

**FACULTIES OF THE
UNIVERSITY OF PRETORIA**

HUMANITIES
NATURAL AND AGRICULTURAL SCIENCES
LAW
THEOLOGY
ECONOMIC AND MANAGEMENT SCIENCES
VETERINARY SCIENCE
EDUCATION
HEALTH SCIENCES
ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

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FACULTY OF NATURAL AND AGRICULTURAL SCIENCES

ACADEMIC PERSONNEL AS ON 30 SEPTEMBER 2008

DEAN

Ströh, A., MSc PhD(Pretoria)

School of Biological Sciences

Cloete, T.E., MSc(Free State) DSc(Pretoria) PrSciNat Professor (Chairperson)

Department of Biochemistry

Verschoor, J.A., MSc(Agric) DSc(Agric)(Pretoria)..... Professor (Head)
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 PhD(Pretoria) Extraordinary Professor
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 Birkholtz, L-M. MSc PhD(Pretoria) Senior Lecturer
 Gaspar, A.R.M., BSc(Hons) MSc PhD(Pretoria) Senior Lecturer

Department of Zoology and Entomology

Nicolson, S.W., BSc(Hons)(Auckland) PhD(Cantab) FRES..... Professor (Head)
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 FRES FRSSA MSAAS PrSciNat Extraordinary Professor
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 PhD(RAU) Extraordinary Professor
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 PhD(Pretoria) FLS FZS(London) PrSciNat..... Professor
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 MSc(Pretoria) PhD(Witwatersrand) Professor
 Scholtz, C.H., BSc(Hons) MSc DSc(Pretoria) FRES Professor
 Van Aarde, R.J., MSc DSc(Pretoria) PrSciNat..... Professor

Natural and Agricultural Sciences 2009
Postgraduate

| | |
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| Bastos, A., BSc(Hons) MSc PhD(Pretoria) | Associate Professor |
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| McKechnie, A.E., MSc PhD(Natal) | Associate Professor |
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| Govender, P., BSc(Hons) MSc(Natal) PhD(Pretoria) | Senior Lecturer |
| Janse van Rensburg, B., BSc(Hons)(Free State) MSc PhD(Pretoria) | Senior Lecturer |
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| Robertson, M.P., BSc BSc(Hons) PhD(Rhodes) | Senior Lecturer |
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| Golpalraj, G.R., BSc MSc(Entomology)(Madurai Kamaraj Univ) ... | Lecturer |

Department of Physiology

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| Joubert, A.M., MSc PhD(Pretoria) | Associate Professor |
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| Soma, P., MBChB MSc(Pretoria) | Senior Lecturer |
| Adams, C., MSc (Western Cape) | Lecturer |
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Department of Anatomy

See Faculty of Health Sciences.

Department of Genetics

| | |
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|--|-----------------------------------|
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| Slippers, B.S., BSc BSc(Hons) MSc(Free State) PhD(Pretoria) .. | Research Fellow |
| Coetzee, M.P.A., BSc BSc(Hons) MSc(Free State) PhD(Pretoria) | Research Fellow |
| Department of Microbiology and Plant Pathology | |
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| Department of Plant Science | |
| Meyer, J.J.M., PhD(Pretoria) | Professor (Head) |
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| Forestry and Agricultural Biotechnology Institute | |
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| Cameron, E.Z., BSc MSc(Cantab) PhD(Massey) | Associate Professor (Director) |

Natural and Agricultural Sciences 2009
Postgraduate

| | |
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| Best, P.B., MA PhD(Cantab) | Extraordinary Professor |
| Clutton-Brock FRS, T.H., MA PhD ScD(Cantab) | Extraordinary Professor |
| Du Toit, J.T., BSc(Hons)(Cape Town) PhD(Witwatersrand) | Extraordinary Professor |
| Getz, W.M., BSc BSc(Hons) PhD(Witwatersrand) | Extraordinary Professor |
| Mills, M.G.L., BSc(Cape Town) BSc(Hons) MSc DSc(Pretoria)... | Extraordinary Professor |

Wingfield M Mondl Chair

| | |
|---------------------------------|-------------------------|
| Roux, J., PhD(Free State) | Senior Research Officer |
|---------------------------------|-------------------------|

School of Physical Sciences

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| Eriksson, P.G., MSc PhD(Natal) Dr rer nat habil (LMU-München) | Professor (Acting Chairperson) |
|---|-----------------------------------|

Department of Geology

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| Altermann, W., DiplGeol Dr rer nat(FU-Berlin) Dr rer nat habil (LMU-München) | Honorary Professor |
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Department of Chemistry

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| Schoeman, W.J., BCom(Unisa) MSc DSc(Pretoria) Dipl Management (National Education) | Associate Professor |
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| Potgieter, M., BSc(Hons)(Stellenbosch) MSc(Unisa) PhD(Illinois) | Senior Lecturer |
| Landman, M., BSc(Hons) MSc PhD(Pretoria) | Senior Lecturer |

| | |
|---|-----------------|
| Laurens, J.B., MSc, PhD(Pretoria) MSc(Toxicology)(Surrey,UK)..... | Senior Lecturer |
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| Pilcher, L.A., BSc(Hons) MSc(Rhodes) PhD(Cantab)..... | Senior Lecturer |
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| De Beer, N., BSc BSc(Hons)(Witwatersrand) HED(Unisa) | Lecturer |
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| Ramatsetse, P.B., BSc(Hons) MSc PhD(University of the North) | Lecturer |

Department of Physics

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|---|------------------------------|
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| Gries, W., BSc MSc(Pretoria) PhD(Stellenbosch)..... | Honorary Professor |
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| Van der Merwe, J.H., BSc MSc(Appl Maths)(Stellenbosch) MSc(Maths)(Pretoria) PhD(Bristol) | Honorary Professor |
| Boeyens, J.C.A, MSc(Free State) DSc(Pretoria) FRSSA | Extraordinary Professor |
| Friedland, E.K.H., BSc MSc DSc(Pretoria) | Extraordinary Professor |
| Gaigher, H.L., BSc MSc DSc(Pretoria) | Emeritus Professor |
| Kunert, H.W., MSc(Poznan) PhD(Warszawa)..... | Emeritus Professor |
| Van Staden, J.C., BSc MSc (Pretoria) Dr Rer Nat(Heidelberg) .. | Emeritus Professor |
| Alberts, H.W., BSc(Hons) MSc(Potchefstroom) DSc(Pretoria) ... | Professor |
| Auret, F.D., MSc(Physics) MSc(Appl.Maths) DSc(Pretoria) | Professor |
| Braun, M.W.H., BSc(Hons)(Unisa) MSc(Port Elizabeth) MSc(Ing.Best.) DSc(Pretoria) | Professor |
| Brink, D.J., MSc(Potchefstroom) DSc(Pretoria) | Professor |
| PhD(Saskatchewan) | Professor |
| Carr, A., BSc(Hons)(Natal) MSc PhD(Pretoria)..... | Senior Lecturer |
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| Hoon, C.F., MSc(Potchefstroom) | Lecturer |
| Legodi, M.J., BSc(Medunsa) MSc(Pretoria) | Lecturer |
| Machatine, A., MSc(Leipzig) | Lecturer |
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| Odendaal, R.Q., MSc(Pretoria) | Lecturer |
| Prinsloo, L.C., MSc(Pretoria) HED(Pretoria) | First Technical Assistant |

Department of Geography, Geoinformatics and Meteorology

| | |
|--|-------------------------------|
| Rautenbach, C.J. de W., BSc(Hons) PhD(Pretoria)..... | Associate Professor (Head) |
| Boelhouwers, J.C., BSc(Utrecht) BSc(Hons) MSc(Natal) PhD(Western Cape)..... | Extraordinary Professor |
| Djolov, G. PhD(Leningrad) PhD(Waterloo) | Extraordinary Professor |
| Hall, K.J., BA(Swansea) MPhil(Reading) PhD(Free State) DSc(Natal) | Extraordinary Professor |
| Landman, W.A., BSc BSc(Hons) MSc(Pretoria) PhD(Witwatersrand)..... | Extraordinary Professor |
| Horn, A.C., BA(Hons) MA DPhil HED(Pretoria) | Associate Professor |
| Meiklejohn, K.I., BSc(Hons) PhD(Natal) HDE | Associate Professor |
| Sumner, P.D., BSc(Hons) MSc HDE(Natal) PhD(Pretoria)..... | Associate Professor |
| Van Helden, P., SS(SA) BSc(Hons) THOD(Potchefstroom) MSc(T&RP) PhD(Pretoria)..... | Associate Professor |
| Engelbrecht, F.A., MSc PhD(Pretoria) | Senior Lecturer |
| Olwoch, J.M. BSc(Makerere) MSc(Medunsa) PhD(Pretoria) | Senior Lecturer |
| Van der Merwe, F.J., BLand Surveying(Pretoria) Pr.L.(SA)..... | Senior Lecturer |
| Bretzke, G.D., BSc(Hons) BSocSci(Hons)(Pretoria) MSc(Free University, Amsterdam) PhD(Pretoria)..... | Lecturer |
| Davis, N., BA(Hons)(Pretoria) MA(Sussex)..... | Lecturer |
| Darkey, D., BSc(Bophuthatswana) MSc(RAU) DAdmin(Durban-Westville) | Lecturer |
| Dyson, L., BSc MSc(Pretoria) | Lecturer |
| Eksteen, S.P., BT&RP(Pretoria)..... | Lecturer |
| Esterhuizen, J., O(SA)(Pretoria Technikon) BCom(Hons) TED(Pretoria)..... | Lecturer |
| Botai, O.J. BSc(Hons)(Moi) MSc Eng(Chalmers) MSc(Rhodes) | Junior Lecturer |

Benfield Natural Hazard Centre, Africa

| | |
|---|------------------------|
| Kijko, A., PhD(Polish Acad. Sci.) Dr Habil (Krakow) | Director and Professor |
| Retief, S.J.P., MSc(Potchefstroom)..... | Senior Lecturer |

Centre for Science, Mathematics and Technology Education

| | |
|--|-------------------------------------|
| Hattingh, A., BSc HED BEd(Hons) MEd PhD(Pretoria) | Director and Associate Professor |
| Ndlalane, T.C., BA UED(Unizul) BEd(Natal) MEd Science Edu(Leeds) PhD(Pretoria)..... | Senior Lecturer |

Institute of Applied Materials

| | |
|---|---|
| Focke, W.W., BEng (Chem) (Pretoria) PhD (MIT) | Professor (Director) |
| Rand, B., BSc (Durham) MSc (Durham) PhD (Newcastle upon Tyne)..... | Professor (Chair: SARChI Chair in Carbon Techno- logy and Materials) |

School of Agricultural and Food Sciences

| | |
|--|-------------------------|
| Kirsten, J.F., BSc(Agric)(Hons)(Stellenbosch) MSc(Agric) PhD(Pretoria)..... | Professor (Chairperson) |
|--|-------------------------|

Department of Agricultural Economics, Extension and Rural Development

| | |
|--|-------------------------|
| Kirsten, J.F., BSc(Agric)(Hons)(Stellenbosch) MSc(Agric) PhD(Pretoria) | Professor (Head) |
| Bostyn, F., PhD(Economics)(Gent, Belgium) | Extraordinary Professor |
| Coetzee, G.K., BSc(Agric)(Hons) MSc(Agric)(Stellenbosch) PhD(Pretoria) | Extraordinary Professor |
| D'Haese, L.J.G.M.H., PhD(Gent, Belgium) | Extraordinary Professor |
| Thirtle, C.G., BSc(Econ)(London School of Economics) MSc(Southern Illinois) MPhil PhD(Columbia) | Extraordinary Professor |
| Westhoff, P., PhD(Iowa State) | Extraordinary Professor |
| Blignaut, G.S., BSc(Agric) MSc(Agric)(Pretoria) DSc(Agric)(Free State) | Professor |
| Düvel, G.H., Dip Agric(Cedara) BSc(Agric) MinstAgrar DInstAgrar(Pretoria) PrSciNat..... | Professor |
| Hassan, R.M., BSc(Hons) MSc(Agric)(Sudan) MSc PhD(Iowa) | Professor |
| Machethe, C.L., BSc(Agric)(Hons)(Fort Hare) MSc(Agric)(University of the North) M.S. PhD(Michigan State University)..... | Professor |
| Van Rooyen, C.J., BSc(Agric) BSc(Agric)(Hons)(Stellenbosch) MSc(Agric) DSc(Agric)(Pretoria) | Professor |
| Louw, A., AEP(Unisa) BSc(Agric)(Stellenbosch) MSc(Agric) DSc(Agric)(Pretoria)..... | Associate Professor |
| Farolfi, S.M (CIHEAM, Paris) MAgric Econ(Bologna) PhD(Padova) HDR(Montpellier 1) | Senior Lecturer |
| Geyser, M., PhD(Pretoria) | Senior Lecturer |
| Meyer, F.H., BScAgric(Hons) MSc(Agric) PhD(Pretoria) | Senior Lecturer |
| Mungatana, E., MSc(Agricultural University of Norway) PhD(Dresden University of Technology) | Senior Lecturer |
| Stevens, J.B., MInstAgrar PhD(Pretoria)..... | Senior Lecturer |
| Terblanche, S.E., BSc(Agric) PhD(Pretoria) | Senior Lecturer |
| Strauss, P.G. BSc(Agric) MSc(Agric)(Pretoria) | Lecturer |

SADC Centre for Land-related, Regional and Development Law and Policy

| | |
|--|----------------------|
| Olivier, N.J.J., BA(Law) LLB BA(Hons)(Pretoria) Drs Juris LLD(Leiden) MA(Pretoria) BA(Hons)(Potchefstroom) LLD(Pretoria) | Professor / Director |
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Department of Plant Production and Soil Science

| | |
|---|-------------------------|
| Reinhardt, C.F., BSc(Hons)(Free State) BSc(Agric)(Hons) MSc(Agric) PhD(Pretoria) | Professor (Head) |
| Bristow, K.L., BSc(Hons)(Natal) MSc(Free State) PhD(WSU)..... | Honorary Professor |
| Duke, S.O., MS(Univ Arkansas) PhD(Duke Univ)..... | Extraordinary Professor |
| Singels, A., BSc(Agric)(Stellenbosch) BSc(Agric)(Hons) MSc(Agric) PhD(Free State)..... | Extraordinary Professor |
| Stirzaker, R.J., MSc(Agric) PhD(Sydney)..... | Extraordinary Professor |
| Annandale, J.G., MSc(Agric)(Pretoria) PhD(WSU) | Professor |
| Claassens, A.S., Dipl Agric(Potchefstroom) MSc(Agric) DSc(Agric)(Pretoria) M.Akad.SA | Associate Professor |
| Du Toit, E.S., BSc(Hons) MSc(Agric) PhD(Pretoria)..... | Associate Professor |
| Soundy, P., BSc(Agric)(Fort Hare) MSc(Agric)(Natal) PhD(Florida)..... | Associate Professor |

Natural and Agricultural Sciences 2009
Postgraduate

| | |
|---|-----------------|
| Steyn, J.M., BSc(Hons) MSc(Agric)(Free State) PhD(Pretoria) | Senior Lecturer |
| De Jager, P.C., BSc BSc(Hons)(Potchefstroom) MSc(Pretoria) .. | Lecturer |
| Madakadze, I.C., BSc(Agric)(Hons)(Zimbabwe) | |
| MSc(Reading) PhD(McGill)..... | Lecturer |
| Marais, D., BSc(Agric)(Hons) MSc(Agric) PhD(Pretoria) | Lecturer |
| Taylor, N. J., BSc(Agric) PhD(KwaZulu-Natal)..... | Lecturer |
| Truter, W. F., BSc(Agric) MSc(Agric) PhD(Pretoria) | Lecturer |

Department of Animal and Wildlife Sciences

| | |
|---|--|
| Webb, E.C., MSc(Agric) PhD(Pretoria) PrSciNat(Anim) | |
| SAAPAS SASA | Associate Professor (Head) |
| Casey, N.H., MSc(Agric)(Natal) DSc(Agric)(Pretoria) | |
| PrSciNat(Anim) MRSSA SAAPAS SASAS | Professor |
| Bothma, J. du P., MSc(Pretoria) PhD(Texas A&M) | Emeritus Professor |
| PrSciNat(Environ)..... | Extraordinary Professor for Centre for Wildlife Management |
| Jansen van Ryssen, J.B., BSc(Agric)(Pretoria) MSc(Agric)(Natal) | |
| PhD(Natal) PrSciNat(Anim) SAAPAS SASAS | Professor (Emeritus/ Extraordinary) |
| Schoeman, S. J., BSc(Agric)(Stellenbosch) BSc(Agric)(Hons) | |
| MSc(Agric) DSc(Agric)(Free State) SASAS PrSciNat(Anim). | Extraordinary Professor |
| Oelofse, A., MSc(Nutrition)(Stellenbosch) PhD(Wageningen) | Associate Professor, Director: Centre for Nutrition |
| Donkin, E.F., BSc(Agric)(Natal) MPhil(London) PhD(Medunsa) | |
| PrSciNat(Anim)..... | Associate Professor |
| Erasmus, L.J., MSc(Agric) PhD(Pretoria) PrSciNat(Anim) | |
| SAAPAS SASAS PAS (VSA)..... | Associate Professor |
| Van Hoven, W., MSc DSc(Potchefstroom) PrSciNat(Environ)..... | Associate Professor |
| Van Niekerk, W.A., MSc(Agric) PhD(Pretoria) | |
| PrSciNat(Anim) SAAPAS SASAS | Associate Professor |
| Hassen, A., MSc(Agric)(Tanz) PhD(Pretoria) | Senior Lecturer |
| Meyer, J.A., MSc(Agric) PhD(Pretoria) SAAPAS SASAS | Senior Lecturer |
| Strydom, P.E., MSc(Agric)(Pretoria) PhD(Free State) | Senior Lecturer |
| Van Marle-Köster, E., BSc(Agric)(Pretoria) BSc(Agric)(Hons) | |
| MSc(Agric)(Free State) PhD(Pretoria) Dipl. Development | |
| Studies(Unisa) PrSciNat(Anim) SAAPAS SASAS..... | Senior Lecturer |
| Coertze, R., BSc(Agric)(Hons)(Pretoria) | Lecturer |
| Jansen van Rensburg, C., MSc(Agric) PhD(Pretoria) SASAS | Lecturer |
| Somers, M.J., MSc(Wildlife Management)(Pretoria) | |
| PhD(Stellenbosch) | Lecturer |
| Van Essen, L. D., MSc(Pretoria) PrSciNat(Environ) | Lecturer |
| Visser, C., BSc(Agric) BSc(Agric)(Hons) MSc(Agric)(Pretoria) | |
| SASAS PrSciNat(Anim) | Lecturer |
| Basson, A., BSc(Agric)(Pretoria)..... | Junior Lecturer |

Department of Consumer Science

| | |
|--|-------------------------------|
| De Klerk, H.M., MSc(Home Econ) PhD(Pretoria) | Associate Professor (Head) |
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|--|-------------------------|
| Erasmus, A.C., BSc(Home Econ) BSc(Home Econ)(Hons) M(HomeEcon) PhD(Pretoria) | Associate Professor |
| Du Rand, G.E., BHome Econ Ed BHome Econ(Hons)(Stellenbosch) MSc(Home Econ) PhD(Pretoria) | Senior Lecturer |
| Donoghue, S., BHome Econ(Hons) M(Home Econ)(Pretoria) PhD(Pretoria) | Lecturer |
| Jacobs, B.M., Dipl in Tertiary Education(Pretoria) B Home Econ(Hons) MConsSc(Pretoria) | Lecturer |
| Pienaar, J.M.M., B ConsSc MConsSc(Pretoria) | Lecturer |
| Retief, A., BSc Home Econ(Hons) M(Home Econ) PhD(Pretoria) | Lecturer |
| Sonnenberg, N., BHomeEcon BHome Econ(Hons) MConsSc(Pretoria) | Lecturer |
| Strydom, M., B Home Econ(Pretoria) BSc(Hons) Home Econ(Potchefstroom) M ConsSc(Pretoria) | Lecturer |
| Van der Spuy, H.H., BSc(Hons)(Dietetics)(Stellenbosch) M ConsSc(Pretoria) | Lecturer |
| Viljoen, A.T., Dipl Hosp Dietetics(Free State) MDietetics(Pretoria) | Lecturer |
| Tselepis T.J., B Home Econ M ConsSc(Pretoria) | Junior Lecturer |
| Visagie, M., B ConsSc(Cloth Mgt)(Stellenbosch)..... | Junior Lecturer |
| Department of Food Science | |
| Minnaar, A., BSc(Agric)(Hons) PhD(Pretoria) | Professor (Head) |
| Taylor, J.R.N., BSc(Hons)(CNA) Post-Grad.Cert.Ed.(Nottingham) PhD(Trent) DSc(Pretoria) | Professor |
| Buys, E.M., BSc(Hons)(Potchefstroom) MSc(Pretoria) PhD(Witwatersrand)..... | Associate Professor |
| De Kock, H.L., BSc(Home Ec)(Hons) MSc(Agric) PhD(Pretoria). | Senior Lecturer |
| Duodu, K.G., BSc(Ghana) MInstAgrar PhD(Pretoria) | Senior Lecturer |
| Emmambux, M.N., BSc(Hons)(Mauritius) MSc PhD(Pretoria) | Lecturer |
| Postgraduate School of Agriculture and Rural Development | |
| Machethe, C.L., BSc(Agric)(Hons)(Fort Hare) MSc(Agric)(University of the North) M.S. PhD(MichiganState)..... | Professor / Director |
| South African Institute for Agricultural Extension | |
| Düvel, G.H., Dip Agric(Cedara) BSc(Agric) MInstAgrar DInstAgrar(Pretoria) PrSciNat | Director |
| School of Mathematical Sciences | |
| Lubuma, J.M-S., MSc PhD(Louvain, Belgium) | Professor (Chairperson) |
| Department of Statistics | |
| Crowther, N.A.S., BSc(Hons)(Free State) MSc(Port Elizabeth) DSc(Free State) | Professor (Head) |
| Stoker, D.J., MSc(Potchefstroom) MSc(Stellenbosch) Dr(Math et Phys)(Amsterdam) | Honorary Professor |
| Steyn, H.S., BSc MSc(Free State) PhD(Edin) DSc(Pretoria)..... | Extraordinary Professor |
| Smit, C.F., MSc DSc(Pretoria) | Professor |

