

Faculty of Natural and Agricultural Sciences

Yearbook 2011

Part 3: Postgraduate Programmes

Dean

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ACADEMIC STAFF

DEAN Professor N.J.L. Heideman

PROGRAMME HEAD (QWAQWA CAMPUS) Professor A.S. Luyt

PROGRAMME DIRECTORS

Programme	Programme Director	Telephone
Actuarial Sciences and Risk Analysis	Mr M. von Maltitz	051 401 2609
Architecture	Mr H.B. Pretorius	051 401 3482
<u>Biological Sciences:</u>		
• Genetics, Behavioural Genetics, Forensic Genetics, Human Molecular Biology	Ms Z. Odendaal	051 401 2776
• Botany, Plant Health, Plant Molecular Biology	Dr B. Visser	051 401 3278
• Zoology, Entomology	Prof. Jo van As	051 401 2427
• Biochemistry	Dr A. van Tonder	051 401 2892
• Microbiology, Medical Microbiology	Prof. S.G. Kilian	051 401 2780
• Extended Programme and General Biology first-year	Mr Johan Kruger	051 401 3199
Building Sciences	Mr F.H. Berry	051 401 2198
Physical and Chemical Sciences	Dr R.E. Kroon	051 401 2884
Geosciences: Geography	Dr C.H. Barker	051 401 2554
Geosciences: Geology	Dr H.E. Praekelt	051 401 2373
Agricultural Sciences	Prof. J.B. van Wyk	051 401 2677
Information Technology	Dr A. van Biljon	051 401 2605
Urban and Regional Planning	Ms G.M. Steenkamp	051 401 3210
Consumer Science	Prof. H.J.H. Steyn	051 401 2304
Mathematical Sciences	Prof. S.W. Schoombie	051 401 2329

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

AGRICULTURAL ECONOMICS (051 401 2824)

Professors	*Prof. B.J. Willemse (Chairperson) M.F. Viljoen, Prof. L.K. Oosthuizen
Professors Extraordinary	Prof. J.A. Groenewald, Dr C.F. le Clus, Prof. Z.G. Alemu, Prof. A. Jooste, Prof. D. Louw
Senior Lecturers	Dr B. Grové, Dr G. Kundhlande, Dr W.T. Nell, Mr J.J. van Staden
Lecturers	Mr H. Jordaan, Mr D.B. Strydom, Mr F. Mare, Ms N. Matthews, Ms L. Terblanche, Ms L. du Preez
Lecturer units	Mr A.O. Ogundeji

DIMTEC (051 401 2721)

Director *Mr A.J. Jordaan

ANIMAL, WILDLIFE AND GRASSLAND SCIENCES (051 401 2211)

Professors	*Prof. J.P.C. Greyling, Prof. G.N. Smit, Prof. H.A. Snyman, Prof. H.J. van der Merwe, Prof. J.B. van Wyk, Prof. F.W.C. Neser
Professors Extraordinary	Prof. A.J. Aucamp, Prof. G.J. Erasmus, Prof. J.P. Hayes, Prof. M.M. Scholtz
Associate Professor	Prof. H.O. de Waal
Senior Lecturer	Dr L.M.J. Schwalbach
Lecturers	Mr M.D. Fair, Mr P.J. Malan, Mr F.H. de Witt, Mr O.B. Ein- kamerer
Junior Lecturers	Mr T. Makae, Mr M.B. Raito , Mr F. Deacon
Researcher	Dr G.D.J. Scholtz

ARCHITECTURE (051 401 2332)

Associate Professors	*Prof. J.D. Smit
Professor	Prof. P.G. Raman
Senior Lecturer	Ms M. Bitzer
Lecturers	Mr G. Bosman, Mr J.L. du Preez, Mr J.W. Ras
Junior Lecturers	Mr R. Bitzer, Mr H.B. Pretorius, Mr H.A. Auret, Mr J. Olivier

CENTRE FOR MICROSCOPY (051 401 2264)

Associate Professor	Prof. P.W.J. van Wyk
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CENTRE FOR ENVIRONMENTAL MANAGEMENT (051 401 2863)

Director	*Prof. M.T. Seaman
Lecturer	Ms M.F. Avenant
Affiliated Professor	Prof. A. Turton

CENTRE FOR SUSTAINABLE AGRICULTURE (051 401 2163)

Director	*Prof. I.B. Groenewald
Associate Professor	Dr A. Stroebel
Professors Extraordinary	Prof. A.E. Nesamvuni, Prof. A. Pell, Prof. F.J.C. Swanepoel

CHEMISTRY (051 401 2547)

Professors	*Prof. A. Roodt, Prof. J.C. Swarts, Prof. B.C.B. Bezuidenhoudt, pro A. Marston
Affiliated Professors	Prof. D. Ferreira, Prof. H. Frank, Prof. J.M. Botha
Associate Professors	Prof. W. Purcell, Prof. C.R. Dennis, Prof. J.H. van der West- huizen, Prof. J. Conradie, Prof. H.G. Visser, Prof. G. Steyl
Affiliated Associate Professors	Prof. S. Otto, Prof. L.G.J. Ackerman
Senior Lecturer	Dr S.L. Bonnet
Lecturers	Dr K. von Eschwege, Dr J.A. Venter, Mr E.H.G. Langner, Dr E. Erasmus
Subject Coordinators	Dr M. Versteeg, Ms R. Meintjes
Qwaqwa Campus	
Professor	*Prof. A.S. Luyt
Lecturers	*Mr T.A. Tsotetsi, Ms M.A. Mokoena, Ms N.F. Molefe, Ms M.A. Jordaan
Junior Lecturer	Mr R.G. Moji

CONSUMER SCIENCE

Associate Professor
Lecturer
Junior Lecturers

*Prof. H.J.H. Steyn
Ms I. van der Merwe
Ms J.S. van Zyl, Ms P.Z. Swart, Ms J.F. Vermaas

COMPUTER SCIENCE AND INFORMATICS (051 401 2754)

Professors
Senior Lecturers
Lecturers

Prof. P.J. Bignaut, Prof. T. McDonald
*Dr Anelize van Biljon, Dr L. de Wet, Dr J.E. Kotze, Dr E. Nel
Ms E.H. Dednam, Mr A.J. Burger, Mr W. Nel, Ms T. Beelders,
Mr R. Brown
Mrs M.J.F. Botha, Mr R.C. Fouché, Mr E.T. Hart, Mr J. Marais

Junior Lecturers

Qwaqwa Campus

Junior Lecturers

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

GENETICS (051 401 2595)

Professor
Affiliated Professor
Associate Professor
Affiliated Associate Professor
Lecturers
Affiliated Lecturers
Junior Lecturers

*Prof. J.J. Spies
Prof. T.E. Turner
Prof. J.P. Grobler
Prof. A. Kotzé
Me. K. Ehlers, mnr. M.F. Maleka, me. P. Spies
Dr. D.L. Dalton, Lt.-Kol. A. Lucassen
Me. Z. Odendaal, me. L. Wessels

GEOGRAPHY (051 401 2255)

Professor
Senior Lecturers
Lecturers
Junior Lecturer

*Prof. P.J. Holmes, Prof. G.E. Visser
Dr. C.H. Barker, Dr. S.J. Brooks
Ms. E. Kruger, Ms. S. Vrahimis, Ms. T.C. Mehlomakhulu
Ms. M. Rabumbulu

