

Part 3: Postgraduate Programmes

Dean

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ACADEMIC STAFF

DEAN Professor N.J.L. Heideman
VICE-DEAN Professor R.C. Witthuhn
PROGRAMME HEAD (QWAQWA CAMPUS) Professor A.S. Luyt

PROGRAMME DIRECTORS

Programme	Programme Director	Telephone
Architecture	Mr J.I. Olivier	051 401 2658
Agricultural Sciences	Prof. J.B. van Wyk	051 401 2677
Biological Sciences:		
• Genetics, Behavioural Genetics, Forensic Genetics, Human Molecular Biology	Ms Z. Odendaal	051 401 2776
• Botany, Plant Breeding, Plant Health Ecology, Plant Pathology	Dr B. Visser	051 401 3278
• Zoology, Entomology	Prof. J.G. van As	051 401 2427
• Biochemistry	Dr A. van Tonder	051 401 2892
• Microbiology, Microbial Biotechnology	Prof. S.G. Kilian	051 401 2780
• General Biology first-year	Dr A. van Wyk	051 401 3924
Extended Programme [South Campus]	Ms R. Meintjes	051 401 2783
Building Sciences	Ms M-M Els	051 401 2257
Centre for Environmental Management	Ms M. Kemp	051 401 2683
Consumer Science	Prof. H.J.H. Steyn	051 401 2304
Computer Science and Informatics (Information Technology)	Dr A. van Biljon	051 401 2605
Geosciences:		
• Geography	Ms E. Kruger	051 401 2185
• Geology and Geohydrology	Dr H.E. Praekelt	051 401 2373
Mathematical Sciences	Prof. S.W. Schoombie	051 401 2329
Mathematical Statistics and Actuarial Science	Mr M.J. von Maltitz	051 401 2609
Physical and Chemical Sciences	Dr J.A. Venter	051 401 3336
Urban and Regional Planning	Prof. V.J. Nel	051 401 2486

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

AGRICULTURAL ECONOMICS (051 401 2824)

Professor	*Prof. B.J. Willemse
Associate Professor	Prof. B. Grové
Affiliated Professors	Prof. Z.G. Alemu, Prof. A. Jooste
Senior Lecturer	Dr A.C. Geyer
Lecturers	Mr H. Jordaan, Mr D.B. Strydom, Ms N. Matthews, Ms L. Morris, Mr A.O. Ogundeji, Mr F.A. Maré, Mr J.I.F. Henning, Mr P. Mokhatla
Lecturer Units	Dr L. Terblanche
Research Associate	Dr P.R. Taljaard
Agricultural Engineering	Mr J.J. van Staden

DiMTEC (051 401 2721)

Director	*Dr A.J. Jordaan
Lecturers	Dr B. Grové, Dr L. Terblanche, Prof. G. Viljoen, Mr E. du Plessis, Prof. H. Hudson, Prof. W. Purcell, Mr C. Dreyer, Dr D. Sakulski, Dr H. Booysen, Ms A. Weyers, Dr D. Chikobvu
Junior Lecturers	Ms O. Kunguma, Ms A. Ncube, Ms J. Belle, Mr A.O. Ogundeji

ANIMAL, WILDLIFE AND GRASSLAND SCIENCES (051 401 2211)

Professors	*Prof. J.P.C. Greyling, Prof. G.N. Smit, Prof. H.A. Snyman, Prof. J.B. van Wyk, Prof. F.W.C. Nesor
Professors Extraordinary	Prof. M.M. Scholtz, Prof. T.L. Nedambale, Prof. A.J. van der Zijpp, Prof. A. Maiwashe
Associate Professor	Prof. H.O. de Waal
Senior Lecturer	Dr A.M. Jooste
Lecturers	Dr M.D. Fair, Mr P.J. Malan, Mr F.H. de Witt, Mr O.B. Einkamerer, Dr G.D.J. Scholtz
Junior Lecturers	Mr M.B. Raito, Mr F. Deacon
Junior Researcher	Dr B.B. Janecke

ARCHITECTURE (051 401 2332)

Professor Prof. W.H. Peters
 Affiliated Professor Prof. O. Joubert
 Senior Lecturer *Ms M. Bitzer, Ms P.N. Tumubweinee
 Lecturers Mr G. Bosman, Mr J.L. du Preez, Mr J.W. Ras
 Junior Lecturers Mr R. Bitzer, Mr H.B. Pretorius, Mr J.I. Olivier, Mr J.H. Nel, Mr H. Raubenheimer

CENTRE FOR MICROSCOPY (051 401 2264)

Associate Professor Prof. P.W.J. van Wyk

CENTRE FOR ENVIRONMENTAL MANAGEMENT (051 401 2863)

Director *Prof. M.T. Seaman
 Lecturer Ms M.F. Avenant
 Affiliated Professor Prof. A. Turton
 Research Associates Dr N.L. Avenant, Dr N.B. Collins, Mr P. Grundlingh, Dr S. Mitchell

CENTRE FOR SUSTAINABLE AGRICULTURE, RURAL DEVELOPMENT AND EXTENSION (051 401 2163)

Director *Prof. I.B. Groenewald
 Senior Researcher Dr J.A. Van Niekerk

CHEMISTRY (051 401 9212)

Outstanding Professor *Prof. A. Roodt
 Senior Professor Prof. A. Marston
 Professors Prof. J.C. Swarts, Prof. B.C.B. Bezuidenhout, Prof. J. Conradie
 Senior Professor Prof. A. Marston
 Associate Professors Prof. W. Purcell, Prof. J.H. van der Westhuizen, Prof. H.G. Visser
 Affiliated Professors Prof. D. Ferreira, Prof. H. Frank, Prof. K. Swart, Prof. T. van der Merwe, Prof. S. Otto,
 Prof. J.M. Botha
 Affiliated Associate Professors Prof. C. Edlin, Prof. G. Fouché, Prof. V. Maharaj, Prof. G. Steyl
 Senior Lecturers Dr S.L. Bonnet, Dr K.G. von Eschwege
 Lecturer Dr J.A. Venter, Dr E.H.G. Langner, Dr E. Erasmus, Dr L. Twigge, Dr A. Brink, Dr M. Schutte,
 Dr E. Fourie, Dr R. Shago, Ms A. Wilhelm-Mouton
 Dr C. Marais, Ms R. Meintjes
 Subject Coordinators
Qwaqwa-Campus
 Professor Prof. A.S. Luyt
 Lecturers Mr T.A. Tsotetsi, Ms N.F. Molefe, Ms M.A. Malimabe, Ms M. Amra-Jordaan
 Junior Lecturers *Mr R.G. Moji, Mr J.S. Sefadi

CONSUMER SCIENCE

Associate Professor *Prof. H.J.H. Steyn
 Lecturers Ms I. van der Merwe, Dr J.F. Vermaas
 Junior Lecturers Ms J.S. van Zyl, Ms P.Z. Swart

COMPUTER SCIENCE AND INFORMATICS (051 401 2754)

Professors Prof. P.J. Bignaut, Prof. T. McDonald
 Affiliated Professor Prof. H.J. Messerschmidt
 Senior Lecturers *Dr A. van Biljon, Dr L. de Wet, Dr J.E. Kotze, Dr E. Nel, Dr T. Beelders
 Lecturers Ms E.H. Dednam, Mr A.J. Burger, Mr W. Nel, Mr R. Brown
 Junior Lecturers Ms M.J.F. Botha, Mr R.C. Fouché, Mr J. Marais, Mr B. Campbell

Qwaqwa Campus

Lecturers Mr R.M. Alfonsi, Ms R.D. Wario
 Junior Lecturers *Mr V.F.S. Mudavanhu, Mr B. Sebastian, Mr F.M. Radebe, Mr T. Lesesa, Mr M.B. Mase,
 Mr G.J. Dollman

GENETICS (051 401 2595)

Professor *Prof. J.J. Spies, Prof. J.P. Grobler
 Affiliated Professor Prof. T.E. Turner
 Affiliated Associate Professor Prof. A. Kotzé
 Lecturers Dr K. Ehlers, Mr M.F. Maleka, Ms P. Spies
 Affiliated Lecturers Dr D.L. Dalton, Lt.-Col. A. Lucassen
 Junior Lecturers Ms Z. Odendaal, Ms L. Wessels, Ms H. van der Westhuizen, Ms S-R. Schneider

GEOGRAPHY (051 401 2255)

Professors	Prof. P.J. Holmes, Prof. G.E. Visser
Senior Lecturer	*Dr C.H. Barker
Lecturers	Ms E. Kruger, Ms T.C. Mehlomakhulu
Junior Lecturers	Ms M. Rabumbulu, Ms A. Steenekamp
Qwaqwa Campus	
Associate Professor	Prof. W.F. van Zyl
Senior Lecturers	*Dr J.H.D. Claassen, Dr G. Mukwada
Lecturers	Mr A. Adjei, me. M. Naidoo
Junior Lecturer	Mr P.S. Mahasa

GEOLOGY (051 401 2515)

Professor-researcher	*Prof. W.A. van der Westhuizen
Affiliated Professor	Prof. D.E. Miller
Associate Professors	Prof. W.P. Colliston, Prof. M. Tredoux, Prof. C.D.K. Gauert
Senior Lecturers	Dr J.O. Claassen, Dr F. Roelofse
Senior Lecturer-researcher	Dr H.E. Praekelt
Junior Lecturer	Ms H. Pretorius, Mr A.I. Odendaal

INSTITUTE FOR GROUNDWATER STUDIES (051 401 2175)

Director	*Dr P.D. Vermeulen
Professor	Prof. G.J. van Tonder
Affiliated Associate Professors	Prof. K. Witthüser, Prof. J.L. Nieber
Lecturers/Researchers	Ms L-M. Deysel, Dr F.D. Fourie

MATHEMATICS AND APPLIED MATHEMATICS (051 401 2691)

Senior Professor	*Prof. J.H. Meyer
Professors	Prof. A.H.J.J. Cloot, Prof. S.W. Schoombie
Associate Professor	Prof. T.M. Acho
Senior Lecturers	Dr H.W. Bargenda, Ms J.S. van Niekerk
Lecturers	Ms A.F. Kleynhans, Dr S. Dorfling, Mr C. Venter
Qwaqwa Campus	
Associate Professor	Prof. J. Schröder
Lecturer	Mr S.P. Mbambo
Junior Lecturer	Ms H.C. Faber

MATHEMATICAL STATISTICS AND ACTUARIAL SCIENCE (051 401 2311)

Senior Professor	Prof. M.S. Finkelstein
Professor	*Prof. R. Schall
Senior Lecturers	Dr J.M. van Zyl, Ms L van der Merwe, Mr F.F. Koning, Dr D. Chikobvu, Dr A. Verster
Lecturers	Mr A.M. Naudé, Mr M.J. von Maltitz, Mr S. van der Merwe, Ms E. Girmay, Ms W. Oosthuizen, Ms Z. Ludick, Mr M. Sjölander

MICROBIAL, BIOCHEMICAL AND FOOD BIOTECHNOLOGY (051 401 2396)**Division of Microbiology and Biochemistry**

Distinguished Professor	Prof. J.L.F. Kock
Professors	*Prof. J.C. du Preez, Prof. J. Albertyn, Prof. R.R. Bragg, Prof. S.G. Kilian, Prof. H-G. Patterson, Prof. M.S. Smit, Prof. E. van Heerden, Prof. B.C. Viljoen
Senior Lecturers	Dr H.G. O'Neill, Dr F.H. O'Neill, Dr D. Opperman, Dr C.H. Pohl-Albertyn, Dr A. van Tonder
Lecturer	Dr O.M. Sebolai
Junior Lecturers	Ms C.E. Boucher, Mr W.P.D. Schabort
Researcher	Ms L. Steyn
Affiliated Associate Professor	Prof. E.J. Lodolo

Division of Food Science

Professor	Prof. G. Osthoff
Associate Professors	Prof. A. Hugo, Prof. C.J. Hugo
Senior Lecturers	Dr J. Myburgh, Dr M. de Wit
Lecturer	Dr C. Bothma

PHYSICS (051 401 2321)

Senior Professor	*Prof. H.C. Swart
Professors	Prof. P.J. Meintjes, Prof. J.J. Terblans, Prof. O.M. Ntwaeaborwa
Associate Professors	Prof. W.D. Roos, Prof. M.J.H. Hoffman
Affiliated Associate Professor	Prof. K.T. Hillie
Senior Lecturer	Dr R.E. Kroon
Lecturer	Dr B. van Soelen
Senior Researcher	Dr E Coetsee-Hugo
Qwaqwa-kampus	
Associate Professor	Prof. B.F. Dejene
Lecturers	*Dr J.J. Dolo, Mr R.O. Ocaya, Mr S.V. Motlounge, Mr K.G. Tshabalala
Junior Lecturer	Mr L.F. Koao

PLANT SCIENCES (051 401 2514)**Plant Pathology**

Professors	Prof. Z.A. Pretorius, Prof. W.J. Swart, Prof. N.W. McLaren, Prof. G.J. Marais
Affiliated Associate Professor	Prof. R. Prins
Professor Extraordinary	Prof. P. Crous
Senior Lecturer	Dr M. Gryzenhout

Botany

Associate Professor	*Prof. P.J. du Preez
Affiliated Associate Professor	Prof. M. van der Bank
Senior Lecturers	Dr G.P. Potgieter, Dr B. Visser
Lecturers	Dr M. Cawood, Dr L. Mohase, Dr M. Jackson, Ms L. Joubert

Plant Breeding

Professor	Prof. M.T. Labuschagne
Associate Professor	Prof. L. Herselman
Affiliated Associate Professor	Prof. R. Prins, Prof. J.B.J. van Rensburg
Lecturers	Dr A. van Biljon, Dr A. Minnaar-Ontong, Dr R. van der Merwe

Qwaqwa-kampus

Senior Lecturers	*Dr A.O.T. Ashafa, Dr E.J.J. Sieben, Dr L.V. Buwa
Lecturer	Mr R. Letsoane
Junior Lecturer	Mr T.R. Pitso

QUANTITY SURVEYING AND CONSTRUCTION MANAGEMENT (051 401 2248)

Professor	*Prof. J.J.P. Verster, Prof. K Kajimo-Shakantu
Senior Lecturer	Mr F.H. Berry
Lecturers	Mr H.J. van Vuuren, Ms B.G. Zulch, Mr P.M. Oosthuizen, Mr C.H. van Zyl, Mr M.S. Ramabodu, Mr M Letsie, Ms E. Jacobs, Ms O.R.C. du Preez, Ms M.M. Els

SOIL, CROP AND CLIMATE SCIENCES (051 401 2212)

Professors	*Prof. C.C. du Preez, Prof. J.C. Pretorius, Prof. L.D. van Rensburg, Prof. S. Walker
Associate Professor	Prof. C.W. van Huyssteen
Affiliated Professor	Prof. C.J. Stigter
Affiliated Associate Professor	Prof. R. van Antwerpen
Senior Lecturers	Dr P.A.L. le Roux, Dr J. Allemann, Dr G.M. Ceronio, Dr G.M. Engelbrecht
Lecturers	Mr J.H. Barnard, Ms L. de Wet, Ms E. Kotzé, Mr A.S. Steyn
Research Associate	Dr J.H. van der Waals

URBAN AND REGIONAL PLANNING (051 401 2486)

Professor	*Prof. V.J. Nel
Senior Lecturer	Dr M.M. Campbell
Lecturers	Mr P.J. Potgieter, Ms E. Barclay, Mr Y. Mashalaba

ZOOLOGY AND ENTOMOLOGY (051 401 2427)

Professors	*Prof. J.G. van As, Prof. S. v.d. M. Louw, Prof. L. Basson
Associate Professor	Prof. L.L. van As
Professors Extraordinary	Prof. G.L. Prinsloo, Prof. L.J. Fourie
Lecturers	Ms E.M.S.P. van Dalen, Mr H.J.B. Butler, Dr C.R. Haddad, Dr C. Jansen van Rensburg, Dr S Brink
Junior Lecturers	Mr V.R. Swart, Ms L. Heyns, Mr D Fourie
Qwaqwa Campus	
Senior Lecturers	*Dr M.M.O. Thekiso, Dr A. le Roux
Lecturers	Dr P.M. Leeto, Dr J. van As, Mr E. Bredenhand
Junior Lecturers	Ms H.J.M. Matete, Ms M. van As

POSTGRADUATE PROGRAMMES IN NATURAL SCIENCES

Honours Degrees (NQF level 8)

INFORMATION

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

Actuarial Science, Agrometeorology, Behavioural Genetics, Biochemistry, Botany, Chemistry, Clinical Psychology, Computer Information Systems, Construction Management (See Yearbook Part 2), Counselling Psychology, Disaster Management, Entomology, Food Science, Forensic Genetics, Genetics, Geography, Geohydrology, Geology, Grassland Sciences, Home Economics, Limnology, Mathematics and Applied Mathematics, Mathematical Statistics, Microbiology, Microbial Biotechnology, Plant Health, Plant Molecular Biology, Psychology, Physics, Soil Science, Statistics, Quantity Surveying (See Yearbook Part 2), Spatial Planning (see Yearbook 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 has 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.