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| Van Zyl, G.J.J., BCom(Hons)(Stellenbosch) Dip Stat(Oxon) PhD(North Carolina)..... | Professor, Acting Director |
| Bekker, A., MSc(Johannesburg) PhD(Unisa)..... | Senior Lecturer |
| Debusho, L.K., MSc(Addis Ababa) PhD(KwaZulu-Natal)..... | Senior Lecturer |
| Fletcher, L., MSc PhD(Unisa)..... | Senior Lecturer |
| Kanfer, F.H.J., MSc PhD(Potchefstroom) | Senior Lecturer |
| Kasonga, R.A., MSc PhD(Canada) | Senior Lecturer |
| Louw, E.M., MSc PhD(Pretoria) | Senior Lecturer |
| Millard, S.M., MCom(Pretoria)..... | Senior Lecturer |
| Swanepoel, A., MSc(Port Elizabeth) | Senior Lecturer |
| Basson, E.M., BSc BSc(Hons) MSc(Pretoria) | Lecturer |
| Bodenstein, L.E., BCom(Hons) MCom(Pretoria)..... | Lecturer |
| Crafford, G., BSc(Hons) MSc PhD(Pretoria) | Lecturer |
| Corbett, A.D., BCom BSc(Hons)(Pretoria) | Lecturer |
| De Villiers, G.M., BSc(Hons) MSc(Pretoria)..... | Lecturer |
| Ehlers, R., BSc(Hons) MSc(Pretoria) | Lecturer |
| Human, S. W., BSc(Hons) MSc(Pretoria) | Lecturer |
| Pauw, J., BSc(Hons)(Pretoria) MSc(Unisa) | Lecturer |
| Strydom, H.F., BSc(Hons)(Pretoria) MSc(Unisa) HED(Pretoria) . | Lecturer |
| Van Staden, P.J., BCom(Hons) MCom(Pretoria)..... | Lecturer |
| Adamski, K., BSc(Hons)(Pretoria)..... | Junior Lecturer |
| Coetsee, J., BCom(Hons)(Pretoria) | Junior Lecturer |

Department of Insurance and Actuarial Science

| | |
|--|-------------------------|
| Ströh, A., MSc PhD(Pretoria) | Professor (Acting Head) |
| Du Plessis, H.L.M., BSc(Witwatersrand) FIA FASSA | Associate Professor |
| Jansen van Rensburg, H., BSc(Hons)(Pretoria) | Junior Lecturer |
| Sauer, J.J.C., BCom(Hons)(Pretoria) FIA FASSA | Senior Lecturer |
| Venter, M., BSc(Hons)(RAU) BCom(Hons)(Cape Town) FFA FASSA..... | Senior Lecturer |

Department of Mathematics and Applied Mathematics

| | |
|---|-------------------------|
| Lubuma, J.M-S., MSc PhD(Louvain, Belgium) | Professor (Head) |
| Delbaen, F.E., PhD(Free Univ Brussels) | Extraordinary Professor |
| Diestel, J., BS(Dayton) PhD(Cath Univ of America) | Extraordinary Professor |
| Rajagopal, K.R., PhD(Minnesota) | Extraordinary Professor |
| Sauer, N., MSc(Pretoria) PhD(Unisa) | Extraordinary Professor |
| Janse van Rensburg, N.F., BSc(Pretoria) BSc(Hons)(Unisa) MSc DSc(Pretoria) HED | Emeritus Professor |
| Rosinger, E.E., MSc Dr Sc(Bucharest) | Emeritus Professor |
| Schoeman, M.J., MSc(Pretoria) Dr Sc T Wet(Delft) M.Akad.SA.. | Emeritus Professor |
| Engelbrecht, J.C., MSc(Pretoria) DSc(Potchefstroom) | Professor |
| Pretorius, L.M., MSc DSc(Pretoria) | Professor |
| Sango, M., MSc(Donetsk State Univ, Ukraine) PhD(Univ of Valenciennes, France) | Professor |
| Ströh, A., MSc PhD(Pretoria) | Professor |
| Swart, J., BSc(Hons) MSc(Potchefstroom) DrPhil(Zürich)..... | Professor |
| Anguelov, R., MSc(Sofia) PhD(Unisa) | Associate Professor |
| Harding, A.F., MSc DSc(Pretoria) Hned | Associate Professor |
| Maré, E., MSc(Witwatersrand) PhD(Free State)..... | Associate Professor |

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|---|---------------------------------|
| Shatalov, M.Y., MSc(Moscow Lomonosov State Univ) PhD(Russian Academy of Science) | Extraordinary Lecturer |
| Duvenhage, R. de V., MSc PhD(Pretoria) | Senior Lecturer |
| Jordaan, K.H., BSc(Hons)(Witwatersrand) MSc(Pretoria) PhD(Witwatersrand) HED | Senior Lecturer |
| Le Roux, C., MSc(Cape Town) PhD(Pretoria) | Senior Lecturer |
| Möller, M.P., BSc(Hons)(Comp. Science) BSc(Hons)(Maths) MSc(Pretoria) | Senior Lecturer |
| Mureithi, E.W., MSc(Kenyatta Univ) PhD(Univ of New South Wales) | Senior Lecturer |
| Mutangadura, S.A., BSc(Hons) PhD(London) | Senior Lecturer |
| Ntumba, P.P., MSc PhD(Cape Town) LPA(Institut Pedagogique Kinshasa) | Senior Lecturer |
| Beyers, F.J.C., BSc(Hons) MSc(Pretoria) | Lecturer |
| Dinga, Y.V., BSc HED(Fort Hare) BSc(Hons)(Rhodes) MSc(Western Cape) | Lecturer |
| Djoko Kamdem, J., BSc(Hons) MSc(Cameroon) PhD(Cape Town) | Lecturer |
| Kama, P., BSc(Hons) MSc(Fort Hare) | Lecturer |
| Kufakunesu, R., BSc(Hons) MSc(Zimbabwe) | Lecturer |
| Labuschagne, A., BSc(Hons) MSc(Potchefstroom) PhD(Pretoria) DTE | Lecturer |
| Maepa, S.M., BSc(Hons)(University of the North) MSc(Lancaster) PhD(Pretoria) STD(Setotolwane College of Educ.) | Lecturer |
| Mostert, L., BSc(Hons) MSc(Potchefstroom) | Lecturer |
| Van Zyl, A.J., BSc(Hons) MSc(Pretoria) | Lecturer |
| Verwey, A., BSc(Hons) MSc(Pretoria) | Lecturer |
| Yani, B.M., BSc(Vista) BSc(Hons)(Pretoria) | Junior Lecturer |
| BSc Four-year Programme | |
| Smith, U.L., BSc MSc CCE(Utrecht) | Director |
| Naudé, K., BA BA(Hons)(Pretoria) MPhil(Stellenbosch) | Lecturer |
| Student Administration | |
| Beresford, M.E., Mrs | Head: Student Administration |
| Kotze, S. | Faculty Manager |

POSTGRADUATE REGULATIONS

The rules for postgraduate qualifications published here are subject to change and may be amended prior to the commencement of the academic year in 2009.

Also refer to General Regulations of the University of Pretoria.

Postgraduate qualifications in the Faculty of Natural and Agricultural Sciences

The following postgraduate qualifications are conferred by the Faculty:

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| Baccalaureus Scientiae Honores | :BSc(Hons) |
| Baccalaureus Scientiae Agricultrae Honores | :BSc(Agric)(Hons) |
| Baccalaureus Institutionis Agrariae Honores* | :BInstAgrar(Hons) |
| Magister Consumer Science | :MConsSc |
| Magister Scientiae | :MSc |
| Magister Scientiae Agricultrae | :MSc(Agric) |
| Magister Philosophiae | :MPhil (Wildlife Management) |
| Magister Institutionis Agrariae* | :MInstAgrar |
| Philosophiae Doctor | :PhD |
| Doctor Scientiae | :DSc |

**(Coordinated in the Postgraduate School of Agriculture and Rural Development. Please consult page 149 for information and Regulations).*

DISCLAIMER

The Faculty reserves the right not to offer a particular module or programme if there is insufficient resources to do so, or if an insufficient number of qualifying students present themselves.

BACCALAUREUS SCIENTIAE HONORES BSc(Hons)

(Refer to General Regulations G.16 - G.29)

a. Admission to study

In addition to the requirements of General Regulations G.1.3 and G.62, an appropriate bachelor's degree is a prerequisite: a candidate with an average of less than 60% in the major subjects in the final year of the bachelor's degree will only be admitted with the approval of the Dean, on the recommendation of the head of department. Additional conditions may be prescribed by the head of department.

b. Duration of study

The duration of study is a minimum of one year for full-time candidates, and two years for part-time candidates.

c. In calculating marks, General Regulation G.12.2 applies.

d. The BSc(Hons) degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

- e. Apart from the prescribed coursework, a research project is an integral part of the study.
- f. The BSc(Hons) degree is conferred in the following fields of study:
- Animal Science
 - Biochemistry
 - Bioinformatics
 - Biotechnology
 - Plant Science
 - Chemical Sciences
 - Earth Sciences
 - Entomology
 - Environmental Sciences
 - Physical Sciences
 - Food Science
 - Genetics
 - Geography
 - Geoinformatics
 - Mathematical Sciences
 - Meteorology
 - Microbiology
 - Plant Pathology
 - Soil Science
 - Wildlife Management
 - Zoology
 - Human Physiology (*Please refer to the Postgraduate publication of the Faculty of Health Sciences*)

BACCALAUREUS SCIENTIAE AGRICULTURAE HONORES
BSc(Agric)(Hons)

a. Admission to study

In addition to the requirements of General Regulations G.1.3 and G.62, the BSc(Agric) degree is a prerequisite: a candidate with an average of less than 60% in his or her major in the final year of the bachelor's degree will only be admitted with the approval of the Dean, on the recommendation of the head of the department. Additional conditions may be prescribed by the head of department.

b. Fields of study

Plant Production (Agronomy/Horticulture/Pasture Science/Soil Science)

c. Duration of study

All honours students are expected to study full-time for at least two semesters at the University (see General Regulations G.18 and G.22).

d. Curricula

The BSc(Agric)(Hons) programme extends over at least two semesters and comprises the following:

- i) Advanced lectures, literature studies and seminar presentations on the major subject/s and related disciplines. Where applicable, a research project of limited scope as well as specific tasks and/or practical work form part of the curriculum.
- ii) Other ancillary modules, as approved by the Dean on the recommendation of the head of the department. Such ancillary modules may be taken simultaneously with the major subject/s.

Details relating to the different fields of study are given separately.

e. Examination and promotion

The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.

General Regulation G.12 applies to the calculation of marks.

f. Degree with distinction

The BSc(Agric)(Hons) degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

BACCALAUREUS HONORES INSTITUTIONIS AGRARIAE
BInstAgrar(Hons)

Please refer to the Regulations of the Postgraduate School of Agriculture and Rural Development, page 147.

MAGISTER SCIENTIAE
MSc

(Refer to General Regulations G.30 to G.62)

a. Admission to study

i) In addition to the General Regulations G.1.3, G.30 and G.62, an appropriate BSc(Hons) degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor, head of department and chairperson of the school. Admission is approved by the chairperson of the school in consultation with the head of department and the supervisor.

ii) Where admission to the MSc degree study does not follow on a BSc(Hons) degree, the minimum period of study for the MSc degree is two years.

b. The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

c. The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/research report from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/research report, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

d. Duration of study

Duration of study is a minimum of one year uninterrupted full-time study.

e. Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and

subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the head of department and chairperson of the school.

f. General

Candidates are required to familiarise themselves with General Regulation G.32.4 regarding the maximum period of registration and G.61 regarding the requirements on the submission of a draft article for publication.

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| MAGISTER SCIENTIAE AGRICULTURAE MSc(Agric) |
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(See also General Regulations G.30 to G.62)

a. Admission to study

In addition to the requirements of General Regulations G.1.3 and G.62, the BSc(Agric) degree is a prerequisite for admission. An average of 60% is required in the final year of the BSc(Agric) degree for admission. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the head of department and the supervisor. Admission is approved by the chairperson of the school in consultation with the head of department and the supervisor.

b. Fields of study

The MSc(Agric) degree is conferred in the following fields of study:

- | | |
|--|-------------------------------|
| • Agronomy | • Food Science and Technology |
| • Agricultural Economics | • Genetics |
| • Animal Science | • Horticulture |
| • (Production Management, Production Physiology, Meat Science, Animal Nutrition) | • Microbiology |
| • Entomology | • Pasture Science |
| • Extension | • Plant Pathology |
| | • Soil Science |
| | • Weed Science |

c. Duration of study

The duration of study is a minimum of two years uninterrupted full-time study (or three years part-time).

d. Residence

On the recommendation of the head of department, the Dean may set specific residential requirements for the MSc(Agric) degree.

e. Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the head of department and chairperson of the school.

f. Curricula

The curriculum for the MSc(Agric) degree consists of the following:

- i) A dissertation; and
- ii) Further study in the major subject/s, augmented by ancillary modules prescribed by the Dean, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BSc(Agric)(Hons) degree may be exempted from additional ancillary modules.

g. Examinations and promotion

- i) The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
- ii) General Regulation G.12.2 applies to the calculation of marks.
- iii) In order to obtain the MSc(Agric) degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

h. Degree with distinction

The MSc(Agric) degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/research report from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/research report, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

i. General

Candidates are required to familiarise themselves with General Regulation G.32.4 regarding the maximum period of registration and G.61 regarding the requirements on the submission of a draft article for publication.

MAGISTER INSTITUTIONIS AGRARIAE
MinstAgrar

Please refer to the Regulations of the Postgraduate School of Agriculture and Rural Development, page 147.

MAGISTER CONSUMER SCIENCE
MConsSci

(See General Regulations G.30 to G.62)

a. Admission to study

For the MConsumer Science degree with specialisation in Clothing, Interior, Foods and Nutrition, a four-year BConsumer Science degree that is BCom-based, is required. For the MConsumer Science General, other applicable four-year degrees will be considered. A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for acceptance.

b. Duration of study

A minimum of two years full-time and a maximum of four years part-time study.

MAGISTER PHILOSOPHIAE
MPhil

Refer to the Regulations of the Centre for Wildlife Management, Department of Animal and Wildlife Sciences available on the internet at www.wildlife.up.ac.za

PHILOSOPHIAE DOCTOR
PhD

(Refer to General Regulations G.45 - G.55)

a. Admission to study

In addition to the requirements of General Regulations G.1.3 and G.62, the MSc, MSc(Agric), MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.

b. Duration of studies (Refer to General Regulation G.51)

The head of department may set specific residential requirements for students who are required to live on campus.

c. Renewal of registration

Renewal of registration for a PhD student will be accepted for the second and third years of study. Registration for a fourth and subsequent years will only take place when the Student Administration of the faculty receives a written motivation that is supported by the head of department and chairperson of the school.

d. Curriculum

The curriculum for the PhD degree consists of the following:

- i) Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
- ii) A thesis.

e. Examinations and promotion

- i) General Regulation G.52 applies to the calculation of marks.
- ii) In order to obtain the PhD degree the candidate must:
 - pass the examinations and the prescribed modules, as determined in the study programme;
 - pass the thesis; and
 - pass the final examination on the thesis and general subject knowledge.

f. Upgrading of MSc studies to PhD

The Faculty supports an effective, fair and flexible system allowing promising students to upgrade from an MSc to a PhD programme, thus ensuring the rapid development and advancement of a dynamic group of researchers in the Faculty. Such a system affords recognition to outstanding postgraduate students (and their projects).

An application to upgrade from an MSc to a PhD programme can only be considered if the candidate provides proof that he/she complies with the

requirements for the conferring of an MSc degree. Consequently, upgrading can only be considered if the candidate has completed one year of full-time study for the MSc/MSc(Agric) research degree, and before the expiry of the second year of study.

The application for upgrading has to include the following:

- i) An accurate progress report by the candidate on the work done to date for the MSc/MSc(Agric) research project. The report has to provide proof that the findings obtained so far are of such a high standard and great scientific importance that it justifies conversion to a PhD project. Any particulars about announcing the findings by means of papers at a conference and/or publication in internationally recognised journals (published or accepted for publication) have to be given in full since special value is attached to such information when considering upgrading.
- ii) A detailed project proposal, by the candidate, describing the envisaged PhD project, indicating the objectives of the project, the methodology and the results expected to be achieved.
- iii) A recommendation from the project supervisor who should in particular comment on the competence of the applicant as a potential PhD candidate and on the desirability and feasibility of the upgrading, especially with reference to the information supplied by the candidate in his/her submissions [items i) and ii)].
- iv) A report from a referee (preferably from abroad, who need not necessarily be the external examiner(s) for the MSc), which is based on the submissions of the candidate and his/her supervisor [items i), ii) and iii)].
- v) A recommendation from the head of department, if the head is not the project leader, expounding in particular on the competence of the applicant as a potential PhD candidate and the supervisor as a potential supervisor for a PhD programme.
- vi) The head of department submits the candidate's application, together with the reports and recommendations, to the Postgraduate Studies Committee (PGSC) via faculty administration.
- vii) The Senate Subcommittee can offer conditional acceptance on the recommendation of the Faculty Board. Within four months after first registration, the doctoral candidate has to present a departmental seminar in which the proposed PhD programme is discussed and at which time he/she will present and attempt to justify in discussion the objectives of the project, the methodology and the envisaged results of the investigation. In the evaluation of this presentation it is preferable to also involve experts from outside the University. Continued registration is subject to departmental confirmation that the candidate does have the requisite insight into and knowledge of the field of study to complete the proposed programme successfully.

viii) In cases where excellent MSc candidates have already published, the Dean may exempt them from certain parts of the prescribed procedures.

g. General

Candidates are required to familiarise themselves with General Regulations G.51, regarding the maximum duration of study, and G.61, regarding the requirements to submit an article/s for publication.

**DOCTOR SCIENTIAE
DSc (03260001)**

The degree is conferred on a candidate who, on the basis of distinguished and comprehensive research work, enjoys international recognition.
See General Regulation G.56.

1. HONOURS PROGRAMMES IN THE SCHOOL OF BIOLOGICAL SCIENCES

1.1. BSc(Hons): Biochemistry (Code 03241011)

a. Admission requirements

Organic and Analytical Chemistry at 200 level; a final mark of 60% or more in Biochemistry at 300-level.

b. Learning programme

Compulsory modules:

BAS 751 General Research Methodology 751 (8 credits)

BCM 751 Enzyme Regulation Strategies 751 (9 credits)

BCM 752 Specialised Cellular Events 752 (9 credits)

BCM 753 Literature Seminar 753 (9 credits)

MLB 721 Molecular and Cellular Biology 721 (18 credits)

BCM 771 Trends in Biochemical Research 771 (18 credits)

BCM 772 Biochemical Research Methodology 772 (18 credits)

BCM 773 Research Project and Report 773 (64 credits)

Examination (7 credits)

Minimum credits required: 160

Note:

- A pass mark is required for all the components of the honours programme and the average mark is calculated proportionally to the credits.
- Additional modules can be prescribed to remedy deficiencies in a candidate's undergraduate training.

1.2 BSc(Hons): Bioinformatics (Code 03241014)

a. Admission requirements

Students must be in possession of a bachelor's degree in Bioinformatics, Biological Sciences, Computer Science, Informatics, Statistics or Computer Engineering.