Qwaqwa Campus

Associate Professor
Senior Lecturer
Lecturers
Junior Lecturer

Prof. W.F. van Zyl
*Dr. J.H.D. Claassen, Dr. G. Mukwada
Mr. A. Adjei, Ms. M. Naidoo
Mr P.S. Mahasa

GEOLOGY (051 401 2515)

Professor-researcher
Associate Professors
Senior Lecturer
Senior Lecturer-researcher
Junior Lecturer

*Prof. W.A. van der Westhuizen
Prof. W.P. Colliston, Prof. M. Tredoux, Prof. C.D.K. Gauert
Dr H. Sommer
Dr H.E. Praekelt
Ms H. Joubert

INSTITUTE FOR GROUNDWATER STUDIES (051 401 2394)

Professor/Director
Professor
Lecturer/Researchers

*Dr. I. Dennis
Prof. G.J. van Tonder
Ms L. Cruywagen, Dr P.D. Vermeulen, Dr S.R. Dennis

MATHEMATICS AND APPLIED MATHEMATICS (051 401 2691)

Professors *Prof. J.H. Meyer, Prof. A.H.J.J. Cloot, Prof. D.M. Murray,
 Prof. S.W. Schoombie
 Associate Professor Prof. T. 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)

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

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

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

Division Food Science

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

PHYSICS (051 401 2321)

Professors *Prof. H.C. Swart, Prof. P.J. Meintjes, Prof. J.J. Terblans
 Associate Professors Prof. W.D. Roos, Prof. M.J.H. Hoffman, Prof. O.M. Ntwaeaborwa
 Affiliated Associate Professor Prof. K.T. Hillie
 Senior Lecturer Dr R.E. Kroon

Qwaqwa-kampus

Associate Professor Prof. B.F. Dejene
 Senior Lecturer *Dr J.Z. Msomi
 Lecturers Dr R.O. Ocaya, Mr J.J. Dolo, Dr B.M. Mothudi

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

Professors Prof. Z.A. Pretorius, Prof. W.J. Swart, Prof. N.W. McLaren,
 Prof. G.J. Marais
 Senior Lecturer Dr. M. Gryzenhout

Botany

Professor Prof. A.J. van der Westhuizen
Associate Professor *Prof. P.J. du Preez
Senior Lecturers Dr. G.P. Potgieter, dr B. Visser
Lecturers Dr L. Mohase, dr. M. Bezuidenhout, me. L. Joubert

Plant Breeding

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

Qwaqwa Campus

Senior Lecturers Dr E.J.J. Sieben, Dr T Ashafa
Lecturers *Ms M.J. Moloi, Mr R. Lentsoane
Junior Lecturer Mr T.R. Pitso

QUANTITY SURVEYING AND CONSTRUCTION MANAGEMENT (051 401 2248)

Professor *Prof. J.J.P. Verster
Senior Lecturers Dr H.J. Marx, Mr F.H. Berry, Ms ORC du Preez, Ms M-M. Archer
Lecturers Mr B.J. Swart, Mr H.J. van Vuuren, Ms B.G. Zulch,
Mr P.M. Oosthuizen, Mr C.H. van Zyl, Mr M.S. Ramabodu,
Ms E Jacobs

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
Senior Lecturers Dr P.A.L. le Roux, Dr J. Allemann, Dr G.M. Ceronio,
Dr G.M. Engelbrecht
Lecturers Ms L. de Wet, Ms E. Kotzé, Mr A.S. Steyn

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. T.C. de K. van der Linde, 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, Mr C.R. Haddad,
Dr C. Jansen van Rensburg
Mr V.R. Swart, Ms L. Heyns
Junior Lecturers
Qwaqwa Campus
Senior Lecturers *Dr M.J. Cunningham, Dr M.M.O. Thekiso
Lecturers Mr J. van As, Mr E. Bredenhand, Ms H.J.M. Matete
Junior Lecturer Ms S.F.C. Nyaile

POSTGRADUATE PROGRAMMES IN NATURAL SCIENCES

Honours Degrees (NQF level 8)

The following Honours Degrees are awarded by the Faculty:

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, Entomology, Food Science, 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), Wildlife, Zoology.

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

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

5. **Module codes**

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

Honours Degree in the subject	Prerequisite/Requirement
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Actuarial Science	A candidate must have a B.Sc. or B.Com. 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.
Behavioural Genetics	A minimum of 60% in Genetics at third year level.
Biochemistry	At least 64 credits in Biochemistry at third year level. Average of 60% in undergraduate Biochemistry modules.

Botany	A minimum of 60% in Botany at third year level in consultation with the Departmental Chairperson.
Chemistry	(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 special cases admission may be allowed in consultation with the programme director or departmental chairperson.
Entomology	Entomology at third year level.
Food Science	Food Science at third year level.
Forensic Genetics	A minimum of 65% in Genetics at third year level or equivalent modules.
Genetics	A minimum of 60% in Genetics at third year level or equivalent modules.
Geology	Geology at third year level, at least 64 credits. Average 60%.
Geography	Geography at third year level or equivalent Geography III at another university. 64 credits. Average of 60%.
Geohydrology	A degree in Engineering or a B.Sc. or a B.Sc. (Agric.) degree.
Grassland Science	Grassland Science at third year level.
Home Economics	B.Sc. Home Ec., B. Consumer Science or an equivalent qualification.
Limnology	A B.Sc. or B.Sc.Agric. degree with at least one of the following as major: Biochemistry, Chemistry, Zoology, Entomology, Physics, Soil Science, Microbiology, Botany, Mathematics.
Mathematics and Applied Mathematics	Mathematics and Applied Mathematics at third year level or equivalent modules.
Mathematical Statistics	A minimum average pass mark of 60% in (WKS314+WKS324+WKS334+WKS344). Admission is subject to approval by the Departmental Chairperson.
Microbiology	At least 64 credits in Microbiology at third year level. An average of 60% in undergraduate Microbiology modules. These include VWS344 and BOC314.
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 60% in undergraduate Microbiology or Biochemistry modules.
Physics	An average pass mark of 60% in (FSK314 + FSK332 + FSK352 + FSK324 + FSK342 + FSK362).
Plant Health	Plant Health or equivalent modules at third year level.
Plant Molecular Biology	A minimum of 60% in the appropriate Botany or equivalent modules at third year level in consultation with the Departmental Chairperson.
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

- (a) The general regulations in respect of Honours degrees are with the necessary modifications applicable to this Faculty.
- (b) In addition to the provisions of the general regulations in respect of Honours degrees, a student must comply with the particular regulations of the Faculty.
- (c) Students also must apply to the Departmental Chairperson for admission to the Honours degree.
- (d) In addition to the stipulations of the General Regulations (A56(b)) a student must also pass the Agriculture Datametrics modules, DMT214 and DMT224, before receiving the degree in Agrometeorology, Soil Science, Grassland Science and Wildlife. 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.