The following Honours Degrees are awarded by the Faculty:

Honours Degree in the subject	Prerequisite/Requirement
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Actuarial Science	A candidate must have a BSc or BCom degree in Actuarial Science, as well as qualified for at least four exemptions of the subjects of the Faculty / Institute of Actuaries, of which at least one exemption has to be for CT1, CT4 or CT6.
Agrometeorology	Agrometeorology at third year level.
Biochemistry	At least 64 credits in Biochemistry at third year level. An average of 65% in undergraduate Biochemistry modules. Admission is subject to a selection process.
Behavioural Genetics	Admission is subject to selection into BScHons in Behavioural Genetics. A minimum of 60% in Genetics at third year level.
Botany	A minimum of 60% in Botany at third year level in consultation with the Departmental Chairperson.
Chemistry	To be considered for BScHons in Chemistry, a student must have a BSc degree. Other pre-requisites: (WTW114 or WTW134) + (WTW124 or WTW144). An average pass mark of 60% in (CEM314 + CEM334 + CEM324 + CEM344).
Computer Information Systems	A minimum average of 60% is required for the four third-year computer science modules (RIS314, RIS334, RIS324, RIS344) or equivalents thereof, are required. In exceptional cases admission may be allowed in consultation with the programme director or departmental chairperson.
Disaster Management	A minimum of 3 year degree of NQF Level 7 from any field of study with a minimum average of 60% that must be obtained in the final year of study. The student must prove to the departmental head that he/she has adequate knowledge to justify admission to this study. Students who do not have the minimum requirements must apply through RPL (Recognition of Prior Learning).
Entomology	Entomology at third year level.
Food Science	Food Science at third year level. An average of 65% in undergraduate Food Science modules. Admission is subject to a selection process.
Forensic Genetics	Admittance into BScHons in Forensic Genetics is subject to selection. A minimum of 60% in Genetics at third year level or equivalent modules.
Genetics	Admittance into BScHons in Behavioural Genetics is subject to selection. A minimum of 60% in Genetics at third year level or equivalent modules.
Geology	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 (two modules in the first semester and two in the second, including GLG314 and GLG324).
Geography and Geographic	Geography at third year level or equivalent Geography III at another university with at least 64

Information Systems	credits. Average of 60% in the third year.
Geohydrology	A degree in Engineering or a BSc or a BScAgric degree. An average of 60% in the final year major subjects plus Geology 1, Chemistry 1, and Mathematics 1 or Statistics 1.
Grassland Science	Grassland Science at third year level.
Home Economics	BSc Home Ec., B. Consumer Science or an equivalent qualification.
Limnology	A BSc or BScAgric degree with at least one of the following as major: Biochemistry, Chemistry, Zoology, Entomology, Physics, Soil Science, Microbiology, Botany, Mathematics. For further questions you must call the next number: 0514012863.
Actuarial Science	A candidate must have a BSc or BCom degree in Actuarial Science, as well as qualified for at least four exemptions of the subjects of the Faculty / Institute of Actuaries, of which at least one exemption has to be for CT1, CT4 or CT6.
Mathematics and Applied Mathematics	Mathematics and Applied Mathematics at third year level or equivalent modules.
Mathematical Statistics	Minimum averages pass mark of 60% in (WKS314+WKS324+ WKS334+WKS344). Admission is subject to approval by the Departmental Chairperson.
Microbial Biotechnology	At least 64 credits in Biochemistry or Microbiology at third year level or else in consultation with the Departmental Chairperson. An average of 65% in undergraduate Microbiology or Biochemistry modules. Admission is subject to a selection process.
Microbiology	At least 64 credits in Microbiology at third year level. An average of 65% in undergraduate Microbiology modules. These include VWS344 and BOC314. Admission is subject to a selection process.
Physics	Averages pass mark of 60% in (FSK314 + FSK332 + FSK352 + FSK324 + FSK342 + FSK362).
Plant Health	Plant Health or equivalent modules at third year level.
Plant Sciences and Plant Molecular Biology	A minimum of 60% in the appropriate Botany or equivalent modules at third year level in consultation with the Departmental Chairperson.
Polymer Science	A minimum of 60% average for all the Chemistry modules on third-year level is required
Soil Science	Soil Science at third year level.
Statistics	WTW114 and WTW124 as well as a minimum average pass mark of 60% in (STK216 + STK226 + STK316 + STK326). Admission is subject to the approval by the Departmental Chairperson.
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

- The general regulations in respect of Honours degrees are with the necessary modifications applicable to this Faculty. (<http://www.ufs.ac.za/content.aspx?id=57>)
- 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.
- Students must apply to the Departmental Chairperson for admission to the Honours degree.
- In addition to the stipulations of the General Regulations A56(b) a student must pass the Agriculture Datametrics modules, DMT214 and DMT224, before receiving the degree in Agrometeorology, Soil Science, Grassland Science and Wildlife 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:

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

Year modules are only presented in Home Economics.

For the times at which examinations are conducted: See Reg. A63.

Reg. D30 – Curricula

(a) Actuarial Science – Study code 4546

Admission to the Honours degree is subject to approval of the Departmental Chairperson. A candidate must have a BSc or BCom degree in Actuarial Science, as well as qualified for at least four exemptions of the subjects of the Faculty/Institute of Actuaries, of which at least one exemption has to be for CT1, CT4 or CT6.

The student needs 120 credits.

Compulsory			Credits
ATW605	-	Actuarial Mathematics	20
ATW608	-	Mathematics of Finance and Economics	20
ATW692	-	Actuarial Modelling and Literature Study	30
STS613	-	Stochastic Processes	20

At least 30 additional credits at honours level. The following are options:

ATW611	-	Actuarial Asset and Liability Management	60
STS611	-	Bayes Analysis	20
STS616	-	Multivariate Methods	20
STS618	-	Categorical Data Analysis	20
STS619	-	<i>Capita Selecta</i>	20
STS622	-	Reliability and Survival Analysis	20
STS624	-	Generalised Linear Models	20
STS625	-	Statistical Programming	20
STS626	-	Modelling Extremal Events	20
STS627	-	Mixed Linear Models	20
STS628	-	Data Mining	20
STS629	-	<i>Capita Selecta</i>	20

Approved topics Mathematics, Applied Mathematics, Economics, Money and Banking and Computer Information Systems may be chosen in consultation with the Departmental Chairperson.

(b) Agrometeorology – Study code 4547 (120 credits)

For this degree LWR601, LWR602, LWR693 and LWR695 are compulsory. Another **two modules** must be selected from LWR603, LWR604, LWR605 and LWR606. One of these elective modules may be replaced by an appropriate honours module from another discipline. The choice of modules must be done in consultation with the Departmental Chairperson. An examination paper of three hours must be answered in each of LWR601, LWR602, LWR603, LWR604, LWR605 and LWR606. No official examination is written in LWR693 and LWR695.

Module code	Subject	Credits
LWR601	- Agrometeorological services for extension	20
LWR602	- Data analysis for weather and climate research	20
LWR603	- Specialised instrumentation	20
LWR604	- Boundary layer meteorology	20
LWR605	- Applied agrometeorology	20
LWR606	- Weather analysis and forecasting	20
LWR693	- Research project	20
LWR695	- Literature review	20

For syllabus see AGROMETEOROLOGY – BScAgricHons – Study code 5518.

(c) Behavioural Genetics – Study code 4519

This course is presented by the Department of Genetics for students who majored in Genetics and Psychology or Zoology. 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 Departmental Chairperson at the beginning of the second semester. Selection will take place during September.

The Honours degree in Behavioural Genetics comprises six compulsory modules, as listed below. A written scientific paper and an oral presentation are required for GGS692 and GGS693. GGS686 will be evaluated continuously. The practical components of GGS686 are prerequisite for GGS692.

The modules start on a date determined by the Departmental Chairperson.

Compulsory modules			Credits
GG614	-	Chromosomal and genetic abnormalities	16
GG634	-	Behavioural Genetics	16
GG686	-	Research techniques	24
GG693	-	Literature study	16
GG692	-	Research essay	32
GEN644	-	Advanced molecular systematics	16

(d) Biochemistry – Study code 4511

The curriculum is compiled in consultation with the Departmental Chairperson of Microbial, Biochemistry and Food Biotechnology. The course commences in January or July on a date determined by the Departmental Chairperson.

The Honours programme in Biochemistry consists of modules with a total credit value of 128. In addition to BOC614, BOC622, BOC634, BOC674, BOC693 and BOC692 that **are compulsory**, students can select BOC654 or any other equivalent (credit value) module in Microbiology, Microbial Biotechnology, Genetics, Chemistry or any other discipline, in consultation with the Departmental Chairperson.

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

(See Module Content for module contents.)

(e) Botany – Study code 4530

For the Honours degree in Botany PLT644, PLK698 and PLK696 are compulsory, whereas three other modules of choice have to be selected from the list below, in consultation with the subject head. An examination paper of three hours must be answered in each of the modules of choice. For PLK698 and PLK696 a written report and oral presentation is required.

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

Compulsory modules		Credits
PLT644	- Breeding Programme Management	16
PLK696	- Literature study	24
PLK698	- Research project	32
Modules of Choice:		
PLK614	- Plant ecology	16
PLK624	- Plant physiology I (Metabolism and growth)	16
PLK634	- Plant molecular systematics	16
PLK644	- Plant physiology II (Plant defence and applications)	16
PLK654*	- Ecophysiology	16
PLK664**	- Plant diversity and taxonomy of higher plants	16
PLK674	- Plant molecular applications	16
PLK684	- Plant analytical biochemistry	16
PLK604	- <i>Capita Selecta</i>	16
XXX000	- Advanced specialized module in the Faculty of Natural and Agricultural Sciences	16

*For 2013 this module will be taken during the second semester.

**For 2013 this module will be taken during the first semester.

(f) Chemistry

After successful completion of the Honours degree candidates will have knowledge of sophisticated theoretical subject as well as understanding and insight of the Chemistry discipline. 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		Credits
CEM624	Inorganic Chemistry	16
CEM644	Physical Chemistry	16
CEM664	Organic Chemistry	16
CEM684	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.

2.3 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 modelling, 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)

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

(g) Computer Information Systems – Study code 4532

A minimum average of 60% is required for the four third-year Computer Science modules (RIS314, RIS334, RIS324, RIS344) or equivalents thereof, are required. In special cases admission may be allowed in consultation with the programme director or Departmental Chairperson.

Students must have a minimum of 120 credits to obtain the Honours degree.

In consultation with the Departmental Chairperson, a project (RIS693 – 30 credits) plus **eight** modules are decided upon. It is compulsory that RIS620, RIS621 and RIS626 be included among the eight modules. A maximum of two approved modules offered by other departments may be taken. It is compulsory to commence with the project at the start of the Honours degree.

MODULES

The list below depicts the modules offered. Please note that all these modules are not necessarily offered every year.

Modules		Credits
RIS601	- Network Management	16
RIS604	- Information Security	16
RIS606	- Theory of Algorithms (prerequisite WTW224)	16
RIS608	- Artificial Intelligence	16
RIS609	- Knowledge based Systems	16
RIS610	- Business Expert Systems	16
RIS612	- Management Information Systems	16
RIS613	- Project Management	16
RIS614	- Decision Support Systems	16
RIS615	- Human-Computer Interaction	16
RIS616	- Advanced Computer Networks	16
RIS617	- Object Design	16
RIS618	- Computer Ethics	16
RIS619	- Advanced Internet Programming	16
RIS620	- Advanced Programming I	16
RIS621	- Advanced Programming II	16
RIS622	- Advanced Databases	16
RIS623	- Robotics	16
RIS624	- Automata Theory and Applications	16
RIS625	- Data Warehousing and Mining	16
RIS626	- Introduction to Research	16
RIS630	- <i>Capita Selecta</i>	16

(h) Disaster Management – Study code 5201

A minimum of 3 year degree of NQF Level 7 from any field of study with a minimum average of 60% that must be obtained in the final year of study. The student must prove to the departmental head that he/she has adequate knowledge to justify admission to this study. Students who do not have the minimum requirements must apply through RPL (Recognition of Prior Learning).

Compulsory modules**First Semester**

		Credits
DIM601	Research Methodology	15
DIM602	Hazards and Disaster Management	15
DIM603	Strategic Disaster Management	15
DIM604	Disaster Management principles and practices	15

Second Semester

DIM605	Disaster Risk Management	15
DIM606	Information Technology in Disaster Management	15
DIM607	Public Health	15
DIM608	Management of natural and human-made disasters	15

(i) Entomology – Study code 4517

For the Honours degree in Entomology ENT614, ENT622, ENT632, ENT642 and ENT692 are compulsory, whilst, in concurrence with the subject head, three other modules must be chosen from the list below. An examination of three hours must be written in each of the choice 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

(j) 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

MOB614	- Water Resource Management	Credits 16
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(k) Food Science – Study code 4535

Prerequisite: Food Science on third year level requires an average of 65% in all undergraduate Food Science modules. Admission is subject to a selection process. To meet the minimum requirements of the degree it is expected of the student to pass six modules, of which VWS601, VWS 602, VWS693 and VWS695 are compulsory. One of the optional modules below may be exchanged in consultation with the departmental chairman with an applicable honours module from another discipline. Oral exams of three hours each are to be completed in VWS601, VWS602, VWS603, VWS604, VWS605, VWS606 and VWS607. For VWS693 and VWS695 scientific reports/seminars and oral presentations are expected.

Module		Credits
VWS601	- Food Microbiology	24
VWS602	- Food Chemistry	24
VWS603	- Dairy Science	24
VWS604	- Meat Science	24
VWS605	- Foods: General	24
VWS606	- Fruit, vegetables and seeds	24
VWS607	- Selected topics in Food Science	24
VWS693	- Research project	20
VWS695	- Literature review	12

For syllabus see FOOD SCIENCE – BScAgricHons – Study code 5522.

(l) Forensic Genetics – Study code 4570

Student should apply for admission to the Honours degree in Forensic Genetics on the prescribed form. These forms should be completed and handed to the Departmental Chairperson at the beginning of the second semester. Selection will take place at the end of October.

Students who did not successfully complete the GEN334 (Forensic Genetics) and/or GEN344 (Population and Conservation Genetics) modules have to pass the short courses KLGEN1 and KLGEN2 in order to continue with a BScHons in Forensic Genetics.

The Honours degree in Forensic Genetics includes three compulsory modules, GDF686, GDF693 and GDF692 and three modules of choice selected in consultation with the Departmental Chairperson from the list below. All modules of choice have three hour examination papers. A written scientific paper and an oral presentation are required for GDF692 and GDF693. GDF686 will be evaluated continuously. The practical components of GDF686 are prerequisite for GDF692.

The courses start on a date determined by the Departmental Chairperson.

Compulsory modules			Credits
GDF686	-	Research Techniques	24
GDF693	-	Research: Literature study	16
GDF692	-	Research essay	32
Modules of choice (48 credits)			
GDF614	-	Forensic DNA typing and quality assurance	16
GDF624	-	Crime Scene Investigation	16
GDF634	-	Forensic Molecular statistics	16
GDF644	-	<i>Capita Selecta</i> Forensic Genetics	16

(m) 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 Departmental Chairperson at the beginning of the second semester. Selection will take place during August.

The Honours degree in Genetics includes three compulsory modules, GEN686, GEN693 and GEN692 and three modules of choice selected in consultation with the Departmental Chairperson from the list below. All modules of choice have three hour examination papers. A written scientific paper and an oral presentation are required for GEN692 and GEN693. GEN686 will be evaluated continuously. The practical components of GEN686 are prerequisite for GEN692.

The courses start on a date determined by the Departmental Chairperson.

Compulsory modules			Credits
GEN686	-	Research Techniques	24
GEN693	-	Research: Literature study	16
GEN692	-	Research essay	32
Modules of choice (48 credits)			
GEN614	-	Advanced cytogenetics	16
GEN624	-	Recombinant DNA technology	16
GEN634	-	Behavioural Genetics	16
GEN654	-	Molecular ecology	16
GEN664	-	Forensic DNA typing	16
GEN674	-	<i>Capita Selecta</i> Genetics	16
GGX614	-	Chromosomal and genetic abnormalities	16
XXX000	-	Advanced related specialized course(s) with a similar number of credits	16

(n) 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. A student's skills in English will be assessed. If the student does not meet the required standard, additional modules (ALN108) 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 following list with due consideration of requirements and prerequisites:

Module		Credits	
GEO616	-	Theoretical foundations of geography	24
GEO692	-	Research essay	32
GGH636/646	-	Urban geography	24

GGF616/626	-	Environmental geography	24
GGF636/646	-	Applied geomorphology	24
GIS616	-	Geographical Information Systems (Advanced)	24
GIS626	-	Geographical Information Systems (Intermediate)	24
GIS646	-	Spatial analysis and modelling	24
GGF656/666	-	Remote sensing and Image processing	24
GEO606	-	<i>Capita Selecta</i> in Geography	24
XXXXY6	-	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)

(o) Geohydrology – Study code 4524

An average of 60% in the final year of a BSc degree major subjects plus Geology, Chemistry, and Mathematics or Statistics on first-year level is required for admission to the degree.

The student compiles his/her curriculum in consultation with the Director. 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
GHR628	-	Mining Geohydrology and Hydrology	20

(p) 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 (two modules in the first semester and two in the second, including GLG314 and GLG324). A maximum of 30 students will be admitted to the Geology honours programme.

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. For students in the Geochemistry programme it is compulsory to take GLG616, GLG636, GLG673, GLG626, GLG646 and GLG663. Modules marked by an asterisk (*) contain a research component. To obtain admission to the examination in these modules a student must acquire a semester mark of at least 50% in the research part of the module. The research component of the modules are as follows: GLG693 amount to 24 credits (100%); GLG626, GLG636, GLG646 and GLG656 each amount to 12 credits (50%); GLG616 amount to 6 credits (25%) and the other electives each 2,4 credits (20%). The study starts either in January or July on a date as determined by the Department of Geology.

First semester

Modules			Credits
GLG616*	-	Plate Tectonics	24
GLG636*	-	Mineralogy	24
GLG653*	-	Igneous Geology	12
GLG656*	-	Structural Geology	24
GLG673*	-	Environmental Geochemistry	12

Second semester

Modules			Credits
GLG626*	-	Economic Geology	24
GLG623*	-	Sedimentology	12
GLG643*	-	Metamorphic Geology	12
GLG646*	-	Advanced Geochemistry	24
GLG663*	-	Mineral Exploration	12
GLG683*	-	Capita Selecta	12
GLG693*	-	Short research essay	24

Electives

OGR424**	-	Environmental- and Mining Law and policy	16
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** Presented by the Faculty of Law.

(q) 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 an assignment/project (WDK693) and a literature study (WDK695) is required.

Modules			Credits
WDK601	-	Rangeland physiology and ecology	20
WDK602	-	Rangeland management	20
(WDK603	-	Intensive pasture production	20

	or		
WDK605)	-	Wildlife management	20
WDK604	-	Rangeland evaluation	20
WDK693	-	Research project	20
WDK695	-	Literature study	20

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

For syllabus see GRASSLAND SCIENCE – BScAgricHons – Study code 5523.

(r) Home Economics – Study code 4550

The student and Departmental Chairperson compile a course with HDK692 (or VWS693+VWS695) and other modules from the list below to reach 120 credits.