Students with a bachelor's degree in either Physics, Mathematics or Electronic Engineering may be required to do a special postgraduate bridging year before admission to BSc(Hons): Bioinformatics.

b. Learning programme

BAS 751 Research Methodology (8 credits)

BIF 701 Bioinformatics Theory and Applications (32 credits)

BIF 702 Trends in Bioinformatics and Literature Seminar (9 credits)

BIF 703 Research project and report (35 credits)

* BIF 704 Introduction to Molecular Biology for Bioinformatics (18 credits) (Elective)

* BME 780 Introduction to Mathematical Statistics for Bioinformatics (18 credits) (Elective)

MLB 721 Molecular and Cell Biology (18 credits)

Total credits required: 120

***Note:**

Students with degrees in Biological Sciences should choose BME 780 as an elective. Students from Computer Science and other related backgrounds should elect BIF 704. Other additional modules may be prescribed for non-degree purposes to address deficiencies in a candidate's undergraduate training.

1.3 BSc(Hons): Biotechnology (Code 02240392)

a. Admission requirements

BSc(Biotechnology) or equivalent degree with GTS 352, BCM 351, BCM 354 and MBY 364; an average pass mark of 60% or more at 300-level or permission by the head of department.

b. Curriculum

BSc(Hons): Biotechnology is a unique inter-departmental programme aimed at enabling students to pursue their interest in molecular biotechnology through relevant research areas within the School of Biological Sciences, such as biochemistry, molecular virology, plants and their pathogens and genetics. Students within this programme will be registered and will conduct their studies within the department of their choice. A student's choice of research programme will determine which of the respective departments within the School will mentor their honours degree.

BTW 701: Biotechnology in the Workplace 701 18 credits

MLB 721: Molecular and Cellular Biology 721 18 credits

The curriculum for the balance of the credits will be determined by the heads of department in the School of Biological Sciences. (Please consult Prof H Huismans, 012 4203258, for further details.)

Total credits required: 160

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.

- Additional modules may be prescribed by the Head of the Department, e.g. Advanced Language Proficiency 300 (EOT 300) where deemed necessary. Honours students may also be required to complete a Biometry or equivalent module, if they have not already done so during their undergraduate training.
- A pass mark is required for all the components of the honours study programme and the final mark is calculated proportionally to the credits of the respective prescribed modules.

1.4 BSc(Hons): Entomology (Code 03241031)

a. Programme composition

| Code | Module | Credits |
|--|---|---------|
| Compulsory modules: | | |
| ZEN 701 | Project and Seminars 701 | 80 |
| ZEN 702 | Research methods 702 | 16 |
| ZEN 707 | Integrated pest management in Africa 707 | 16 |
| ZEN 713 | Scientific communication | 16 |
| Choice of two additional modules: | | |
| ZEN 703 | Systematics, evolution and biogeography 703 | 16 |
| ZEN 704 | Environmental physiology 704 | 16 |
| ZEN 705 | Ecology 705 | 16 |
| ZEN 710 | Large mammal ecology 710 | 16 |
| ZEN 712 | Behavioural ecology 712 | 16 |

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their post-graduate studies.
- A pass mark is required for all the components of the honours study programme.

Total credits required: 160

1.5 BSc(Hons): Genetics (Code 03241051)

a. Admission requirements

An average pass mark of 60% or more in at least four Genetics modules at 300-level (one of which must be GTS 352) or permission by the head of department.

b. Curriculum

The honours study programmes serve as the first level of postgraduate training and we therefore aim to introduce our students to the methods of research – from the reading of research papers, through to the conceptualisation, planning, execution and communication of a research project. The study programme comprises the following modules:

| | |
|---|------------|
| GTK 701: Advanced Genetics 701 | 40 credits |
| GTK 702: Seminar Course 702 | 20 credits |
| GTK 703: Research Project 703 | 70 credits |
| GTK 704: Trends in Genetics 704 | 12 credits |
| MLB 721: Molecular and Cellular Biology 721 | 18 credits |

Total credits required: 160

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their post-graduate studies.
- Additional modules may be prescribed by the head of the department, e.g. Advanced Language Proficiency 300 (EOT 300) where deemed necessary. Honours students may also be required to complete a Biometry or equivalent module, if they have not already done so during their undergraduate training.
- A pass mark is required for all the components of the honours study programme and the final honours mark is calculated proportionally to the credits of the respective prescribed modules.

1.6 BSc(Hons): (Option) Medicinal Plant Science (Code 03241090)

Suitably qualified candidates may also apply for the interdepartmental BSc(Hons): Biotechnology* (Code 02240392) with a supervisor in the Department of Plant Science.

* Curriculum to be determined by the heads of department in the School of Biological Sciences: Please contact Prof H Huisman, tel 012 4203258, for further details.

a. Admission requirements

BSc(Plant Science), or a recommendation from the head of department if the candidate did not major in Plant Science. A minimum of 60% in Phytomedicine 365 (BOT 365), which is offered at third-year level in the Department of Plant Science. The recommended modules at BSc third-year level are as follows:

1. BOT 367 Practical Plant Identification (Dept of Plant Science)
2. BOT 356 Plant Ecophysiology (Dept of Plant Science)
3. BCM 363 Xeno-Biochemistry (Dept of Biochemistry)
4. BCM 355 Immunobiology (Dept of Biochemistry)
5. FAR 382 Pharmacology (Dept of Pharmacology)
6. CMY 282 Physical Chemistry (Dept of Chemistry)
7. CMY 284 Organic Chemistry (Dept of Chemistry)

b. Duration

The honours degree programme for full-time students covers one academic year and for part-time students two consecutive academic years. Lectures and practicals are scheduled to accommodate part-time students.

c. Learning programme

The programme consists of compulsory modules (40 credits) and elective modules (50 credits). Students may register for modules to the maximum of 20 credits presented by another department, which forms part of the elective modules.

Apart from the compulsory and elective modules, a project, leading to a mini-dissertation (50 credits), forms an essential part of the programme. One seminar (20 credits) must also be written and field excursions are undertaken. In addition to the compulsory modules, electives are selected in consultation with the supervisor.

Total credits required: 160

Programme composition for BSc(Hons): (Option) Medicinal Plant Science

| Code | Module | Sem. | Credits |
|---------|---|------|---------|
| | Compulsory modules | | |
| BAS 751 | Research Methodology 751 | 1 | 8 |
| BOT 761 | Advanced Phytomedicine 761 | 2 | 10 |
| BOT 748 | Phytopharmacology 748 | 1 | 10 |
| BOT 749 | Pharmacognosy / Phytotherapy 749 | 2 | 10 |
| BOT 782 | Mini-dissertation 782 | year | 50 |
| BOT 783 | Seminar main 783 | 2 | 20 |
| BOT 786 | Plant Taxonomy 786 | 1 | 10 |
| | Elective modules | | |
| BOT 712 | Plant Nomenclature 712 | 1 | 10 |
| BOT 718 | Introduction to Plant Biotechnology 718 | 1 | 10 |
| BOT 714 | Seed Ecology 714 | 1 | 10 |
| BOT 719 | Primary Plant Metabolism 719 | 1 | 10 |
| BOT 717 | Plant Morphology 717 | 1 | 10 |
| BOT 722 | General Plant Ecology 722 | 2 | 10 |
| BOT 746 | Applications in Plant Biotechnology 746 | 2 | 10 |
| BOT 741 | Plant Taxonomy 741 | 2 | 10 |
| BOT 742 | Plant Classification 742 | 2 | 20 |
| BOT 781 | Field Evaluation and Management 781 | 1 | 10 |
| BOT 784 | Seminar elective 784 | 1 | 20 |
| BOT 787 | Vegetation Dynamics and Phenology 787 | 2 | 10 |
| BOT 788 | Vegetation Classification 788 | 2 | 10 |

1.7 BSc(Hons): Microbiology (Code 03240911)

Programme composition

Compulsory modules:

MBY 751: Virology 751 (18 credits)

MBY 752: Applied biotechnology 752 (18 credits)

MBY 753: Microbial systematics 753 (18 credits)

MBY 754: Prokaryote molecular biology 754 (18 credits)

MBY 755: Advanced techniques in microbiology 755 (10 credits)

MBY 756: Research project 756 (50 credits)

MBY 757: Literature review 757 (10 credits)

MLB 721: Molecular and Cellular Biology 721 (18 credits)

Total credits required: 160

1.8 BSc(Hons): Plant Pathology (Code 03240931)

a. Programme composition

| Code | Module | Credits |
|---------|---|---------|
| PLG 751 | Research Project in Plant Pathology 751 | 60 |
| MBY 755 | Advanced Techniques in Microbiology 755 | 10 |
| MLB 721 | Molecular and Cellular Biology 721 | 18 |
| PLG 783 | Advanced Plant Disease Control 783 | 18 |
| PLG 789 | Specialist topics 789 | 9 |

| | | |
|----------------------|---|------------|
| PLG 790 | Current Concepts in Plant Pathology 790 | 18 |
| PLG 753 | Molecular Plant Pathology 753 | 18 |
| PLG 754 | Crop Diseases 754 | 9 |
| Total credits | | 160 |

Total credits required: 160

1.9 BSc(Hons): Plant Science (Code 03241091)

Suitably qualified candidates may also apply for the interdepartmental BSc(Hons) Biotechnology* degree (Code 02240392) with a supervisor in the Department of Plant Science.

* Curriculum to be determined by the heads of department in the School of Biological Sciences. Please contact Prof H Huismans, tel 012 4203258, for further details.

a. Admission requirements

BSc(Plant Science), or a recommendation from the head of the department if the candidate did not major in Plant Science.

b. Duration

One academic year for full-time students and two consecutive academic years for part-time students. Lectures and practicals are scheduled to accommodate part-time students.

c. Learning programme

The programme consists of compulsory modules (40 credits) and elective modules (30 credits). Students may register for modules to the maximum of 20 credits presented by another department, which forms part of the elective modules. The following fields are presented in the BSc(Hons): Plant Science programme:

- Plant Diversity (D)
- Plant Biotechnology / Physiology (PB)
- Plant Ecology (E)
- (Option) Medicinal Plant Science

Apart from the compulsory and elective modules, a project, leading to a mini-dissertation (50 credits), forms an essential part of the training programme. Two seminars (20 credits each) must also be written and field excursions are undertaken.

In addition to the compulsory modules, electives are selected in consultation with the supervisor.

Total credits required: 160

Programme composition for BSc(Hons): Plant Science

| Code | Module | Sem. | Credits | D | E | PB |
|---------|--------------------------|------|---------|----|----|----|
| BAS 751 | Research Methodology 751 | 1 | 8 | * | * | * |
| BOT 712 | Plant Nomenclature 712 | 1 | 10 | ** | | |
| BOT 714 | Seed Ecology 714 | 1 | 10 | | ** | |
| BOT 717 | Plant Morphology 717 | 1 | 10 | ** | | |

| | | | | | | |
|---------|---|------|----|----|----|----|
| BOT 718 | Introductory Plant Biotechnology 718 | 1 | 10 | | | ** |
| BOT 719 | Primary Plant Metabolism 719 | 1 | 10 | | | ** |
| BOT 721 | Plant Community Ecology 721 | 2 | 10 | | ** | |
| BOT 722 | General Plant Ecology 722 | 2 | 10 | | ** | |
| BOT 741 | Plant Taxonomy 741 | 2 | 10 | ** | | |
| BOT 742 | Plant Classification 742 | 2 | 20 | ** | | |
| BOT 746 | Applications in Plant Biotechnology 746 | 2 | 10 | | | ** |
| BOT 761 | Advanced Phytomedicine 761 | 2 | 10 | | | ** |
| BOT 781 | Veld Evaluation and Management 781 | 1 | 10 | | ** | |
| BOT 782 | Mini-dissertation 782 | year | 50 | * | * | * |
| BOT 783 | Seminar main 783 | 1 | 20 | * | * | * |
| BOT 784 | Seminar elective 784 | 1 | 20 | * | * | * |
| BOT 786 | Plant Taxonomy 786 | 1 | 10 | | | |
| BOT 787 | Vegetation Dynamics and Phenology 787 | 2 | 10 | | | |
| BOT 788 | Vegetation Classification 788 | 2 | 10 | | | |

* Compulsory modules for all students

** Compulsory modules for the discipline of study

1.10 BSc(Hons): Zoology (Code 03241021)

Programme composition

| Code | Module | Credits |
|---|---|---------|
| Compulsory modules: | | |
| ZEN 701 | Project and Seminars 701 | 80 |
| ZEN 702 | Research methods 702 | 16 |
| ZEN 713 | Scientific communication | 16 |
| Choice of three additional theory modules: | | |
| ZEN 703 | Systematics, evolution & biogeography 703 | 16 |
| ZEN 704 | Environmental Physiology | 16 |
| ZEN 705 | Ecology 705 | 16 |
| ZEN 707 | Integrated Pest Management in Africa 707 | 16 |
| ZEN 710 | Large mammal ecology 710 | 16 |
| ZEN 712 | Behavioural ecology 712 | 16 |

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their post-graduate studies.
- A pass mark is required for all the components of the honours study programme.

Total credits required: 160

2. MASTER'S PROGRAMMES IN THE SCHOOL OF BIOLOGICAL SCIENCES

2.1 MSc: Biochemistry (Code 03251011)

Programme composition

BCM 801: Trends in Biochemical research 801 (18 credits)

BCM 802: Literature Seminar 802 (9 credits)

BCM 890: Research project and dissertation 890 (206 credits)
Examination (7 credits)

Total credits required: 240

2.2 MSc: Bioinformatics (Code 03251014)

a. Admission requirements

Students must be in possession of a BSc(Hons) degree in Bioinformatics or the equivalent thereof.

b. Programme composition

BIF 801: Seminar in Bioinformatics 801 (18 credits)

BIF 802: Trends in Bioinformatics 802 (9 credits)

BIF 803: Research project and report (213 credits)

Total credits required: 240

2.3 *MSc: Biotechnology (Code 03251052)

*Inter-departmental programme. Curriculum to be determined by the Heads of Department in the School of Biological Sciences.

Please consult with Prof H Huismans, Tel 012 4203258, for further details.

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.
- Additional modules may be prescribed by the head of department, e.g. Advanced Language Proficiency 300 (EOT 300), where deemed necessary.

Total credits required: 240

2.4 MSc: Conservation Ecology and Planning (Coursework) (Code 03251028)(Suspended until further notice/No intake for 2009)

a. Programme objectives

To produce professional scientists who are specifically qualified to provide biological expertise in a field of speciality.

b. Duration

A minimum of one year full-time and a maximum of two years part-time study.

The coursework must be completed within the first year of registering.

The coursework is spread over five months.

c. Programme composition

- Coursework consists of four prescribed modules (120 credits):
ZEN 808, ZEN 809, ZEN 872, ZEN 875
- Each coursework module consists of 20 lectures or discussion groups.
- The research project (ZEN 891) is spread over the remaining 6 to 18 months (120 credits)
- The research topic is open to selection by the student and supervisor within the field of study.

- Candidates who have not previously passed a module in biometrics, statistics, or research methodology at BSc(Hons) level are required, in addition to the above, to attend and pass ZEN 702 to qualify for the MSc degree.
- In addition to the above prescribed coursework, all candidates are required to complete a postgraduate module in Research Methodology (BAS 751) that is offered by the Faculty of Natural and Agricultural Sciences.

Total credits required: 240

2.5 MSc: Entomology (Code 03251031)

An MSc degree on the grounds of a dissertation.

Programme composition

ENT 800: Entomology 800

ENT 890: Dissertation 890

Total credits required: 240

2.6 *MSc: (Option) Forest Science (Code 03251050)

*Inter-departmental programme.

a) Admission requirements

A prior four-year bachelor's qualification in Forestry or Forest Science, or an equivalent honours degree in related field.

b) Programme composition

Curriculum to be determined by the Heads of Department in the School of Biological Sciences. Please consult with Prof B Wingfield, Tel 012 4203946 for further details.

GTK 800: Genetics 800

GTK 890: Dissertation 890

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.
- Additional modules may be prescribed by the head of department, e.g. Advanced Language Proficiency 300 (EOT 300), where deemed necessary.

Total credits required: 240

2.7 MSc: Genetics (Code 03251051)

Programme composition

GTK 800: Genetics 800

GTK 890: Dissertation 890

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.

- Additional modules may be prescribed by the head of department, e.g. Advanced Language Proficiency 300 (EOT 300), where deemed necessary.

Total credits required: 240

2.8 MSc: Integrated Pest and Disease Management (Coursework)

(Code 03251025) (Suspended until further notice/No intake for 2009)

Presented jointly by the Department of Microbiology and Plant Pathology and the Department of Zoology and Entomology.

a. Programme objectives

To produce professional scientists who are specifically qualified to provide biological expertise in a field of speciality.

b. Duration

A minimum of one year full-time and a maximum of two years part-time study.
The coursework must be completed within the first year of registering.
The coursework is spread over five months.

c. Programme composition

- Coursework consists of four prescribed modules (120 credits): ZEN 802, ZEN 803, ZEN 804, ZEN 805
- Each coursework module consists of 20 lectures or discussion groups.
- The research project (ZEN 891) is spread over the remaining 6 to 18 months (120 credits)
- The research topic is open to selection by the student and supervisor within the field of study.
- Candidates who have not previously passed a module in biometrics, statistics, or research methodology at BSc(Hons) level are required, in addition to the above, to attend and pass ZEN 702 to qualify for the MSc degree.
- In addition to the above prescribed coursework, all candidates are required to complete a postgraduate module in Research Methodology (BAS 751) that is offered by the Faculty of Natural and Agricultural Sciences.

Total credits required: 240

2.9 MSc: Mammalogy (Coursework)

(Code 03251027)(Suspended until further notice/No intake for 2009)

a. Programme objectives

To produce professional scientists who are specifically qualified to provide biological expertise in a field of speciality.

b. Duration

A minimum of one year full-time and a maximum of two years part-time study.
The coursework must be completed within the first year of registering.
The coursework is spread over five months.

c. Programme composition

- Coursework consists of four prescribed modules (120 credits):

- ZEN 871, ZEN 873, ZEN 874, ZEN 876
- Each coursework module consists of 20 lectures or discussion groups.
 - The research project (ZEN 891) is spread over the remaining 6 to 18 months (120 credits).
 - The research topic is open to selection by the student and supervisor within the field of study.
 - Candidates who have not previously passed a module in biometrics, statistics, or research methodology at BSc(Hons) level are required, in addition to the above, to attend and pass ZEN 702 to qualify for the MSc degree.
 - In addition to the above prescribed coursework, all candidates are required to complete a postgraduate module in Research Methodology (BAS 751) that is offered by the Faculty of Natural and Agricultural Sciences.

Total credits required: 240

2.10 MSc: (Option) Medicinal Plant Science (Code 03251090)

- a. **Admission requirements:**
BSc(Hons): Medicinal Plant Science or a recommendation by the head of department. A minimum of 60% will be necessary in the compulsory modules, BOT 761, BOT 748, and BOT 749, which are offered at honours level in the Department of Plant Science.
- b. **Programme composition**
BOT 800: Plant Science 800
BOT 890: Dissertation 890

Total credits required: 240

2.11 MSc: Microbiology (Code 03250911)

Programme composition
MBG 800: Microbiology 800
MBG 890: Dissertation 890

Total credits required: 240

2.12 MSc: Plant Physiology (Code 03251081)

- a. **Admission requirements**
BSc(Hons): Plant Science or BSc(Hons): (Option) Medicinal Plant Science with an average of 60%, or a recommendation from the head of department.
- b. **Programme composition**
PFG 800: Plant Physiology 800
PFG 890: Dissertation 890

Total credits required: 240

2.13 MSc: Plant Science (Code 03251091)

a. Admission requirements

BSc(Hons): Plant Science or BSc(Hons): (Option) Medicinal Plant Science with an average of 60%, or a recommendation from the head of department.

b. Programme composition

BOT 800: Plant Science 800

BOT 890: Dissertation 890

Total credits required: 240

*BOT 800 and BOT 890 also apply to MSc: Biotechnology (code 03251052) students in the Plant Science department. Curriculum to be determined by heads of departments in the School of Biological Sciences. Please consult with Prof H Huismans, tel 012 4203258 for further details.

2.14 MSc: Plant Pathology (Code 03250881)

Programme composition

PPT 800: Plant Pathology 800

PPT 890: Dissertation 890

Total credits required: 240

2.15 MSc: Systematics and Conservation Evaluation (Coursework) (Code 03251026)(Suspended until further notice/No intake for 2009)

Presented jointly by the Department of Plant Science and the Department of Zoology and Entomology.

a. Programme objectives

To produce professional scientists who are specifically qualified to provide biological expertise in a field of speciality.

b. Duration

A minimum of one year full-time and a maximum of two years part-time study.

The coursework must be completed within the first year of registering.

The coursework is spread over five months.

c. Programme composition

- Coursework consists of four prescribed modules (120 credits):
Students in Zoology and Entomology enrol for ZEN 806, ZEN 807, ZEN 808 and ZEN 809.
Students in Plant Science enrol for ZEN 806, BOT 802, ZEN 808 and ZEN 809.
- Each coursework module consists of 20 lectures or discussion groups.
- The research project (ZEN 891) is spread over the remaining 6 to 18 months (120 credits).
- The research topic is open to selection by the student and supervisor within the field of study.
- Candidates who have not previously passed a module in biometrics, statistics, or research methodology at BSc(Hons) level are required, in addition to the above, to attend and pass ZEN 702 to qualify for the MSc degree.