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 B.Sc. or B.Com. 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
ATW601	- Actuarial Asset and Liability Management	20
ATW605	- Actuarial Mathematics	20
ATW608	- Mathematics of Finance and Economics	20
ATW692	- Actuarial Modelling and Literature Study	30
STS613	- Stochastic Processes	20

Another module from the following:

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
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) Behavioural Genetics - Study code 4519

This course is presented by 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 four compulsory modules (GGS634, GGS693, GGS686 and GGS692) and two modules of choice from the list in consultation with the Departmental Chairperson.

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

Compulsory modules			Credits
GGS634	-	Behavioural Genetics	16
GGS686	-	Research techniques	24
GGS693	-	Literature study	16
GGS692	-	Research essay	32
Modules of Choice (32 credits)			
GEN644	-	Advanced molecular systematics	16
GEN654	-	Applied Conservation Genetics	16
GEN664	-	DNA Forensics	16
DRK664	-	Animal behaviour	16
SIL613	-	Psychopathology	12
SIL614	-	Developmental Psychology	12
XXX000	-	Advanced related specialized course(s) with a similar credit value	12

(c) 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	- Enzymology	16
BOC654	- Genomics and proteomics	16
BOC674	- Advanced molecular biology	16
BOC622	- Oral examination in theory and practical	8
BOC693	- Research: Literature study	24
BOC692	- Research essay	32

(See syllabi for module contents.)

(d) 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	- Enzymology	16
BOC654	- Advanced protein structure and function	16
BOC674		
or		
MKB674	- Advanced molecular biology	16
MKB634	- Microbial diversity	16
MKB654	- Applied microbial physiology	16

(e) Botany - Study code 4530

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

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

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

Modules of Choice:

PLK614	-	Plant ecology	16
PLK624	-	Plant physiology I (Metabolism and growth)	16
PLK634	-	Algal biotechnology	16
PLK644	-	Plant physiology II (Plant defence and applications)	16
PLK654	-	Limnobotany	16
PLK664	-	Plant diversity and taxonomy of higher plants	16
PLK674	-	Plant molecular applications	16
PLK684	-	Palynology and palaeo-environments	16
PLK604	-	<i>Capita Selecta</i>	16
XXX000	-	Advanced specialized module in the Faculty of Natural and Agricultural Sciences	16

(f) Chemistry

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

1. General requirements

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

2. Curricula**2.1 Chemistry - Study code 4513**

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

Modules		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.

2.4 Explanation

The module contents are compiled in such a way as to facilitate research activities of the department. The learning programme includes topics like reaction kinetics, crystallography, organic synthesis, computer 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	12
RIS604	- Information Security	12
RIS606	- Theory of Algorithms (prerequisite WTW224)	12
RIS608	- Artificial Intelligence	12
RIS609	- Knowledge based Systems	12
RIS610	- Business Expert Systems	12
RIS612	- Management Information Systems	12
RIS613	- Project Management	12
RIS614	- Decision Support Systems	12
RIS615	- Human-Computer Interaction	12
RIS616	- Advanced Computer Networks	12
RIS617	- Object Design	12
RIS618	- Computer Ethics	12
RIS619	- Advanced Internet Programming	12

RIS620	-	Advanced Programming I	12
RIS621	-	Advanced Programming II	12
RIS622	-	Advanced Data basis	12
RIS623	-	Robotics	12
RIS624	-	Automata Theory and Applications	12
RIS625	-	Data Warehousing and Mining	12
RIS626	-	Introduction to Research	12
RIS630	-	<i>Capita Selecta</i>	12

(h) 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

(i) Environmental Management - Study code 4528

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

Optional module			Credits
MOB614	-	Water Resource Management	16

(j) Food Science - Study code 4535

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	32
VWS602	-	Food Chemistry	32
VWS603	-	Dairy Science	32
VWS604	-	Meat Science	32
VWS605	-	Foods: General	32
VWS606	-	Fruit, vegetables and seeds	32
VWS607	-	Selected topics in Food Science	32
VWS693	-	Research project	20
VWS695	-	Literature review	12

For syllabus see FOOD SCIENCE –B.Sc.Agric.Hons. – Study code 5522.

(xx) Forensic Genetics – Study code XXXX

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 B.Sc.Hons. 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 courses start on a date determined by the departmental chairperson.

Compulsory modules			Credits
GDF686	-	Research Techniques	16
GDF693	-	Research: Literature study	24
GDF692	-	Research essay	32

Modules of choice (48 credits)

GDF614	-	Forensic DNA typing and quality controle	16
GDF624	-	Crime Scene Investigation	16
GDF634	-	Forensic Molecular statistics	16
GDF644	-	<i>Capita Selecta</i> Forensic Genetics	16

(k) 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 courses start on a date determined by the departmental chairperson.

Compulsory modules			Credits
GEN686	-	Research Techniques	16
GEN693	-	Research: Literature study	24
GEN692	-	Research essay	32
Modules of choice (48 credits)			
GEN614	-	Advanced cytogenetics	16
GEN624	-	Recombinant DNA technology	16
GEN634	-	Behavioural Genetics	16
GEN644	-	Advanced molecular systematics	16
GEN654	-	Molecular ecology	16
GEN664	-	Forensic DNA typing	16
GEN674	-	<i>Capita Selecta</i> Genetics	16
XXX000	-	Advanced related specialized course(s) with a similar number of credits	16

(I) 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 rest with due consideration of requirements:

			Credits
GEO616	-	Theoretical foundations of geography	24
GEO692	-	Research essay	32
GGH626	-	Advanced tourism studies (Qwaqwa)	24
GGH636/646	-	Urban geography	24
GGH656/666	-	Conservation and Society	24
GGH676/686	-	Tourism and Recreation 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
XXXYY6	-	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)

(m) Geohydrology - Study code 4524

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

Prerequisites: An average of 60% in a B.Sc. degree major subjects plus Geology, Chemistry, Physics and Mathematics on a first-year level.

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

(n) 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 25 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.

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
GLG653*	- 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.

(o) 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 – B.Sc.Agric.Hons. – Study code 5523.

(p) 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		

(q) Limnology - Study code 4525

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

Dean

Programme Director

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

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

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

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

(r) 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 modeling	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
Research essay	WTW692	36

* 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.

(s) 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 strongly 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.

(t) 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 syllabi. One 16 credit Honours module from any other discipline (e.g. Biochemistry, Genetics, Chemistry or Food Science) may also be chosen in consultation with the Departmental Chairperson.

Modules			Credits
MKB614	-	Techniques in Microbiology	16
MKB634	-	Microbial diversity	16
MKB654	-	Applied microbial physiology	16
MKB674	-	Advanced molecular biology	16
MKB622	-	Oral exam on theory and practical work	8
MKB693	-	Research: Literature study	24
MKB692	-	Research essay	32
BTG634	-	Continuous and batch culture of micro-organisms	16

(u) 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 M.Sc. in surface physics are strongly recommended to register for these courses.

(v) Plant Health – Study Code 4529

For the honours course in Plant Health PPG692, PPG693 and PWS614 are compulsory, whereas three other modules have to be selected, in consultation with the division head, from PPG614, ENT654, PLK614 and PLK664. An examination paper of three hours must be answered in each of those selected from the latter modules. After completion of module PWS614 an oral examination is undertaken. Continuous assessment takes place in PPG693 and a project report is required for PPG692.

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

Modules of choice

PLK614	-	Plant ecology	16
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 – B.Sc.Agric.Hons. – Study code 5519.