Modules		Credits
HDK602	- Clothing industry	32
HDK603	- Social aspects of clothing	32
HDK604	- Natural fibres	32
HDK605	- Synthetic fibres	32
HDK606	- History: Textiles, Clothing, Interior or Food	24
VBW601	- Foods Consumer analysis	32
VDG601	- Nutrition	32
VWS605	- Foods: General	24
VWS606	- Fruit, vegetables and seeds	24
VWS607	- Selected topics in Food Science	24
HDK692 or	- Research essay	36
VWS693+VWS695		

(s) Limnology – Study code 4525

This programme is currently being re-curriculated and will be presented in 2014. For further information please contact the Centre for Environmental Management at 0514012863.

(t) 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 needs strengthening.** The Chairperson of the Department grants admission. The Honours degree requires a total credit value of at least 120, and consists of six elective modules from the following list and the compulsory research essay. The curriculum is compiled in consultation with the Departmental Chairperson. Appropriate modules from other disciplines may also be included.

Module	Code	Credits
Algebra	WTW601	16
Galois theory	WTW602	16
Topology	WTW603	16
Modern topology	WTW604	16
Analysis	WTW605	16
Measure and integration theory	WTW606	16
Coding theory	WTW607	16
Discrete Mathematics	WTW608	16
Set theory	WTW609	16
Group theory	WTW610	16
Ring theory	WTW611	16
Category theory	WTW612	16
Methods of Mathematics	WTW613	16
Digital image processing	WTW614	16
Numerical linear algebra	WTW615	16
Numerical solution of differential equations	WTW616	16
Optimisation	WTW617	16
Cryptography	WTW618	16
Partial differential equations	WTW619	16
Fluid mechanics	WTW620	16
Biological modelling	WTW621	16
Fractional Calculus	WTW622	16
Financial Mathematics	WTW623	16
Graph Theory*	WTW624*	16
Asymptotic methods	WTW625	16
<i>Capita Selecta</i>	WTW644	16
<i>Capita Selecta</i>	WTW645	16
<i>Capita Selecta</i>	WTW646	16

* Prerequisites for WTW624: WTW334 and Min. (WTW344)

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.

(u) Mathematical Statistics – Study code 4538

A minimum average pass mark of 60% in (WKS314+WKS324+WKS334+WKS344) is required. Admission is subject to approval by the departmental chairperson.

The student needs 120 credits.

Modules		Credits
STS611	- Bayes Analysis	20
STS613	- Stochastic Processes	20
STS614	- Stochastic Simulation	20
STS615	- Financial Time Series	20
STS616	- Multivariate Methods	20
STS618	- Categorical Data Analysis	20
STS619	- <i>Capita Selecta</i>	20
STS621	- Risk Analysis	20
STS622	- Reliability and Survival Analysis	20
STS623	- Econometrics	20
STS624	- Generalised Linear Models	20
STS625	- Statistical Programming	20
STS626	- Modelling Extremal Events	20
STS627	- Mixed Linear Models	20
STS628	- Data Mining	20
STS629	- <i>Capita Selecta</i>	20
STS692	- Statistical Modelling and Literature Study (Compulsory)	30

Students are advised to choose approved modules from other disciplines in consultation with the Departmental Chairperson. In addition to a minimum of 80 credits chosen from the above modules, students can choose the remaining modules from Mathematics, Applied Mathematics, Economics, Money and Banking, or Computer Information Systems. Basic computer literacy is a strong recommendation.

(v) Microbial Biotechnology – Study code 4512

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

The Honours degree in Microbial 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 modules from Microbiology, Microbial Biotechnology and Biochemistry. 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	- Protein structure and catalysis	16
BOC654	- Bioinformatics and Genomics	16
BOC674		
or		
MKB674	- Advanced molecular biology	16
MKB634	- Microbial diversity	16
MKB654	- Applied microbial physiology	16

(w) 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 consist 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 Microbial Biotechnology Honours Module

Content. 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
BTG634	- Continuous and batch culture of micro-organisms	16

(x) Physics – Study Code 4518

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.

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 MSc in Surface Physics are strongly recommended to register for these courses.

NB. Successful completion of all the necessary Honours modules of the National Astrophysics and Space Science Programme (NASSP) (www.star.ac.za) will be recognised by crediting the student with FSK625 (120 credits), the only requirement for BScHons (National Astrophysics and Space Science Programme). These students should register under study code 4580.

(y) Plant Health – Study Code 4529

For the honours course in Plant Health PPG696, PPG698 and PLT644 are compulsory, whereas three other modules have to be selected, in consultation with the division head, from PPG614, ENT654, PLK614 and PLT624. An examination paper of three hours must be answered in each of those selected from the latter modules. Continuous assessment takes place in PPG696 and a project report is required for PPG698.

Compulsory modules		Credits
PLT644	- Breeding Programme Management	16
PPG696	- Literature study	24
PPG698	- Research project	32
Modules of choice		
PLK614	- Plant ecology	16
PLT624	- Marker assisted breeding	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.

For syllabus see PLANT BREEDING – BScAgricHons – Study code 5519.

(z) Plant Molecular Biology – Study code 4531

For the Honours degree in Plant Molecular Biology PLT644, PLK698 and PLK696 are compulsory, whereas three other modules have to be selected from the list below, in consultation with the subject head. An examination paper of three hours must be written in each of the modules of choice. For PLK698 and PLK696 a written report and oral presentation is required.

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

Compulsory modules		Credits
PLT644	- Breeding Programme Management	16
PLK696	- Literature study	24
PLK698	- Research project	32
Modules of choice		
PLK624	- Plant physiology I (Metabolism and growth)	16
PLK644	- Plant physiology II (Plant defence and applications)	16
PLK674	- Plant molecular applications	16
PLK684	- Plant analytical biochemistry	16
PLK604	- <i>Capita Selecta</i>	16
XXX000	- Advanced specialized module in the Faculty of Natural and Agricultural Sciences with the same credit value	16

(aa) 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 Departmental Chairperson, Department of Psychology, UFS.

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

(bb) Soil Science – Study Code 4523

All the modules below are compulsory for this degree. One of the modules, except GKD693 and GKD695, may be replaced by an appropriate honours module from another discipline in consultation with the Departmental Chairperson.

Modules		Credits
GKD615	- Soil chemical principles and applications	20
GKD635	- Soil physical principles and applications	20
GKD625	- Soil genesis and evaluation	20
GKD645	- Soil fertility and fertilization	20
GKD693	- Research: Practical reports and seminars	20
GKD695	- Literature review	20

(cc) Statistics – Study code 4534

WTW114 and WTW124 as well as a minimum average pass mark of 60% in (STK216+STK226+STK316+STK326) are required. Admission is subject to the approval by the Departmental Chairperson.

The student needs 120 credits.

Modules		Credits
STS611	- Bayes Analysis	20
STS612	- Regression Analysis	20
STS613	- Stochastic Processes	20
STS614	- Stochastic Simulation	20
STS615	- Financial Time Series	20
STS616	- Multivariate Methods	20
STS618	- Categorical Data Analysis	20
STS619	- <i>Capita Selecta</i>	20
STS621	- Risk Analysis	20
STS622	- Reliability and Survival Analysis	20
STS623	- Econometrics	20
STS624	- Generalised Linear Models	20
STS625	- Statistical Programming	20
STS626	- Modelling Extremal Events	20
STS627	- Mixed Linear Models	20
STS628	- Data Mining	20
STS629	- <i>Capita Selecta</i>	20
STS692	- Statistical Modelling and Literature Study (Compulsory)	30

Students are advised to choose approved modules from other disciplines in consultation with the Departmental Chairperson. In addition to a minimum of 80 credits chosen from the above modules, students can choose the remaining modules from Mathematics, Applied Mathematics, Economics, Money and Banking, or Computer Information Systems. Basic computer literacy is a strong recommendation.

(dd) 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.

(ee) Zoology – Study code 4516

For the Honours degree in Zoology DRK614, DRK622, DRK632, DRK642 and DRK692 are compulsory, whilst, in concurrence with the discipline head, three other modules must be chosen from the list below. An examination of three hours is written 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)			
DRK634	-	Wetland ecology	16
DRK654	-	Veterinary Ectoparasitology	16
DRK664	-	Animal Behaviour / 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

BACCALAUREUS HONORES IN SPATIAL PLANNING
Study code 4543

B. HONS SP.

Programmes in Urban and Regional Planning: Residential and Compact Learning

Consult Yearbook Part 2: Architecture, Quantity Surveying and Construction Management and Urban and Regional Planning.

Master's degrees (NQF level 9)

Degree		Abbreviation	Study code	Page
(i)	Magister Scientiae	MSc	4700**	20
(ii)	Magister in Mineral Resource Management	MRM	4709	25
(iii)	Magister Architecturae	MArch	4710**	29
(iv)	Magister Scientiae (Quantity Surveying)	MSc(QS)	4720**	29
(v)	Magister Scientiae (Clinical Psychology)	MSc(Clinical Psychology)	4740	29
(vi)	Magister Scientiae (Counselling Psychology)	MSc(Counselling Psychology)	4750	29
(vii)	Magister in Urban and Regional Planning	M.U.R.P. (Professional)	4762**	29
(viii)	Magister in Housing	M.Housing (Research)	4763**	29
(ix)	Magister in Urban and Regional Planning	M.U.R.P. (Research)	4764**	29
(x)	Magister Scientiae in Home Economics	MSc(Home Ec.)	4770	29
(xi)	Magister Scientiae (Construction Management)	MSc(Construction Management)	4780**	29
(xii)	Magister in Environmental Management	M.E.M.	4790	29
(xiii)	Magister in Land and Property Development Management	M.L.P.M. (M.PROP)	4798**	29
(xiv)	Masters in Disaster Management	M.D.M.	5703	31
(xv)	Magister in Geohydrology	MSc (Geohydrology)	4792	20

** For information see Yearbook Part 2.

MAGISTER SCIENTIAE

Study code 4700

MSc

INFORMATION

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

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

TAKE NOTE:

- ** 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 MSc degree consists only of a dissertation (180 credits), the alphabetical part which refers to the module code is followed by the number 700.

In cases where the MSc 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 PhD degree level. Following admission to the PhD, at least two years must elapse before the PhD degree can be conferred. The period of study for the degree will therefore be at least three years.

The MSc degree may be conferred upon a candidate if:

- (i) the candidate withdraws his candidature for the PhD degree, or
- (ii) his candidature for the PhD 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 Agrometeorology, Biochemistry, Botany, Chemistry, Entomology, Genetics, Geology, Grassland Science, Limnology, Microbiology, Microbial Biotechnology, Plant Health, 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 Yearbook, 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 BSc Honours degree in Chemistry with study code 4513.

A dissertation (subject code CEM700) (180 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) (180 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) (100 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 BSc 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

An applicable honours degree with a minimum average of 65% is required. Additional course work may be prescribed where candidates do not have the required background in Geohydrology. In special cases admission may be allowed in consultation with the Director.

After successful completion of the learning programme for the Master's degree in Geohydrology, the candidate will be able to demonstrate knowledge and understanding of supervised planning and execution of a research project in geohydrology. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

(f) Limnology (Will be offered in 2014)

Candidates in possession of a BScHons 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 BScHons or BScAgricHons 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. For further information: 051 401 2863.

(g) Computer Information Systems

An applicable honours degree with a minimum average of 60% is required. In special cases admission may be allowed in consultation with the programme director or Departmental Chairperson.

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

The following two options apply:

- (i) A Research Master's degree (code 4792)
- (ii) A structured Master's degree (code 4793)

For both options candidates must have a total of 180 credits to obtain the Master's degree. All candidates must have passed RIS626 or another approved module in research methodology.

Research Master's degree

A dissertation (RIS700 – 180 credits), covering an approved subject of Computer Information Systems, is required.

Structured Master's degree

In consultation with the Departmental Chairperson, an extended research essay (RIS791 – 120 credits) plus **three** modules are decided upon. The extended research essay (120 credits) represents the required research component of the degree. At least two of the modules must be from Computer Information Systems.

The list below depicts the modules offered. Please note that all these modules are not necessarily offered every year.

IT Management	Credits
RIS701 - Network Management	24
RIS704 - Information Security	24
RIS706 - Theory of Algorithms (prerequisite WTW224)	24
RIS708 - Knowledge Based Systems	24
RIS709 - Artificial Intelligence	24
RIS710 - Business Expert Systems	24
RIS712 - Management Information Systems	24
RIS713 - Project Management	24
RIS714 - Decision Support Systems	24
RIS715 - Human-Computer Interaction	24
RIS716 - Advanced Computer Networks	24
RIS717 - Object Design	24
RIS718 - Computer Ethics	24
RIS719 - Advanced Internet Programming	24
RIS722 - Advanced Databases	24
RIS723 - Robotics	24
RIS724 - Automata and Applications	24
RIS725 - Data Warehousing and Mining	24
RIS730 - <i>Capita Selecta</i>	24
RIS731 - <i>Capita Selecta</i>	24

(h) Statistics

An appropriate honours degree and mathematical background are required. Admission is subject to the approval of the Departmental Chairperson.

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

- (i) Study code 4792: Conditional on approval by the Head of Department, an extended research dissertation (STS700 -180 credits) on an approved topic for at least two semesters, or

(ii) Study code 4793:

A written examination paper on four themes from the following and a compulsory short dissertation on an approved topic, or at least 120 credits from the following, including the compulsory short dissertation, and the remainder chosen in consultation with the Departmental Chairperson from Mathematical Statistics, Mathematics, Applied Mathematics, Economics, Money and Banking, or Computer Information Systems. Themes should be chosen such that the module content does not overlap with a successfully completed honours-level module, e.g. STS711 may not be chosen if STK611 was successfully completed. Themes are selected in consultation with the Departmental Chairperson.

The candidate needs 180 credits.

		Credits
STS711	- Bayes Analysis	30
STS713	- Stochastic Processes	30
STS714	- Stochastic Simulation	30
STS715	- Financial Time Series	30
STS716	- Multivariate Methods	30
STS718	- Categorical Data Analysis	30
STS719	- <i>Capita Selecta</i>	30
STS721	- Risk Analysis	30
STS722	- Reliability and Survival Analysis	30
STS723	- Econometrics	30
STS724	- Generalised Linear Models	30
STS725	- Statistical Programming	30
STS726	- Modelling Extremal Events	30
STS727	- Mixed Linear Models	30
STS729	- <i>Capita Selecta</i>	30
STS791	- Short Dissertation (Compulsory)	60

(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 requires a total credit value of at least 120, and consists of five elective modules from the following list, as well as the compulsory 48-credit Research Essay. The curriculum is compiled in consultation with the Departmental Chairperson. Appropriate modules from other disciplines may also be included.

Module	Code	Credits
Algebra	WTW701	16
Galois theory	WTW702	16
Topology	WTW703	16
Modern topology	WTW704	16
Functional analysis	WTW705	16
Measure and integration theory	WTW706	16
Coding theory	WTW707	16
Discrete Mathematics	WTW708	16
Set theory	WTW709	16
Group theory	WTW710	16
Ring theory	WTW711	16
Category theory	WTW712	16
Methods of Mathematics	WTW713	16
Digital image processing	WTW714	16
Numerical linear algebra	WTW715	16
Numerical solution of differential equations	WTW716	16
Optimisation	WTW717	16
Cryptography	WTW718	16
Partial differential equations	WTW719	16
Fluid mechanics	WTW720	16
Biological modelling	WTW721	16
Fractional Calculus	WTW722	16
Financial Mathematics	WTW723	16
Graph Theory*	WTW724*	16
Perturbation methods	WTW725	16
<i>Capita Selecta</i>	WTW744	16
<i>Capita Selecta</i>	WTW745	16
<i>Capita Selecta</i>	WTW746	16
Research essay	WTW792	48

* Prerequisites for WTW724: WTW334 and Min. (WTW344)

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 mini dissertation 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) Mathematical Statistics

An appropriate honours degree and mathematical background are required. Admission is subject to the approval of the Departmental Chairperson.

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

- (i) Study code 4792: Conditional on approval by the Head of Department, an extended research dissertation (STS700 -180 credits) on an approved topic for at least two semesters, or
- (ii) Study code 4793:

A written examination paper on four themes from the following and a compulsory short dissertation on an approved topic, or at least 150 credits from the following, including the compulsory short dissertation, and the remainder chosen in consultation with the Departmental Chairperson from Mathematical Statistics, Mathematics, Applied Mathematics, Economics, Money and Banking, or Computer Information Systems. Themes should be chosen such that the module content does not overlap with a successfully completed honours-level module, e.g. STS711 may not be chosen if STS611 was successfully completed. Themes are selected in consultation with the Departmental Chairperson.

The candidate needs 180 credits.

			Credits
STS711	-	Bayes Analysis	30
STS713	-	Stochastic Processes	30
STS714	-	Stochastic Simulation	30
STS715	-	Financial Time Series	30
STS716	-	Multivariate Methods	30
STS718	-	Categorical Data Analysis	30
STS719	-	<i>Capita Selecta</i>	30
STS721	-	Risk Analysis	30
STS722	-	Reliability and Survival Analysis	30
STS723	-	Econometrics	30
STS724	-	Generalised Linear Models	30
STS725	-	Statistical Programming	30
STS726	-	Modelling Extremal Events	30
STS727	-	Mixed Linear Models	30
STS729	-	<i>Capita Selecta</i>	30
STS791	-	Short Dissertation (Compulsory)	60

(k) Mathematical Statistics (Risk Analysis)

An appropriate honours degree and mathematical background are required. Admission is subject to the approval of the Departmental Chairperson.

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

- (i) Study code 4792: Conditional on approval by the Head of Department, an extended research dissertation (STS700 -180 credits) on an approved topic for at least two semesters, or
- (ii) Study code 4793:

A written examination paper on four themes from the following and a compulsory short dissertation on an approved topic, or at least 120 credits from the following, including the compulsory short dissertation, and the remainder chosen in consultation with the Departmental Chairperson from Mathematical Statistics, Mathematics, Applied Mathematics, Economics, Money and Banking, or Computer Information Systems. Themes should be chosen such that the module content does not overlap with a successfully completed honours-level module, e.g. STS711 may not be chosen if STS611 was successfully completed. Themes are selected in consultation with the Departmental Chairperson.

The candidate needs 180 credits.

