding participatory action research (PAR). Construct and present a project proposal for short research essay.

DIM602 - Hazards and Disaster Management (15 credits)

Understand disaster hazards and how they pose disaster threats. Categories and characteristics of disaster threats. Learning about environmental and other hazards; identification, description and management of all potential hazards that may occur in the area of responsibility.

DIM603 - Strategic Disaster Management (15 credits)

Understanding the application of the principles and procedures of strategic management in the domain of disaster management. Strategic management principles, methods and tools. Develop strategic thinking in the field of disaster management. Improving the quality of humanitarian environmental assessment, planning, organising, leadership and monitoring and evaluation of all role-players in disaster management.

DIM604 - Disaster Management principles and practices (15 credits)

Consider most important factors that need attention for the implementation of Disaster Management. National and International Disaster Management Legislation, key factors, principles and ethics consideration for effective planning, controlling, co-ordinating, monitoring and implementing Disaster Management.

DIM605 - Disaster Risk Management (15 credits)

Execution of a qualitative and quantitative risk and vulnerability assessment. Integrated risk and resources assessment. Hazard mapping. Determining of potential disaster losses. Establish levels of acceptable risk. Utilising GIS as a means to manage risk and vulnerability assessment.

DIM606 - Information Technology in Disaster Management (15 credits)

Understanding the link between decision making and information. Understanding and classify information systems that can have an impact on the dynamic disaster environment. Demonstrate the process of the development of a Management Information System. Understand the concept of simulation in decision-making for disaster management. Demonstrate how different information technologies could be used in disaster management.

DIM607 - Public Health (15 credits)

Understanding concepts related to Public Health with regard to biological, community health and psycho-social and certain mental health implications of disasters. Biological warfare, Veterinary risks; Epidemiology: Community assessment, infection control and prevention disease. Handling and management of health risks during disasters and/or conflict. Psycho-social aspect of HIV/AIDS and Mental health burnout.

DIM608 - Management of natural and human-made disasters (15 credits)

Understanding the critical common factors in responding to disasters. Demonstrate the management principles of at least four natural and four human-made disasters. Assessing of hazards and risk. Vulnerability analysis. Determining the potential impacts of disasters. Social-, economics and environmental impact. Formulating of hazard and risk reduction strategies. Formulating prevention and mitigation strategies.

DIM701 - Trauma Management (15 credits)

The management of crisis intervention and trauma management to support victims of traumatic incidents. Posttraumatic-stress and burn-out resulting from long-term exposure to traumatic incidents and the emotional distress of victims of trauma. Action strategies for crisis workers. Coping strategies and management principles of natural disasters, human made disasters, family and sexual violence and injury, chronic and life-threatening illness.

DIM702 - Political Strategic Planning (15 credits)

The main aim of this module is the development of sophisticated techniques within the context of political environmental analysis with specific emphasis on forecasting. Specific attention will be given to scenario development as a technique for predicting the future.

DIM703 - Information Management (15 credits)

This module pays pertinent attention to information needed within the organisational context. The importance of information to the manager, how he/she applies it, how the information is retrieved and from what type of sources are only a few of the issues which will be discussed. Applications of information in the industry, information systems and their management, as well as the integrity thereof will be explored.

DIM704 - Ethnic and Cultural Conduct (15 credits)

The nature and development of human settlement. The nature of settlement in Africa. Indigenous settlement patterns. Formal and informal urbanisation. Anthropology of poverty. Ethnography of urbanisation. The ethnic and cultural influences on human settlements in multi-cultural urban environments. Problems created by the present tendencies in urban settlement from an anthropological perspective.

DIM705 - Management of media relations (15 credits)

Understanding the influence of old-fashioned charity approach and the rights-based approach to the provision of humanitarian assistance has on public participation. Role of communities in all phases of disaster management if public participation programme is planned and co-ordinated effectively. Risk communication. Releasing information to the community.