(w) Plant Molecular Biology – Study code 4531

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

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

Compulsory modules			Credits
PWS614	-	Research techniques	16

PLK693	-	Research: Literature study	24
PLK692	-	Research essay	32

Modules of choice

PLK624	-	Plant physiology I (Metabolism and growth)	16
PLK634	-	Algal biotechnology	16
PLK644	-	Plant physiology II (Plant defence and applications)	16
PLK674	-	Plant molecular applications	16
PLK694	-	Plant transformation	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

(x) Psychology – Study Code 4533

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

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

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

(y) 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

(z) 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 strongly 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.

(aa) 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.

(bb) 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)

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

(cc) 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 – B.Sc.Agric.Hons. – Study code 5518.

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.

BACCALAUREUS HONORES IN LAND AND PROPERTY DEVELOPMENT

MANAGEMENT (HOUSING)
Study code 4544

B.L.P.H. (HONS.)

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	M.Sc.	4700	29
(ii)	Magister in Mineral Resource Management	MRM	4709	37
(iii)	*Magister Architecturae	M.Arch.	4710	39
(iv)	*Magister Scientiae (Quantity Surveying)	M.Sc.(Q.S.)	4720	39
(v)	Magister Scientiae (Clinical Psychology)	M.Sc.(Clinical Psychology)	4740	39
(vi)	Magister Scientiae (Counselling Psychology)	M.Sc.(Counselling Psychology)	4750	39
(vii)	*Magister in Housing	M.L.P.M. (Housing)	4761	39
(viii)	*Magister in Urban and Regional Planning	M.U.R.P.	4762	39
(ix)	Magister Scientiae in Home Economics	M.Sc.(Home Ec.)	4770	40
(x)	*Magister Scientiae (Construction Management)	M.Sc.(Construction Management)	4780	39
(xi)	Magister in Environmental Management	M.E.M.	4790	40
(xii)	*Magister in Land and Property Development Management	M.L.P.M. (M.PROP)	4798	39

Degree	Abbreviation	Study code
(xii) *Magister in Property Science	M.PROP.	4791

* For information see Yearbook Part 2.

MAGISTER SCIENTIAE

Study code 4700

M.Sc.

INFORMATION

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

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

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

Module codes

In cases where an M.Sc. degree consists only of a dissertation (180 credits), the alphabetical part which refers to the module code is followed by the number 700.

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

REGULATIONS

Reg. D31 – Admission

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

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

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

Reg. D32 – Pass requirements

(a) Pass requirements

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

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

(b) Relative weight per question paper

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

Reg. D33 – Requirement(s)

In the following fields of study, namely Agrometeorology, Biochemistry, Botany, Chemistry, Entomology, Genetics, Geology, Grassland Science, Limnology, Microbiology, Microbial Biotechnology, 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 B.Sc. 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 B.Sc. Honours degree or an equivalent qualification (NQF level 7) in Geology or related subjects will be considered by the Department. A suitable subject for the dissertation will be decided upon in consultation with the Departmental Chairperson.

(e) Geohydrology

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

(f) Limnology

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

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

(g) Computer Information Systems

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	20
RIS704	- Information Security	20
RIS706	- Theory of Algorithms (prerequisite WTW224)	20

RIS708	-	Knowledge Based Systems	20
RIS709	-	Artificial Intelligence	20
RIS710	-	Business Expert Systems	20
RIS712	-	Management Information Systems	20
RIS713	-	Project Management	20
RIS714	-	Decision Support Systems	20
RIS715	-	Human Computer Interaction	20
RIS716	-	Advanced Computer Networks	20
RIS717	-	Object Design	20
RIS718	-	Computer Ethics	20
RIS719	-	Advanced Internet Programming	20
RIS722	-	Advanced Databases	20
RIS723	-	Robotics	20
RIS724	-	Automata and Applications	20
RIS725	-	Data Warehousing and Mining	20
RIS730	-	<i>Capita Selecta</i>	20
RIS731	-	<i>Capita Selecta</i>	20

(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: 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 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 modeling	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: 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: 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

Recommended:

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

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

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

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

Reg. D38 - Admission requirements

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

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

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

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

Reg. D39 - Course composition and contents

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

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

Code Course modules

Phase 1

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

Phase 2

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

Phase 3

- GLG731 Capita Selecta
- GLG732 Financial cost modelling and decision making
- GLG733 Risk management in the mining and minerals industry
- GLG734 Modern mining supply chain principles
- GLG735 The role of enterprise management systems in resource management

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, 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 Management, a minimum pass mark of 50% in each module, including the extended research essay, is required.

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 [M.ARCH.]	Study code 4710	50
MAGISTER SCIENTIAE IN QUANTITY SURVEYING [M.Sc.(Q.S.)]	Study code 4720	54
MAGISTER SCIENTIAE IN CONSTRUCTION MANAGEMENT [M.Sc.(Construction Management)]	Study code 4780	54
MAGISTER IN PROPERTY SCIENCE [M.PROP.]	Study code 4797 or 4798	55
MASTERS IN LAND AND PROPERTY DEVELOPMENT MANAGEMENT: HOUSING M.L.P.M.	Study code 4761	58
MAGISTER IN URBAN AND REGIONAL PLANNING [M.U.R.P.]	Study code 4762	61
MAGISTER IN URBAN AND REGIONAL PLANNING	Study code 4765	65
DOCTOR ARCHITECTURAE [D.Arch.]	Study code 4910	70
PHILOSOPHIAE DOCTOR [Ph.D.]	Study code 4920	70

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

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

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

The programme consists of compulsory modules, choice modules and a mini-dissertation.

Reg. D44 - Course composition and content

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

The programme will consist of four separate modules, each taking six months. In the first two modules the basic principles and concepts of the natural environment, as well as planning and management aspects will be covered, the third will be a speciality module and the fourth a mini-dissertation. A two-week block period of class attendance is compulsory during each semester, 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 hand them in or present them orally.

Code	Course modules
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First year of study

Semester 1

Compulsory module

MOB707 (48 credits) - Resources and processes

Introduction to environmental management, natural sources and processes, computer use and writing skills.

Semester 2

Compulsory module

MOB708 (48 credits) - Man and the environment

Compulsory:		Sustainable living and populations trends
	a.	Environmental economics
	b.	Planning, Local Agenda 21 and planning techniques
	c.	Politics and the environment
	d.	Environmental policy and law
	e.	Environmental communication
	f.	Corporate governance and reporting
	g.	Environmental auditing and ISO 14000
	h.	Environmental management systems
	i.	Conflict management
	j.	Project management
	k.	

Second year of study

Semester 3

Choice modules

MOB741 – MOB744 (48 credits) - Speciality directions

Environmental aspects of an approved subject, probably an extension of the candidate's undergraduate major subject(s), under supervision of a nominated supervisor. The extended research essay will preferably be in the same subject. Each module will include a strong Environmental Impact Assessment (EIA) component.

Only one choice (with approval) will be made:

- MOB741 Environmental management of pollution and rehabilitation
- MOB742 Environmental management of aquatic systems
- MOB743 Environmental management for tourism
- MOB744 Biodiversity and conservation

Semester 4 Compulsory module

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

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

Reg. D45 - Organisation of course

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

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

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

Reg. D46 - Examination

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

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

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

Doctor's degrees (NQF level 10)

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

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

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

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

REGULATIONS

Reg. D47 - Admission

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

(c) Limnology

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

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

(d) Psychology

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

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

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

(e) Environmental management

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

(f) 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 Ph.D.