- In addition to the above prescribed coursework, all candidates are required to complete a postgraduate module in Research Methodology (BAS 751) that is offered by the Faculty of Natural and Agricultural Sciences.

Total credits required: 240

2.16 MSc: Zoology (Code 03251021)

Programme composition

ZOO 800: Zoology 800

ZOO 890: Dissertation 890

Total credits required: 240

3. DOCTORAL PROGRAMMES IN THE SCHOOL OF BIOLOGICAL SCIENCES

3.1 PhD: Biochemistry (Code 03260012)

Programme composition

BCM 901: Trends in Biochemical Research 901 (18 credits)

BCM 990: Research project and thesis 990 (minimum 295 credits)

Examination (7 credits)

Total credits required: 320 – 480

3.2 PhD: Bioinformatics (Code 03260014)

a. Admission requirements

Students must be in possession of an MSc degree in Bioinformatics or an equivalent thereof.

b. Programme composition

BIF 901: Trends in Bioinformatics Research (18 credits)

BIF 990: Research project and thesis (A minimum of 302 credits)

Total credits required: 320 – 480

3.3 *PhD: Biotechnology (Code 03262162)

*Inter-departmental programme.

Programme composition

Curriculum to be determined by the heads of department in the School of Biological Sciences. Please consult with Prof H Huisman, Tel 012 4203258, for further details.

All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.

Total credits required: 360

3.4 PhD: Entomology (Code 03260121)

Programme composition

ENT 900: Entomology 900

ENT 990: Thesis 990

Total credits required: 360

3.5 *PhD: (Option) Forest Science (Code 03262160)

*Inter-departmental programme.

Programme composition

Curriculum to be determined by the heads of department in the School of Biological Sciences. Please consult with Prof B Wingfield, Tel 012 4203946, for further details.

GTK 900: Genetics 900

GTK 990: Thesis 990

All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.

Total credits required: 360

3.6 PhD: Genetics (Code 03260292)

Programme composition

GTK 900: Genetics 900

GTK 990: Thesis 990

All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.

Total credits required: 360

3.7 PhD: (Option) Medicinal Plant Science (Code 03261090)

a. Admission requirements

MSc: (Option) Medicinal Plant Science or MSc: Plant Science, or a recommendation from the head of department. A minimum of 60% is required in the compulsory modules, BOT 761, BOT 748, and BOT 749, which are offered at honours level in the Department of Plant Science.

b. Programme composition

BOT 900: Plant Science 900

BOT 990: Dissertation 990

Total credits required: 360

3.8 PhD: Microbiology (Code 03260072)

Programme composition

MBG 900: Microbiology 900

MBG 990: Thesis 990

Total credits required: 360

3.9 PhD: Plant Pathology (Code 03260302)

Programme composition

PPT 900: Plant Pathology 900

PPT 990: Thesis 990

Total credits required: 400

3.10 PhD: Plant Physiology (Code 03261081)

a. Admission requirements

MSc: Plant Science or MSc: (Option) Medicinal Plant Science 60%, or a recommendation from the head of department.

b. Programme composition

PFG 900: Plant Physiology 900

PFG 990: Dissertation 990

Total credits required: 400

3.11 PhD: Plant Science (Code 03261091)

a. Admission requirements

MSc: Plant Science or MSc: (Option) Medicinal Plant Science 60%, or a recommendation from the head of department.

b. Programme composition

BOT 900 Plant Science 900

BOT 990 Thesis 990

*BOT 900 and BOT 90 also apply to PhD: Biotechnology (code 03262162) students in the Plant Science department. Curriculum to be determined by heads of departments in the School of Biological Sciences. Please consult with Prof H Huismans, tel 012 4203258 for further details.

Total credits required: 400

3.12 PhD: Zoology (Code 03261021)

Programme composition

ZOO 900: Zoology 900

ZOO 990: Thesis 990

Total credits required: 360

4. HONOURS PROGRAMMES OFFERED IN THE SCHOOL OF PHYSICAL SCIENCES

4.1 BSc(Hons): Chemistry (Code 02240121)

a. Admission requirements

An appropriate BSc degree with at least 60% for Chemistry at 300 level.

b. Duration of programme

The programme normally extends over one year for full-time students. The curriculum comprises an advanced study of the four major fields of chemistry.

c. Closing date for applications

Prospective students must apply for admission to the head of department before **15 December** and will be notified of the outcome by 15 January. Details of the contents of the different modules can be obtained from the head of department.

d. Pass requirements:

A subminimum of 40% is required for each module and a final average mark of 50%.

e. Programme composition

| Code | Module | Credits |
|-------------------------------|--------------------------|------------|
| CMY 710 | Analytical Chemistry 710 | 28 |
| CMY 711 | Organic Chemistry 711 | 28 |
| CMY 712 | Inorganic Chemistry 712 | 28 |
| CMY 713 | Physical Chemistry 713 | 28 |
| CMY 729 | Projects 729 | 48 |
| Total credits required | | 160 |

4.2 BSc(Hons): Engineering and Environmental Geology (Code 02240372)

Please note that within the Honours Programme in Engineering and Environmental Geology, there are two possible options, namely *Engineering Geology* and *Hydrogeology*. Each has a component of core modules and of elective modules, as shown in the tables below.

| | |
|---------------------------------------|---|
| Minimum credits required : 160 | |
| | |
| Credits for core modules: 96 | Credits for elective modules: 64 |
| | |

| Core modules for option in ENGINEERING GEOLOGY (96) | | | |
|---|--------------------------------|---------|-----------------|
| Code | Module name | Credits | Prerequisites |
| GTX 713 | Site Investigation Project 713 | 16 | GLY 363/GLY 362 |
| GTX 714 | Engineering Geology of SA 714 | 16 | |
| GTX 722 | Rock Engineering 722 | 16 | PSZ 311 or TDH* |
| GTX 723 | Engineering Applications 723 | 16 | |
| GLY 706 | Mining Methods 706 | 8 | GTX 722 or TDH* |

| | | | |
|--|-------------------------------------|----------------|----------------------|
| GLY 703 | Basin Analysis (tectonics part) 703 | 8 | |
| GLY 713 | Economic Geology 713 | 16 | |
| Elective modules for option in ENGINEERING GEOLOGY (64) | | | |
| Code | Module name | Credits | Prerequisites |
| GTX 715 | Environmental Geochemistry 715 | 16 | PSZ 410 or TDH* |
| GTX 716 | Environmental Management 716 | 16 | |
| GTX 718 | Hydrogeological Modelling 718 | 16 | |
| GTX 721 | Construction Materials 721 | 16 | |
| GTX 726 | Rock and Soil Improvement 726 | 16 | |
| GTX 727 | Mining Project 727 | 32 | |

| | | | |
|---|-------------------------------------|----------------|------------------------------------|
| Core modules for option in HYDROGEOLOGY (96) | | | |
| Code | Module name | Credits | Prerequisites |
| GTX 713 | Site Investigation Project 713 | 16 | GLY 265/GLY 362 |
| GTX 714 | Engineering Geology of SA 714 | 16 | GTX 715 or TDH* |
| GTX 715 | Environmental Geochemistry 715 | 16 | |
| GTX 719 | Contaminant Transport 719 | 16 | |
| GLY 706 | Mining Methods 706 | 8 | |
| GLY 703 | Basin Analysis (Tectonics part) 703 | 8 | |
| GLY 713 | Economic Geology 713 | 16 | |
| Elective modules for option in HYDROGEOLOGY (64) | | | |
| Code | Module name | Credits | Prerequisites |
| GTX 716 | Environmental Management 716 | 8 | GTX 719 or TDH* PSZ 311 or TDH* |
| GTX 718 | Hydrogeological Modelling 718 | 16 | |
| GTX 717 | Environmental Project 717 | 32 | |
| GTX 722 | Rock Engineering 722 | 16 | |
| GTX 726 | Rock and Soil Improvement 726 | 16 | |

* TDH = permission by head of department

4.3 BSc (Hons): Environmental Analysis and Management (Code 02240412)

a. Admission requirements

A BSc degree with suitable majors as recommended by the head of department and 60% average at the 300 and 400- level.

b. Programme composition

Following is the curriculum for the BSc(Hons) in Environmental Analysis and Management. Please note that this may change each year at the discretion of the head of department or the honours co-ordinator in the Department of Geography and Geoinformatics.

| Code | Module name | Credits |
|----------------------------|------------------------------------|----------------|
| Fundamental modules | | |
| GGY 711 | Environmental Principles | 20 |
| Core modules | | |
| GGY 702 | Geography Project | 30 |
| GGY 703 | Research and Presentation Skills | 10 |
| Elective modules | | |
| GGY 701 | Selected Theme 701 | 20 |
| GGY 718 | Southern African Geomorphology 718 | 20 |

| | | |
|---|--|----|
| GGY 727 | Environmental Compliance 727 | 20 |
| GGY 728 | Conservation Environmental Enforcement 728 | 20 |
| GGY 729 | Industrial Environmental Enforcement 729 | 20 |
| GGY 785 | Environmental Impact Assessment and Auditing 785 | 20 |
| GGY 789 | Environmental Change 789 | 20 |
| GGY 795 | Arid Environments 795 (Not offered in 2009) | 20 |
| ZEN 705 | Ecology 705 | 16 |
| ZEN 710 | Large Mammal Ecology 710 | 16 |
| BOT 721 | Plant Community Ecology 721 | 10 |
| BOT 722 | General Plant Ecology 722 | 10 |
| BOT 781 | Veld Evaluation and Management 781 | 10 |
| Appropriate modules other than the above approved by the honours co-ordinator or head of department may be taken. | | |

Minimum credits required: 160

4.4 BSc(Hons): Geography (Code 02240411)

a. Admission requirements

An appropriate bachelor's degree, with an overall average of 60% for 300 and 400-level modules.

b. Programme composition

Following is the curriculum for the BSc(Hons) in Geography. Please note that this may change each year at the discretion of the head of department or the honours co-ordinator in the Department of Geography and Geoinformatics.

| Code | Module name | Credits |
|----------------------------|--|---------|
| Fundamental modules | | |
| GGY 710 | Evolution of Geographical Thought 710 | 20 |
| UNI 780 | or GIS Introduction 780 | 20 |
| Core modules | | |
| GGY 702 | Geography Project 702 | 30 |
| UNI 792 | or GIS Project 792 | 30 |
| GGY 703 | Research and Presentation Skills 703 | 10 |
| Elective modules | | |
| GGY 701 | Selected Theme 701 | 20 |
| GGY 719 | Special Regional Focus 719 | 20 |
| GGY 780 | Urban Geography of Southern Africa 780 | 20 |
| GGY 718 | South African Geomorphology 718 | 20 |
| GGY 785 | Environmental Impact Assessment and Auditing 785 | 20 |
| GGY 789 | Environmental Change 789 | 20 |
| GGY 793 | Geography of Land Reform 793 | 20 |
| GGY 795 | Arid Environments 795 (Not offered in 2009) | 20 |
| UNI 763 | Internet GIS | 20 |
| UNI 766 | Spatial Statistics 766 | 20 |
| UNI 781 | Data Modelling and Data Structures 781 | 20 |
| UNI 783 | Geographic Databases 783 | 20 |
| UNI 785 | Spatial Analysis 785 | 20 |
| UNI 787 | Data Acquisition and Quality 787 | 20 |

Appropriate modules other than the above approved by the honours co-ordinator or head of department may be taken.

Minimum credits required: 160

4.5 BSc(Hons): Geoinformatics (Code 02240408)

a. Admission requirements

A BSc Geoinformatics degree or applicable BSc degree with relevant experience in computer data management and analysis. In the latter case prospective students will be required to do additional modules to enable them to reach the desired level of study. Selection takes place before admittance. All these modules are available on a distance learning basis.

b. Programme composition

Students can choose from the following modules in consultation with the programme manager:

| Code | Module name | Credits |
|---|--|---------|
| GGY 703 | Research and Presentation Skills 703 (Compulsory for all students) | 10 |
| UNI 763 | Internet GIS 763 | 20 |
| UNI 766 | Spatial Statistics 766 | 20 |
| UNI 780 | GIS Introduction 780 | 20 |
| UNI 781 | Data Modelling and Data Structures 781 | 20 |
| UNI 783 | Geographic Databases 783 | 20 |
| UNI 785 | Spatial Analysis 785 | 20 |
| UNI 787 | Data Acquisition and Quality 787 | 20 |
| UNI 790 | Visualisation 790 | 20 |
| UNI 791 | GIS and Organisations 791 | 20 |
| UNI 792 | GIS Project 792 (Compulsory for all students) | 30 |
| Modules offered by other departments can also be selected in consultation with the programme manager. | | |

Minimum credits required: 160

4.6 BSc (Hons): Geology (Code 02240141)

Programme composition

| Code | Core modules | Credits |
|---------|--|---------|
| GLY 702 | Fluid-rock Interaction 702 | 16 |
| GLY 703 | Basin Analysis 703 | 16 |
| GLY 704 | Crustal Evolution 704 | 16 |
| GLY 706 | Mining Methods 706 | 8 |
| GLY 707 | Mapping Camp 707 | 8 |
| GLY 710 | Research Project 710 | 32 |
| GLY 711 | Igneous Petrology and Geochemistry 711 | 16 |
| GLY 712 | Metamorphic Petrology and Geochemistry 712 | 16 |
| GLY 713 | Economic Geology 713 | 16 |
| GLY 714 | Mineralogy 714 | 16 |

Total credits required: 160

4.7 BSc(Hons): Meteorology (Code 02240070)

a. Admission requirements

A BSc: Meteorology degree

OR

An appropriate bachelor's degree with second-year Mathematics and first-year Physics

WKD 151: Atmospheric Processes

WKD 152: Atmospheric Circulation and Climate

WKD 701: Dynamic and Synoptic Meteorology

WKD 702: Physical and Applied Meteorology

WTW 114: Calculus*

WTW 128: Calculus*

WTW 126: Linear Algebra*

WTW 218: Calculus*

PHY 171: First Course in Physics*

(* or an equivalent qualification as approved by the Head of the Department.)

| Core modules | Cts | Elective modules | Cts |
|--|-----|---|-----|
| Study field 1: Dynamic meteorology | | | |
| • WKD 706: Dynamic meteorology | 20 | • WKD 703: Seasonal climate modelling | 20 |
| • WKD 713: Research methodology | 20 | • WKD 704: Numerical modelling: Applications | 20 |
| Study field 2: Weather forecasting | | • WKD 718: Specialized forecasting | 20 |
| • WKD 751: Instrumentation and general meteorology | | • WKD 705: Numerical modelling: Basic concepts | 20 |
| • WKD 714: Remote sensing | 20 | • WKD 706: Dynamic meteorology | 20 |
| • WKD 715: Extra tropical meteorology and classical forecasting techniques | 20 | • WKD 708: Cloud microphysics | 20 |
| • WKD 709: Tropical and meso-scale meteorology | 20 | • WKD 761: Basic concepts of remote sensing | 20 |
| • WKD 716: Marine forecasting | 20 | • WKD 709: Tropical and mesoscale meteorology | 20 |
| • WKD 717: Aviation forecasting | 20 | • WKD 719: Boundary layer meteorology | 20 |
| • WKD 718: Specialized forecasting | 20 | • WKD 781: Cloud dynamics | 20 |
| Study field 3: Physical meteorology | | • WKD 751: Instrumentation & general meteorology | |
| • WKD 708: Cloud microphysics | 20 | • WKD 713: Research methodology | 20 |
| • WKD 781: Cloud dynamics | 20 | • WKD 715: Extra trop. met. & class forecast. tech. | 20 |
| • WKD 761: Basic concepts of remote sensing | 20 | • WKD 714: Remote sensing | 20 |
| • WKD 714: Remote sensing | 20 | • WKD 716: Marine forecasting | 20 |
| • WKD 713: Research methodology | 20 | • WKD 717: Aviation forecasting | 20 |

| | Credits for core modules | Credits for elective modules |
|----------------------|--------------------------|------------------------------|
| Dynamic Meteorology | 40 | 120 |
| Weather Forecasting | 140 | 20 |
| Physical Meteorology | 100 | 40 |

Total credits required: 160

4.8 BSc(Hons): Physics (Code 02240231)

a. Admission requirements

BSc (or equivalent qualification) with a minimum of 60% in Physics at third-year level and with permission from the head of department.

b. Programme composition

| Code | Module name | Lectures | Credits |
|---------|-------------|----------|---------|
| FSK 700 | Physics 700 | 240 | 160 |

Students registered for the BSc(Hons) Physics degree enrol for Physics 700. The programme comprises 160 credits and consists of 240 lectures, including advanced experimental work, and a project also presented as a seminar. The curriculum is compiled in consultation with the Head of the Department of Physics, from whom details are available. With permission from the head of department a maximum of 30 credits may be taken from other postgraduate modules from other departments. The modules listed below may be taken by students in other honours study programmes. They must, however, first consult with the Head of the Department of Physics about the availability of a particular module in a particular year.

Postgraduate Physics modules

| Code | Module name | Lectures | Credits |
|---------|--|----------|---------|
| PHY 701 | Mathematical Methods 701 | 30 | 15 |
| PHY 702 | Classical Mechanics 702 | 30 | 15 |
| PHY 703 | Quantum Mechanics I 703 | 30 | 15 |
| PHY 704 | Statistical Physics 704 | 30 | 15 |
| PHY 705 | Electrodynamics I 705 | 30 | 15 |
| PHY 706 | Project and Seminar 706 | | 15 |
| PHY 707 | Quantum Mechanics II 707 | 30 | 15 |
| PHY 708 | Many Body Physics 708 | 30 | 15 |
| PHY 709 | Electrodynamics II 709 | 30 | 15 |
| PHY 710 | Numerical Physics 710 | 30 | 15 |
| PHY 711 | Solid State Physics 711 | 30 | 15 |
| PHY 712 | Quantum Optics 712 | 20 | 10 |
| PHY 713 | Electronic Materials 713 | 30 | 15 |
| PHY 714 | Analytical Physics 714 | 30 | 15 |
| PHY 716 | Group Theory 716 | 20 | 10 |
| PHY 718 | Experimental Physics 718 (5 experiments) | | 15 |
| PHY 781 | Foundations of Physics 781 | 20 | 10 |
| PHY 782 | Current trends in Physics 782 | 30 | 30 |

5. MASTER'S PROGRAMMES IN THE SCHOOL OF PHYSICAL SCIENCES

5.1 MSc: Applied Mineralogy (Code 02250381)

Programme composition

TMN 890: Dissertation 890 (160 credits)

Selected coursework as prescribed by the head of the department (40 credits).

Total credits required: 200

In addition to the dissertation, 20% of the total credits are allocated to coursework as prescribed by the head of the department according to the needs and background of the individual MSc student.

5.2 MSc: Chemistry (Code 02250121)

Programme composition

CHM 800: Chemistry 800

CHM 890: Dissertation 890

Total credits required: 200

5.3 MSc: Engineering Geology (Code 02250371)

Programme composition

IGL 890: Dissertation 890

Total credits required: 200

5.4 MSc: Engineering and Environmental Geology (Code 02250372)

Programme composition

IGL 890: Dissertation 890

Total credits required: 200

5.5 MSc: Geography (Code 02250411)

Programme composition

GGF 800: Geography 800

GGF 890: Dissertation: Geography 890

Total credits required: 240

5.6 MSc: Geoinformatics (Code 02250412)

Programme composition

GIS 890: Dissertation: Geoinformatics 890

Total credits required: 240

5.7 MSc: Geology (Code 02250141)

Programme composition

GLG 890: Dissertation 890

Total credits required: 200

5.8 MSc: Meteorology (Code 02250070)

Programme composition

AWM 800: Meteorology 800

AWM 890: Dissertation: Meteorology 890

Total credits required: 240

5.9 MSc: Physics (Code 02250231)

a. Admission requirements

BSc(Hons) in Physics (or equivalent qualification) and with permission from the head of department.

b. Programme composition and credit requirements:

240 credits consisting of:

Dissertation (determined by supervisor and head of department)

Theoretical modules (maximum of 60 lectures) may be taken and are determined by the supervisor and head of department. These modules are to supplement the subject of the dissertation of the student.

FSK 890: Dissertation 890 (210 credits)

PHY 891: Relevant courses 891 (30 credits)

6. DOCTORAL PROGRAMMES IN THE SCHOOL FOR PHYSICAL SCIENCES

6.1 PhD: Chemistry (Code 02260451)

Programme composition

CHM 900: Chemistry 900

CHM 990: Thesis 990

Total credits required: 360

6.2 PhD: Engineering and Environmental Geology (Code 02260542)

Programme composition

IGL 900: Engineering Geology 900

IGL 990: Thesis 990

Total credits required: 360

6.3 PhD: Geography (Code 02260511)

Programme composition

GGF 900: Geography 900

GGF 990: Thesis: Geography 990

Total credits required: 400

6.4 PhD: Geoinformatics (Code 02260512)

Programme composition

GIS 900: Geinformatics 900

GIS 990: Thesis: Geoinformatics 990

Total credits required: 480

6.5 PhD: Geology (Code 02260521)

Programme composition

GLG 900: Geology 900

GLG 990: Thesis 990

Total credits required: 360

6.6 PhD: Meteorology (Code 02260630)

Programme composition

AWM 900: Meteorology 900

AWM 990: Thesis Meteorology 990

Total credits required: 450

6.7 PhD: Physics (Code 02260481)

a. Admission requirements

MSc in Physics (or equivalent qualification) and with permission from the head of department.

b. Programme composition and credit requirements:

360 credits consisting of:

i) Thesis (determined by supervisor and head of department)

ii) Optional modules

The contents of the coursework are determined by the supervisor and head of department to supplement the subject of the thesis of the student.