			Credits
ATW711	-	Actuarial Asset and Liability Management	60
STS711	-	Bayes Analysis	30
STS713	-	Stochastic Processes	30
STS714	-	Stochastic Simulation	30
STS715	-	Financial Time Series	30
STS716	-	Multivariate Methods	30
STS718	-	Categorical Data Analysis	30
STS719	-	<i>Capita Selecta</i>	30
STS721	-	Risk Analysis	30
STS722	-	Reliability and Survival Analysis	30

STS723	-	Econometrics	30
STS724	-	Generalised Linear Models	30
STS725	-	Statistical Programming	30
STS726	-	Modelling Extremal Events	30
STS727	-	Mixed Linear Models	30
STS729	-	<i>Capita Selecta</i>	30
STS791	-	Short Dissertation (Compulsory)	60

Recommended:

WTW723	-	Financial Mathematics	16
ECO724	-	Derivative markets	16
RIS712	-	Informatics	24

(I) Master of Science in Nanoscience – 4719

Study code 4719: This qualification forms part of the National Nanoscience Postgraduate Teaching Platform (NNPTP) and is offered in collaboration with the University of the Western Cape, the University of Nelson Mandela Metropole and the University of Johannesburg. Candidates are subjected to a selection process. The programme consists of a theoretical coursework component (80 Credits) and a research dissertation (100 Credits).

(a) Theoretical Coursework

The coursework component is presented at the University of the Western Cape (UWC). NSC701 and NSC702 are compulsory. Candidates register for a major field of specialization (NSC704, NSC705 or NSC706) and the applicable Experimental Techniques module. To complete the theoretical coursework component candidates have to enrol for the two foundation courses that are not part of the major field of specialization. For example: Candidates opting for Advanced Nanophysics (NSC705) accordingly select Foundations of Nano-biomedical Sciences for non-biologists (NSC706) and Foundations of Nanochemistry for Non-chemists (NSC701). The coursework component incorporates the following modules:

Modules	Credits
NSC701 - Central Concepts in Nanoscience	4
NSC702 - Management for Nanoscientists	4
NSC703 - Foundations of Nano-biomedical sciences for Non-biologists	4
NSC704 - Foundations of Nanochemistry for Non-chemists	4
NSC705 - Foundations of Nanophysics for Non-physicists	4
NSC701 - Experimental Techniques in Nanochemistry	16
NSC702 - Experimental Techniques in Nanophysics	16
NSC703 - Experimental Techniques in Nano-biomedical Science	16
NSC704 - Advanced Nanochemistry	48
NSC705 - Advanced Nanophysics	48
NSC706 - Advanced Nano-biomedical science	48
NSC710 - Nanoscience Research Project	100

(b) Research Project

On successful completion of the coursework component, candidates must do an approved research project (dissertation) (NSC710) (100 credits) in Nanoscience (in consultation with the Departmental Chairperson) at the University of the Free State.

Currently not available at the University of the Free State.

For more detail: Contact the Programme Director at 051 401 3336

MAGISTER IN MINERAL RESOURCE MANAGEMENT
Study code 4709

MRM

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 (including all MRM practices).

Mining has traditionally consisted of various disciplines, which have been managed, in a fragmented fashion. The results 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 the Magister in Mineral Resource Throughput Management is to effectively integrate the relevant fields of expertise so as to manage mining activities in the most cost effective manner possible.

Reg. D38 - Admission requirements

An honours degree or an equivalent qualification (NQF level 8) 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 30 September of the preceding year, where after 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 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 Magister qualification in Mineral Resource Throughput Management.

Code Course modules

Phase 1

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

Phase 2

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

Phase 3

GLG731 Capita Selecta
GLG732 Mining Throughput Accounting and Modelling
GLG733 MRTM Risk Practices
GLG734 Modern Mining Supply Chain Principles

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 10 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, GLG723, 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 Master's degree in Mineral Resource Throughput Management, a minimum pass mark of 50% in each module, including the extended research essay, is required.

MODULE CONTENT

GEOLOGY

GLG711: Overview of geology, mining, metallurgy and business processes

Introduce learners to the different functional disciplines through an overview of Mineral Resource Throughput Management in strategic, tactical and operational environments. The functional areas include geology, mining, beneficiation, marketing, finance, human resources, maintenance, planning and scheduling, budgeting and supporting processes.

GLG712: Mineral resource throughput management I (methodology)

Methodology of Mineral Resource Throughput Management through the identification and quantification of process variables, dependencies, inter-dependencies and constraints. The development of a business process concept with emphasis on product delivery, cost, income and market demand for the strategic, tactical and operational environments. Included are strategic evaluation of the long-term environment, as well as management and control of operations in terms of the budget and short-term plan.

GLG713: Applied geology

Understand and identify the influence of geological variables in the Mineral Resource Throughput Management environment in terms of the exploitation needs in the long-term and production environments. The learners will be lectured in the application of ore morphology, ore body morphology, geology and geological information in the total production process to achieve optimum ore-utilisation through a product volume and grade focus.

GLG714: Applied mining

Application of variables, mining dependencies and inter-dependencies and condition-driven standards in mine planning, scheduling and production management and control. Methods to determine the influence of “run-of-mine” quality on plant efficiency and product delivery. Exposure to the quantification, application and relevance of mining information to the production process (beneficiation, stockpile management). Included are the effects of maintenance performance and strategy in terms of condition-driven standards.

GLG715: Applied metallurgy

The influence of plant conditions and standards on the long-term and production environments, with emphasis on product range, will be examined using Mineral Resource Throughput Management principles. The value of beneficiation information when focussing on adding value to the production process (beneficiation, stockpile management and product specifications) will be highlighted as well as the way in which the information is used to achieve optimum product delivery.

GLG721: MRTM implementation practices

The applicability of project management as a major critical performance area in sustainable Mineral Resource Throughput Management will be examined and discussed. The module will emphasise the practical application of “flow world” thinking processes in structuring projects on how to deal with the challenges in implementing MRTM in a mining operation. Examples and exercises will be presented in the module.

GLG722: Information architecture: methods and processes; business analysis; benchmarking

Availability of flow Information is an important component for sustainable Mineral Resource Throughput Management. This module will examine all the key elements of data structures, recording challenges, validation issues and presentation. The question of information provision to management structures and the timeliness impact on the mining value chain will be examined. Case studies and exercises will be discussed in the module.

GLG723: MRTM organisation change practices

Change management is often misunderstood and methodologies are used with little visible return on investment. The reason is that typical training approaches are neither appropriate nor effective within this environment. With the advent of the NQF and outcome-based employee development, opportunities to optimise the human resource base with a measurable return on investment become realistic. The subject-matter will be examined and discussed in four broad areas under the heading of enterprise resource alignment. These areas are strategy and guidance mapping, mobilisation, enablement and performance as well as competence tracking. The process methodologies and how they apply within Mineral Resource Throughput Management will be discussed. Practical and simplistic management procedures to ensure HR optimisation are imparted for continuous measurable results.

GLG724: ‘Virtual mining’ simulation and optimisation

This module covers the design of a cost and production simulation model based on the total production process (reserve to market). The simulation model will incorporate relevant variables and dependencies. Strategic, tactical and operational planning and budgeting will be addressed in terms of key throughput and performance variables and condition-driven standards. The application of the model in an operational management and control environment will be covered.

GLG725: Mineral resource throughput management II (advanced): grade control, ore balance sheets, ore utilisation

The Module mainly focuses on the development and execution of a MRTM project.

GLG726: Geological modelling and applied Geostatistics

The importance of accurate and reliable geological information to the short-term mine schedule and production environment is significant. In the mining environment, the most important information is contained in the geological models. Understanding the role of Geostatistics in Mineral Resource Throughput Management and how it is used to determine optimum ore-utilisation and product delivery is imperative. Geostatistical approaches can also be applied strategically to optimise ore-utilisation and maximise product delivery in the long-term.

GLG731: *Capita Selecta*

Capita Selecta of advanced aspects, applications and processes related to the MRTM environment.

GLG732: Mining throughput accounting and modelling

Application of throughput accounting, so that the learner understands how to calculate and make operational financial decisions that guarantee/deliver the required financial returns. Learning what determines optimal profitability, cash-flow and a healthy balance sheet as applied to daily and practical operational performance and improvement decisions, considering efficiencies and productivity. Basic understanding of financial statements and what they mean. Making of decisions that are based on financial statements and where these decisions lead to. Learn how to define a goal (its boundaries), and the function and purpose of assumptions.

GLG733: MRTM risk practices

Application of risk management principles in the minerals industry in terms of health, safety and the environment. Responsibilities of owners, employers and suppliers will be highlighted with special reference to mandatory codes of practice (COP's). The COP's referred to include trackless mobile mining equipment, the construction of mine residue dumps, the prevention of rock fall accidents, underground fires and explosions.

GLG734: Modern mining supply chain principles

To obtain an overview of the traditional and MRTM-adjusted supply chain principles. Mining and supply chain optimisation through systems and business process integration, internal and external collaborative planning and studying the interlinked nature of downstream processes with the ore characteristics and what can be done about it. A case study to aid the learner to identify and explore the hurdles in supply chain optimisation is discussed.

GLG791: Extended research essay

Subject chosen in consultation with module co-ordinator. The candidate must carry out a research task under supervision and present an extended research essay.

INFORMATION

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

		Page
MAGISTER ARCHITECTURAE [MARCH]	Study code 4710	12
MAGISTER SCIENTIAE IN QUANTITY SURVEYING [MSc(Q.S.)]	Study code 4720	34
MAGISTER SCIENTIAE IN CONSTRUCTION MANAGEMENT [MSc(Construction Management)]	Study code 4780	34
MAGISTER IN PROPERTY SCIENCE [MPROP]	Study code 4797 or 4798	34
MAGISTER IN URBAN AND REGIONAL PLANNING [M.U.R.P.] PROFESSIONAL	Study code 4762	56
MAGISTER IN HOUSING [MHousing] RESEARCH	Study code 4763	58
MAGISTER IN URBAN AND REGIONAL PLANNING [M.U.R.P.] RESEARCH	Study code 4764	58
DOCTOR ARCHITECTURAE [DArch]	Study code 4910	15
PHILOSOPHIAE DOCTOR [PhD]	Study code 4920	33

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 Yearbook, 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 on (NQF-Level 6) 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 (cem@ufs.ac.za) must be handed in by the end of September of the preceding year, where after selection will take place.

The programme consists of compulsory modules, choice modules and an extended mini-dissertation. A total of 240 credits are needed to graduate.

Reg. D44 – Course composition and content

The programme offered is 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 an extended mini-dissertation. A two-week block period of class attendance is compulsory during each semester, or two to three weeks in the case of the second semester of the first year, during which lectures, practicals, tutorials and discussions will take place. For the rest of the semester the candidate will be required to prepare assignments through self-study and submit them or present them orally.

Code	Course Modules	Credits
Semester 1		
MOB707	Resources and processes	48
Semester 2		
MOB708	Corporate environmental management and sustainability	48
Semester 3		
MOB741	Water, pollution and rehabilitation management	48
MOB743	Biodiversity and conservation management	48
MOB745	Wetland management	48
Semester 3 and 4		
MOB791	Extended mini-dissertation	96

First year of study – Semester 1

MOB707 (48 credits) – Resources and processes

Compulsory:

This module does not only introduce sustainability science and environmental management, but also introduces the candidates to environmental sciences, e.g., geology, soil science, hydrology, meteorology and ecology. Emphasis is placed on the impact humans have on the environment and how the application of sustainability principles can assist in solving environmental problems. Introductory principles of resource management and economics of natural resources and processes are also covered. Candidates receive classes on writing skills, computer use and basic geographical information systems.

First year of study – Semester 2

MOB708 (48 credits) – Corporate Environmental Management and Sustainability

Compulsory:

In this module, the focus is on humans in the human environment. Aspects such as population dynamics, environmental economics, conflict management, environmental law, urban sustainability, urban planning and environmental management systems will be addressed.

During the second contact session, attention will be given particularly to environmental assessment (EIA), including public participation, social impact assessment and ecological impact assessment.

Second year of study – Semester 3

MOB741 – MOB745 (48 credits) - Speciality directions

Choice modules:

Candidates may choose between three specialist directions. Each one of these modules addresses a different environmental field that is dealt with in depth by both academics and specialists from industry.

Only one choice (with approval) may be made:

MOB741 Water, pollution and rehabilitation management
 MOB743 Biodiversity and conservation management
 MOB745 Wetland management

Second year of study – Semester 3 and 4

MOB791 (96 credits) – Extended mini-dissertation

Compulsory module:

Candidates must carry out a research task under supervision and submit it for examination in the form of an extended mini-dissertation. The subject and supervisor(s) will preferably be linked to the module chosen from among MOB741-745.

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. In the second semester of the first year, students will have to come to the campus for an additional week in October/November.

Upon completion of the degree the candidate should, be able to:

- Apply a holistic, integrated approach when solving complex environmental problems, conducting environmental assessments, evaluating environmental assessment processes or report, or related activities;
- Identify, interpret and apply the theory and applied knowledge for the suite of environmental assessment tools, procedures and methods;
- Make informed decisions, guided by ethical standards, scientific evidence and societal needs within the context of Environmental Management;
- Communicate effectively with a variety of audiences, including those from the academia, private- and public sectors; Demonstrate the ability to conduct research on an environmental management related problem.

Reg. D46 – Examination

Continuous evaluation of work and assignments will contribute to the semester mark, which together with formal examination (MOB707, MOB708 and MOB741-745), 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 mini-dissertation.

Formal examinations will contribute 40% of the combined mark, and the semester mark (and oral where applicable) 60%, to each of MOB707, MOB708 and MOB741-745. MOB707, MOB708 and MOB741-MOB745 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% must be obtained.

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

MAGISTER IN DISASTER MANAGEMENT

Study code 5703

M.D.M

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) A disaster management honours degree or equivalent from any other institute (Minimum 120 Credits, NQF Exit Level 8) with an average pass of 60%.
 - (ii) A disaster management postgraduate diploma from UFS or any other institute (Minimum 120 Credits, NQF Exit Level 8) with an average pass of 60%.
 - (iii) The student must prove to the departmental head that he/she has adequate knowledge to justify admission to this study.
 - (iv) Practical and/or preparatory experience will be an added advantage.
 - (v) Student must submit a research proposal together with the application

Nota Bene: An Executive Committee of UFS would assess the extent, nature and suitability of experience. /or 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 two formal contact sessions of plus or minus five days each year. During the first contact session, candidates will be orientated and will receive study materials.

- (c) The programme consists of eight electives of which a student should elect a minimum of two subjects. Each elective consist of 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.
- (d) The programme also consists of a compulsory research project reported in an extended research essay format.
- (e) A formal and compulsory theoretical and Practical examination will take place at the end of the semester (except for the year subject)

Reg. H28(a) – Year mark and pass mark

- (a) See General Regulations A92 and A93.
 - (a) A semester 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 degree can be offered over a minimum period of one year (full time). Students will be allowed to take the degree over a two-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

Compulsory

DIM791 Extended research essay

Electives (choose any two):

Module Code	Subject	
DIM701	Trauma Management	16
DIM702	Political Strategic Planning	16
DIM703	Information Management	16
DIM704	Ethnic and Cultural Conduct	16
DIM705	Management of media relations	16
DIM706	Environmental risk and impact assessment	16
DIM707	Disaster vulnerability and risk assessment	16
*DIM708	Water-related disaster risk management	16

* Module is subject to approval by the Departmental Chairperson.

Doctor's degrees (NQF level 10)

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

Degree	Abbreviation	Study code	Course code
(i) Doctor Scientiae	DSc	4900	900
(ii) Doctor Architecturae	DArch	4910	900
(iii) Philosophiae Doctor	PhD	4920	900

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

Agrometeorology, Applied Mathematics, Architecture, Astronomy, Behavioural Genetics, Biochemistry, Botany, Chemistry, Computer Information Systems, Disaster Management, Entomology, Environmental Management, Food Science, Forensic Genetics, Genetics, Geochemistry, Geography, Geology (GLG), Geohydrology, Grassland Science, Home Economics, Limnology, Mathematics and Mathematical Statistics, Microbiology, Microbial Biotechnology, Mineral Resource Management (MRM), Plant Health, 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) Disaster Management

To be admitted to the PhD a candidate must be in possession of a cognate master's degree and specific/relevant subjects in the post graduate diploma in disaster management. Depending on the background and knowledge that the student has, some core disaster management modules may be required in order to equip the student with adequate disaster management knowledge. A candidate's thesis is written under the guidance of a promoter, and the thesis must demonstrate that the candidate is able to conduct independent scientific research. The Management Committee of DiMTEC will assign promoters and decide upon which department a candidate should register in.

(d) Limnology

To be admitted to the PhD a candidate must be in possession of an MSc in Limnology. Persons in possession of an MSc 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.

(e) Psychology

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

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

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

(f) Environmental management

To comply with the admission requirements a candidate must possess a MEM degree before registering for the PhD 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.

(g) Microbial Biotechnology

A candidate must be in possession of a Master's degree in Microbiology, Biochemistry, Food Science, Microbial 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 Microbial 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 PhD

DOCTOR SCIENTIAE
Study code 4900

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

MODULE CONTENT

Biochemistry

BOC614 (16 credits) – General analytical and chromatographic techniques in Biochemistry (first quarter)

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

BOC634 (16 credits) – Protein structure and catalysis (3rd quarter)

Enzyme structure and the theory of catalysis: thermodynamic and kinetic principles, mechanisms applied in catalysis. Enzyme reaction mechanisms, ligand binding and design. Enzyme structure determination and prediction. Enzyme applications in organic chemistry.

BOC654 (16 credits) – Bioinformatics and Genomics (2nd quarter)

Computational methods: databases and analysis of sequence data. The minimal genome, genome sequencing, existing and emerging technologies, genome annotation and metabolic pathway construction. Applications of genomics and metagenomics.

BOC674 (16 credits) – Advanced molecular biology (second quarter)

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 self-study on selected topics that are related to molecular biology.

BOC622 (8 credits) – Oral examination of theory and practical (end of fourth quarter)

The oral examination is normally scheduled for November. A panel consisting of lecturers from the divisions of Microbiology and Biochemistry, and including an external assessor, is convened for this purpose. The general knowledge of the student with regard to the subject area as well as aspects of the Biochemistry Honours course will be assessed during this oral examination.