DOCTOR SCIENTIAE
Study code 4900

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

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) – Enzymology (third quarter)

Theory of catalysis: thermodynamic and kinetic principles, mechanisms applied in catalysis. Enzyme reaction mechanisms. Application of principles of catalysis in selected reaction mechanisms e.g. serine esterases, dehydrogenases, lysozyme, etc. Enzyme applications in organic chemistry. Directed design of drugs.

BOC654 (16 credits) – Genomics and proteomics (second quarter)

Physical methods for determining secondary and tertiary structure: circular dichroism, NMR, mass spectrometry, X-ray diffraction. Computational methods: prediction of tertiary structure, molecular dynamics. The minimal genome, genome sequencing, existing and emerging technologies, genome annotation

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.

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.

Botany

PWS614 (16 credits) – Research techniques

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

A written or oral examination will be undertaken on completion of the module.

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

PLK693 (24 credits) – Research: Literature study

The student compiles a review of a specific subject and delivers a presentation on the topic.

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

PLK692 (32 credits) – Research essay

Research project stretches over the whole year.

An oral presentation and a project report are required.

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

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

PLK614 (16 credits) – Plant ecology

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

One examination paper of three hours.

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

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

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

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

One examination paper of three hours.

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

Secondary metabolism related to lipid mobilization in plants.

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

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

PLK634 (16 credits) – Algal biotechnology

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

One examination paper of three hours.

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

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

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

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

One examination paper of three hours.

The plant's defence mechanisms in relation to biotic stress factors such as injury, insects and pathogens. Resistance and susceptibility are explained in terms of defence mechanisms. Constitutive versus induced defence mechanisms, eliciting and signal transduction mechanisms, secondary

defence reactions, plant activators, manipulation of resistance, relation to new alternative, but very exciting, uses of plants.

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

PLK654 16 credits) – Limnobotany

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

One examination paper of three hours.

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

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

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

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

One examination paper of three hours.

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

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

PLK674 (16 credits) – Plant molecular applications

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

One examination paper of three hours.

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

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

PLK684 (16 credits) – Palynology and palaeoenvironments

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

One examination paper of three hours.

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

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

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.

Entomology

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

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

ENT622 (8 credits) – Quantitative Ecology

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

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

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

ENT642 (8 credits) – The Environment

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

ENT654 (16 credits) – Insect - Plant Interactions

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

ENT664 (16 credits) – Medical and Veterinary Entomology

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

After completion of this module the student will have a fundamental knowledge of insects of 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, analyzing, interpreting and communication of results. The independence and scientific insight that is developed here provides opportunities for further post-graduate studies.

XXX000 – Advanced related module

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

Environmental Management

MOB614 (16 credits) – Water Resource Management

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

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

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

Genetics (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.

Lectures and practicals on selected techniques and competencies as applied in genetics.

On completion of this module the student should:

- a) have the necessary skills to apply certain laboratory techniques.

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.

After the successful completion of the module, the student should:

- a) be skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments,
- b) be able to interpret and communicate results.

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

A review paper is written and presented orally on a date determined by the Departmental Chairperson.

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:

- a) is acquainted with literature searches, organizing information, the compilation of information according to a specific format,
- b) is acquainted with written and verbal communication skills.

GEN614 (16 credits) – Advanced Cytogenetics

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

One examination paper of three hours.

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

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

- a) plan and execute a cytotoxic study and analyse the results.

GEN624 (16 credits) – Recombinant DNA technology

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

One examination paper of three hours.

Recombinant DNA technology provides a powerful basis for the study of any gene isolated from any organism. This technology centres around the cloning of nuclear acids (eg. DNA) into recombinant vectors, as facilitated by the polymerase chain reaction (PCR). The recombinant vectors are then used to transform appropriate bacterial cells. The nucleotide sequence of the cloned cells are determined. This module introduces the basic techniques and methods used in recombinant technology.

After successful completion of this module, a student should:

- a) Be able to use different laboratory techniques to extract DNA and RNA from cells and/or eukaryotic tissue,
- b) Be able to plan and execute experiments to synthesise complimentary DNA (cDNA),
- c) Be able to design, use and evaluate experiments based on PCR,
- d) Be able to make recombinant DNA molecules by cloning DNA fragments into cloning vectors,
- e) Be able to use laboratory guides to insert recombinant cloning vectors into bacteria,
- f) Be able to analyse and compare DNA fragments by using nucleotide sequences and several computerised sequence analysis programs.

GEN644 (16 credits) – Advanced molecular systematics

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

One examination paper of three hours.

Genomes, nucleotide sequencing, mutation rates, cladistics, the use of molecular data for determining phylogenetic relationships and parenthood, species identification, computer programs used in molecular analyses: PAUP, CLUSTAL W/G and MacClade.

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

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

GEN654 (16 credits) – Applied Conservation Genetics

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

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, 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 analyze 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

GEN664 (16 credits) – DNA Forensics

Three hour lecture and a six hour practical per week in first semester.

One examination paper of three hours.

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

GEN674 (16 credits) – *Capita Selecta* Genetics

Three hour lecture and a six hour practical per week.

One examination paper of three hours.

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

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

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

One examination paper of three hours.

After the completion of this module, a student will:

- a) Be familiar with the sampling and handling of DNA evidence, without disrupting the chain of custody,
- b) Know various methods of DNA extraction, pipeting, real-time PCR techniques,
- c) Know the maintenance of the ABI 3130,
- d) Be able to load samples on the ABI 3130,
- e) Be able to analyse DNA profiles using GeneScan, Genotyper and GeneMapper (software will be discussed),
- f) Know how to interpret mixtures and off-ladder alleles.
- g) Attention will be given to quality control and accreditation of forensic laboratories.

Assignments form an integral part of the module, both for the theory and the practical work. The assignment will involve the setup of a management and maintenance plan for a forensic laboratory.

GDF624 (16 credits) – Crime Scene Investigation

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

Continuous evaluation.

The procedures that have to be followed when investigating a crime scene. Preliminary tests that can be done at the crime scene to identify biological material (including blood, saliva and semen samples). Chain witnesses and the gathering of evidence and reference samples will be studied. The compilation of a DNA report, as well as providing evidence in courts are also part of this module. After successful completion of this module, a student will:

- a) be familiar with the preliminary tests done at a crime scene,
- b) be able to describe the different procedures that can take place at a crime scene,
- c) be able to evaluate the evidence found at a crime scene,
- d) know how to compile a forensic report to be handed in at court,
- e) know how to defend and explain the results in court.

GDF634 (16 credits) – Forensic molecular statistics

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

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

GG634 / GEN634 (16 credits) – Behavioural Genetics

Class discussion for three hours and a six-hour practical per week during the first semester. Continuous evaluation.

Determination of the inheritance of behaviour; monogenic vs. polygenic inheritance; allelism, pleiotropy, epistasis; twin studies; pedigrees; experimental design; gene frequencies in populations.

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

- a) plan and execute a behavioural genetic study,
- b) identify factors influencing behaviour, and
- c) determine the influence of inheritance on behaviour.