FSK 990: Thesis 990 (360 credits)

Optional modules can be chosen from the following list:

PHY 701 Mathematical Methods 701 (15 credits)

PHY 702 Classical Mechanics 702 (15 credits)

PHY 703 Quantum Mechanics (I) 703 (15 credits)

PHY 704 Statistical Physics 704 (15 credits)

PHY 705 Electrodynamics (I) 705 (15 credits)

PHY 706 Project and Seminar 706 (15 credits)

| | | |
|---------|---------------------------------|--------------|
| PHY 707 | Quantum Mechanics (II) 707 | (15 credits) |
| PHY 708 | Many Body Physics 708 | (15 credits) |
| PHY 709 | Electrodynamics (II) 709 | (15 credits) |
| PHY 710 | Numerical Physics 710 | (15 credits) |
| PHY 711 | Solid State Physics 711 | (15 credits) |
| PHY 712 | Quantum Optics 712 | (10 credits) |
| PHY 713 | Electronic Materials 713 | (15 credits) |
| PHY 714 | Analytical Physics 714 | (15 credits) |
| PHY 715 | Nuclear Solid State Physics 715 | (10 credits) |
| PHY 716 | Group Theory 716 | (10 credits) |
| PHY 718 | Experimental Physics 718 | (15 credits) |
| PHY 781 | Foundations of Physics 781 | (10 credits) |
| PHY 782 | Current trends in Physics 782 | (30 credits) |
| PHY 891 | Relevant Courses 891 | (30 credits) |

Relevant study courses as prescribed by the head of department.

7. BSC HONOURS PROGRAMMES IN THE SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

7.1 BSc(Hons): Animal Science (Code 03241201)

The BSc(Hons) degree in Animal Science covers one academic year (two semesters) of full-time study. The admission requirements are a BSc(Animal Science) degree or equivalent qualification. A South African equivalent aggregate mark of 60% is usually required for all the modules taken in the final year of undergraduate studies. Determination, attitude and standard of undergraduate projects, where available, will also be taken into consideration. Students are selected on merit.

The honours degree consists of the following compulsory modules:

| | | |
|-----------|----------------------------------|--------------|
| (TLR 700) | Animal Breeding and Genetics 700 | (24 credits) |
| (VGE 703) | Animal Nutrition 700 | (50 credits) |
| (PFS 700) | Production Physiology 700 | (22 credits) |
| (VKU 700) | Animal Science 700 | (70 credits) |

A minimum of 166 credits is required to obtain the degree.

Note: A pass mark is required for all the components of the honours programme and the average mark is calculated proportionally to the credits.

Additional modules can be prescribed to remedy shortcomings in a candidate's undergraduate training, notably BME 210 and GKD 250.

7.2 BSc(Hons): Food Science (Code 03240921)

The University of Pretoria together with the CSIR's Division of BioSciences is the Southern African Development Community's official centre for postgraduate training in Food Science and Technology.

a. Admission requirements

A BSc: Food Science degree with a pass mark of at least 60%. A candidate with another, applicable academic background can be admitted to the programme on passing a preliminary examination and/or on completion of certain prescribed modules aimed at supplementing lacking background knowledge.

b. Duration

One year full-time.

c. Programme composition (Compulsory modules – 120 credits)

| | |
|-----------|--|
| (FST 700) | Research Methodology and Seminars 700 (20 credits) (Year module) |
| (FST 712) | Sensory Evaluation 712 (10 credits) |
| (FST 713) | Product Development & Quality Management 713 (30 credits) |
| (FST 720) | Advanced Food Science 720 (20 credits) |
| (FST 763) | Research project 763 (40 credits) (Year module) |

Elective modules (40 credits)

Each candidate must complete elective modules to a total of 40 credits.

We strongly recommend the following two modules as electives, or other modules as approved by the head of department:

| | |
|-----------|--|
| (FST 701) | Animal Food Technology 701 (20 credits) |
| (FST 702) | Plant Food Technologies 702 (20 credits) |

Total credits required: 160

7.3 BSc(Hons): Nutrition and Food Science (Code 03240922)

a. Admission requirements

A BSc: Nutrition and Food Science degree with a pass mark of at least 60%. A candidate with another, applicable academic background can be admitted to the programme on passing a preliminary examination and/or on completion of certain prescribed modules aimed at supplementing lacking background knowledge.

b. Duration

One year full-time.

c. Composition of the programme

| | |
|-----------|---|
| (FST 700) | Research Methodology and Seminars 700 (20 credits) |
| (FST 712) | Sensory Evaluation 712 (10 credits) |
| (VDS 713) | Recipe Development and Standardisation 713 (30 credits) or |
| (FST 713) | Product Development and Quality Management 713 (30 credits) |
| (VWV 720) | Advanced Nutrition and Food Science 720 (20 credits) |
| (VWV 763) | Research Project 763 (45 credits) |
| (VDS 723) | Food Consumerism and Product Advice 723 (15 credits) |
| (VWV 765) | Micronutrient Malnutrition 765 (20 credits) |

Total credits required: 160

7.4 BSc(Hons): Soil Science (Code 03240901)

a. Admission requirements

Chemistry at second-year level and Geology at first-year level are required.

b. Programme composition

The honours degree is awarded on the basis of formal modules passed. Students registered for BSc(Hons) Soil Science will register for all the Soil Science modules prescribed for the fourth year BSc(Agric), any other modules deemed necessary by

the head of department as well as PGW 702 and a choice out of the following modules:

- (GDK 771) Soil Chemistry 771 (30 credits)
- (GDK 772) Soil Physics 772 (30 credits)
- (GDK 773) Plant Nutrition, Soil Biology and Soil Fertility 773 (30 credits)
- (GDK 774) Pedology and Soil Mineralogy 774 (30 credits)
- (GDK 779) Basic Soil Science 779 (10 credits)
- (PGW 702) Scientific Communication 702 (30 credits)

Total credits required: 160

7.5 BSc(Hons): Wildlife Management (Code 03241001)

a. Admission requirements

To qualify for admission to the BSc(Hons) in Wildlife Management, prospective students must have completed a BSc degree with Animal Science, Ecology, Zoology, Plant Science, or a similar relevant biological major subject; or a BSc(Agric)(Animal Sciences and/or Plant Production); a BSc(Forestry), a BVSc degree, or a similar degree. The candidate must also furnish proof of having passed a relevant module in statistics, otherwise they must register for one separately. A South African equivalent aggregate mark of 60% is usually required for all the modules taken in the final year of undergraduate studies. Determination, attitude and standard of undergraduate projects, where available, will also be taken into consideration. Students are selected on merit.

b. Closing date for applications

All applications for admission should reach the Client Service Centre, University of Pretoria, Pretoria, 0002 or the Director of the Centre for Wildlife Management by **15 October** of the preceding year.

c. Duration of the programme

The programme extends over one academic year, full-time.

d. Programme composition

The curriculum is compiled in consultation with the Director of the Centre for Wildlife Management from the modules stated below or any other relevant modules. The programme includes lectures/discussions, seminars, a research project (paper), excursions and informal seminars/lectures. A final mark of at least 50% is required in each of the modules listed for this honours degree.

The honours programme comprises a minimum of 160 credits:

| Module name | Credits |
|---|---------|
| NLB 780 Animal population dynamics | 5 |
| NLB 781 Wildlife management principles and techniques | 5 |
| NLB 782 Wildlife nutrition | 10 |
| NLB 783 Paracites, diseases and capture of wild animals | 10 |
| NLB 784 Man and natural resources | 5 |
| NLB 785 Seminar | 15 |
| NLB 795 Research project | 40 |
| BOT 781 Veld evaluation and management | 10 |

| | | |
|---------|--------------------------------------|----|
| BOT 785 | Vegetation of South Africa | 10 |
| BOT 786 | Plant taxonomy | 10 |
| BOT 787 | Plant dynamics and phenology | 10 |
| BOT 788 | Plant classification | 10 |
| GDK 779 | Basic soil science | 10 |
| WDE 701 | Range Management in Wildlife Systems | 10 |

Total credits required **160**

The Department of Plant Science presents the following modules for BSc(Hons): Wildlife Management:

| | |
|---------|------------------------------------|
| BOT 781 | Veld evaluation and management 781 |
| BOT 785 | Vegetation of South Africa 785 |
| BOT 786 | Plant Taxonomy 786 |
| BOT 787 | Plant dynamics and phenology 787 |
| BOT 788 | Plant Classification 788 |

8. BSC(AGRIC) HONOURS PROGRAMMES IN THE SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

8.1 BSc(Agric)(Hons): Plant Production (Code 03240160)

Postgraduate training in the department is offered in agronomy, grassland science, horticultural science, ornamental horticultural science, soil science and weed science. **A minimum of 160 credits is required, of which at least 120 should be in the major discipline.**

a. Duration

One year full-time study.

b. Programme composition

| Code | Module name | Credits |
|---|-------------------------------|---------|
| PGW 701 | Plant Production 701 | 30 |
| PGW 702 | Scientific Communication 702 | 30 |
| PGW 704 | Crop Research Methodology 704 | 15 |
| Electives: Any module that is presented in the Faculty of Natural and Agricultural Sciences, chosen in consultation with the Head(s) of Department(s). | | 85 |

8.2 BSc(Agric)(Hons): Soil Science (Code 03240032)

a. Admission requirements

Chemistry at second-year level and Geology at first-year level are required.

b. Programme composition

The honours degree is awarded on the basis of formal modules passed. Students registered for BSc(Hons) Soil Science will register for all the Soil Science modules prescribed for the fourth year BSc(Agric), any other modules deemed necessary by

the head of department as well as PGW 702 and a choice out of the following modules:

- (GDK 771) Soil Chemistry 771 (30 credits)
- (GDK 772) Soil Physics 772 (30 credits)
- (GDK 773) Plant Nutrition, Soil Biology and Soil Fertility 773 (30 credits)
- (GDK 774) Pedology and Soil Mineralogy 774 (30 credits)
- (GDK 779) Basic Soil Science 779 (10 credits)

Total credits required: 160

9. MASTER'S PROGRAMMES IN THE SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

9.1 MConsumer Science

There are two options available, each requiring a minimum of 240 credits

Dissertation option: Interior Merchandise Management (02253004)
Clothing Management (02253006)
Food Management (02253008)
General (02253009)

Coursework option: Interior Merchandise Management (02253003)
Clothing Management (02253005)
Food Management (02253007)
General (02253010)

a. Admission requirements

For the MConsumer Science degree with specialisation in Clothing, Interior, Foods and Nutrition, a four-year BConsumer Science degree that is BCom-based is required. A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for acceptance.

For the MConsumer Science General, other applicable four-year degrees will be considered.

b. Duration of study

A minimum of two years full-time and a maximum of four years part-time study.

c. Programme composition

Dissertation option:
(NME 814) Research methodology 814 (30 credits)
Theoretical framework (15 credits)*
Electives (a minimum of 30-45 credits, of which 30 credits must be from the Department of Consumer Science)
VBR 890 (Dissertation) (150 credits)

Coursework option:
(NME 814) Research methodology 814 (30 credits)
Theoretical framework (15 credits)*

Electives (a minimum of 120-135 credits, of which 60 credits must be from the Department of Consumer Science)

VBR 892 (Essay) (60 credits)

*To earn credits for theoretical frameworks one of the following modules can be taken:

| | | Credits |
|-----------|---|----------------|
| (HSK 810) | Theoretical frameworks in Cultural Studies | 15 |
| (HSK 812) | Theoretical frameworks in Consumer Studies | 15 |
| (HSK 813) | Symbolic Interactionism: Social Cognition and a Life Course Perspective 813 | 15 |

Other applicable theoretical frameworks offered in and outside the Department can be taken with the approval of the postgraduate committee of the Department.

Depending on the study, a maximum of two postgraduate modules may be selected from disciplines in other departments.

Students who hold an honours degree related to one of the chosen specialisation areas, may apply for exemption of certain modules. The level and scope of the modules will be considered for exemption purposes.

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

A basic course in Statistics is compulsory when a quantitative approach is used for the research for the dissertation/essay.

Work on the dissertation/essay consists of three parts, namely a research proposal, project execution, and writing the research report (dissertation/essay). It is compulsory to give an oral presentation of the proposal as well as of the research on completion of the degree.

Electives for the different areas of specialisation:

| Interior Merchandise Management Programmes | |
|--|--|
| First semester electives | Second semester electives |
| ITW 881: Equipment studies 881 (30 credits) | ITW 880: Interior merchandising 880 (30 credits) |
| TKS 881: Textiles and quality control 881 (30 credits) | ITW 882: Socio-psychological aspects of housing and interior 882(30 credits) |
| VBF 811: Consumer facilitation 811 (30 credits) | |

| Clothing Management Programmes | |
|---|--|
| First semester electives | Second semester electives |
| KLD 880: Social aspects of clothing 880 (30 credits) | KLD 883: Clothing: Product development 883 (30 credits) |
| TKS 881: Textiles and quality control 881 (30 credits) | KLD 884: Clothing merchandising 884 (30 credits) |

| Food Management programmes | |
|--|---|
| First semester electives | Second semester electives |
| VDS 880: Social aspects of foods 880 (15 credits) | VDS 883: Consumer aspects of food product design and development 883 (15 credits) |
| VDS 881: Food merchandising 881 (15 credits) | VDG 881: Nutritional assessment and status 881 (15 credits) |
| VDG 880: Contemporary aspects of nutrition 880 (30 credits) | VVW 762: Food compositional data 762 (30 credits) |
| VDB 880: Menu planning (30 credits) | VVW 765: Micronutrient Malnutrition 765 (20 credits) |
| VDB 881: Quality management in food service systems 881 (30 credits) | |

| General programmes* | |
|--|---|
| First semester electives | Second semester electives |
| VBF 811: Consumer facilitation 811 (30 credits) | ITW 880: Interior merchandise 880 (30 credits) |
| VDS 880: Social aspects of foods 880 (15 credits) | ITW 881: Equipment studies 881 (30 credits) |
| *Subjects from the other fields of specialisation may be included in this particular programme | ITW 882: Socio-psychological aspects of housing and interior 882 (30 credits) |
| | KLD 880: Social aspects of clothing 880 (30 credits) |

Electives outside the department

The following electives can be considered for certain programmes or are prerequisites for certain electives (see paragraph 4):

| Code | Module name | Credits |
|-------------|---|----------------|
| (ENP 812) | Entrepreneurship 812 | 20 |
| (ENP 821) | Introduction to entrepreneurship 821 | 20 |
| (BEM 781) | Marketing management 781 | 20 |
| (KBE 780) | Small business management 780 | 20 |
| (KHB 780) | Retail management 780 | 20 |
| (TBE 711) | Strategic tourism management 711 | 20 |
| (TBE 713) | Strategic hospitality management (food focus) 713 | 20 |
| (TBE 811) | Strategic management 811 | 20 |
| (VVW 762) | Food compositional data 762 | 40 |
| (VVW 765) | Micronutrient Malnutrition 765 | 20 |
| (AGV 726) | Extension 726 (Planology and Programme Planning) | 20 |
| (AGV 728) | Extension 728 (Extension Evaluation) | 20 |
| (AGV 729) | Extension 729 (Adoption and Diffusion) | 20 |

Prerequisites for electives

The following orientation/s or elective/s from other departments is/are prerequisites for (a) particular elective/s:

| <u>Prerequisite(s)</u> | <u>Elective</u> |
|--|--|
| HSK 810: Theoretical frameworks in Cultural Studies 810; and/or HSK 813: Symbolic Interactionism: Social Cognition and a Life Course Perspective 813 | KLD 880: Social aspects of clothing 880 |
| KHB 780: Retail management 780 | KLD 883: Clothing: Product development 883 |
| KHB 780: Retail management 780 | KLD 884: Clothing merchandising 884 |
| HSK 812: Theoretical frameworks in Consumer studies 812; and/or KHB 780: Retail Management 780 | ITW 880: Interior merchandising 880 |
| HSK 812: Theoretical frameworks in Consumer studies 812 | ITW 881: Equipment studies 881 |
| HSK 810: Theoretical frameworks in Cultural Studies 810; and/or HSK 813: Symbolic Interactionism: Social Cognition and a Life Course Perspective 813 HSK 812: Theoretical frameworks in Consumer studies 812 | ITW 882: Socio-psychological aspects of housing and interior 882 |
| HSK 812: Theoretical frameworks in Consumer studies 812 | VBF 811: Consumer facilitation 811 |
| HSK 810: Theoretical frameworks in Cultural studies 810 | VDS 880: Social aspects of foods 880 |
| KHB 780: Retail management 780; and BEM 781: Marketing management 781 | VDS 881: Food merchandising 881 |
| KHB 780: Retail management 780; or HSK 812: Theoretical frameworks in Consumer studies 812 | VDS 883: Consumer aspects of food product design and development 883 |

9.2 MPhil: Wildlife Management (Code 03250700)

a. Admission

Students wishing to register for the MPhil(Wildlife Management) should have obtained an approved four-year first degree at a recognised university or any qualification that is accepted by the Senate as equivalent to it in terms of Regulation G.62.

b. Duration

The programme extends over two years. The theoretical component forms 40%, the research project 35% and the practical component 25% of the programme.

c. Programme composition

This programme is aimed at candidates interested in this field but who come from various non-biological backgrounds. It is a postgraduate programme focusing on the philosophy, ethics, ecological principles and application of wildlife management.

| Compulsory theoretical modules | Credits |
|--|----------------|
| (NLB 871) The philosophy, principles and ethics of wildlife management | 10 |
| (NLB 872) Man and conservation | 5 |
| (NLB 873) Veld management | 7 |
| (NLB 874) Plant identification | 5 |
| (NLB 875) Vegetation dynamics | 5 |
| (NLB 876) Reptile biology and identification | 5 |
| (NLB 877) Mammalogy | 5 |
| (NLB 878) Wildlife nutrition | 10 |
| (NLB 879) Wildlife management techniques | 6 |
| (NLB 880) Parasites and diseases | 5 |
| (NLB 881) Game ranch and nature reserve economics | 5 |
| (NLB 882) Animal population dynamics | 7 |
| (NLB 883) Ecotourism | 7 |
| (NLB 884) Wildlife and the law | 7 |
| (NLB 885) Wildlife utilisation | 7 |
| (NLB 886) Practical studies | 60 |
| (NLB 887) Research project | 84 |
| Total credits required | 240 |

9.3 MSc: Food Science (Code 03250921)

Programme composition

The degree is conferred based on a dissertation and other requirements as follows:

FST 801: Advanced Food Science 801 (20 credits)

Any one module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

FST 890: Dissertation (220 credits)

Each candidate must write a dissertation on his/her research project in Food Science and/or Food Technology and at least a concept research paper for publication in a peer-reviewed scientific journal.

Total credits required: 240

9.4 MSc: Nutrition (Code 03251106)

Programme composition

The degree is conferred based on a dissertation and 60 credits of coursework.

VDG 801: Electives (60 credits)

Modules at the advanced level chosen in consultation with the Director of the Centre for Nutrition and the Head of Department. See list of modules below.

VDG 890: Dissertation (180 credits)

Each candidate must write a dissertation on his/her research project in Nutrition and at least a concept research paper for publication in a peer-reviewed scientific journal.

List of elective modules – choose modules to the value of 60 credits

- (VDS 880) Social Aspects of Foods 880 (15 credits)
(VDS 881) Food Merchandising 881 (15 credits)
Prerequisite: KHB 780 (Merchandising orientation)
(VDS 883) Consumer Aspects of Food Product Design and Development 883 (15 credits)
*Prerequisites: HSK 812 (Theoretical frameworks in Consumer studies)
KHB 780 (Merchandising orientation)*
(VDG 880) Contemporary Aspects of Nutrition 880 (15 credits)
Prerequisites: VDG 211 & 320 Nutrition (Principles of basic nutrition and nutrition during the life cycle) or similar modules
(VDG 881) Nutritional assessment and status 881 (15 credits)
Prerequisites: VDG 211 & 320 Nutrition or similar modules
(DEK 802) Seminar meetings 802 (15 credits)
(DEK 803) Literature studies 803 (15 credits)
(PFS 801) Production Physiology 801 (30 credits)
(PFS 802) Production Physiology 802 (30 credits)
(VLE 801) Meat Science 801 (30 credits)
(VLE 802) Meat Science 802 (30 credits)
(VGE 801) Monogastric Nutrition 801 (30 credits)
(VGE 802) Ruminant Nutrition 802 (30 credits)

Total credits required: 240

9.5 MSc: Soil Science (Code 03250901)

Programme composition

- GDK 800: Soil Science 800 (80 credits)
GDK 890: Dissertation (160 credits)

Total credits required: 240

9.6 MSc: Wildlife Management (Code 03251001)

Programme composition

- NLB 890: Dissertation 890
Research project with dissertation. Please contact the Acting Director: Centre for Wildlife Management; Prof W van Hoven on 0124202569 for the available options.