BOC693 (24 credits) – Research: Literature study (second and third quarters)

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 assessor and marks are allocated by both.

BOC692 (32 credits) – Research essay (second to fourth quarter)

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 assessor and marks are allocated by both.

Botany

PLT644 (16 credits) – Breeding Programme Management

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.

PLK696 (24 credits) – 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.

PLK698 (32 credits) – Research Project

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 (24credits) – 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) – Plant molecular systematics

A three hour discussion and the equivalent of a six hour practical per week during the first semester.

One examination paper of three hours.

This module offers the study of phylogenetic systematics where the aim is to reconstruct the evolutionary history of a plant group. The concepts of phylogenetics will be studied by discussing different phylogenetic methods such as Parsimony, Maximum Likelihood and Bayesian Inference, as well as character fitness (CI, RI, HI) and clade support (Bootstrap, Decay) of phylograms/cladograms. Students will be given the opportunity to apply these methods to construct a phylogeny/cladogram using datasets. Practical aspects such as DNA extraction, PCR, sequencing and gel electrophoresis will also be discussed.

After successful completion the module, the student will be able to:

- plan and execute a phylogenetic systematic study;
- perform practical experiments such as DNA extraction, PCR and gel electrophoresis;
- construct phylogenies/cladograms with the different phylogenetic methods.

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) – Ecophysiology (For 2013 this module will be taken during the second semester)

A three hour discussion and the equivalent of a six hour practical per week during the second semester.

One examination paper of three hours.

Global warming is a potential threat to existing ecosystems on the planet. During this module, the causes of this phenomenon will be discussed in detail, as well as the anticipated impacts that it could have in future. Several alternative solutions to reduce global warming have been proposed with the natural ability of plants to sequester carbon being one. The benefits, feasibility and future implementation of all these plans will be investigated and evaluated.

After the successful completion of the module, the student should be able to

- understand and describe the causes of global warming and the threats and associated problems it presents;
- understand and describe the natural ability of plants to sequester carbon;
- understand and describe new and innovative initiatives to prevent global warming, including the novel use of plants to reduce carbon levels.

PLK664 (16 credits) – Plant diversity and taxonomy of higher plants(For 2013 this module will be taken during the first semester)

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) – Plant molecular applications

A three hour discussion and the equivalent of a six hour practical per week during the first semester.

One examination paper of three hours.

The response of plants following either a biotic or abiotic stimulus is very complex. Using an appropriate example, a variety of molecular techniques that were used to study this response will be discussed. In addition, the production and use of transgenic plants to improve plant resistance against stress conditions will be studied.

After the successful completion of the module, the student should be able to

- describe the molecular techniques that were discussed in detail;
- understand how each technique contributed to our understanding of the stress response;
- critically evaluate a relevant article where these techniques were used during the exam.

PLK684 (16 credits) – Plant analytical biochemistry

A three hour discussion and the equivalent of a six hour practical per week during the second semester.

One examination paper of three hours.

Bioactive compounds from plants are currently the subject of much research as part of investigations on their possible application in the pharmaceutical and agricultural sectors. This module focuses on the isolation and purification of bioactive metabolites from plant material and determining their biological properties. Various techniques to purify and characterize these compounds will be discussed.

After completion of the module, the student must be able to

- extract both polar and non-polar compounds from plant material;
- purify and partially identify different isolated compounds;

- c) determine biological activity of partially purified compounds using different bio-assays.

PLK604 (16 credits) – *Capita Selecta*

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

One examination paper of three hours.

***Capita Selecta* from aspects of Botany which can meaningfully complement the field of study.**

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.

Computer Information Systems

The list of Master's modules presented is adapted each year in order to stay abreast of the fast en forever-changing discipline of Computer Information Systems. Each module presented is related to a lecturer's research field and the student and lecturer work together on a one-on-one basis. The outcome of each module is a document that contains an introduction and literature study based on the chosen research topic, as well as the problem statement and research questions of a possible research dissertation that might flow from it.

RIS601 (16 credits) – Network Management

Overview and concepts of computer networks, including: different types of networks and network standards, analog and digital communications concepts, network hardware concepts, internetworking layer concepts, dialup, baseband, broadband and wireless networking concepts and network security issues.

RIS604 (16 credits) – Information Security

Fundamental concepts of computer security, including: security threats, harden internal systems and services, harden internetwork devices and services, secure network communications, security best practices for creating and running web-based applications, managing public key infrastructure (PKI), managing certificates, enforcing organisational security policies, monitoring the security infrastructure and security incidents.

RIS606 (16 credits) – Theory of Algorithms

The theory of algorithms is a subfield of information theory and computer science that concerns itself with the relationship between computation and information. Algorithmic information theory principally studies complexity measures on strings (or other data structures). Because most mathematical objects can be described in terms of strings, or as the limit of a sequence of strings, it can be used to study a wide variety of mathematical objects, including integers and real numbers.

RIS608 (16 credits) – Artificial Intelligence

The science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

RIS609 (16 credits) – Knowledge based Systems

The basic knowledge management principles, concepts, technologies and systems, including knowledge discovery systems, knowledge capture systems, knowledge sharing systems and knowledge application systems, as well as the evaluation and application thereof in practice.

RIS610 (16 credits) – Business Expert Systems

The emphasis here is on business intelligence deployed in corporate environments, including approaches for turning e-commerce data into knowledge that organizations can act upon and tools and techniques for deploying these systems.

RIS612 (16 credits) – Management Information Systems

All the aspects involved with managing Information Technology in an organization, including: strategic information systems, supply chain management, ERP, electronic commerce, networking, business process reengineering, knowledge management, decision support systems, data management, managing the information services department, managing information resources and security.

RIS613 (16 credits) – Project Management

Basic principles of Project Management, including: the differences between Project Management and IT Project Management, how to perform as a Project Manager and to be part of a project team in all the 9 knowledge areas of Project Management, using a Project Management software tool in order to manage an IT project.

RIS614 (16 credits) – Decision Support Systems

A decision support system (DSS) is a computer-based information system that supports business or organizational decision-making activities. DSSs include knowledge-based systems. Students learn how to help decision makers compile useful information from a combination of raw data, documents, and personal knowledge, or business models to identify and solve problems and make decisions.

RIS615 (16 credits) – Human-Computer Interaction

Theoretical background and practical experience in Human-Computer Interaction, with specific emphasis on Usability Engineering. The module provides an in-depth knowledge and understanding of issues involved in the evaluation of user interfaces for interactive systems.

RIS616 (16 credits) – Advanced Computer Networks

Detailed investigation and study of computer networks, standards, communications concepts, hardware concepts, internetworking layer concepts, dialup, baseband, broadband and wireless networking concepts and network security issues.

RIS617 (16 credits) – Object Design

Emphasis and deeper knowledge in the design of objects in the Object-oriented design paradigm.

RIS618 (16 credits) – Computer Ethics

Computer Ethics is a branch of practical philosophy which deals with how computing professionals should make decisions regarding professional and social conduct. It is a set of moral principles that regulate the use of computers. Some common issues of computer ethics that are covered include intellectual property rights (such as copyrighted electronic content), privacy concerns, and how computers affect society.

RIS619 (16 credits) – Advanced Internet Programming

Client side programming of web sites, scripting languages, cookies and session objects, request & response objects, and server side programming.

RIS620 (16 credits) – Advanced Programming I

Compulsory. The programming skills of the students are taken to the next higher level compared to pre-graduate programming.

RIS621 (16 credits) – Advanced Programming II

Compulsory. Learning advanced programming concepts through game programming.

RIS622 (16 credits) – Advanced Databases

The administration of a database requires thorough knowledge from planning through to creating the database, the database users, their privileges and determining backup and recovery strategies, including: architecture and installation options, physical structures and settings of the database, and queries of data dictionary views to manage a database.

RIS623 (16 credits) - Robotics

The design, construction, operation and application of robots and computer systems for their control, sensory feedback, and information processing.

RIS624 (16 credits) – Automata Theory and Applications

Automata theory is the study of mathematical objects called abstract machines or automata and the computational problems that can be solved using them.

RIS625 (16 credits) – Data Warehousing and Mining

The development of a data warehouse requires thorough knowledge from planning through to implementing the warehouse, as well as the mining of the information in the warehouse.

RIS626 (16 credits) – Introduction to Research

Compulsory. Guidance on how to conduct research in a structured, methodical manner, to analyse collected data and subsequently how to write a well-structured report/article.

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, and 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 medically 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 *post-mortem 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, analysing, 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.

Disaster Management

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 mini-dissertation. *There will be a compulsory practical exercise in DIM 601 Research Methodology. On completion of participation in this exercise students will receive a 10% mark which is part of the final mark.*

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.

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 bio-monitoring 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 (Including Behavioural Genetics and Forensic Genetics)

GDF686 / GEN686 / GGS686 (24 credits) – Research Techniques

Full day lectures and practicals for arranged periods in the first semester.

Continuous evaluation.

Logic, Scientific writing, Scientific presentations (conferences - oral and poster; press releases, TV/radio interviews), Job interviews, Statistics. Theory behind techniques such as extraction, quantification, PCR and analysis. Students should be familiar with all laboratory equipment (centrifuges, heating blocks, water baths, pipettes, autoclave, vortexes, PCR machines, pH-meter, magnetic stirrers and the NanoDrop) and save laboratory practices. Students should be able to prepare chemicals and to perform techniques such as DNA extraction, gel electrophoresis and PCR reactions.

The practical component of this module is prerequisite for **GDF692 / GEN692 / GGS692**.

On completion of this module the student should:

- apply formal logic and evaluate the logic of scientific writing
- write and present a paper at a conference
- create and present a poster at a conference
- write a scientific paper
- write and present a press release
- handle a TV/radio interview
- construct a CV and handle a job interview
- use appropriate statistical measures and associated software to analyse data
- know safe laboratory practise
- set centrifuges, heating blocks, water baths, pipettes and the autoclave according to protocols given to them.
- write programs on the different PCR machines in the department.
- extract DNA from different sources, visualize it on an agarose gel and amplify a specific region using appropriate primers and a PCR reaction.

GDF692 / GEN692 / GGS692 (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 Departmental Chairperson. 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.

The practical components of GDF686/GEN686/GGS686 has to be passed before continuing with this module.

On completion of this module the student is acquainted with:

- Problem identification
- Hypothesis formulation
- Planning and conducting of experiments
- Analysis and interpretation of results
- Discussion of results
- Compiling the information according to a specified structure
- Technical aspects of scientific writing
- Practical presentation skills.

GDF693 / GEN693 / GGS693 (16 credits) – Research: Literature study

A review paper is written and presented orally on a date determined by the Departmental Chairperson. The review includes searching and accessing literature on a particular topic, organizing and integrating the information, drawing conclusions from the available body of literature, compiling the information according to a specified format, technical aspects of scientific writing and practical presentation skills. 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:

- Searching and accessing literature on a particular topic,
- Organizing and integrating the information,
- Drawing conclusions from the available body of literature,
- Compiling the information according to a specified format,
- Technical aspects of scientific writing,
- Practical presentation skills.

GEN614 (16 credits) – Advanced Cytogenetics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Chromosome evolution, cytotaxonomy, speciation.

On completion of this module the student is acquainted with:

- a) planning and executing a cytotoxic study, analysing and reporting the results.

GEN624 (16 credits) – Recombinant DNA technology

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Recombinant DNA technology provides a powerful platform that enables the study of any gene isolated from virtually any organism. Central to this technology is the cloning of nucleic acid fragments (for example, DNA) into cloning vectors, a process simplified by the Polymerase Chain Reaction (PCR) technique. Subsequently, recombinant vectors are used to transform competent bacterial cells and the sequence information of the cloned gene can be determined by DNA sequencing. This course aims to introduce basic tools and techniques that are utilized in recombinant DNA technology.

After successful completion of the module the student will be able to:

- a) apply various laboratory procedures to isolate DNA and RNA from cellular and/or eukaryotic tissues
- b) plan and perform experiments on complementary DNA (cDNA) synthesis
- c) design, implement and evaluate experiments based on the Polymerase Chain Reaction (PCR) technique
- d) create recombinant DNA molecules by cloning DNA fragments into cloning vectors
- e) use laboratory protocols to transform recombinant cloning vectors into bacteria
- f) analyse and compare cloned DNA fragments using sequencing and various computer-based sequence analysis programmes.

GEN634 / GGS634 (16 credits) – Behavioural Genetics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Determination of the inheritance of behaviour; monogenic vs. polygenic inheritance; allelism; Pleiotropy; epistasis; quantitative studies and analysis; experimental design.

After successful completion of the module, the student is acquainted with:

- a) Planning and executing a behavioural genetic study
- b) Identification and judgment of factors influencing behaviour
- c) Apply basic statistical analysis to behavioural genetic quantitative data.

GEN644 (16 credits) – Advanced molecular systematics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Genomes, nucleotide sequencing, mutation rates, cladistics, the use of molecular and other data for determining phylogenetic relationships and parenthood, species identification, computer programs used in molecular analyses.

After successful completion of this module the student is acquainted with:

- a) plan and execute molecular studies and analyse the results.

GEN654 (16 credits) – Molecular ecology

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

This course aims to describe genetic processes in wild and captive populations, at a very practical level. The emphasis is on the use of molecular markers and appropriate statistical coefficients to determine levels of diversity, detect historic bottlenecks, measure drift and differentiation, describe population structure, and detect hybridization and to apply assignment methods. These outcomes are reached using appropriate software such as Arlequin, GeneClass and MSToolkit.

After completing the module successfully, the student should:

- a) understand how to analyse molecular data with various statistical coefficients and appropriate software,
- b) implement molecular data results in such a way that it can contribute to the conservation of biodiversity, and
- c) understand and describe the contribution of genetics to conservation and ecology.

GEN674 (16 credits) – *Capita Selecta* Genetics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

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.

GDF614 (16 credits) – Forensic DNA typing and quality assurance

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Quality control, quality assurance and accreditation of Forensic Laboratories.

After successful completion of this module the student should:

- a) Understand and compare analytical methods used in DNA forensic analysis
- b) Evaluate the management and maintenance of a forensic laboratory based on quality assurance, quality control and accreditation guidelines.

GDF624 (16 credits) – Crime Scene Investigation

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Crime scene analysis; Presumptive test done at the crime scene including (blood, saliva, semen samples); Chain of custody of evidence samples; Collecting reference samples; Chain of custody in the Forensic laboratories; Compiling a DNA evidence report for court; Presenting DNA evidence in court.

After completing the module successfully, the student should be able to:

- a) Perform presumptive tests of various types of forensic evidence samples
- b) Explain the different procedures that take place at a crime scene
- c) Evaluate evidence found at a crime scene
- d) Compile a forensic report that can be presented in the court of law in South Africa
- e) Defend and justify results in a court of law under cross examination.

GDF634 (16 credits) – Forensic molecular statistics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Organizing molecular data for further statistical analysis, including the general descriptive statistics. The comparison of individuals and populations, utilizing population genetic theories. Determining relationships and paternity.

After successful completion of this module, a student will:

- a) be able to analyse and interpret data generated in the forensic laboratory, by using the appropriate statistical principles and software,
- b) Identity and paternity determination by utilizing DNA profiles.

GDF644 (16 credits) – *Capita Selecta* in Forensic Genetics

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Capita Selecta of advanced aspects of Forensic Genetics, with the purpose of broadening the knowledge of the object presented in this module. Assignments form an important part of this module for both the theory and practical work.

GG614 (16 credits) – Chromosomal and genetic abnormalities

Formal contact time of 80 hours is assigned to this module, and will be presented at a time determined by the Department of Genetics. Continuous evaluation.

Chromosomal and sex linked disorders, patterns of inheritance, single gene and multifactorial disorders, epigenetics, mapping and identifying genes, molecular and cytogenetic laboratory techniques, cancer genetics, hematological malignancies, prenatal diagnosis, treatment of genetic diseases and ethical issues concerning genetic testing.

After successful completion of this module, the learner will be able to demonstrate:

- a) The specific outcomes of the module, such as an understanding and knowledge of the applicable theories, principles, definitions and other learning areas.
- b) Basic computer skills.
- c) Various communication skills.
- d) The collection and presentation of information.
- e) The implementation of different methods in the analysis of data.
- f) The use and care of scientific equipment.

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.

Geohydrology

GHR611 (20 credits): Groundwater Hydraulics

This module will provide learners with a basic understanding of groundwater hydrology. On completion of this module learners will be able to construct a conceptual model of an area, after using drill logs (geology) and pump test data. They will be capable to apply the principles and skills of pumping test analysis in the industry.

GHR612 (20 credits): Hydrochemistry and Pollution

This module will provide learners with the theoretical and practical knowledge, skills and approach to groundwater chemistry. The learner will get an integrated understanding of groundwater chemistry and contaminant hydrogeology as preparation for a career as geohydrologist or geochemist. They will also be prepared to provide expert hydrochemical input in the industry.

GHR613 (20 credits): Groundwater Geophysics

This module focuses on the principles of various geophysical techniques and the application to geohydrological investigations. Upon completion of this module learners will be familiar with geophysical techniques most often used in the groundwater industry. The module addresses both theoretical and practical aspects of geophysical investigations.

GHR621 (20 credits): Groundwater Modelling

This module will provide learners with a basic understanding of numerical groundwater flow and mass transport models. Learners will be exposed to various types of groundwater models, including the advantages and disadvantages of each model. On completion of this module learners will be able to combine and apply all knowledge they have gained in GHR611, GHR612 and GHR613 to develop conceptual models, basic numerical models and be able to assess groundwater models.

GHR622 (20 credits): Groundwater Management

This module will provide learners with a global understanding of managing and protecting groundwater resources. On completion of this module learners will have developed an understanding of groundwater systems by assessing all available data using all available tools. Once this is understood, management and protection strategies can be developed taking into account South African guidelines and legislation.

GHR628 (20 credits): Mining Geohydrology and Hydrology

This module focuses on groundwater influxes in mines, dewatering, water quality management, monitoring of groundwater, and modelling of groundwater flow and quality into mines, hydrology field techniques with a strong component of surface water–groundwater interaction. It will also include basic flood hydrology and determination of every-day management of flood levels.