XXX000 – Advanced specialized course

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

Limnology

PWS614 (16 credits) – Research techniques

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

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

Lectures and practical sessions pertinent to techniques and skills.

LIM693 (24 credits) – Research: Literature study

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

LIM692 (32 credits) – Research essay

Research project stretches over the whole year. An oral presentation and a project report are required. The student completes a research project under the guidance of a supervisor and is acquainted with problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.

PLK654 (16 credits) – Limnobotany

See 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.

Microbiology

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 evaluate 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

PWS614 (16 credits) – Research techniques

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

PPG693 (24 credits) – Research: Literature study

The student compiles a review of a specific subject and delivers presentations of selected articles in plant pathology journals. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.

PPG692 (32 credits) – Research essay

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

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

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

PLK614 (16 credits) – Plant ecology

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

One examination paper of three hours.

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

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

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

One examination paper of three hours.

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

ENT654 (16 credits) – Insect - Plant Interactions

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

Plant Molecular Biology

PWS614 (16 credits) – Research techniques

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

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

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

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

PLK693 (24 credits) – Research: Literature study

The student compiles a review of a specific subject and delivers a presentation on the topic.

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

PLK692 (32 credits) – Research essay

Research project stretches over the whole year.

An oral presentation and a project report are required

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

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

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

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

One examination paper of three hours.

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

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

PLK634 (16 credits) – Algal biotechnology

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

One examination paper of three hours.

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

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

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

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

One examination paper of three hours.

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

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

PLK674 (16 credits) – Plant molecular applications

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

One examination paper of three hours.

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

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

PLK694 – Plant transformation

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

One exam paper of three hours.

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

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

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.

Statistics

GHR628 (32 credits) – Statistical Analyses

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

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

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

DRK622 (8 credits) – Quantitative Ecology

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

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

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

DRK642 (8 credits) – The Environment

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

DRK654 (16 credits) – Veterinary Ectoparasitology

The course focuses on the occurrence, biology, 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 economical importance in South Africa. The practical aspects of this course include laboratory diagnostics and molecular parasitological techniques.

DRK674 (16 credits) – Aquatic Parasitology / Wetland ecology

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

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

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

DRK692 (32 credits) – Research essay

The research project extends over the whole year.

An oral examination and project report is required.

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

XXX000 – Advanced related module

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

Annexure A: Transitional Regulations

Previous course	New module
CEM601	CEM614 and CEM624 (Anorganic Chemistry)
CEM602	CEM654 and CEM664 (Organic Chemistry)
CEM603	CEM634 and CEM644 (Physical Chemistry)
CEM604	CEM674 and CEM684 (Analitical 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:

Degree	Minimum period of study	Study code	Page
Honours degree			
Baccalaureus Scientiae Agriculturae Honores			
a) Agricultural economics - B.Sc.Agric.Hons.	1 year	5517	63
b) Agronomy - B.Sc.Agric.Hons.		5515	66
c) Agrometeorology - B.Sc.Agric.Hons.		5518	69
d) Animal Science - B.Sc.Agric.Hons.		5521	70
e) Food Science - B.Sc.Agric.Hons.		5522	72
f) Grassland Science - B.Sc.Agric.Hons.		5523	74
g) Plant Breeding - B.Sc.Agric.Hons.		5519	76
h) Plant Pathology - B.Sc.Agric.Hons.		5520	77
i) Soil Science - B.Sc.Agric.Hons.		5516	78
j) Irrigation Science - B.Sc.Agric.Hons.		5524	79
Baccalaureus Agriculturae Honores			
a) Specialisation in Agricultural Management	1 year	5531	82
b) Specialisation in Irrigation Management		5532	84
c) Specialisation in Wildlife Management		5533	85
Master's degrees			
Magister Scientiae in Agriculture (M.Sc.Agric.)	1 year	5722/23	86
Magister in Sustainable Agriculture (M.S.A)	2 years	5710	88
Magister in Disaster Management (M.Disaster Management)	2 years	5703	93
Magister Agriculturae (M.Agric.)	1 year	5725/26	97
Doctor's degrees			
Philosophiae Doctor	2 years	5910	98
Doctor Scientiae	See regulations	5920	99

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

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

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

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

Honours Degrees (NQF level 8)

BACCALAUREUS SCIENTIAE AGRICULTURAE HONORES

B.Sc.Agric.Hons.

INFORMATION

STUDY AIMS

The objectives of the study for this degree are:

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

Module codes

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

REGULATIONS

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

Reg. H14 - Admission

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

Reg. H15 - Semester and year marks and pass requirements

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

Reg. H16 - Compulsory modules

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

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

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

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

(a) AGRICULTURAL ECONOMICS - B.Sc.Agric.Hons. - Study code 5517 (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 financing and derivative markets: LEK605, ECO621, ECO724 plus four other postgraduate modules
- Agricultural policy and development LEK606, LEK607, LEK608 plus four other postgraduate modules
- Agricultural marketing and international trade LEK607, LEK609, ECO724 plus four other postgraduate modules
- Resource and environmental economics LEK608, LEK610, LEK611 plus four other postgraduate modules
- Farm management LEK609, LEK612, LEK605 plus four other postgraduate modules
- Food and agribusiness management AGB605, AGB704, LEK609 plus four 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. Apart from the written paper an oral examination is to be taken for LEK612.

Module code	Credits	Subject
LEK601	15	Quantitative techniques The learner will be competent in demonstrating knowledge about microeconomic concepts, market structures, and concentration in the South African economy.

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 <i>GAMS modelling language</i>, 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 analyze 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>
LEK612	15	<p>Advanced agricultural management</p> <p>The overall learning outcome of this module is to develop a computer model on a spreadsheet which will be used to do a whole-farm planning for a farming - or agribusiness.</p>
AGB604	15	<p>Technology management: Value adding</p> <p>Agriculture does not provide food, but the raw materials that can be processed into food products. In this course the general processing methods of plant materials and animal products are studied in five themes. In each of the 5 themes, the general processing methods are studied, as well as specialized processes for specific products. The student gets insight regarding the quality, legislation, labeling, nutrition and marketing of the processed product, and to become conversant with the nature and composition of the raw, unprocessed food products and the range of processing techniques whereby raw materials of food are converted into end products. The aim of the course is not to become a full fledged food scientist, but to obtain the necessary knowledge needed for the important decisions to be made in the sustainability of an agricultural institution, be it economically or for specialisation of production.</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>
ECO621	15	<p>Financial systems and monetary policy</p> <p>The objectives of this unit are:</p> <ul style="list-style-type: none"> ▪ interest rate behaviour: the determination of the interest rate level, the risk and terms structure of interest rates; ▪ the interaction between the Reserve Bank and the financial markets: the monetary transmission mechanism, the South African monetary system, monetary policy and interest rates; ▪ the interaction between domestic and international financial markets; and ▪ financial institutions and markets
ECO724	15	<p>Derivative instruments</p> <p>The objectives of this unit are</p> <ul style="list-style-type: none"> ▪ Futures contracts and markets The nature and origin of financial futures markets and contracts; the role of liquidity in the functioning of futures markets; the different market participants, the importance of clearing houses and the various futures contracts ▪ Price determination Hedging and hedging strategies; arbitrage and speculation; the link between spot and futures markets; the South African futures market; options and option markets; the nature and functioning of option markets; pricing of options and determinants of value; possibilities for applying options; arbitrage and speculation; types of options; the South African option market; the nature and functioning of swaps.
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.</p>

(b) AGRONOMY - B.Sc.Agric.Hons. - 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</p>

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.