Total credits required: 240

9.7 MSc(Agric): Agricultural Economics (Code 03250041)

The requirements for the master's degree are the following:

- i) At least 9 semester modules (155 credits).
- ii) Completing the module in research methodology: LEK 783.
- iii) A dissertation based on research under the guidance of a member of the academic staff of the department (LEK 890: Dissertation 890).

Programme composition

| Code | Module | Credits |
|---|---|----------------|
| First year | | |
| Core modules | | |
| MIE 780 | Microeconomics 780 | 20 |
| EKT 713 | Econometrics 713 | 20 |
| LEK 711 | Advanced Production Economics 711 | 20 |
| LEK 810 | Agricultural Economics (Econometrics) 810 <i>[students attend EKT 723 and do practicals and additional lectures in Department of Agricultural Economics]</i> | 20 |
| LEK 882 | Institutional and Behavioural Economics 882 | 15 |
| Elective modules (According to area of specialisation) | | |
| Environmental Economics: | | |
| LEK 726 | Environmental Valuation and Policy 726 | 15 |
| LEK 886 | The Economics of Natural Resources Management 886 | 15 |
| <i>Two electives from:</i> | | |
| LEK 814 | Quantitative Models for Agricultural Policy and Planning 814 | 15 |
| LEK 780 | Introduction to Natural Resource and Environmental Economics 780 | 15 |
| LEK 785 | Project Planning and Appraisal 785 | 15 |
| Any other elective of relevance to environmental economics | | |
| Agricultural and Rural Finance: | | |
| LEK 722 | Agricultural Finance 722 | 15 |
| LEK 784 | Advanced Rural Finance 784 | 15 |
| <i>Two electives from:</i> | | |
| LEK 712 | Agricultural Policy 712 | 15 |
| LEK 723 | Agricultural Economics (Agricultural Development) 723 | 15 |
| LEK 785 | Project Planning and Appraisal 785 | 15 |
| Any other elective in Financial Management | | |
| Agribusiness management: | | |
| <i>Any four electives from:</i> | | |
| IEK 780 | International Economics 780 | 15 |
| LEK 713 | Agricultural Marketing 713 | 15 |
| LEK 720 | Strategic Management in Agriculture 720 | 15 |
| LEK 722 | Agricultural Finance 722 | 15 |
| LEK 782 | International Agricultural Trade and Policy 782 | 15 |
| LEK 785 | Project Planning and Appraisal 785 | 15 |
| LEK 883 | Agricultural Supply Chain Management 883 | 15 |
| Agricultural policy analysis: | | |
| <i>Required:</i> | | |
| LEK 712 | Agricultural Policy 172 | 15 |
| MEK 780 | Macro Economics 780 | 15 |
| <i>Any two electives from:</i> | | |
| IEK 780 | International Economics 780 | 15 |
| LEK 723 | Agricultural Economics (Agricultural Development) 723 | 15 |
| LEK 782 | International Agricultural Trade and Policy 782 | 15 |
| LEK 785 | Project Planning and Appraisal 785 | 15 |

LEK 820 Agricultural Economics (Applied Trade Analysis) 820 15

Second year

Required modules

LEK 783 Research methodology and thesis design 783 20
LEK 890 Dissertation 890 200

Total credits for master's degree over two years 340

9.8 MSc(Agric): Agricultural Extension (Code 03251030)

Programme composition

All the Extension or similar substitutable modules must be completed:

| Code | Module | Credits |
|-------------------------------|--|----------------|
| AGV 711 | Extension 711 (Extension philosophy, organisation and management) | 20 |
| AGV 712 | Extension 712 (Leadership and Group Dynamics) | 20 |
| AGV 713 | Extension 713 (Communication) | 20 |
| AGV 715 | Extension 715 (Principles and Approaches of Development and Extension) | 20 |
| AGV 725 | Extension 725 (Community Development and Rural Sociology) | 20 |
| AGV 726 | Extension 726 (Planology and Programme Planning) | 20 |
| AGV 728 | Extension 728 (Extension Evaluation) | 20 |
| AGV 729 | Extension 729 (Adoption and diffusion) | 20 |
| Subtotal credits | | 160 |
| AGV 800 | Research leading to a dissertation | 20 |
| AGV 890 | A dissertation based on appropriate research in the field of Extension | 180 |
| Total credits required | | 360 |

9.9 MSc(Agric): Agronomy (Code 03250454)

Programme composition

AGR 800: Agronomy 800 (80 credits)
AGR 890: Dissertation 890 (160 credits)

Total credits required: 240

9.10 MSc(Agric): Animal Science qualifications

9.10.1 Animal Breeding and Genetics (Code 03250457)

9.10.2 Nutrition Science (Code 03250421)

9.10.3 Meat Science (Code 03250122)

9.10.4 Production Management (Code 03250441)

9.10.5 Production Physiology (Code 03250391)

a. Programme composition (9.10.1 – 9.10.5)

The curriculum for the MSc(Agric) degree consists of the following:

- i) A dissertation; and
- ii) Advanced study in the major subject/s, augmented by ancillary modules to the maximum of 120 credits that may be prescribed by the Dean on the recommendation of the head of department. Such ancillary modules may be

taken simultaneously with the major subject/s. Candidates in possession of the BSc(Agric)(Hons) degree may be exempted from additional ancillary modules.

VKU 801: Animal Science 801

Consisting of a maximum of 120 credits of coursework selected from Animal Science modules on 800-level or other relevant modules. (See list below)

| | | |
|-----------|------------------------------------|--------------|
| (GVK 800) | Large Stock Science 800 | (30 credits) |
| (KVK 800) | Small Stock Science 800 | (30 credits) |
| (PVK 800) | Poultry Science and Aviculture 800 | (30 credits) |
| (PFS 801) | Production Physiology 801 | (30 credits) |
| (PFS 802) | Production Physiology 802 | (30 credits) |
| (TLR 801) | Animal Breeding and Genetics 801 | (30 credits) |
| (TLR 802) | Animal Breeding and Genetics 802 | (30 credits) |
| (VKD 800) | Pig Science 800 | (30 credits) |
| (VNE 800) | Livestock Ecology 800 | (30 credits) |
| (VLE 801) | Meat Science 801 | (30 credits) |
| (VLE 802) | Meat Science 802 | (30 credits) |
| (VGE 801) | Monogastric Nutrition 801 | (30 credits) |
| (VGE 802) | Ruminant Nutrition 802 | (30 credits) |
| (WLK 800) | Wool Science 800 | (30 credits) |

VKU 890: Dissertation 890

Dissertation of 240 credits or a mini-dissertation of 120 credits.

Total credits required: 240

9.11 MSc(Agric): Entomology (Code 03250120)

Programme composition

ENT 800: Entomology 800

ENT 890: Dissertation 890

Total credits required: 240

9.12 MSc(Agric): Food Science and Technology (Code 03250261)

a. Admission requirements

BSc(Agric) or equivalent degree.

b. Programme composition

The degree is conferred based on a dissertation and other requirements as follows:

FST 801 Advanced Food Science 801 (20 credits)

Any one module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

FST 890 Dissertation (220 credits)

Each candidate must write a dissertation on his/her research project in Food Science and/or Food Technology and at least a concept research paper for publication in a peer-reviewed scientific journal.

Total credits required: 240

9.13 MSc(Agric): Genetics (Code 03250291)

Programme composition

GTK 800: Genetics 800

GTK 890: Dissertation 890

Students registered for the MSc(Agric) programme will be required to complete ancillary modules concurrently with the above-mentioned modules during their first year of registration. These modules will be selected from the Genetics honours modules (700-level). Candidates in possession of a BSc(Agric)(Hons) may be exempted from these modules.

Please note:

- All postgraduate students in the School of Biological Sciences are required to complete the Research methodology module (BAS 751) during their postgraduate studies.
- Additional modules may be prescribed by the head of department, e.g. Advanced Language Proficiency 300 (EOT 300), where deemed necessary.

9.14 MSc(Agric): Horticulture (Code 03250091)

Programme composition

TBK 800: Horticultural Science 800 (80 credits)

TBK 890: Dissertation 890 (160 credits)

Total credits required: 240

9.15 MSc(Agric): Microbiology (Code 03250071)

Programme composition

MBG 800: Microbiology 800

MBG 890: Dissertation 890

Total credits required: 240

9.16 MSc(Agric): Pasture Science (Code 03250455)

Programme composition

WDE 800: Pasture Science 800 (80 credits)

WDE 890: Dissertation 890 (160 credits)

Total credits required: 240

9.17 MSc(Agric): Plant Pathology (Code 03250301)

Programme composition

PPT 800: Plant Pathology 800

PPT 890: Dissertation 890

Total credits required: 240 credits

9.18 MSc: Postharvest Technology (Code 03251102)

Programme composition

The degree is awarded based on a mini-dissertation and one elective module:

PLG 801: Elective module (140 credits)

PLG 802: Mini-dissertation (80 credits)

Total credits required: 240 credits

9.19 MSc(Agric): Soil Science (Code 03250456)

Programme composition

GDK 800: Soil Science 800 (80 credits)

GDK 890: Dissertation (160 credits)

Total credits required: 240

10. DOCTORAL PROGRAMMES IN THE SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

10.1 PhD: Agrarian Extension (Code 03262002)

Programme composition

The programme consists of:

- a. Original research leading to a thesis.
- b. An examination on the thesis.

AGV 900: Extension 900

AGV 990: Thesis 990

Total credits required: 360

10.2 PhD: Agricultural Economics (Code 03260042)

Programme composition:

(EKN 812) Microeconomics

(EKN 813) Macroeconomics

(EKT 816) Advanced econometrics

(LEK 814) Quantitative models for policy analysis

(LEK 990) Thesis: Agricultural Economics

Total credits required: 360

10.3 PhD: Agronomy (Code 03262164)

Programme composition

AGR 900: Agronomy 900 (60 credits)

AGR 990: Thesis 990 (300 credits)

Total credits required: 360

10.4 PhD: Animal Science (Code 03260141)

Programme composition

The curriculum for the PhD degree consists of the following:

- i) A theoretical knowledge of the major subject/s and such additional modules as may be prescribed (Animal Science modules on 800-level).
- ii) A thesis.

VKU 900: Animal Science 900

VKU 990: Thesis 990

Total credits required: 360

10.5 PhD: Consumer Science

a. Admission requirements

M Consumer Science or applicable master's degree with a pass mark of at least 60%.

To proceed with the thesis a student should have fulfilled the requirements for the master's degree regarding the following modules or modules with similar content and scope including publication record:

- Theoretical frameworks;
- Research methodology 814 or similar module of the same level and scope;
- The student has published at least one article in an accredited/refereed research journal during the two years prior to registration for the PhD degree or can prove that one has been accepted in an accredited/refereed journal.

It must be evident from the master's dissertation or publications based on it, that the candidate is able to undertake research independently.

Note: It may be required from the student to do additional coursework.

Degrees, duration of study and number of credits

The following fields of specialisation and degrees are offered:

Interior merchandise management 02263001

Clothing management 02263002

Food management 02263004

Development 02263003

The programme extends over a minimum of two and a maximum of five years of study.

Total credits required: 360

10.6 PhD: Food Science (Code 03260272)

Programme composition

The degree is awarded based on a thesis and other requirements as follows:

FST 901: Examination 901 (40 credits)

Oral examination in Food Science and related fields at the doctoral level by nationally and internationally renowned experts.

FST 990: Thesis 990 (360 credits)

Each candidate must write a thesis on his/her research project in Food Science and have at least a research paper accepted for publication in a peer-reviewed scientific journal.

Total credits required: 400

10.7 PhD: Horticultural Science (Code 03262167)

Programme composition

TBK 900: Horticultural Science 900 (60 credits)

TBK 990: Thesis 990 (300 credits)

Total credits required: 360

10.8 PhD: Nutrition (Code 03261006)

Each candidate must write a thesis on his/her research project in Nutrition and have at least a research paper accepted for publication in a peer-reviewed scientific journal.

Programme composition

VDG 900: Oral examination Nutrition

VDG 990: Thesis Nutrition

Total credits required: 360

10.9 PhD: Pasture Science (Code 03262165)

Programme composition

WDE 900: Pasture Science 900 (60 credits)

WDE 990: Thesis 990 (300 credits)

Total credits required: 360

10.10 PhD: Soil Science (Code 03262166)

Programme composition

GDK 900: Soil Science 900 (60 credits)

GDK 990: Thesis (300 credits)

Total credits required: 360

10.11 PhD: Wildlife Management (Code 03261001)

a. Admission requirements

MSc: Wildlife Management or an equivalent applicable degree.

Programme composition

NLB 990: Thesis 990

Research project with thesis only

Total credits required: 360

11. HONOURS PROGRAMMES IN THE SCHOOL OF MATHEMATICAL SCIENCES

11.1 BSc(Hons): Actuarial Science (Code 02240275)

a. Admission requirements

An appropriate bachelor's degree with an average of 60% for all modules on third-year level, as well as exemption recommendations for at least five of the Core Technical subjects of the Institute/Faculty of Actuaries. Details are available from the Head of the Department of Insurance and Actuarial Science as well as from the departmental brochure.

b. Duration of study

A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of part-time students, within three years of first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the head of department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

Details of the compilation of the curriculum are available from the head of department as well as from the departmental brochure.

To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum in collaboration with, and subject to the approval of the Head of the Department of Insurance and Actuarial Science.

Total credits required: At least 160

11.2 BSc(Hons): Applied Mathematics (Code 02240171)

a. Admission requirements

An appropriate BSc degree with a minimum of 60% for all Mathematics/Applied Mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Real Analysis on third-year level as well as one of the modules Partial Differential Equations, Ordinary Differential Equations or Numerical Analysis on third-year level (each with a mark of at least 60%).

b. Duration

The minimum duration is one year of full-time study or two years of part-time study. A student must complete his or her study for an honours degree, in the case of full-time students, within two years from the first examination to the final examination and in the case of part-time students, within three years from the first examination to the final examination. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the Postgraduate Coordinator/Head of the Department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of seven honours modules of 20 credits each (six compulsory and one elective) as well as the mandatory essay (20 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum as approved by the Postgraduate Coordinator/Head of the Department of Mathematics and Applied Mathematics.

Total credits required: 160

11.3 BSc(Hons): Financial Engineering (Code 02240274)

a. Admission requirements

An appropriate bachelor's degree with a minimum of 60% for all modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Calculus, Differential Equations and Linear Algebra on second-year level (each with a mark of at least 60%).

b. Duration

The minimum duration is one year of full-time study or two years of part-time study. A student must complete his or her study for an honours degree, in the case of full-time students, within two years from the first examination to the final examination and in the case of part-time students, within three years from the first examination to the final examination. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the Postgraduate Coordinator/Head of the Department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of a number of compulsory and elective honours modules of 16 – 20 credits each (totalling at least 140 credits), as well as the mandatory project (20 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum in collaboration with, and subject to the approval of the Postgraduate Coordinator/Head of the Department of Mathematics and Applied Mathematics.

Total credits required: 160

11.4 BSc(Hons): Mathematical Statistics (Code 02240191)

a. Admission requirements

An appropriate bachelor's degree with a satisfactory performance in all Mathematical Statistics modules on third-year level.

b. Duration of programme

A period of two years is allowed from the first examination to the final examination.

c. Promotion

The progress of all honours candidates is monitored biannually by the head of department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

Details of compilation of curriculum are available from the Head of the Department of Statistics as well as from the departmental brochure.

A candidate must compile his/her curriculum in consultation with the head of department or his representative. It is also possible to include postgraduate modules from other departments.

Total credits required: At least 160

11.5 BSc(Hons): Mathematics (Code 02240181)

a. Admission requirements

An appropriate BSc degree with a minimum of 60% for all Mathematics/Applied Mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Real Analysis and Algebra on third-year level (each with a mark of at least 60%).

b. Duration

The minimum duration is one year of full-time study or two years of part-time study. A student must complete his or her study for an honours degree, in the case of full-time students, within two years from the first examination to the final examination and in the case of part-time students, within three years from the first examination to the final examination. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the Postgraduate Coordinator/Head of the Department. A candidate's study may be terminated if the

progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of seven honours modules of 20 credits each (six compulsory and one elective) as well as the mandatory essay (20 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum in collaboration with, and subject to the approval of the Postgraduate Coordinator/Head of the Department of Mathematics and Applied Mathematics.

Total credits required: 160

11.6 BSc(Hons): Mathematics of Finance (Code 02240272)

a. Admission requirements

An appropriate BSc degree with a minimum of 60% for all Mathematics/Applied Mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Real Analysis on third-year level and Linear Algebra on second-year level (each with a mark of at least 60%).

b. Duration

The minimum duration is one year of full-time study or two years of part-time study. A student must complete his or her study for an honours degree, in the case of full-time students, within two years from the first examination to the final examination and in the case of part-time students, within three years from the first examination to the final examination. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the Postgraduate Coordinator/Head of the Department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of seven honours modules of 20 credits each (six compulsory and one elective) as well as the mandatory essay or project (20 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum in collaboration with,

and subject to the approval of the Postgraduate Coordinator/Head of the Department of Mathematics and Applied Mathematics.

Total credits required: 160

11.7 BSc(Hons): Teaching of Mathematics (Code 02240271)

a. Admission requirements

An appropriate BSc degree with a minimum of 60% for all Mathematics/Applied Mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has a mark of at least 60% in Real Analysis and in Algebra on third-year level.

b. Duration

The minimum duration is one year of full-time study or two years of part-time study. A student must complete his or her study for an honours degree, in the case of full-time students, within two years from the first examination to the final examination and in the case of part-time students, within three years from the first examination to the final examination. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited extension of this period.

c. Promotion

The progress of all honours candidates is monitored biannually by the Postgraduate Coordinator/Head of the Department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of eight honours modules of 16 to 20 credits each (five compulsory and three electives), totalling at least 140 credits, as well as the mandatory essay (20 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>
To qualify for this degree, the candidate must successfully complete a total of at least 160 credits, made up from modules from the curriculum in collaboration with, and subject to the approval of the Postgraduate Coordinator/Head of the Department of Mathematics and Applied Mathematics.

Total credits required: 160

12. MASTER'S PROGRAMMES IN THE SCHOOL OF MATHEMATICAL SCIENCES

12.1 MSc: Actuarial Science (Code 02250395)

Total credits required: 240

Details are available from the Head of the Department of Insurance and Actuarial Science as well as from the departmental brochure.

12.2 MSc: Applied Mathematics (Code 02250171)

a. Admission requirements

An appropriate BSc(Hons) degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular, it is required that the following modules be included on honours level: Measure and Integration Theory, Functional Analysis, Partial Differential Equations and Numerical Analysis.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

The duration for this degree is two years. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.32 and G.36.)

c. Promotion

The progress of all master's candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of three master's modules of 40 credits each (as approved by the Postgraduate Coordinator) as well as a dissertation (120 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

Total credits required: 240

12.3 MSc: Applied Statistics (Code 02250401)

Total credits required: 240

Details are available from the Head of the Department of Statistics as well as in the departmental brochure.

12.4 MSc: Financial Engineering (Code 02250184)

a. Admission requirements

An appropriate BSc(Hons) degree in Financial Engineering with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

The duration for this degree is two years. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.32 and G.36.)

c. Promotion

The progress of all master's candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of three master's modules of 40 credits each (as approved by the Postgraduate Coordinator) as well as a dissertation (120 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

Total credits required: 240

12.5 MSc: Mathematical Statistics (Code 02250191)

Total credits required: 240

Details are available from the Head of the Department of Statistics as well as in the departmental brochure.

12.6 MSc: Mathematics (Code 02250181)

a. Admission requirements

An appropriate BSc(Hons) degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular, it is required that the following modules be included on honours level: Measure and Integration Theory, Functional Analysis, Topology and Algebra.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

The duration for this degree is two years. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.32 and G.36.)

c. Promotion

The progress of all master's candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of three master's modules of 40 credits each (as approved by the Postgraduate Coordinator) as well as a dissertation (120 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/mathspostgrad>

Total credits required: 240

12.7 MSc: Mathematics Education (Code 02250183)

a. Admission requirements

An appropriate BSc(Hons) degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular, it is required that the following modules be included on honours level: Measure and Integration Theory and Functional Analysis.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

The duration for this degree is two years. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.32 and G.36.)

c. Promotion

The progress of all master's candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of four master's modules from the Education Faculty (totalling 80 credits), two master's modules from the Department of Mathematics and Applied Mathematics (totalling 80 credits) as well as a dissertation (80 credits). The compilation of the modules should be approved by the Postgraduate Coordinator.