Geology

GLG616 Plate Tectonics

The module in plate tectonics provides a useful backdrop for understanding the dynamic circumstances that give rise to deformational movements that create rock-forming environments, which in turn give rise to the fundamental original properties of regional rock assemblages (sedimentary, igneous and metamorphic rocks), their deformational characteristics and associated economic deposits.

GLG623 Sedimentology

The module entails experience building in sedimentological principles in both the understanding and the practical application thereof.

GLG626 Economic geology

The module entails: the study of economic geology, metallogenesis, geometallurgy, industrial minerals and fossil fuels covering aspect such as aspects of mining, metallurgy, reserves, grades, resources, environmental and legal issues. A small metallogenic research project focusing on deposit description, geological setting, ore-forming processes, economic significance and results of microscopic descriptions. A literature assignment on primary literature of metallogenic case studies (e.g. Economic Geology, Mineralium Deposita) will be requested, including the acquisition of articles.

GLG636 Mineralogy

The module entails the theory and practical application of advanced mineralogical techniques and instruments, including: reflected light petrographic microscopy (for the study of ore minerals), X-ray diffraction and scanning electron microscopy, systematic mineralogy, mineralogical principles and processes and their applications in various industries. Applied mineralogy focused on the use of mineralogical knowledge in the optimisation of extraction and purification of ores.

GLG643 Metamorphic geology

The module involves a study of topical themes within the subject area with reference to recently published works. Students are also introduced to techniques that can be used to decipher the petrogenesis of metamorphic rocks.

GLG646 Advanced geochemistry

The module is based around sophisticated isotopic systematics to investigate geochemical problems. The topics include geometric dating, radiogenic isotope geochemistry, extinct radio-isotopes and their uses, fractionation of light isotope ratios and their application to igneous and environmental geochemistry, and the use of isotope geochemistry to investigate ore forming processes.

GLG653 Igneous Geology

The module involves a study of topical themes within the subject area with reference to recently published works. Students are also introduced to techniques that can be used to decipher the petrogenesis of igneous rocks.

GLG656 Structural Geology

The module covers the principles and techniques associated with structural geology and the applications thereof.

GLG663 Mineral Exploration

The module entails: The study of mineral exploration, metallogenesis, geochemical and geophysical exploration methods for various commodities, recent findings worldwide, and exploration techniques; aspects of exploration, as well as environmental and legal issues. Own involvement in exploration projects compiling a SAMREC-compliant exploration report is required. A literature assignment on primary literature of exploration case studies (e.g. Journal of Exploration Geochemistry, Journal of Environmental Geochemistry) is required.

GLG673 Environmental Geochemistry

The module constitutes prevention and rehabilitation of geochemical damage as a result of mining and industrial operations. Health aspects as a result of the activities are also included.

GLG683 Capita Selecta

Capita Selecta of advanced aspects, applications and processes related to the geological environment.

GLG693 Short Research Essay

The research project stretches over a year under the guidance of a supervisor. The topic is chosen in consultation with the supervisor and in collaboration with the departmental chair. The short research essay will be evaluated by the supervisor and an external examiner.

Limnology

The Honours program in Limnology will only be presented in 2014. The program is currently being reviewed. For enquiries please sent an email to cem@ufs.ac.za or phone the Centre for Environmental Management at 051 401 2863.

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 Plant Sciences

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 Plant Sciences

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.

Microbial Biotechnology

BTG614 (16 credits) – Advanced techniques in Biotechnology

Research techniques in Biotechnology: handling and preservation of micro-organisms, serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, data processing.

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, Microbial Biotechnology and Microbiology Honours modules.

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.

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.

MKB614 (16 credits) – Advanced techniques in Biotechnology

Research techniques in Microbiology: handling and preservation of micro-organisms, serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, data processing.

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) – Seminar

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 evaluates the written report and both allocate marks as will be explained to students.

MKB692 (32 credits) – Research project

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.

BTG614 (16 credits) – Bioprocess technology

Research techniques in Microbiology: handling and preservation of micro-organisms, serological techniques, chromatographic, spectroscopic and other analytical techniques for the analysis of organic compounds, data processing.

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.

Plant Health

PLT644 (16 credits) – Breeding Programme Management

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.

PPG696 (24 credits) – 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.

PPG698 (32 credits) – Research Project

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.

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

PLT644 (16 credits) – Breeding Programme Management

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.

PLK696 (24 credits) – 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.

PLK698 (32 credits) – Research Project

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.

- 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.

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.

PLK674 (16 credits) – Plant molecular applications

A three hour discussion and the equivalent of a six hour practical per week during the first semester.

One examination paper of three hours.

The response of plants following either a biotic or abiotic stimulus is very complex. Using an appropriate example, a variety of molecular techniques that were used to study this response will be discussed. In addition, the production and use of transgenic plants to improve plant resistance against stress conditions will be studied.

After the successful completion of the module, the student should be able to

- describe the molecular techniques that were discussed in detail;
- understand how each technique contributed to our understanding of the stress response;
- critically evaluate a relevant article where these techniques were used during the exam.

PLK684 (16 credits) – Plant analytical biochemistry

A three hour discussion and the equivalent of a six hour practical per week during the second semester.

One examination paper of three hours.

Bioactive compounds from plants are currently the subject of much research as part of investigations on their possible application in the pharmaceutical and agricultural sectors. This module focuses on the isolation and purification of bioactive metabolites from plant material and determining their biological properties. Various techniques to purify and characterize these compounds will be discussed.

After completion of the module, the student must be able to

- extract both polar and non-polar compounds from plant material;
- purify and partially identify different isolated compounds;
- determine biological activity of partially purified compounds using different bio-assays.

PLK604 (16 credits) – *Capita Selecta*

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

One examination paper of three hours.

Capita Selecta from aspects of Botany which can meaningfully complement the field of study.

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.

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.

DRK 634 (16 Credits) – Wetland Ecology

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. This course includes class work, presentations by students, practical work, seminars and an open book examination.

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, interaction with hosts and the environment, transmission of pathogen organisms to host and control of selected ectoparasites associated with domesticated animals and pets. Specific attention will be given to the development of resistance against chemical control and in management of this in especially farming activities. The course included 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 economic 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, epizootology 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

*This elective is subject to approval by the Faculty programme committee.

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, analysing, 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
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
GLG683	GLG653

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:

	Minimum period of study	Study code	Page
Honours degree	1 year		
Baccalaureus Scientiae Agriculturae Honores			
a) Agricultural economics - BScAgricHons		5517	51
b) Agronomy – BScAgricHons		5515	53
c) Agrometeorology - BScAgricHons		5518	54
d) Animal Science - BScAgricHons		5521	55
e) Food Science - BScAgricHons		5522	56
f) Grassland Science - BScAgricHons		5523	57
g) Plant Breeding - BScAgricHons		5519	58
h) Plant Pathology - BScAgricHons		5520	59
i) Soil Science - BScAgricHons		5516	59
j) Irrigation Science – BScAgricHons		5524	60
Baccalaureus Agriculturae Honores	1 year		
a) Specialisation in Agricultural Management		5531	62
b) Specialisation in Irrigation Management		5532	62
c) Specialisation in Wildlife Management		5533	63
Master's degrees			
Magister Scientiae in Agriculture (MSc Agric)	1 year	5722/23	64
Magister in Sustainable Agriculture (M.S.A)	2 years	5710	65
Magister in Disaster Management (MDisaster Management)	2 years	5703	68
Magister Agriculturae (MAgric)	1 year	5725/26	70
Doctor's degrees			
Philosophiae Doctor	2 years	5910	72
Doctor Scientiae	See regulations	5920	

The BScAgricHons 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 BAgricHons degree can be obtained in the following interdisciplinary fields of study:

Irrigation Management, which is co-ordinated by the Department of Soil, Crop and Climatic 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.

INFORMATION

STUDY AIMS

The objectives of the study for this degree are:

- to deepen and extend the student's knowledge in subjects of their choice in the context of research and extension;
- to prepare the student for further post-graduate study;
- to develop independent study capability in the student;
- 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

- See General Regulation A56.
- Acceptance to the Honours degree study is subject to permission from the Departmental Chairperson.
- A deserving student in possession of a BSc 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 BScAgricHons, during which prescribed honours modules as well as certain additional undergraduate Agriculture modules may be taken in consultation with the Departmental Chairperson.
- 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 interdepartmental study of Irrigation Science.
- Deserving students that obtained a BAgriC degree according to the Regulations of the 2000 or following Yearbooks may be allowed by the Faculty Committee, to register for a BScAgricHons degree, that will be done over a period of 2 years. During this period the final year BScAgric 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

- See General Regulation A65.
- 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 provide proof of successful completion of the following Agriculture Datametrics modules, DMT214 and DMT224, before receiving the degree, providing that:

- students who passed the modules BMT218 and BMT228 in 1987 or earlier, be exempted; and
- 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 BScAgricHons

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

(a) AGRICULTURAL ECONOMICS – BScAgricHons – Study code 5517 (120 credits)

This degree is awarded in the fields of agricultural financing and derivative markets, agricultural policy and development, agricultural marketing and international trade, resource and environment economics, farm management or food and agribusiness management. To meet the requirements of the degree it is expected of a student to pass **eight** modules of which LEK601 and LEK693 are compulsory. The student must choose a field and successfully complete the three prescribed modules plus three other honours modules.

- Agricultural policy and development LEK606, LEK607, LEK608 plus three other postgraduate modules.
- Agricultural marketing and international trade LEK607, LEK609, LEK605 plus three other postgraduate modules.
- Resource and environmental economics LEK608, LEK610, LEK611 plus three other postgraduate modules.
- Farm management LEK609, LEK608, LEK605 plus three other postgraduate modules.

- Agribusiness management

AGB605, LEK605, LEK609 plus three other postgraduate modules.

One of these elective modules may be replaced by an appropriate Honours module from another discipline in consultation with the Departmental Chairperson. An examination paper of three hours must be answered in each of these modules, except LEK693 (script).

Module code	Credits	Subject
LEK601	15	<p>Quantitative techniques</p> <p>The learner will be competent in demonstrating knowledge about microeconomic concepts, market structures, and concentration in the South African economy.</p>
LEK602	15	<p>Production and consumer economics</p> <p>This module aims to build the capacity of the student to econometrically estimate production, cost and profit functions and to apply those functions to identify optimal input and output levies. The student will be able to motivate a choice of a specific functional form and to derive product supply and factor demand functions using both the primal and dual approaches.</p>
LEK603	15	<p>Operational research</p> <p>The primary learning outcome of this course is to build the capacity of the student to synthesize information regarding complex agricultural problems, to represent these problems mathematically within a linear, mixed integer, dynamic linear or a risk programming framework as appropriate, to solve these problems using the General Algebraic Modelling System (GAMS) and to interpret the results. To build the capacity of the student to represent a specific problem using mathematical notation specific to the GAMS modelling language, solve the model and interpret the results for various problem sets</p>
LEK604	15	<p>Agricultural econometrics</p> <p>This is an applied course in basic regression analysis and other econometric techniques and models. The module contains lessons that you can apply to a wide range of empirical economic problems. The course consists of both theoretical and practical application, where the student will be able to use various computer programs to solve economic problems. Econometrics gives empirical content to most economic theory. The student must be able to familiarize with the nature and structure of the data in question and be able to apply various techniques in data transformation and modelling.</p>
LEK605	15	<p>Agricultural financing</p> <p>After completion of this module, the student will be able to critically analyse and independently evaluate an agribusiness's financial position, and propose recommendations on the growth and protection of equity capital in a risky macroeconomic environment.</p>
LEK606	15	<p>Agricultural policy</p> <p>After completion of this course the student should understand the agricultural policy process and have a good theoretical knowledge about agricultural policy; know the South African agricultural policy and have a thorough understanding of it; be able to evaluate agricultural policy by using different methods; and be able to evaluate the effect of agricultural policy on agricultural development</p>
LEK607	15	<p>International agricultural trade</p> <p>After completion of this learning program the student will have the necessary knowledge base, a deep understanding of the complexities of international trade and have the skills to analyse international trade independently.</p>
LEK608	15	<p>Agricultural development</p> <p>Using the theoretical and empirical knowledge gained from the unit, students will be able to analyse agricultural households, rural markets and institutions, evaluate the ability of alternative policies to engender agricultural and economic development based on their understanding of how agricultural households and rural organisations and institutions function.</p>
LEK609	15	<p>Agricultural marketing and price analysis</p> <p>After completion of this learning program the student will have the necessary knowledge base, a deep understanding of the complexities of marketing agricultural products and have the skills to do compile an all-encompassing marketing plan.</p>
LEK610	15	<p>Advanced resource and environmental economics</p> <p>With an understanding of the theory of environmental and natural resource economics learners will be able understand concept of value as it applies to these resource and the role the importance of economic values in guiding resource allocation and management. Students will gain an understanding of valuation techniques such as the travel cost method, hedonic price methods and contingent valuation, and the capacity to use these techniques to determine the benefits to society from different natural resource management and environmental improvement policies and programs.</p>
LEK611	15	<p>Project planning and analysis</p> <p>The objectives of this unit are to introduce learners to the principles of project design, planning and management, project design concepts and methods that effectively link projects to rural and economic development strategies</p>

AGB605	15	<p>Agribusiness management</p> <p>The overall learning outcome of this module is to obtain a comprehensive knowledge of strategic management principles and methods for production, processing, wholesaling, retailing and service forms in the context of the markets of these firms, thus across specialised areas in agriculture.</p>
LEK693	15	<p>Research project in Agricultural Economics</p> <p>Students will complete a research project under the guidance of a supervisor and will become skilled in problem identification, development of research objectives and hypotheses, identification and reviewing of relevant literature, specification of a conceptual and analytical framework, locating sources of data, sampling concepts and design, methods of data collection including questionnaire design and testing, analysis of data, presentation and interpretation of research results, and report writing. This report will be evaluated for the final mark in this module.</p>

(b) AGRONOMY – BScAgricHons – Study code 5515 (120 credits)

This degree is awarded in the fields of crop production, vegetable production or fruit production. To meet the requirements of the degree a student must pass the following modules: AGR615, AGR625, AGR635, AGR645, AGR693 and AGR695 for crop production; AGR615, AGR635, HRT625, HRT645, HRT693 and HRT695 for vegetable production; AGR615, AGR635, HRT625, HRT665, HRT693 and HRT695 for fruit production. One of the modules, except AGR693, AGR695, HRT693 and HRT695, may be replaced by an appropriate honours module from another discipline, in consultation with the Departmental Chairperson. An examination paper of three hours must be answered in each of AGR615, AGR625, AGR635, AGR645, HRT625, HRT645 and HRT665.

Module code	Credits	Subject
AGR615	20	<p>Crop and stress physiology</p> <p>On completion of this module students will have developed their critical reading skills, and will be able to relate stress symptoms in crops with physiological and biochemical mechanisms. In the crop physiology section students will develop a high level of understanding of the physiological principles of dry land crop production, as well as the possibilities of manipulating the physiological and biochemical processes to improve yields. The stress physiology part of the module will enable students to understand the effects of climate change on food production, and gain a deeper understanding of how plants react to various stresses imposed by the environment and production practices.</p>
AGR625	20	<p>Plant nutrition</p> <p>In this module the student is familiarised with classification systems of plant nutrients. The student will acquire knowledge and insight of selected plant nutrients on their supply, uptake and physiological functions in crop manipulation. Nutrient requirements, of crops, value and interpretation of plant and soil analyses, application of nutrients through inorganic and organic fertilisation is part of the holistic approach to plant nutrition. On completion of this module the student will be able to successfully compile and evaluate a crop fertiliser program.</p>
AGR635	20	<p>Plant-water relations</p> <p>On completion of this module students will have acquired sound knowledge of the soil-plant-atmosphere continuum, root growth and water uptake, the movement of water in plants, measurements of the plant water status, and plant response to water deficit and water logged conditions. Each student is required to prepare and present an assignment on the water requirements of a selected crop by using relevant literature.</p>
AGR645	20	<p>Weed control</p> <p>After completion of this module students will have advanced knowledge of various aspects of weed control, including different herbicides and their modes of action, application methods, allelopathy and its use in weed control, the development of herbicide resistance in weeds and how to prevent it, the registration process to be followed for new herbicides, as well as how to diagnose herbicide problems and conduct experiments to confirm the diagnosis. This module expands the student's knowledge of weed control, mainly through self-study. It is expected that the student identify any shortcomings in his or her knowledge base and rectify these.</p>
AGR693	20	<p>Research project</p> <p>Students will conduct a research project on an aspect of agronomy under the guidance of a supervisor. At the end of the second semester students will be required to submit the results of this research in the form of a scientific paper, and will be expected to prepare and present the results in the form required by scientific conferences. During this project skills in problem identification, hypothesis formulation, planning, conducting and analysis of agronomic experiments, as well as the interpretation and communication of results in both written and oral form will be developed by the students.</p>
AGR695	20	<p>Literature review</p> <p>Students develop skills and knowledge on scientific writing for publication through the preparation of a comprehensive literature review linked to their research project. This study will be written up and presented in the form of a seminar at the end of the first semester. Students should become familiar with the scientific style of writing, as well as being well acquainted with the resources available and skills required for literature searches, as well as being able to combine relevant sources in a meaningful manner. Valuable experience will also be gained in public presentation.</p>

HRT625	20	<p>Plant propagation</p> <p>On completion of this module students will be familiar with the sexual and asexual propagation of horticultural crops: The following aspects are dealt with at an advanced level: seedling propagation; theoretical aspects of vegetative propagation by budding, grafting, cuttings, layering and specialised plant structures; rootstock and scion relationships and principles of tissue culture for micro propagation.</p>
HRT645	20	<p>Vegetable production</p> <p>On completion of this module students will be familiar with vegetable production. The following aspects are dealt with at an advanced level: establishment; induction of flowering; environmental influences on development, growth and yield; correlative growth and the production aspects of the major leaf, bulb, root and fruit vegetable crops.</p>
HRT665	20	<p>Fruit production</p> <p>This module consists mainly of self-study of scientific review articles on specific advanced topics in fruit production. After completion of this module, students will have acquired an in-depth knowledge of important concepts in fruit production, including flowering and dormancy, fruit development, and fruit tree manipulation. Experience in evaluating scientific literature and extracting relevant information from such sources will also be gained.</p>
HRT693	20	<p>Research project</p> <p>The research project extends over a whole year. A subject specific project will be completed under supervision. They will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of horticultural experiments, as well as the interpretation and communication of results. Students will be required to submit a scientific research report and make an oral presentation on the project results by the end of the second semester. After completion of this module, skills of scientific insight and procedure, as well as written and oral presentation skills of scientific information will have been developed.</p>
HRT695	20	<p>Literature review</p> <p>Students will prepare a comprehensive, scientific literature review linked to their research project and present this seminar by the end of the first semester. On successful completion of this module students should have an understanding of the importance of a comprehensive literature survey in research, and be completely familiar with the scientific style of writing. Students should be well acquainted with the resources available and skills of literature searches, and the combination of relevant sources into a meaningful union. Students will also gain valuable experience in presentation of scientific matter in front of an audience.</p>

(c) AGROMETEOROLOGY – BScAgricHons – Study code 5518 (120 credits)

For this degree LWR601, LWR602, LWR693 and LWR695 are compulsory. Another two modules must be selected from LWR603, LWR604, LWR605 and LWR606. One of these elective modules may be replaced by an appropriate honours module from another discipline. The choice of modules must be done in consultation with the Departmental Chairperson. An examination paper of three hours must be answered in each of LWR601, LWR602, LWR603, LWR604, LWR605 and LWR606. No official examination is written in LWR693 and LWR695.