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>
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(c) AGROMETEOROLOGY - B.Sc.Agric.Hons. - 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>After completion of this module students will be able to measure and describe the radiation, temperature, humidity, wind, turbulence and profiles of momentum and mass transfer within the atmospheric boundary layer over a diurnal and seasonal cycle. They will also be able to explain the Monin-Obukhov similarity principle and determine</p>

the top of the mixing layer and how this may affect pollution transport as well as other applications.

LWR605	20	Applied agrometeorology 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.
LWR606	20	Weather analysis and forecasting After completion of this module students will be able to decipher meteorological observation codes, interpret thermodynamic diagrams and analyse synoptic weather charts. They will also be able to distinguish between various tropical and extra-tropical synoptic scale weather systems and have an in-depth knowledge of these systems; apply some of the key dynamical meteorology concepts in order to predict the evolution of these synoptic scale weather systems; interpret meteorological satellite and radar imagery; interpret numerous numerical weather prediction (NWP) model fields and prepare short-term weather forecasts.
LWR693	20	Research project 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.
LWR695	20	Literature review 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.

(d) ANIMAL SCIENCE - B.Sc.Agric.Hons. - 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.

Module code	Credits	Subject
DAF601	20	<p>General Animal Physiology Following completion of this module the student will have indepth 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 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 Following completion of this module the student will understand the application of certain physiological principles tn the manipulation of assisted reproductive techniques in farm animals.</p>
DTL601	20	<p>Fundamental animal breeding After successful completion of this module the student will have an indepth 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 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 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 breeding plan that will result in genetic improved populations of different livestock species under South African environmental conditions.</p>
DVL601	20	<p>Fundamental animal nutrition 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 - B.Sc.Agric.Hons. - Study Code 5522 (128 credits)

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 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.</p>
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 neutraceuticals 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</p>

affect the quality of a variety of economically important cereals, legumes and oil seeds.

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 - B.Sc.Agric.Hons. - 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.

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>
WDK 602	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>

WDK 603	20	Intensive pasture production The application of veld intensification and the use of planted pastures to improve and supplement the natural veld in order to maintain sustainable productivity.
WDK 604	20	Rangeland evaluation 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.
WDK 693	20	Research project 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.
WDK 695	20	Literature review 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.

WILDLIFE MANAGEMENT

Module code	Credits	Subject
WDK601	20	Rangeland physiology and ecology
WDK 602	20	Rangeland management
WDK 604	20	Rangeland evaluation
WDK 605	20	Wildlife management 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.
WDK 693	20	Research project
WDK 695	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 - B.Sc.Agric.Hons. - Study Code 5519 (120 credits)

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

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

Module code	Credits	Subject
PLT614	16	Estimates of heritability In this module the student is familiarized with the estimation of genetic variances and co-variances as used to determine heritabilities. The estimates are done for vegetatively propagated, cross-pollinating and self-pollinating species in one and more environments. Hierarchical, factorial and diallel designs are also included. After completion of this module students should have extensive knowledge on estimates of variances and heritability for different plant species and statistical designs.
PLT624	16	Marker-assisted breeding The aim of this module is to expose the student to techniques used for marker-assisted breeding, and application of these techniques in breeding programs. RFLP (restriction fragment length polymorphism), PCR (polymerase chain reaction), RAPD (random amplified polymorphic DNA), AFLP (amplified fragment length polymorphism), SSR (single sequence repeats), SDS-PAGE (sodium dodecyl sulphate polyacrylamide gel electrophoresis), isozymes and HPLC (high performance liquid chromatography) are studied theoretically and carried out in the laboratory. After completing this module the student should be able to apply these techniques in plant breeding.
PLT634	16	Applied Plant Breeding In this module the student acquires knowledge on applications in plant breeding. The student studies breeding for insect and disease resistance, temperature and moisture stress, quality and adaptation in a specific crop. On completion of the module the student should be able to successfully initiate a breeding program for the crop studied.
PLT644	16	Breeding Program 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.

PLT693	24	Research: Literature study The student compiles a review of a specific subject and delivers a presentation on the topic. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.
PLT692	32	Research essay The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.
PWS614	16	Research techniques Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted.

Any of the abovementioned elective modules may be replaced by a suitable Honours module from another field, in consultation with the division head.

(h) PLANT PATHOLOGY - B.Sc.Agric.Hons. - Study Code 5520 (120 credits)

For the Honours course in **Plant Pathology PPG693, PPG692, PLT624 and PWS614 are compulsory**, whereas two other modules have to be selected, in consultation with the division head, from **PPG614, PPG624, PPG634 or PPG644**. An examination paper of three hours must be written in each of those selected from the latter modules. Continuous assessment takes place in PPG693 and a project report is required for PPG692. After completion of module PWS614 an oral examination is undertaken.

Module code	Credits	Subject
PPG614	16	Ecology and biology of disease organisms On completion of this module the student is acquainted with the various disease causing organisms on plants. Their role in the environment and biological cycles, including infection, reproduction, dispersal and survival of fungi, bacteria and viruses will receive special attention.
PPG624	16	Plant/Pathogen interactions On completion of this module the student is acquainted with critical interactions that take place between plant pathogens, their hosts and the biotic and 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	<p>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.</p>
PPG693	24	<p>Research: Literature study The student compiles a review of a specific subject and delivers presentations of selected articles in plant pathology journals. On completion of this module the student is acquainted with literature searches, organizing information, the compilation of information according to a specific format, as well as in written and verbal communication skills.</p>
PPG692	32	<p>Research essay The student completes a research project under the guidance of a supervisor and becomes skilled in problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results.</p>
PWS614	16	<p>Research techniques Lectures and practical sessions pertinent to techniques and skills in plant biology are conducted. On completion of the module the student will have the knowledge to perform certain techniques and laboratory skills used in plant biology.</p>

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 - B.Sc.Agric.Hons. - 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	<p>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.</p>
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,</p>

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.

GKD635	20	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.
GKD645	20	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 economical principles of fertilisation.
GKD693	20	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.
GKD695	20	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.

(j) IRRIGATION SCIENCE - B.Sc.Agric.Hons. - 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</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>
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>
BSB693	20	<p>Research project</p> <p>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</p> <p>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</p>

essential nutrients in soils; methods used for evaluation of soil fertility status; fundamental biophysical and economical principles of fertilisation.

LWR601	20	Agrometeorological services for extension 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.
LWR605	20	Applied agrometeorology 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.

BACCALAUREUS AGRICULTURAE HONORES**B.Agric.Hons.**

INFORMATION**STUDY AIMS**

The aims of this degree are:

- 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;
- to prepare the student for further post-graduate study;
- to lead the student in independent study of the main subject or field of specialisation; and
- to develop, through the Honours degree in Agricultural Management, the student's managerial skills in a variety of functional areas in agricultural enterprise management and development and the management of agricultural businesses.

Module codes

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

REGULATIONS

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

Reg. H18 - Admission

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

Reg. H19 - Pass requirements

As specified in the different curricula.