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/mathspostgrad>

Total credits required: 240

12.8 MSc: Mathematics of Finance (Code 02250182)

a. Admission requirements

An appropriate BSc(Hons) degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular, it is required that the

following modules be included on honours level: Measure and Integration Theory, Functional Analysis and Financial Mathematics/Financial Engineering.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

The duration for this degree is normally two years. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.32 and G.36.)

c. Promotion

The progress of all master's candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

The programme compilation consists of three master's modules of 40 credits each (as approved by the Postgraduate Coordinator) as well as a dissertation (120 credits).

Full details of the compilation of the curriculum are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

Total credits required: 240

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| 13. DOCTORAL PROGRAMMES IN THE SCHOOL OF MATHEMATICAL SCIENCES |
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13.1 PhD: Mathematical Sciences (Code 02260761)

a. Admission requirements

An appropriate master's degree is required for admission to doctoral study in Mathematics and Applied Mathematics. The programme composition of the master's degree must include a heavy research component that led to a dissertation reflecting originality either in the content or in the presentation. In the selection procedure the candidate's complete honours and master's academic records will be considered. In particular, it is required that the master's degree be obtained with distinction. If a candidate did not pass his/her master's degree with distinction, he/she may submit an application together with a motivation by his/her potential supervisor to the Postgraduate Coordinator.

Admission is also subject to the availability of a suitable supervisor for the study.

b. Duration

Subject to other faculty regulations, a student for a doctoral degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (See Regulations G.47 and G.51.)

c. Promotion

The progress of all doctoral candidates is monitored biannually by the supervisor and the Postgraduate Coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

d. Programme composition

A candidate must complete a thesis in one of several fields in which research is actively being done in the Department. The research fields and the names of possible supervisors are available from the departmental postgraduate brochure on the web address: <http://www.up.ac.za/math/postgrad>

Total credits required: 360

Related doctoral degree described elsewhere in this publication

PhD: Science and Mathematics Education (Code 02260753) on p 55

Please refer to the Centre for Science, Mathematics and Technology Education in this publication (point 19.2, page 75) and to the postgraduate brochure of the Department of Mathematics and Applied Mathematics: <http://www.up.ac.za/math/postgrad>

CENTRE FOR ENVIRONMENTAL STUDIES (CFES)
[Environmental Studies programme]

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems. Training of students takes place in two ways:

- a) Research-based master's and PhD studies in Environmental Science.
- b) Coursework master's specialisation options in Environmental Studies.

Admission requirements

Candidate learners must be in possession of a four-year degree qualification, or equivalent degree status with appropriate subjects as prescribed for each field of specialisation. Final admission is subject to the approval of the Director of the Centre and the head(s) of the respective co-ordinating department(s).

14. SPECIALISATION IN AIR QUALITY MANAGEMENT

Coordinated through the Department of Geography, Geoinformatics and Meteorology.

The extensions to the National Environmental Management Act (NEMA) promulgated after 2005 affect environmental management in South Africa in a profound way. In particular, the Air Quality Act brings South African legislation into line with international trends. The metro councils are charged with the responsibility of implementing the Act at the local level. In addition, companies need appropriate expertise to obtain licenses for their air quality management plans. This focus area serves to provide suitable expertise for the implementation of the above legislation by industry by training graduates specialised for careers in air quality management. On completion of the training,

candidates should be conversant and be able to partake in, or render advice concerning the legislative requirements with respect to air quality management, modelling of and measurement of air pollution and the interpretation of pollution plumes, the measurement and interpretation of chemical air pollution as well as dust pollution, international agreements and requirements as well as the effects of air pollution on humans.

14.1 MSc: (Option) Air Quality Management (Coursework) (Code 03251038)

a. Admission requirements

Candidates must be in possession of an appropriate four-year degree, or equivalent degree status which includes mathematics and chemistry at first-year level. Admission is subject to the approval of the Director of the Centre and the appropriate head of department outside the Centre.

b. Programme composition:

Fundamental modules (60 credits):

ENV 810 Environmental Paradigms 810 (20 credits)

OMR 881 Environmental Law 881 (40 credits)

Core modules (80 credits):

AQM 811 Boundary Layer Meteorology 811 (20 credits)

AQM 812 Atmospheric Chemistry 812 (20 credits)

AQM 813 Atmospheric Thermodynamics 813 (20 credits)

AGM 814 Air pollution: Society and Environment 814 (20 credits)

Research Project (100 credits):

ENV 891: Research project 891 (100 credits)

Total credits required: 240

14.2 PhD: (Option) Air Quality Management (Code 03260129)

Admission is dependent on the candidate being in possession of an MSc Option in Air Quality Management, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

ENV 998: Thesis 998

Total credits required: 360

15. SPECIALISATION IN ENVIRONMENT AND SOCIETY

Coordinated through the Department of Geography, Geoinformatics and Meteorology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the humanities. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the

management of human-environment interactions. This includes social impact assessments, policy formulation, social development and planning, participatory appraisal assessments, demographic pattern and trend interpretations, resource appraisals and management.

15.1 MSc: Environment and Society (Coursework) (Code 03251032)

a. Admission requirements

Before application for admission to the MSc(Environment and Society) degree programme candidates must be in possession of a four-year degree qualification, BSc(Hons), or equivalent degree status which includes appropriate subjects in the humanities, geography or planning. Final admission is subject to the approval of the Director of the Centre and the Head of the Department of Geography.

b. Programme composition:

Core modules (80 credits):

(ENV 810) Environmental paradigms 810

(ENV 812) Environmental analysis, assessment and modelling 812

(OMR 881) Environmental law 881

Specialisation modules (60 credits):

(ENS 811) Environment and development 811

(ENS 822) Strategic environmental management 822

One module selected from:

(ENS 823) Environment and land reform 823

(ENS 824) Social modelling and assessment 824

(OMS 881) Environmental change 881

Elective module (20 credits):

At least one additional elective module must be selected in consultation with the Director of the Centre and the Head of the Department of Geography, Geoinformatics and Meteorology. Options will be based on the academic background and/or anticipated career of the candidate.

Project (100 credits):

ENV 891: Research Project 891

Total credits required: 260

15.2 PhD: Environment and Society (Code 03260122)

Admission is dependent on the candidate being in possession of an MSc in Environment and Society, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

ENV 991: Thesis 991

Total credits required: 360

16. SPECIALISATION IN ENVIRONMENTAL ECOLOGY

The purpose of this focus area is to train environmental graduates who specialised in careers in the ecology of the environment, including conservation planning, environmental management and air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the management of the ecological consequences of human existence. This includes a thorough grounding in ecosystem structure, composition and function, ecosystem services, notions of ecosystem health, the management of declining and small populations, captive propagation, control of invasive species, species and community restoration, conservation education, local communities and conservation, as well as aspects of biogeography and macro-ecology, conservation planning and monitoring, the structure, composition and function of biological communities, population and community variability.

16.1 MSc : Environmental Ecology (Coursework) (Code 03251033)

a. Admission requirements

Before application for admission to the MSc(Environmental Ecology) degree programme, candidates must be in possession of a four-year degree qualification, BSc(Hons), or equivalent degree status which includes appropriate subjects in ecology. Applicants for the air quality management programme need to have passed mathematics and chemistry at first-year level. Admission is subject to the approval of the Director of the Centre and the appropriate head of department outside the Centre.

b. Programme composition

Compulsory modules (80 credits):

ENV 810: Environmental paradigms 810

ENV 812: Environmental analysis, assessment and modelling 812

OMR 881: Environmental law 881

Elective modules (80 credits):

A minimum of 80 credits must be selected from the elective modules subject to the approval of the Director of the Centre. Choice of electives will be based on the academic background and/or anticipated career of the student. Students studying conservation ecology have to register for Conservation Planning and Monitoring 808 (ZEN 808) and Conservation in Practice 875 (ZEN 875) as electives.

Project (100 credits):

ENV 891: Research project 891

Total credits required: 260

16.2 PhD: Environmental Ecology (Code 03260123)

a. Admission requirements

Admission is dependent on the candidate being in possession of an MSc in Environmental Ecology, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre and the head(s) of the particular

department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

b. Programme composition

ENV 992: Thesis 992

Total credits required: 360

17. SPECIALISATION IN ENVIRONMENTAL ECONOMICS

The purpose of this focus area is to train environmental graduates who specialised in careers in environmental economics and policy. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the economic implications of environmental resource use. This includes economic analytical approaches, economic inefficiency, misallocation, market failure, policy failure, the economics of renewable and non-renewable resources, cost-benefit analysis, valuation of environmental goods and services, environmental accounting, temporal allocation and dynamic optimisation of resource use.

17.1 MSc: Environmental Economics (Coursework) (Code 03251034)

Before application for admission to the MSc(Environmental Economics) degree programme, candidates must be in possession of a four-year degree qualification, BSc(Hons), or equivalent degree status which includes appropriate subjects in economics. Final admission is subject to the approval of the Director of the Centre and the Head of the Department of Agricultural Economics, Extension and Rural Development.

a. Admission requirements

For admission to the MSc in Environmental Economics, candidates must have a four-year degree qualification (BSc(Hons), BSc(Agric) or BSc(Agric) Economics) or equivalent degree status, with appropriate subjects in economics and statistics. Final admission is subject to the approval of the Director of the Centre of Environmental Economics and Policy (CEEPA) and/or the Head of the Department of Agricultural Economics, Extension and Rural Development.

b. Programme composition

Required modules:

Core modules (140 credits)

LEK 711: Advanced Production Economics 711 (20 credits)

LEK 780: Introduction to Natural Resource and Environmental Economics 780 (15 credits)

LEK 785: Project planning and appraisal 785 (15 credits)

LEK 712: Agricultural Policy 712 (15 credits)

LEK 886: The Economics of Natural Resources Management 886 (15 credits)

ENV 810: Environmental paradigms 810 (20 credits)

ENV 812: Environmental analysis, assessment and modelling 812 (20 credits)

Specialisation modules (80 credits)

MIE 780: Micro-economics 780 (20 credits)

EKT 713/or LEK 710: Econometrics 713 / 710 (20 credits)

LEK 810: Advanced Econometrics 810 (20 credits)

LEK 814: Quantitative models for agricultural policy and planning 814 (15 credits)

LEK 890: Dissertation 890 (180 credits)

Total credits required: 400

17.2 PhD: Environmental Economics (Code 03260124)

Admission is dependent on the candidate being in possession of an MSc in Environmental Economics, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

Programme composition

ENV 993: Thesis 993

Total credits required: 360

18. SPECIALISATION IN ENVIRONMENTAL MANAGEMENT

The purpose of this focus area is to train environmental graduates considered generalists for managing the full spectrum of human-environment-economic interactions. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in managing social, economic and environmental processes in a sustainable manner. This includes social and environmental impact assessment, policy formulation, social development and planning, ecosystem structure, composition and function, ecosystem services, ecosystem health, invasive species, species and community restoration, conservation education, local communities and conservation, economic inefficiency, misallocation, market failure, policy failure, the economics of renewable and non-renewable resources, cost-benefit analysis, valuation of environmental goods and services and environmental accounting.

18.1 MSc: (Option) Environmental Management (Coursework) (Code 03251037)

a. Admission requirements

Candidates must be in possession of a four-year degree (BSc, or equivalent degree status). Final admission is subject to the approval of the Director of the Centre for Environmental Studies.

b. Programme composition

Coursework modules (130 credits):

ENV 810 Environmental Paradigms 810 (20 credits)

OMR 881 Environmental Law 881 (40 credits)
ZEN 811 Conservation and Development 811 (30 credits)
ENS 811 Environment and Development 811 (20 credits)
ENS 822 Strategic Environmental Management 822 (20 credits)

Elective module (20 credits):

At least one additional elective module must be selected in consultation with the Director of the Centre for Environmental Studies and the Director of the Postgraduate School of Agriculture and Rural Development. Options will be based on the academic background and/or anticipated career of the candidate.

Project (100 credits):

ENV 891: Research Project 891 (100 credits)

Total credits required: 250

18.2 PhD: (Option) Environmental Management (Code 03260125)

a. Admission requirements

Admission is dependent on the candidate being in possession of an MSc or MInstAgrar in Environmental Management, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre for Environmental Studies, the Director of the Postgraduate School for Rural and Agricultural Development and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

b. Programme composition

ENV 994: Thesis 994

Total credits required: 360

19. SPECIALISATION IN ENVIRONMENTAL EDUCATION

(Coordinated through the Department of Curriculum Studies, Faculty of Education)

The purpose of this focus area is to train environmental graduates who specialised in careers in environmental education. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the transfer of environmental principles by education. This includes the transfer of relevant ethical, social and ecological principles to learners, the roles of the NQF and outcomes-based education for approaches towards environmental education, the roles of facilitation, engagement, metalearning, creative problem solving, cooperative learning and feedback in the learning task.

19.1 MSc: Environmental Education (Coursework) (Code 03251036)

a. Admission requirements

Before application for admission to the MSc(Environmental Education) degree programme, candidates must be in possession of an appropriate four-year degree qualification, BSc(Hons), or equivalent degree status which includes appropriate educational subjects. Final admission is subject to the approval of the Director of the Centre for Environmental Studies and the Director of the Centre for Science, Mathematics and Technology Education.

b. Programme composition

Compulsory core modules (60 or 80 credits):

ENV 810: Environmental paradigms 810

ENV 811: Environmental governance 811 or OMR 881: Environmental law 881

ENV 812: Environmental analysis, assessment and modelling 812

Compulsory specialisation modules (60 credits):

ENO 811: Foundations of environmental education 811

ENO 821: Teaching and learning strategies for environmental education 821

SCE 881: Educational research methodology 881

Elective module (20 credits):

At least one additional elective module must be selected in consultation with the Director of the Centre and the Director of the Postgraduate School for Rural and Agricultural Development. Choices will be based on the academic background and/or anticipated career of the candidate.

Project (100 credits):

ENV 891: Research project 891

Total credits required: 240 or 260

19.2 PhD: Environmental Education (Code 03260128)

a. Admission requirements

Admission is dependent on the candidate being in possession of an MSc: Environmental Education, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre for Environmental Studies and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

b. Programme composition

ENV 995: Thesis 995

Total credits required: 360

20. SPECIALISATION IN WATER RESOURCE MANAGEMENT
(Coordinated through the Department of Microbiology and Plant Pathology)

The purpose of this focus area is to train environmental graduates who specialised in careers in the sustainable management of water resources. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in water resource management in Southern Africa. This includes principles of quality management, water conservation, water demand management, water supply and sanitation technologies.

20.1 MSc: Water Resource Management (Coursework) (Code 03251035)

a. Admission requirements

Before application for admission to the MSc(Water Resource Management) degree programme, candidates must be in possession of a four-year degree qualification, BSc(Hons), or equivalent degree status which includes appropriate subjects in water management and/or water ecology. Final admission is subject to the approval of the Director of the Centre for Environmental Studies and the Head of the Department of Microbiology and Plant Pathology.

b. Programme composition

Compulsory core modules (80 credits):

ENV 810: Environmental paradigms 810

ENV 812: Environmental analysis, assessment and modelling 812

OMR 881: Environmental law 881

Compulsory specialisation modules (60 credits):

EWM 810: Water quality management 810

EWM 821: Water conservation and demand management 821

EWM 822: Water supply and sanitation 822

Elective module (20 credits):

At least one additional elective module must be selected in consultation with the Director of the Centre and the Head of the Department of Microbiology and Plant Pathology. Choice of electives will be based on the academic background and/or anticipated career of the candidate.

Project (100 credits):

ENV 891: Research project 891

Total credits required: 260

20.2 PhD: Water Resource Management (Code 03260126)

a. Admission requirements

Admission is dependent on the candidate being in possession of an MSc in Water Resource Management, or an equivalent degree with the status thereof, as evaluated by the Director of the Centre for Environmental Studies and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will

involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.

- b. Programme composition**
ENV 990: Thesis 990

Total credits required: 360

Additional possible electives in Environmental studies:

Any module at master's level in either Diplomatic Studies or Political Policy Studies as approved by the Head of the Department of Political Sciences and the Director of the Centre for Environmental Studies.

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| 21. CENTRE FOR SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION |
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21.1 MSc: Science Education (Code 02250442)

Students are registered in a discipline department. The MSc: Science Education is designed for educators who wish to pursue their postgraduate studies in both a scientific discipline and in science education. Science, in this context, is interpreted in its broadest sense, and includes the physical, biological and earth sciences, as well as mathematics and technology.

At the end of this programme the student will be capable of doing research in both scientific and educational disciplines. Candidates achieve an adequate background to pursue further qualifications in either content disciplines or the discipline of Science Education.

a. Admission requirements

Refer to regulation Sc 11.1 in the Regulations and Syllabi: Faculty of Natural and Agricultural Sciences (Undergraduate).

b. Programme composition

Modules to a maximum of 60 credits may be required by the head of the department concerned. The dissertation will be supervised jointly by the Centre for Science Education and a discipline department.

Where a candidate wishes to register for the MSc programme without a prior BSc(Hons), additional postgraduate coursework (additional to the required 240 credits) is compulsory. Refer to regulation Sc 11.1 (b) of the Regulations and Syllabi: Faculty of Natural and Agricultural Sciences (Undergraduate).

Total credits required: 240

Related master's degrees described elsewhere in this publication

MSc: Mathematics Education (Code 02250183) on p47

MSc: Environmental Education (Code 02250443) on p53

21.2 PhD: Science and Mathematics Education (Code 02260753)

The programme is designed for science educators at all levels who wish to pursue their postgraduate studies in science education but closely allied with a scientific discipline. Science, in this context, is interpreted in its broadest sense, and includes the physical, biological and earth sciences, as well as mathematics and technology.

At the end of this programme the student will be capable of doing independent research within the values and approaches of the sciences, and their impact and role in the broader social and economic environment with an educational focus.

For admission to the PhD in Mathematics Education, the programme composition of the master's degree must include a reasonable research component that led to a dissertation.

a. Admission requirements

The status of a master's degree, subject to regulation Sc.12 of the Regulations and Syllabi: Faculty of Natural and Agricultural Sciences (Undergraduate).

A candidate must demonstrate expertise in Education Research Methodology (including relevant statistical methods) and in current thinking in the field, with the understanding that a candidate who does not satisfy the required level of expertise may be admitted on condition that additional agreed study assignments are completed and/or examinations passed.

b. Programme composition

For Science Education, the code for the PhD thesis is SCE 900 (Thesis Science Education)

For Mathematics Education, consult the Department of Mathematics and Applied Mathematics. The code for the PhD thesis is WTW 993 (Thesis Mathematics Education).

Total credits required: 360

Refer to regulation Sc. 12 of the Regulations and Syllabi: Faculty of Natural and Agricultural Sciences (Undergraduate) as well as General Regulations G.45 to G.61 of the University.

OTHER MODULES

A head of department may determine that the language proficiency module: **Advanced Language Proficiency 300** (EOT 300), must be prescribed under certain conditions. In such an event, this module does not form part of the curriculum of a degree programme. This is applicable to all postgraduate students.

| Module code | Department | Credits | Full-time | Flexilearning | Language |
|-------------|----------------------------|---------|-----------|-----------------|----------|
| EOT 300 | Unit for Academic Literacy | 12 | 2lpw | Limited contact | Eng |

PROCEDURES AND POLICIES CONCERNING POSTGRADUATE STUDENT TRAINING

Agreement to be entered into with students on registration

The following provisions should be adhered to:

1. Agreement on ownership of data and intellectual property rights needs to be clarified with the supervisor before application. The University of Pretoria's policy with regard to Intellectual Property Rights applies (see General Reg. G.57.4).
2. Agreement on authorship of publications. This needs to be clearly defined with the supervisor and the head of department (see General Reg. G.57.4).

See General Regulations G.32.4 and G.33 governing responsibilities and obligations of staff, the Faculty of Natural and Agricultural Sciences' Staff Policy and in particular the University of Pretoria's "Code of Research Ethics".

Supervision

See General Regulation G.57 governing the nomination of supervisors and co-supervisors and the University of Pretoria's "Code of Research Ethics".

Appointment of a supervisor for a student

A prospective postgraduate student should have discussions with a potential supervisor regarding the work that is to be undertaken. Once the supervisor and the student have agreed on a project, the student should be registered and the supervisor appointed. The student and the supervisor should agree to conduct their relationship in accordance with the guidelines given in item: *Agreement to be entered into with students on registration*, above.

The supervisor and/or the head of department may recommend the appointment of a co-supervisor for a particular candidate and project. This will be approved in terms of faculty procedures.

Additional Faculty supervisory requirements

Supervisory committees

In many/most instances the supervisor and co-supervisor categories are adequate. However, a Supervisory Committee may be useful in cases where multidisciplinary thesis research (especially at the PhD level) is undertaken. Such a committee could comprise the supervisor (and co-supervisor if applicable) and an additional two to three members selected for their expertise in specific areas. At least one member of the committee should be outside the department in which the student is registered. The composition of the committee would be approved by the head of department and the chairperson of the school. The Supervisory Committee would bear primary responsibility for guiding and monitoring the student's progress until graduation (as is the case of a conventional supervisor/co-supervisor postgraduate degree). Moreover, when appropriate, it is the responsibility of the supervisor or the chairperson of the Supervisory Committee to recommend that the student be placed on academic probation or be dismissed from the postgraduate programme.