Module code	Credits	Subject
LWR601	20	<p>Agrometeorological services for extension</p> <p>The student will be expected to understand the various communication channels and methods of technology transfer with specific emphasis on weather bulletins and advisories (for the whole range of temporal and spatial scales) for use by farmers, extension officers and policy makers. They will also learn how to conduct a participatory needs assessment survey to determine end-user needs, and how to develop new products from available forecasts and information obtained from meteorologists or climatologists.</p>
LWR602	20	<p>Data analysis for weather and climate research</p> <p>Upon completion of this module students will be able to apply basic statistical procedures to weather and climate data sets, and to do time series analysis, analysis of multivariate data sets, statistical weather forecasting for all time scales and forecast verification.</p>
LWR603	20	<p>Specialised instrumentation</p> <p>After completion of this module students will be able to discuss the history, nature operation and use of agrometeorological instruments. The goal is to provide students with the background, knowledge and analytical skills to test, calibrate and evaluate agrometeorological instruments. Students will obtain hands-on experience with instruments where possible.</p>
LWR604	20	<p>Boundary layer meteorology</p> <p>The outcomes of this module will allow students to evaluate the influence of various weather elements and growth factors on photosynthesis and crop growth. The aim is to develop students' reasoning capacity and to provide them with the necessary background to test crop growth models by means of sensitivity analysis and statistical verification before these models can be applied in agriculture. Students will obtain practical experience with crop growth models where possible.</p>

LWR605	20	<p>Applied agrometeorology</p> <p>The outcomes of this module will enable students to identify existing or anticipated problems related to the agrometeorological environment. Knowledge acquired by students will equip them to formulate objectives and methods required to tackle specific problems, given the necessary tools, such as seasonal forecasts, advisory reports, etc. Students will gain practical experience by writing a scientific article through acquisition and analysis of data as well as interpretation of results and drawing conclusions. This provides preparation to enter the workplace, equipped to solve agrometeorological problems and apply this knowledge to real-life situations.</p>
LWR606	20	<p>Weather analysis and forecasting</p> <p>Upon completion of this module the student will be able to manipulate large climate datasets within a Linux environment. After familiarising themselves with the different elements of a programming language, data description statements, control structures, data-processing statements as well as in- and output statements will be incorporated in programs that aim to automate data manipulation. Students will obtain practical experience in programming and be able to apply these skills in certain aspects of their research.</p>
LWR693	20	<p>Research project</p> <p>The student will gain knowledge on sound research methodology by locating and evaluating relevant literature to write a research proposal. A research project must also be completed by a student through analysis and interpretation of results that are compiled into a report.</p>
LWR695	20	<p>Literature review</p> <p>The student will gain knowledge on scientific writing for publication and receive guidance in preparing and presenting a literature review paper on an approved topic in agrometeorology. This seminar must preferably be presented at a discipline-related conference.</p>

(d) ANIMAL SCIENCE – BScAgricHons – Study code 5521 (120 credits)

This degree is awarded in the fields of animal breeding, animal nutrition or animal physiology. To meet the requirements of the degree it is expected of a student to pass **six** modules, of which **VKD693 and VKD695 are compulsory**, whereas **four** other modules have to be successfully completed for each of the three main fields of study:

- Animal Breeding: DTL601, DTL602, DTL603 and one other postgraduate module;
- Animal Nutrition: DVL601, DVL602, DVL603, DVL604 for animal nutrition
- Animal Physiology; DAF601, DAF602, DAF603 plus one other postgraduate module.

One of these elective modules may be replaced by an appropriate honours module from another discipline in consultation with the Departmental Chairperson. An examination paper of three hours must be answered in each of DTL601, DTL602, DAF601, DAF602, DVL601, DVL602 and DVL604. For DTL603, VKD693 and VKD695 scientific reports and oral presentations are required. For DAF603 and DVL603 oral examinations are to be undertaken.

Admittance is subject to a selection process. A minimum average of 60% in all third and fourth year modules of the specific Hons disciplines is required.

Module code	Credits	Subject
DAF601	20	<p>General Animal Physiology</p> <p>Following completion of this module the student will have in depth knowledge of the physiological functioning of the different systems(e.g. circulatory, respiratory, urinary, digestive system etc.) of the animal body.</p>
DAF602	20	<p>Endocrinology</p> <p>Following completion of this module the student will have insight and understand the mechanisms regulating the endocrine system, its glands and hormones and the relevant control of the most important physiological functions in the body.</p>
DAF603	20	<p>Applied reproduction physiology</p> <p>Following completion of this module the student will understand the application of certain physiological principles in the manipulation of assisted reproductive techniques in farm animals.</p>
DTL601	20	<p>Fundamental animal breeding</p> <p>After successful completion of this module the student will have an in-depth knowledge of the underlying principles of quantitative genetics and the application thereof in the genetic improvement of domesticated livestock.</p>
DTL602	20	<p>Experimental animal breeding</p> <p>After successful completion of this module the student will have a fundamental knowledge of the underlying principles and methodologies (single and multiple trait, maternal, environmental and threshold models) of how accurate genetic predictions could be made using statistical analyses and utilised as selection aids for genetic improvement of domesticated livestock. The role and application of molecular techniques in modern animal breeding will also be discussed.</p>
DTL603	20	<p>Applied animal breeding</p> <p>After successful completion of this module the student will have a fundamental knowledge and insight of selection objectives, selection criteria, genetic parameters thereof and how to construct a comprehensive</p>

breeding plan that will result in genetic improved populations of different livestock species under South African environmental conditions.

DVL601	20	<p>Fundamental animal nutrition</p> <p>Through self-study (studying literature and written seminars) the student is familiarized with the concepts of feeds and nutrients (water, carbohydrates, lipids, proteins, minerals and vitamins); digestive systems (monogastric, ruminant and lower digestive tract fermenters), digestion, absorption and metabolism; nutrient deficiencies, toxicity and metabolic disturbances; digestibility of feeds and feed components; techniques for the evaluation of feeds and pastures; protein and energy requirements for monogastric animals, ruminants and lower digestive tract fermenters. The student is provided opportunity to master through self-study specific topics and write seminars in scientific style and format.</p>
DVL602	20	<p>Experimental animal nutrition</p> <p>On completion of this module the student will be well acquainted and have an in-depth knowledge regarding the quantitative aspect of nutrition e.g. the quantity of nutrients provided by the feed and secondly the nutrient requirements of various farm animals. Experimental techniques used for the quantification of nutrient utilization and requirements are addressed in-depth.</p>
DVL603	20	<p>Applied ruminant nutrition</p> <p>On completion of this module the student will have a valid knowledge and in-depth insight regarding feeding management of dairy cattle, dairy calves, beef cattle and sheep in different physiological stadiums to produce economical high quality animal products under specific environmental conditions.</p>
DVL604	20	<p>Applied monogastric nutrition</p> <p>On completion of this module the student will be well acquainted and have an in-depth knowledge regarding feeding requirements, feed facilities, feeding systems, diet formulation and feeding management of poultry and pigs at different physiological stadiums to ensure the production of economical high quality animal products.</p>
VKD693	20	<p>Research project</p> <p>A subject specific project will be completed under the guidance of a supervisor and will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of animal science experiments/research, as well as the interpretation and communication of results. It is expected of students to submit a scientific research report in the form of a publication and to prepare and orally present the results in the form required by scientific conferences. The independence and scientific insight developed in this module provides a background for further post-graduate studies.</p>
VKD695	20	<p>Literature review</p> <p>The student prepares a comprehensive scientific literature review on a specific subject and presented it in the form of a seminar and oral 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>

(e) FOOD SCIENCE – BScAgricHons – Study code 5522 (128 credits)

Prerequisite: Food Science on fourth year level. An average of 65% in undergraduate Food Science modules. Admission is subject to a selection process. To meet the minimum requirements of the degree it is expected of the student to pass six modules, of which **VWS601, VWS 602, VWS693 and VWS695 are compulsory**. One of the optional modules below may be exchanged in consultation with the departmental chairman with an applicable honours module from another discipline. Oral exams of three hours each are to be completed in VWS601, VWS602, VWS603, VWS604, VWS605, VWS606 and VWS607. For VWS693 and VWS695 scientific reports/seminars and oral presentations are expected.

Module code	Credits	Subject
VWS601	24	<p>Food microbiology</p> <p>The student will learn to know the following specific areas of food microbiology in 5 modules: food spoilage, food-borne disease and food poisoning, yeasts and yeast-like organisms in food, natural antimicrobial systems and food preservation, probiotics in food and the role of fermentation in food.</p>
VWS602	24	<p>Food chemistry</p> <p>Advanced aspects of food chemistry are covered in 6 modules, dealing with flavourants and flavour perception, new movements in the research and application of sweeteners, role and contribution of lipids and proteins to flavour, modification of functional properties of proteins, and molecular mobility and food stability.</p>
VWS603	24	<p>Dairy Science</p> <p>The course consists of 5 modules on advanced aspects in dairy science. This includes residues in milk and milk products such as residues and contaminants, antimicrobials, paracitocides, pesticides and mycotoxins. Bacteriophages in the cheese industry. Accelerated cheese ripening with enzyme technology. HACCP in the dairy industry. Finally an assignment is required on the latest developments in Dairy Science.</p>
VWS604	24	<p>Meat Science</p> <p>The course consists of six modules dealing with advanced aspects of importance in meat science. The following aspects are covered: composition and structure of muscle, the conversion of muscle to meat and</p>

muscle proteins in meat technology, an advanced study of the colour of meat, an advanced study of meat tenderness and the chemistry of meat flavour, restructured meat products and canning of meat and meat products, fermented and intermediate moisture meat products, and new technology for the meat processing industry.

VWS605	24	<p>Foods: General</p> <p>The objective of this course is to provide the student with knowledge of food ingredients in general. This course is divided in six modules. The first module deals with food systems, where the properties and structure of the different food systems are investigated. The second and third modules deal with the functional properties of hydrocolloids; their functions and applications in food. The last three modules investigate the application of fat substitutes, nutritive and non-nutritive sweeteners as well as nutraceuticals and other food additives.</p>
VWS606	24	<p>Fruit, vegetables and seeds</p> <p>This course focuses on the functional, biochemical and quality aspects of fruit and vegetable processing. The course is divided into six modules and allows choices between fruit, vegetables and seeds. The focus is on the determination of quality as well as the influence of processing on quality, investigation of vegetable- and fruit juices and related products, minimal processing of fruit and vegetables, modified atmosphere storage and freezing of fruit and vegetables, the factors influencing the shelf life of fruit and vegetables, and the factors that affect the quality of a variety of economically important cereals, legumes and oil seeds.</p>
VWS607	24	<p>Selected topics in Food Science</p> <p>The course consists of six modules, consisting of choices of two modules from each of the above courses VWS 603, VWS 604 en VWS 606. It is ideal for students who have completed three-year BSc degrees or degrees in Consumer science, where only the basic aspects of Food Science was included in the curriculum.</p>
VWS693	20	<p>Research project</p> <p>Students will carry out under supervision of a study leader a research project on aspects of Food Science. It is expected of the student to hand in a report and prepare the results in the format of a scientific article as would be expected at a scientific congress, and deliver an oral presentation. During the project the student will develop skills in problem identification, hypothesis formulation, planning, carrying out experimental work in Food Science, as well as interpretation and communication of results in both written and oral presentation. The independence and scientific insight developed in this module will provide the student with the necessary background for further postgraduate studies.</p>
VWS695	12	<p>Literature study</p> <p>The student prepares a comprehensive scientific literature review on a specific topic which is presented in the form of a seminar and oral presentation. After completion of this module the student will be capable of unlocking literature, organizing information, concluding this information according to a structured format, as well as written and oral communication.</p>

(f) GRASSLAND SCIENCE – BScAgricHons – Study Code 5523 (120 credits)

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 a mini research project (WDK 693) and a literature review (WDL 695) is required. All modules are 20 credits each.

Admittance is subject to a selection process. A minimum average of 60% in all third and fourth year modules of the specific Hons disciplines is required.

GENERAL FIELD

Module code	Credits	Subject
WDK601	20	<p>Rangeland physiology and ecology</p> <p>To familiarise the student with the principles of grassland science (ecology, physiology and phenology) on advanced level, on which the sustainable utilization and management of the rangeland ecosystem are based.</p>
WDK602	20	<p>Rangeland management</p> <p>To familiarise the student with the different ways of veld utilization to obtain sustainability, as well as the practical planning of a farming unit in a scientific way.</p>
WDK603	20	<p>Intensive pasture production</p> <p>The application of veld intensification and the use of planted pastures to improve and supplement the natural veld in order to maintain sustainable productivity.</p>
WDK604	20	<p>Rangeland evaluation</p> <p>To equip the student with the necessary knowledge on advanced level of the various criteria and techniques that can be used to evaluate the resource, so that the productivity of the ecosystem can be identified and to determine vegetation changes.</p>

WDK693	20	<p>Research project</p> <p>A subject specific project will be completed under the guidance of a supervisor and will be introduced to problem identification, hypothesis formulation, planning, conducting and analysis of grassland science experiments/research, as well as the interpretation and communication of results. It is expected of students to submit a scientific research report in the form of a publication and to prepare and orally present the results in the form required by scientific conferences. The independence and scientific insight developed in this module provides a background for further post-graduate studies.</p>
WDK695	20	<p>Literature review</p> <p>The student prepares a comprehensive scientific literature review on a specific subject and presented it in the form of a seminar and oral presentation on a grassland science 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>

WILDLIFE MANAGEMENT

Module code	Credits	Subject
WDK601	20	Rangeland physiology and ecology
WDK602	20	Rangeland management
WDK604	20	Rangeland evaluation
WDK605	20	<p>Wildlife management</p> <p>To enable the student with the aid of basic knowledge on advanced level, of game species such as their social behaviour and feeding preferences, to manage the ecosystem in such a way that optimal production in a sustainable manner can be maintained.</p>
WDK693	20	Research project
WDK695	20	Literature review

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.

(g) PLANT BREEDING – BScAgricHons – Study code 5519 (120 credits)

The student must have achieved an average mark of at least 60% on average for the final year level to qualify for admission to the Honours degree.

For the Honours course in **Plant Breeding** all modules are **compulsory**. An examination paper of three hours must be answered in each of PLT614, PLT624 and PLT634. For PLT644, PLT696 and PLT698 a practical report, oral presentation and a project report are required, respectively.

Module code	Credits	Subject
PLT614	16	<p>Advanced quantitative genetics in plant breeding</p> <p>This module consists of analysis of variance of data of different breeding techniques in early and late generations of self-pollinating plants, and in cross-pollinating and vegetatively propagated plants and calculation of variance components and heritability. The module also covers stability and genotype x environment interaction and the techniques used to analyse it.</p>
PLT624	16	<p>Quality and stress tolerance breeding</p> <p>In this module the student will gain knowledge on the application of plant breeding techniques for the improvement of quality, high and low temperature stress and moisture stress tolerance and insect and diseases resistance.</p>
PLT634	16	<p>Marker-assisted breeding</p> <p>In this module students will be acquainted with different techniques used for marker-assisted breeding. Older as well as the newest DNA marker technologies and protein based methods will be studied. Students will learn to apply these techniques in DNA fingerprinting, for construction of linkage maps, for selection and use of mapping populations, in application of different strategies to target specific genes or genomic regions in plants and in functional genomics and gene discovery.</p>
PLT644	16	<p>Breeding Programme 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>
PLT696	24	<p>Literature review</p> <p>In this module the student will do a literature review on a specific topic in plant breeding, with the use of different resources. The student will learn how to present this information in an organised and logical format, which is scientifically correctly written, in the form of a seminar.</p>

PLT698	32	Research project The student will carry out a scientific project under supervision of a lecturer and will learn how to plan, and execute research, gather data, analyse and interpret the data, make conclusions from the data and write a scientific report.
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(h) PLANT PATHOLOGY – BScAgricHons – Study code 5520 (120 credits)

For the Honours course in **Plant Pathology PPG696, PPG698 and PLT644 are compulsory**, whereas three other modules have to be selected, in consultation with the division head, from **PPG614, PPG624, PPG634, PPG644 or PLT624**. An examination paper of three hours must be written in each of those selected from the latter modules. Continuous assessment takes place in PPG696 and a project report is required for PPG698.

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 a-biotic 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 and chemical control.
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.
PPG696	24	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.
PPG698	32	Research Project 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.
PLT644	16	Breeding Programme Management 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.

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

(i) SOIL SCIENCE – BScAgricHons – Study code 5516 (120 credits)

All the modules below are compulsory for this degree. One of the modules, except GKD693 and GKD695, may be replaced by an appropriate honours module from another discipline in consultation with the Departmental Chairperson.