Reg. H20 - Compulsory modules

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

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

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

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

An essay 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.
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(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	Advanced Agricultural Management (LBB609A) and Financial Agricultural Management (LBB609B) LBB609A: Economic resources and management; effective management styles, leadership and management; strategic management and information system; analysing the macro and business environment; using the scenario and paradigm shift management tools; organisation; delegation and organising information of the four factors of production; designing an appropriate control system for the production, marketing and financial management functions. LBB609B: Construction and interpretation of financial statements; types and sources of risk, measurement and management of risk; planning and evaluation of an irrigation farming business; the effect of income tax on an irrigation farming business.
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	Advanced Agricultural Management (LBB609A) and Financial Agricultural Management (LBB609B) LBB609A: Economic resources and management; effective management styles, leadership and management; strategic management and information system; analysing the macro and business environment; using the scenario and paradigm shift management tools; organisation; delegation and organising information of the four factors of production; designing an appropriate control system for the production, marketing and financial management functions. LBB609B: Construction and interpretation of financial statements; types and sources of risk, measurement and management of risk; planning and evaluation of an irrigation farming business; the effect of income tax on an irrigation farming business.
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	M.Sc.Agric.	86
Magister in Sustainable Agriculture	2 years	M.S.A.	88
Magister in Disaster Management	2 years	M.Disaster Management	93
Magister Agriculturae	1 year	M.Agric	97

MAGISTER SCIENTIAE AGRICULTURAE

M.Sc.Agric.

INFORMATION

STUDY AIMS

The aims of this degree study are:

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

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

Module codes

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

For the M.Sc.Agric. in:

Agricultural Economics	LEK700
Agrometeorology	LWR700
Agronomy	AGR700
Animal Science	VKD700
Biochemistry	BOC700
Biotechnology	BTG700
Entomology	BTG700
Food Science	VWS700
Genetics	GEN700
Grassland Science	WDK700
Horticulture	HRT700
Irrigation Science	BSD700

Plant Breeding	PLT700
Plant Pathology	PPG700
Soil Science	GKD700

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

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

REGULATIONS

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

Reg. H22 - Admission

- (a) See General Regulation A80.
- (b) According to General Regulation A80, a candidate, in order to qualify for admission to the M.Sc.Agric. studies, has to
 - (i) have a B.Sc.Agric.Hons. degree; and
 - (ii) convince the head of the department/centre concerned that he/she has adequate knowledge of the subject to justify admission to the studies.

Reg. H23 - Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a B.Sc.Agric.Hons.-degree a dissertation is required, except in the Department of Agricultural Economics's 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 it's 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 M.Sc. Agric. 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 M.Sc.Agric. study.

Requirements for M.Sc.Agric. 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

Rural development	Value added	Agribusiness management	Plant production	Animal production
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.
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.
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(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 Live-stock 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 undermentioned alternatives in order to complete their studies obtaining 72 credits

(a) Alternative 1: Extended research essay

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

MVL792	Short research essay/Proposal	By the means of the four themes within this module, students will acquire skills to formulate a significant project proposal, which will lead to the accomplishment of a research report.
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**M.Disaster 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

- See General Regulation A80.
- 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:
 - an appropriate three-year degree plus appropriate practical experience and/or preparatory studies, or
 - any other relevant degree, e.g. four-year and/or Honours degree or a relevant professional qualification equivalent with practical and/or preparatory experience will also allow candidates to read for the Master' in Disaster Management degree.

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

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

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

assignments a formal evaluation (written or oral) will take place at the end of each semester, normally during June and November.

- (e) Practical examination in second year is compulsory.

Candidates who are unable to successfully complete the second year of the Master in Disaster Management will be able to exit the course with an **Advanced Diploma in Disaster Management**, under the precondition that the candidate has successfully completed the eight compulsory modules for the first year of the Master in Disaster Management. Candidates who want to continue with the second year must have 60% and above average. If not achieved the student will exit with an **Advanced Diploma in Disaster Management**.

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

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

Reg. H29(a) - Duration of study

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

Reg. H30(a) - Learning programme

First Semester

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

Second Semester

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

SECOND ACADEMIC YEAR

Compulsory

DIM791	Extended research essay
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Electives (choose any two):

Module Code	Subject
DIM701	Trauma Management
DIM702	Political Strategic Planning
DIM703	Information Management
DIM704	Ethnic and Cultural Conduct

DIM705	Management of media relations
DIM706	Environmental risk and impact assessment
DIM707	Disaster vulnerability and risk assessment

CONTENTS OF MODULES

DIM601 - Research Methodology (24 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.

DIM602 - Hazards and Disaster Management (16 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 (16 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 (20 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 (12 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 (8 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 (12 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 (12 credits)

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

environmental impact. Formulating of hazard and risk reduction strategies. Formulating prevention and mitigation strategies.

DIM701 - Trauma Management (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.

DIM791 - Extended research essay (90 credits)

INFORMATION**STUDY AIMS**

The aims of this degree study are:

- (a) to present specialised post-degree agricultural management training;
 - (b) to guide the candidate in such a way that he/she will be able to successfully integrate, communicate and apply the principles, concepts and knowledge of agricultural and management science;
 - (c) to enhance applicable research skills in order to enable the candidate to qualify as a specialist in his/her field.
- 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 M.Agric. 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 M.Agric. modules:
 - (i) convince the specific Departmental Chairperson that he/she has enough knowledge of the subject in order to be admitted to the modules.
 - (ii) be in possession of a B.Agric.Hons. degree or equivalent qualification;

Reg. H32 - Method of presentation

- (a) See General Regulation A86.
- (b) For candidates holding a B.Agric.Honours degree a dissertation (BSB700, LBB700 or NLB700) is required, or an extended research essay in Agricultural Management (LBB791), plus two examination papers of three hours each in research methodology (LBB701) and strategic and risk management (LBB702).
- (c) Candidates must give attention to the General Regulation A89 on the regulations for the 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 essay and examination papers.
- (c) When considering the final mark for purpose of a degree, the weight of the different modules will be calculated according to the percentage of its credits relative to the total for the degree.

Doctor's Degrees (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	Ph.D.	5910	98
Doctor Scientiae	See regulations	D.Sc.	5920	99

PHILOSOPHIAE DOCTOR

Study code 5910

Ph.D.

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 Ph.D. 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
Entomology	ENT900
Genetics	GEN900
Food Science	VWS900
Grassland Science	WDK900
Horticulture	HRT900
Irrigation Management	BSB900
Irrigation Science	BSD900
Plant Breeding	PLT900

Plant Pathology	PPG900
Soil Science	GKD900
Sustainable Agriculture	VHL900
Wildlife Management	NLB900

REGULATIONS

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

Reg. H34 - Admission

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

Reg. H35 - Learning programme composition and duration of study

- (a) See General Regulation A113.
- (b) A thesis (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 Ph.D. degree in consultation with the supervisor after a study and registration period of at least one year and on recommendation of the Examination Committee, the head of the department concerned and the Research Committee of the Faculty via the Dean. After admission to the Ph.D. study, at least two years must elapse before a Ph.D. degree can be awarded. The degree study therefore lasts three years.

DOCTOR SCIENTIAE
Study Code 5920

D.Sc.

REGULATIONS

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