DIM706 - Environmental risk and impact assessment (15 credits)

Environmental damage assessment: damage risk assessments on humans lives, farm and range lands, water and aquatic lives and air, vegetation and stratosphere. Post damage assessments. Pre- and post-damage remedies. Social dimensions of environmental degradation; drought risks and impacts on food production and supply, disease epidemics, political conflicts, refugees and pollutant emissions. Economic impacts of disasters; economic risk assessment, valuing of disaster damage (cost-benefit analysis and environmental impact assessment) and forecasting of disaster risks. Biological and biophysical aspects of environmental degradation; pests and diseases attack, microorganisms as polluting agents of food and drinks, microorganisms roles in biodegradation. Policy dimensions to environmental disasters.

DIM707 - Disaster vulnerability and risk assessment (15 credits)

Quantitative method to determine vulnerability and risks. Case studies to determine the vulnerability of communities and communities at risk. Actuary probability theory. Determining the probable disaster loss. Using vulnerability and risk assessment to formulate prevention and mitigation strategies.

DIM791 - Extended research essay (90 credits)

INFORMATION

STUDY AIMS

The aims of this degree study are:

- (a) to present specialised post-degree agricultural management training;
- (b) to guide the candidate in such a way that he/she will be able to successfully integrate, communicate and apply the principles, concepts and knowledge of agricultural and management science;
- (c) to enhance applicable research skills in order to enable the candidate to qualify as a specialist in his/her field.

Module codes

A candidate who registers for the M.Agric. degree and presents a dissertation (120 credits), must use one of the following codes:

Agricultural Management	LBB700
Irrigation Management	BSB700
Wildlife Management	NLB700

REGULATIONS

Nota Bene: The general regulations regarding Master's degrees (General Regulations A79 to A107) are *mutatis mutandis* applicable to this faculty.

Reg. H31 - Admission

- (a) See General Regulation A80.
- (b) Apart from the definition of the General Regulation A80, a candidate must in order to be admitted to the M.Agric. modules:
 - (i) convince the specific Departmental Chairperson that he/she has enough knowledge of the subject in order to be admitted to the modules.
 - (ii) be in possession of a B.Agric.Hons. degree or equivalent qualification;
- (c) **Agricultural, Irrigation and Wildlife Management:** Candidates in possession of an appropriate B.Agric. degree or equivalent qualification can be allowed to do the M.Agric degree in Irrigation Management, Agricultural Management or Wildlife Management after consultation with the responsible Departmental Chairperson. The responsible departments are Irrigation Management (Soil Science); Agricultural Management (Agricultural Economics; Centre for Agricultural Management) and Wildlife Management (Grassland Science). Admission is subject to the following:
 - (i) that the period for the M.Agric. study in Irrigation Management, Agricultural Management or Wildlife Management will be at least two years; and
 - (ii) two supplementary modules in each discipline must be passed in addition to the dissertation (120 credits), BSB700, LBB700 or NLB700.

Irrigation Management:

BSB701 and BSB702 (60 credits each, two examination papers of three hours, practical report and seminar in each module).

Agricultural Management:

LBB703 and LBB704 (60 credits each, two examination papers of three hours in each module).

or

LBB701 and LBB702 (30 credits each, one examination paper of three hours in each module) plus LBB703 and LBB704 (60 credits, two examination papers of three hours in each module) plus LBB791 (60 credits, extended research essay). No dissertation LBB700 (120 credits) is required with this option.

Wildlife Management:

NLB701 and NLB702 (60 credits each, two examination papers of three hours, practical report and seminar in each module).

- (iii) Candidates that passed the prescribed modules, but did not fulfill the requirements for the dissertation or extended research essay can apply for the B.Sc.Agric.Honours degree to be awarded.

Reg. H32 - Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a B.Agric.Honours degree a dissertation (BSB700, LBB700 or NLB700) is required, or an extended research essay in Agricultural Management (LBB791), plus two examination papers of three hours each in LBB701 and LBB702.
- (c) Candidates must give attention to the General Regulation A89 on the regulations for the compiling of dissertations.
- (d) Candidates holding a B.Agric. degree or an equivalent qualification enroll according to the curricula in Regulation H31(c).