Module code	Credits	Subject
GKD615	20	Soil chemical principles and applications Outcome: After completion of this module students will be able to apply soil chemical principles in natural and agricultural ecosystems. Contents: The following aspects are dealt with on an advanced level: nature and practical significance of soil colloids; carbon balance of soil and the role of organic matter therein; dynamics and availability of nitrogen, phosphorus and potassium in soils; acid soils and the management thereof; salt-affected soils and the management thereof; and heavy metals in soil and the environmental significance thereof.

GKD625	20	<p>Soil genesis and evaluation Outcome: After completion of this module students will be able to identify, describe and interpret soil properties in relation to land use. Contents: The following aspects are dealt with on an advanced level: concepts of soil, soil properties and soil genesis; philosophy, similarities and differences of selected international soil classification systems; design of soil surveys for specific uses; principles of land evaluation; compilation of land use requirements, interpretation of land characteristics, and matching thereof with land use requirements; properties and behaviour of primary and secondary minerals.</p>
GKD635	20	<p>Soil physical principles and applications Outcome: After completion of this module students will be able to apply soil physical principles in natural and agricultural ecosystems. Contents: The following aspects are dealt with on an advanced level: the description and application of processes related to the soil water balance, namely infiltration, runoff, evaporation from soil and plant surfaces and drainage; soil physical factors influencing root growth; irrigation scheduling and leaching management.</p>
GKD645	20	<p>Soil fertility and fertilisation Outcome: After completion of this module students will have a sound knowledge on soil fertility and fertilisation with regard to agricultural ecosystems. Contents: The following aspects are dealt with on an advanced level: functions of all essential nutrients in plants, including consequences of insufficient and excessive supply; nature, dynamics and availability of all essential nutrients in soils; methods used for evaluation of soil fertility status; fundamental biophysical and economic principles of fertilisation.</p>
GKD693	20	<p>Research project Outcome: After completion of this module students will have the skill to conduct a small research project successfully. Contents: Every student will conduct under guidance a small research project on a soil science topic. In the process a student will gain experience in the compilation of a research protocol, selection of appropriate methodology, conducting of trials, processing of data, interpretation of results and reaching of conclusions. A student must write a report on the project for evaluation according to an approved procedure.</p>
GKD695	20	<p>Literature review Outcome: After completion of this module students will have the skill to conduct successfully literature reviews. Contents: Every student will conduct literature reviews on soil science topics under guidance. In this process a student will gain experience in the unlocking and synthesis of information as well as the written and oral presentation thereof according to approved procedures.</p>

(j) IRRIGATION SCIENCE – BScAgricHons- Study code 5524 (120 credits)

Only learning programs with specialisation in irrigation science provide admission to this interdisciplinary study field. For this field **AGR635, BSB693, BSB695, GKD635 and LWR601 are compulsory**. Another module must be selected from **AGR615, GKD645 and LWR605** in consultation with the Departmental Chairperson.

Module code	Credits	Subject
AGR615	20	<p>Crop and stress physiology On completion of this module students will have developed their critical reading skills, and will be able to relate stress symptoms in crops with physiological and biochemical mechanisms. In the crop physiology section students will develop a high level of understanding of the physiological principles of dry land crop production, as well as the possibilities of manipulating the physiological and biochemical processes to improve yields. The stress physiology part of the module will enable students to understand the effects of climate change on food production, and gain a deeper understanding of how plants react to various stresses imposed by the environment and production practices.</p>
AGR635	20	<p>Plant-water relations On completion of this module students will have acquired sound knowledge of the soil-plant-atmosphere continuum, root growth and water uptake, the movement of water in plants, measurements of the plant water status, and plant response to water deficit and water logged conditions. Each student is required to prepare and present an assignment on the water requirements of a selected crop by using relevant literature.</p>
BSB693	20	<p>Research project After completion of this module a student will have experience in the integrated planning of irrigation farming. This planning will be conducted under guidance. The soil, climate, agronomy, economy and engineering aspects must be taken into account. A report covering all aspects of the planning is required.</p>
BSB695	20	<p>Literature review After completion of this module students will have the skill to conduct successfully literature reviews. Every student will conduct literature reviews on irrigation science topics under guidance. In this process a student will gain experience in the unlocking and synthesis of information as well as the written and oral presentation thereof according to an approved procedure.</p>

GKD635	20	<p>Soil physical principles and applications</p> <p>After completion of this module students will be able to apply soil physical principles in natural and agricultural ecosystems. The following aspects are dealt with on an advanced level: the description and application of processes related to the soil water balance, namely infiltration, runoff, evaporation from soil and plant surfaces and drainage; soil physical factors influencing root growth; irrigation scheduling and leaching management.</p>
GKD645	20	<p>Soil fertility and fertilisation</p> <p>After completion of this module students will have a sound knowledge on soil fertility and fertilisation with regard to agricultural ecosystems. The following aspects are dealt with on an advanced level: functions of all essential nutrients in plants, including consequences of insufficient and excessive supply; nature, dynamics and availability of all essential nutrients in soils; methods used for evaluation of soil fertility status; fundamental biophysical and economic principles of fertilisation.</p>
LWR601	20	<p>Agrometeorological services for extension</p> <p>The student will be expected to understand the various communication channels and methods of technology transfer with specific emphasis on weather bulletins and advisories (for the whole range of temporal and spatial scales) for use by farmers, extension officers and policy makers. They will also learn how to conduct a participatory needs assessment survey to determine end-user needs, and how to develop new products from available forecasts and information obtained from meteorologists or climatologists.</p>
LWR605	20	<p>Applied agrometeorology</p> <p>The outcomes of this module will enable students to identify existing or anticipated problems related to the Agrometeorological environment. Knowledge acquired by students will equip them to formulate objectives and methods required to tackle specific problems, given the necessary tools, such as seasonal forecasts, advisory reports, etc. Students will gain practical experience by writing a scientific article through acquisition and analysis of data as well as interpretation of results and drawing conclusions. This provides preparation to enter the workplace, equipped to solve Agrometeorological problems and apply this knowledge to real-life situations.</p>

BACCALAUREUS AGRICULTURAE HONORES

BAgricHons

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 BAgric 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 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 spread sheet 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 head and with approval of the Dean of the Faculty, take such a course.

Reg. H21 – Curricula for the BAgricHons degree

(a) Specialisation in Agricultural Management – Study code 5531 (120 credits)

An essay (LBB693) and seven examination papers of three hours each.

Module code	Credits	Subject
LBB601	15	Advanced Agricultural Management - effective management styles, leadership and information systems.
LBB602	15	Financial Management - a critical analysis and interpretation of the financial statements of an agribusiness by using key financial ratios. The evaluation of the impact and financial feasibility of new projects, growth strategies on the key financial ratios and the long term well-being of the business by taking into account the changing macro-economic environment. At the end of the course the student must submit an assignment and do a presentation illustrating the application of these principles on an agribusiness of his/her choice.
LBB603	15	Production Management - after the successful completion of this module the student will understand the theoretical concepts of production economics, which include, amongst others, input/output, input/input, and output/output relationships; economic optimal input and output levels; and economies of scale. The student will be able to compile comprehensive enterprise budgets for cash and perennial crops, pastures and livestock enterprises with special reference to the consideration of the availability, and the quality of available natural resources. With the aid of actual case studies, the student will understand how theoretical concepts are applied in practice when making management decisions to choose between different production alternatives, production processes, and the adoption of new production technology. The student will be able to assess the financial impact of management decisions within a case study of his/her choice.
LBB604	15	Project Management - project management is the process by which projects are defined, planned, implemented, monitored and controlled to realise project objectives. After completing this module the student will be able to develop a project plan, define the scope of the project, set objectives, develop a time-schedule and a budget, manage resources, measure progress and manage the project to complete the project successfully.
LBB605	15	Marketing Management - after completion of this module the students will be equipped with the decision making skills and knowledge needed to perform a complete marketing plan for an agri-business. More specifically, the module encompasses the analysis of the macro and internal environment in which marketing takes place, strategic marketing process and the development of marketing plan. Supplementation will take place by giving real life case studies.
LBB606	15	Human Resource Management - after the completion of this module the student will be able to have a comprehensive knowledge of human resource management in South Africa. Students will be able to analyse and confidently manage challenges pertaining to the management of their staff in terms of employment relationships, workforce planning, establishing employee relationships (recruiting, appointing and orientating), utilising and developing employees (motivating, leading and training) and the influence of Labour Laws and policies.
LBB607	15	Business Management - after completion of this module the student will have a comprehensive knowledge of strategic management theories and methods. The student will be able to practically apply strategic management concepts in terms of production, processing, retail and service sectors of businesses in various industries.
LBB693	15	Research Project – an integrated business plan under the guidance of a supervisor will be completed. The students will become skilled in problem identification, development of research objectives and hypotheses, identification and reviewing of relevant information sources, the design of a business plan, methods of data collection, the analysis of data and the presentation and interpretation of results in a business plan. This report will be evaluated for the final mark in this module.

(b) Specialisation in Irrigation Management – Study code 5532 (120 credits)

An examination of three hours in each of **BSB601, BSB602 and BSB603** must be written, while a mini dissertation on a project assignment in **BSB693 is compulsory**. One examination of two hours each in LBB609A (Advanced Agricultural Management) and LBB609B (Financial Agricultural Management).

Module code	Credits	Subject
LBB609	24	Financial Management - a critical analysis and interpretation of the financial statements of an agribusiness by using key financial ratios. The evaluation of the impact and financial feasibility of new projects, growth strategies on the key financial ratios and the long term well-being of the business by taking into account the

changing macro-economic environment. At the end of the course the student must submit an assignment and do a presentation illustrating the application of these principles on an agribusiness of his/her choice.

BSB601	24	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	24	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	24	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	24	Research: Integrated planning of irrigation farming, and taking in account the soil, climate, agronomy, economy and engineering aspects.

(c) Specialisation in Wildlife Management – Study code 5533 (120 credits)

Four papers of three hours in **NLB601, NLB602 and NLB603**, as well as the integrating of the theoretical principles of wildlife management in a practical assignment/project (**NLB693**) is required. Two examinations of two hours each in LBB609A (Advanced Agricultural Management) and LBB609B (Financial Agricultural Management).

Module code	Credits	Subject
LBB609	24	Financial Management -a critical analysis and interpretation of the financial statements of an agribusiness by using key financial ratios. The evaluation of the impact and financial feasibility of new projects, growth strategies on the key financial ratios and the long term well-being of the business by taking into account the changing macro-economic environment. At the end of the course the student must submit an assignment and do a presentation illustrating the application of these principles on an agribusiness of his/her choice.
NLB601	24	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	24	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	24	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	24	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 (NQF level 9)

Degrees

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

Degree	Minimum study period	Abbreviation	Page
Magister Scientiae Agriculturae	1 year	MScAgric	64
Magister in Sustainable Agriculture	2 years	M.S.A.	65
Magister in Disaster Management	2 years	MDisaster Management	68
Magister Agriculturae	1 year	MAgric	79

MAGISTER SCIENTIAE AGRICULTURAE

MScAgric

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.

Module codes

A candidate who registers for the MScAgric degree and who plans to submit a dissertation (180 credits), uses one of the following codes:

For the MScAgric in:

Agricultural Economics	LEK700
Agrometeorology	LWR700
Agronomy	AGR700
Animal Science	VKD700
Biochemistry	BOC700
Biotechnology	BTG700
Disaster Management	DIM708
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

- See General Regulation A80.
- According to General Regulation A80, a candidate, in order to qualify for admission to the MScAgric studies, has to
 - have a BScAgricHons degree and;
 - convince the head of the department/centre concerned that he/she has adequate knowledge of the subject to justify admission to the studies.
 - in the case of Animal and Grassland Sciences the admission to the study is subject to the approval of a post graduate selection committee and Departmental Chairperson. Approval will be based on a satisfactory study record and appropriate qualification or experience already obtained. Additional modules may be required before admission to the MScAgric study is granted.

Reg. H23 – Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a BScAgricHons-degree a dissertation is required, except in the Department of Agricultural Economics' 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 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.
- (c) When considering the final mark for purpose of a degree, the weight of each module will be calculated according to the percentage of its credits relative to the total for the degree.

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

Admission to the study is subject to the approval of the Departmental Chairperson and a post graduate selection committee, which will be based on a satisfactory study record and appropriate qualification already obtained. Before acceptance for the MScAgric-degree a student must also provide proof of successful completion of LEK601, LEK602, LEK603, LEK604 and LEK693. The Departmental Chairperson may require additional subjects/modules to be completed before the admission to the MScAgric study.

Requirements for MScAgric in Agricultural Economics:

Candidates with an applicable Honours degree:

Option 1 A dissertation (LEK700, 180 credits) (Study code 5722)

Option 2 At least two modules (15 credits each) and an extended research essay (LEK791, 150 credits) (Study code 5723).

MAGISTER IN SUSTAINABLE AGRICULTURE

M.S.A.

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.

- Students register under the code 5710

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
MVL752	Strategic Management and Planning in Agriculture	24

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

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

Extended research essay

MVL791 extended research essay (72 credits) or MVL792 Short research essay (24 credits) + MVL793 research essay/article (48 credits)

- (i) **Compulsory modules (MVL720, MVL721, MVL722, MVL723 and MVL752 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.
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.

- (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.
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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	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.

(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.

(d) Focus area 4: Plant production

MVL761	Sustainable 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. This module deals with both agronomical and horticultural plant production systems.
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.

(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.
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.

(iii) Compulsory dissertation or alternative option (60 credits)

Candidates have a choice between under mentioned 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.

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.

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

MAGISTER IN DISASTER MANAGEMENT
Study Code 5703

MDisaster Management

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.

- Students register under the code **5703**

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) A disaster management honours degree or equivalent from any other institute (Minimum 120 Credits, NQF Exit Level 8) with an average pass of 60%.
 - (ii) A disaster management postgraduate diploma from UFS or any other institute (Minimum 120 Credits, NQF Exit Level 8) with an average pass of 60%.
 - (iii) The student must prove to the departmental head that he/she has adequate knowledge to justify admission to this study.
 - (iv) Practical and/or preparatory experience will be an added advantage.
 - (v) Student must submit a research proposal together with the application

Nota Bene: An Executive Committee of UFS would assess the extent, nature and suitability of experience. /or 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 two formal contact sessions of plus or minus five days each year. During the first contact session, candidates will be orientated and will receive study materials.
- (c) The programme consists of eight electives of which a student should elect a minimum of two subjects. Each elective consist of 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.

- (d) The programme also consists of a compulsory research project reported in an extended research essay format.
- (e) A formal and compulsory theoretical and Practical examination will take place at the end of the semester (except for the year subject)

Reg. H28(a) – Year mark and pass mark

- (a) See General Regulations A92 and A93.
- (b) A semester mark for admission to the examination is required for all the theoretical modules.
- (c) 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 degree can be offered over a minimum period of one year (full time). Students will be allowed to take the degree over a two-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

Compulsory

DIM791 Extended research essay

Electives (choose any two):

Module Code	Subject	Credits
DIM701	Trauma Management	16
DIM702	Political Strategic Planning	16
DIM703	Information Management	16
DIM704	Ethnic and Cultural Conduct	16
DIM705	Management of media relations	16
DIM706	Environmental risk and impact assessment	16
DIM707	Disaster vulnerability and risk assessment	16
DIM708	Water-related disaster risk management	16

DIM701 - Trauma Management (16 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 (16 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 (16 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 (16 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 (16 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 (16 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 (16 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.

***DIM708 - Water-related disaster risk management (16 credits)**

The subject will offer the students the opportunity to acquire skills and knowledge in an intra and multidisciplinary course to understand and manage disasters and their consequences. This subject entails seven modules about water related disasters. The modules are as follows: weather and climate, waterborne diseases, early warning and information systems, droughts and water scarcity, floods, water pollution and legal or institutional.

DIM791 - Extended research essay (90 credits)

*Subject to approval by the program committee

MAGISTER AGRICULTURAE
MAgric

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.
- Students, who enrol for the Master's degree by dissertation, register under the code 5725.
 - Students, who enrol for the one year structured Master's degree, register under the code 5726.

Module codes

A candidate who registers for the MAgric degree and presents a dissertation (180 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 MAgric 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 BAgricHons degree or equivalent qualification;

Reg. H32 - Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a BAgricHonours degree a dissertation (BSB700, LBB700 or NLB700) is required, or an extended research essay in Agricultural Management (LBB791), plus two appropriate postgraduate modules chosen in consultation with the Departmental Chairperson.

LBB701 – Advanced Agricultural Management – Effective management styles, leadership and information systems and

LBB702 – Production Management – After the successful completion of this module the student will understand the theoretical concepts of production economics, which include, amongst others, input/output, input/input, and output/output relationships; economic optimal input and output levels; and economies of scale. The student will be able to compile comprehensive enterprise budgets for cash and perennial crops, pastures and livestock enterprises with special reference to the consideration of the availability, and the quality of available natural resources. With the aid of actual case studies, the student will understand how theoretical concepts are applied in practice when making management decisions to choose between different production alternatives, production processes, and the adoption of new production technology. The student will be able to assess the financial impact of management decisions within a case study of his/her choice.

One or both these modules may be replaced by appropriate post graduate modules from another discipline in consultation with the Departmental Chairperson.

- (c) The attention of candidates is drawn to General regulation A89 in connection with compiling of dissertations.

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 essays.
 - (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.
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Doctor's Degrees (NQF level 10)

Degrees

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

Degree	Minimum study period	Abbreviation	Study code	Page
Philosophiae Doctor	2 years	PhD	5910	72
Doctor Scientiae	See regulations	DSc	5900	72

PHILOSOPHIAE DOCTOR
Study code 5910

PhD

INFORMATION

STUDY AIMS

This graduate study aims at:

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

Module codes

A candidate who registers for the PhD degree (360 credits) uses one of the following codes:

Agricultural Economics	LEK900
Agricultural Management	LBB900
Agronomy	AGR900
Agrometeorology	LWR900
Animal Science	VKD900
Biochemistry	BOC900
Biotechnology	BTG900
Disaster Management	DIM900
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 PhD studies.
- (c) In terms of the stipulations of General Regulation A109 a student in order to qualify for admission to PhD studies, must:
- (d) have a MAgric or MScAgric or M.S.A.;
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 (360 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 PhD 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 PhD study, at least two years must elapse before a PhD degree can be awarded. The degree study therefore lasts three years.

DOCTOR SCIENTIAE
Study Code 5900

DSc

REGULATIONS

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