Reg. H33 - Year mark/semester mark/pass requirements

- (a) See General Regulation A92.
- (b) No year mark/semester mark is required for the extended research essay and examination papers.
- (c) When considering the final mark for purpose of a degree, the weight of the different modules will be calculated according to the percentage of its credits relative to the total for the degree.

DOCTOR'S DEGREES

Degrees

The following Doctor's degrees are awarded in this faculty:

Degree	Minimum study period	Abbreviation	Study code
Philosophiae Doctor	2 years	Ph.D.	5910
Doctor Scientiae	See regulations	D.Sc.	5920

PHILOSOPHIAE DOCTOR
Study Code 5910

Ph.D.

INFORMATION

STUDY AIMS

This graduate study aims at:

- providing the candidate with the opportunity to prove her/his ability to plan and do research independently and to report the results;
- enabling the candidate to make an original contribution to the respective discipline.

Module codes

A candidate who registers for the Ph.D. degree (120 credits) uses one of the following codes:

Agricultural Economics	LEK900
Agricultural Management	LBB900
Agronomy	AGR900
Agrometeorology	LWR900
Animal Science	VKD900
Biochemistry	BOC900
Biotechnology	BTG900
Entomology	ENT900
Genetics	GEN900
Food Science	VWS900
Grassland Science	WDK900
Horticulture	HRT900
Irrigation Management	BSB900
Irrigation Science	BSD900
Plant Breeding	PLT900
Plant Pathology	PPG900
Soil Science	GKD900
Sustainable Agriculture	VHL900
Wildlife Management	NLB900

REGULATIONS

Nota Bene: The general regulations regarding Doctor's degrees (General Regulations A108 to A126) apply to this faculty *mutatis mutandis*.

Reg. H34 - Admission

- (a) See General Regulation A109.
- (b) Candidates must apply at the Departmental Chairperson on the prescribed form for admission to Ph.D. studies.
- (c) In terms of the stipulations of General Regulation A109 a student in order to qualify for admission to Ph.D. studies, must:
- (d) have a M.Agric. or M.Sc.Agric. or M.S.A. degree; and
- (e) convince the Departmental Chairperson concerned beforehand that he/she has sufficient knowledge of the subject to warrant admission.

Reg. H35 - Learning programme composition and duration of study

- (a) See General Regulation A113.
- (b) A thesis (120 credits) is required, the topic of which must be chosen in consultation with the head of the department.
- (c) A candidate does research for at least four semesters on an approved topic selected in consultation with the Departmental Chairperson in preparation of a thesis which serves as the only requirement for the degree. The candidate will present at least one seminar/research report in each year of study in accordance with departmental regulations.

Reg. H36 - Presentation and examination

- (a) See General Regulation A115.
- (b) According to General Regulation A115(b) a thesis is required.

Reg. H37 - A candidate who is admitted to Master studies according to Reg. A80, may apply for admission to the Ph.D. degree in consultation with the supervisor after a study and registration period of at least one year and on recommendation of the Examination Committee, the head of the department concerned and the Research Committee of the Faculty via the Dean. After admission to the Ph.D. study, at least two years must elapse before a Ph.D. degree can be awarded. The degree study therefore lasts three years.

The M.Agric, M.Sc.Agric. or M.S.A. degree may be awarded to a candidate if:

- (a) the candidate rescinds his/her candidature for the Ph.D. degree; or
- (b) if his/her candidature for the Ph.D. degree is cancelled; or
- (c) if the candidate does not meet the requirements for the Doctor's degree.

DOCTOR SCIENTIAE
Study Code 5920

D.Sc.

REGULATIONS

Reg. H38 - General Regulations A127 to A132 regarding the Doctor Scientiae applies to this faculty *mutatis mutandis*.