Research proposal

A written research proposal is a prerequisite for all research-based master's and PhD studies. This should be in a format specified by the appropriate department, have been seen and approved by the supervisor (and co-supervisor/Supervisory Committee if applicable), and should be placed in the student's permanent file in the department. The research proposal should include Specific aims, Background and significance, Research design and methods and references as described below:

1. **Specific aims:**
State concisely what the research is intended to accomplish and/or what hypothesis is to be tested.
2. **Background and significance:**
Briefly sketch the background to the proposal, critically evaluate existing knowledge, and specifically identify what the research will achieve.
3. **Research design and methods:**
Briefly summarise how the problem is to be addressed and the procedures that will be used to solve the problem.

Once a draft of the research proposal has been prepared, an oral presentation of the material should be given in the department. The oral presentation should take place within 6 months of initial registration. After this, the final project proposal should be submitted to the supervisor for approval and submission to the Student Administration of the Faculty.

All research protocols that deal with animals, genetically modified organisms, environmental impact and human subjects must have the approval of the Ethics Committee. Submission procedures can be obtained from the faculty's web page.

Student progress

The student should meet with the supervisor (and co-supervisor, or committee – whichever is appropriate) at least once each semester to review and critically evaluate the student's research progress to plan future work, and to establish performance criteria and to monitor timetables for the completion of the degree requirements. At six-monthly intervals the student should write a report that is approved by the supervisor and this should be kept on file in the office of the department concerned. The report should contain the following information:

Progress:

1. Research accomplishments of the student and specific recommendations for future research.
2. Modules the student has completed during the past semester.
3. The schedule for completion of degree requirements.

Evaluation:

1. An evaluation of the candidate's research performance.
2. A summary of the student's current strengths and weaknesses (as a developing independent investigator) including comments on written and oral skills.

In addition to the six-monthly evaluation reports, students will be required to submit an annual written progress report. In addition to detailing the incremental progress, the

report could include information on publications, awards received, conference participation, courses passed and other related outputs.

Funding and research facilities for undertaking the research project

Both the funding of and facilities required for the study should be identified before the student starts the study. The supervisor bears the primary responsibility for ensuring that the infrastructure and support is in place before the study begins. The head of department should be satisfied that adequate provision has been made for the study before approving the registration of the student.

Approval of the title

The final title of a research report/dissertation/thesis should be submitted to the Faculty Student Administration 6 months before the research report/dissertation/thesis is handed in for examination. The title should be recommended by the supervisor and approved in terms of the faculty structures.

Appointment of examiner

This is handled in accordance with the General Regulations by the Dean's office in conjunction with head of department. The student may not be informed of the names of the external examiners until the process of examination has been completed.

Submission of research report/dissertation/thesis

Students need to inform the faculty student administration, one month before the date of proposed submission, of their intention to do so. Students who wish to graduate at a particular graduation ceremony should enquire from the Faculty Student Administration what the dates for submission and completion of the examination process are. These dates are usually significantly in advance of the date of graduation.

The student will submit the research report/dissertation/thesis to the Faculty Student Administration Office together with a form signed by the supervisor and if applicable, the co-supervisor that indicates that the material is being submitted with the approval of the supervisor. If a student wishes to submit without the approval of the supervisor, then this must be done through the head of department who should be aware of the circumstances surrounding the submission. If a head of department is the supervisor, the matter will be referred to the Dean.

Termination of registration

Supervisors have the right to recommend termination of the registration of students who fail to maintain satisfactory academic progress in any phase of their postgraduate programme. Students must take special notice of the conditions governing postgraduate study as published in the General Regulations of the University of Pretoria.

In cases of conflict, the supervisor (co-supervisor and Supervisory Committee as applicable) should notify the student in writing (via the head of department) of his/her concern about the student's performance. The student will be placed on probation for one semester and will be given written instructions of the conditions that need to be fulfilled in order to achieve a satisfactory performance. A student who fails to meet the provisions of the warning, following the probationary period, can be considered for termination of registration by the Postgraduate Studies Committee of the Faculty.

In cases where termination is recommended, the student has the right to appeal to the Dean. The student must make his/her case in writing and a written response should be

solicited from the supervisor. It is suggested that the Dean should base his judgement on written submissions only but may, where necessary, call for oral responses to questions raised. The Dean's decision is final.

Faculty guidelines for consideration of BTech and/or MTech students to postgraduate study

Candidates who hold BTech and/or MTech degrees are required to fulfill the following conditions:

1. Honours level

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that the candidate wishes to pursue for an honours programme. The student will be given conditional acceptance to an honours programme, but in order to align the student's undergraduate training with the outcomes expected of a BSc graduate, the student will be expected to undertake additional coursework at level 6. The head of department concerned will be required to identify specific modules. The programme of study must be recommended by the Postgraduate Studies Committee, Faculty Board and for approval by the Subcommittee of the Senate. Confirmation of candidature will be based on the successful completion of the additional module requirements during the first year of the honours programme.

1.1 Procedure

The candidate must submit an official application form, together with a motivation, matriculation certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications.

The head of department has to identify and prescribe modules as set out in 1 above.

The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

See the guidelines of the Senate of the University of Pretoria as set out below.

2. Master's level

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that the candidate wishes to pursue for a master's programme. The student will be given conditional acceptance to a master's programme, but in order to align the student's undergraduate training with the outcomes expected of a BSc(Hons) graduate, the student will be expected to undertake additional coursework at level 6 and 7. Additional coursework will be prescribed by the head of department concerned. A minimum of 70 credits at level 7 will be required. The programme of study must be recommended by the Faculty Postgraduate Studies Committee, Faculty Board and for approval by the Subcommittee of the Senate. Confirmation of candidature will be based on the successful completion of the additional module requirements during the first year of the master's programme.

2.1 Procedure

The candidate must submit an official application form, together with a motivation, matriculation certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications.

The head of department has to identify and prescribe modules as set out in 1, above.

The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

See the guidelines of the Senate of the University of Pretoria as set out below.

3. Doctoral level

The candidate must have an MTech degree and have obtained at least 60% for the MTech dissertation. Since the PhD is clearly more demanding of a wider (philosophical) scientific background, the selection of candidates for the PhD degree must be stringent, and could include outside evaluation of the dissertation work by nominees selected by the head of department and recommended by the Faculty Postgraduate Studies Committee, evidence of peer-reviewed publication, appropriate work-related experience (i.e. in a research environment) and, where necessary, formal coursework to address deficiencies in the academic background.

3.1 Procedure

The candidate must submit an official application form, together with a motivation, academic record, a copy of the MTech dissertation and a short CV. The CV should include details of appropriate work experience and list of any publications.

The head of department will submit a motivation to support the application.

The application is submitted, via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

See the guidelines of the Senate of the University of Pretoria as set out below.

Senate of the University of Pretoria guidelines for Senate discretionary admissions

Regulation G.62 provides as follows:

"G.62 In accordance with section 32 of the Higher Education Act, 1997 (Act No. 101 of 1997) the Senate may:

- (a) grant a graduate of another university (either in the Republic or elsewhere) a status at the University that is equivalent to the status the student has at such other university.
- (b) admit a person, who
 - (i) has passed examinations at another university or institution (either in the Republic or elsewhere) which the Senate deems equivalent to, or higher than the examinations prescribed for a degree at the University, which are set as a prerequisite for admission to a particular postgraduate study programme, or for the admission of such a person as a research student; or
 - (ii) in another manner has reached a standard of competence the Senate considers adequate for the purposes of postgraduate study or research at the University, as a student for a postgraduate degree, diploma or certificate".

The regulation provides two alternative routes with regard to the admission of students at postgraduate level in cases where they do not comply with the prescribed requirements:

1. A first possibility is via the academic route where a student has proven himself/herself on the basis of academic achievement.

2. The second possibility refers to a standard of competence that would make a student eligible to continue with postgraduate studies.

With regard to the viewpoint set out above candidates may, inter alia, be evaluated according to the following criteria:

Honours studies

1. In cases where only a diploma and not a degree programme was previously offered in a certain field of study, the Dean may, in consultation with the head of the department, consider the admission of such candidates.
2. Should a student have the necessary academic background, but did not graduate in the applicable field of study, he/she may be admitted to the honours degree on the grounds of:
 - the successful completion of an oral/written entrance examination; and
 - a submission to the SenateIn certain cases one or more external examiners may evaluate such an application.
or
3. The academic merit of a student who has achieved a standard of competence in another manner can be evaluated by means of:
 - a written motivation by the student which is evaluated by the head of the department;
 - the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
 - a submission to the Senate.

Master's studies

1. The application of a student who is not in possession of the required honours degree which would admit him/her to study for the master's degree, but has an academically advanced background, may be considered on grounds of:
 - the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
 - a submission to the Senate.**or**
2. In cases where a standard of competence was reached in another manner, status may be granted by means of:
 - a written motivation by the student which was compiled in conjunction with the head of the department and/or study supervisor, and a recommendation;
 - the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
 - a submission to the Senate.

Doctoral studies

1. The application of a student who is not in possession of the required master's degree which would admit him/her to doctoral study, but has an academically advanced background, may be considered on the grounds of:
 - the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
 - a submission to the Senate**or**
2. In cases where a standard of competence was reached in another manner, status may be granted by means of:

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- a written submission compiled in conjunction with the head of the department and/or study supervisor in which the standard of competence is indicated;
- a report by an external reference(s) motivating the merits of admission to doctoral study;
- the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
- a submission to the Senate.

MODULE CONTENT

(AGR 785) Crop Production Systems : I Field Crops (15 credits)

Integrating agronomic, climatic, soil, botanical, economic and managerial considerations in crop production systems aimed at maximum economic yield and sustainability. Case studies of specific field crops.

(AGR 786) Crop Production Systems : II Vegetable Crops (15 credits)

Integrating agronomic, climatic, soil, botanical, economic and managerial considerations in crop production systems aimed at maximum economic yield and sustainability. Case studies of specific vegetable crops.

(AGV 412) Group dynamics, leadership and community facilitation (20 credits)

Community - concept and meaning; the community and change; hindrances to change. The use of small groups in the community; group dynamics; group and community goals. The paradigm shift from directing to facilitating; group techniques; participative techniques. Leadership development in communities. Case studies.

(AGV 413) Communication (20 credits)

Nature and importance of development communication; the process and models of communication; critical elements and factors in communication; symbol systems and non-verbal communication. Credibility. Messages and message treatment; audience and audience identification; channels and methods of communication. Effective listening and feedback. Practical training in communication: Effective speaking; visual aids in communication; managing conflict; report writing.

(AGV 415) Principles and Approaches of Development and Extension (20 credits)

The role, importance and nature of extension and development; ethics in development and extension. International approaches to development and extension; paradigm shifts within extension and development. The Third World: concept, characteristics and change. The subsistence farmer, rural poverty and the deprivation trap. Development practice theories. Participation; appropriate technology; role players and responsibilities in development.

(AGV 426) Programme and Project Planning (20 credits)

Nature and purpose and principles of a programmed and purposeful approach. Institutional framework for community participation, ownership and empowerment; linking with complementary and support services. Participative need appraisal, problem identification and delimitation; PRA methods and techniques; problem conceptualisation and development of survey instrument; situation surveys and analyses; formulation of objectives; identification and scheduling of methods and activities; Workplan or calendar construction, budgeting.

(AGV 428) Evaluation of Development and Development Projects (20 credits)

Reasons and purposes of evaluation; expectations from evaluations; Role players and motives in evaluation. Criteria and indicators of development, development projects and development organisations. Methods of evaluation; formulation of objectives and scale construction for evaluation; developing and coding the measuring instrument. Sampling and sampling techniques; data analysis and interpretation; evaluation report.

(AGV 429) Behaviour Change and Intervention (20 credits)

Understanding behaviour: Characteristics of human behaviour; Basic concepts: Perception, defence mechanism, decision making and problem solving, learning, innovativeness and adoption behaviour; Diffusion of Innovations: Elements and phases of diffusion, opinion leaders and contact farmers, methodological implications for extension. Psychological, cultural and social barriers to change. Behaviour change or modification: Comparison of different approaches and strategies. A practical model: Background principles and theories, identifying “forces” or behaviour determinants; designing effective extension messages for development programmes.

(AGV 711) Extension 711 (Extension Philosophy, Organisation and Management) (20 credits)

The history of agricultural extension; development phases; extension in other countries; nature, philosophy and objectives of extension; ethics in extension; models of organisation; personnel management; administration.

(AGV 712) Extension 712 (Leadership and Group Dynamics) (20 credits)

The group as channel and instrument in extension; definitions and characteristics of groups; group formation; theories regarding the functioning of groups; internal and external group dynamics; group techniques and evaluation; rural groups and their engagement; definitions and theories of leadership; leadership types, sorts and functions; the extensionist as professional leader; opinion leadership; training of leaders.

(AGV 713) Extension 713 (Communication) (20 credits)

Clarification of principles and definitions; theory of communication; role and importance in extension; the communication process; communication models; key elements and channels of communication; credibility; persuasion; public speaking; audiovisual aids; mass media and its effect; news reporting; articles and newsletters.

(AGV 715) Extension 715 (Principles and Approaches of Development and Extension) (20 credits)

Overview of the origin, role, nature and development of extension and development; principles of extension; extension role in sustainable agricultural development; participation and coordination of stakeholders in extension and development initiatives. Rural poverty and the deprivation trap.

(AGV 725) Extension 725 (Community Development and Rural Sociology) (20 credits)

The relationship between rural sociology, community development and extension; physical and social structures of communities; culture and value systems; social stratification; development as change; process and ethical norms; principles and functions of community development; development barriers; methods and models.

(AGV 726) Extension 726 (Planology and Programme Planning) (20 credits)

Planology: Introduction; rural and regional development; levels of planning; legislation and policy; agricultural and other organisations.

Programme Planning: Definitions and clarification of principles; advantages of programming; historical perspective of programme development; programme models; procedures in programme development with special reference to problem analysis; the writing of objectives and the drafting of communication plans.

(AGV 728) Extension 728 (Extension Evaluation) (20 credits)

Meaning, scope and place of evaluation in extension; definition of a science; the science of extension; the research and evaluation process; problem identification; theory and hypotheses; objectives; literature research and information sources; sampling; methods of data collection; criteria of efficiency; quality of measuring instruments; scale construction; interviewing; statistical methods; reporting research findings; computer programming.

(AGV 729) Extension 729 (Adoption and Diffusion) (20 credits)

The nature and goal of extension; definitions; psychological principles and dynamics of human behaviour; theories and models of decision making and behavioural change; the field theory, theory and practice; characteristics and adoption of innovations, behaviour determining factors; adoption categories; diffusion, concepts; theories; models and factors influencing communication flow; findings and limitations of empirical research.

(AGV 890) Dissertation: Agrarian Extension 890

A mini-dissertation on a relevant aspect of Rural Development.

(AGV 891) Research Report: Extension 891

A dissertation in the form of a situation specific development programme or based on appropriate research in the field of extension.

(AGV 900) Agrarian Extension

(AGV 990) Thesis: Agrarian Extension 990

(AKM 705) Actuarial Mathematics 705 (24 credits)

The stochastic approach to annuities and assurances involving one of two lives. Definitions, estimation and use of select mortality functions. Multiple decrements and pension funds. Variable benefit, disability, long-term care contracts. Life insurance contracts: expenses and bonuses. Net and gross premiums and reserves for fixed and variable benefit contracts. Discounted emerging cost techniques. Profit testing. Asset shares for life insurance contracts. Alterations to contracts. Costs of guarantees under life insurance contracts. Factors affecting mortality, selection, standardisation. The process of population projection and its main determinants. Valuation of benefits under a disability insurance contract.

(AQM 811) Boundary Layer Meteorology 811 (20 credits)

Introduction to global circulation and South African weather and climate. Mathematical functions and atmospheric balance laws. Stability and mixing heights. The atmospheric boundary layer over urban and rural areas. Turbulence. Earth's energy budget. Transfer and exchange of energy. Introduction to atmospheric and chemical dispersion modeling. Practical modeling of air pollution: Box models, Gaussian puff or plume models, stochastic models, trajectory models.

(AQM 812) Atmospheric Chemistry 812 (20 credits)

The history of atmospheric pollution. Cycles of matter and atmospheric transformations. Gaseous inorganic pollutants. Gas phase organic pollutants. Particulates. The chemistry of atmospheric environmental problems, including acid rain; global warming; ozone depletion; persistent organic pollutants; and photochemical smog. Atmospheric monitoring: sampling methods; sampling strategies; and analytical techniques.

(AQM 813) Atmospheric Thermodynamics 813 (20 credits)

Gas laws. Virtual temperature. The hydrostatic and hypsometric equations. Dry adiabatic processes. The first law of thermodynamics. Latent heat. Stabilities and instabilities. Dry adiabatic temperature lapse rate. Potential temperature. Inversion layers. Atmospheric moisture and saturated-adiabatic processes. Vapour pressure. Saturation and condensation. Dew and frost point. Relative humidity. Saturated adiabatic temperature lapse rate. Cloud and rain formation. The second law of thermodynamics.

(AQM 814) Air pollution: Society and Environment 814 (20 credits)

International air quality criteria and standards. Ambient air quality and meteorological monitoring. Domestic pollution. Household fuel burning. Vehicle emissions. Toxicology and Physiology. Industrial pollution. Emissions inventory and report sources. Air pollution and biomass. Air pollution control. Identification of alert air quality thresholds and associate information reporting, investigation and mitigation requirements. Renewable energy. Air pollution and climate. Practical experience.

(APZ 782) Primary Veterinary Health Care (30 credits)

Animal health and welfare of livestock; manifestations of disease and principles of pathology and autopsy; appropriate diagnostic methods and notifiable diseases; veterinary public health; disease surveillance; epidemiology and disease control; socio-economic aspects of primary veterinary health care.

(ARD 780) Rural Development Studies (40 credits)

Overview of the concepts and theories of rural development including evolution of rural development theories, role of agriculture in rural developments, natural resource base and role of government. Rural livelihood systems focusing on household farming systems, decisions and operation of farming systems, the farm as a social system, non-farm, off-farm small, micro and medium enterprises in the rural economy, development intervention and household food security. Rural institutions including local governance, community based and farmer organisations, agricultural credit and rural finance, input and output markets, human capital formation, land tenure and land reform, policy making institutions, and institutions of the agricultural knowledge triangle (research, teaching and extension). Methodologies for rural development including farming systems approach, participatory appraisal techniques, assessment of land-use patterns and agrarian systems in rural settings: zoning techniques, socio-economic and technical assessment of the farming system, topological techniques and gender sensitive methodologies. Communication for rural development and planning rural development at local levels. Practical assignment in collaboration with rural communities managed by the School's outreach department.

(ARD 781) Agricultural Development Principles: Theory and Evidence
(Only for Extension students and covers first part of ARD 780)

Overview of concepts, theories and key definitions of development and rural development, poverty and food security to understand the magnitude and different dimensions of rural development in developing countries; evolution of rural development theories, policies and practices along recent history; the dynamic role of agriculture in the development process at country level and the successive phases of its contribution from early developing stages to industrial economies; smallholder agriculture and development; concepts and dimensions of rural livelihoods as the basis cluster of rural development; farming systems in smallholder agriculture; rural non-farm enterprises; food security and development; institutions and rural development; land tenure systems, property rights and land reform; rural finance and agricultural credit; agricultural markets

with some policy and implementation dimensions; local institutions, property rights and collective action in communities; development support interventions.

(ARD 782) Physical-biological Resources and Development (20 credits)

Review of the most important physical-biological agricultural resources -soil, water, climate, topography, plant species, animal species; differences in characteristics, quality and vulnerability; the concept of optimum land-use; resource conservation; general ecological principles; examples of problems caused by mismatching of physical-biological resources and land use during development planning; principles of sensible technology transfer.

(ARD 784) Practical Field Attachment (10 credits) (Not offered until further notice)

A compulsory outreach module for all Honours and M Inst Agrar students specialising in Rural Development Management and Planning. Students in other disciplines may take it as an elective.

- Students engaging with the communities in the rural development process.
- Expose Honours and Masters students to the realities and problems of rural life in a way that they will gain enhanced understanding and commitment for making constructive contributions to improving rural life.
- Participate in capacity building of rural communities especially among the disadvantaged groups.
- Case study based participatory research on priority issues identified with communities.

This module is an essential component of the Rural Development Studies course **(ARD 780)**.

(BAS 751) General Research Methodology 751 (8 credits)

20 lectures, first semester

Philosophy of science; creativity in science; laboratory procedures and safety; statistical methods in science; research management; writing a research protocol/paper/report/dissertation; intellectual property; ethics in research and presentation of scientific data or research proposals.

(BAS 751) Research Methodology 751 (8 credits)

3 days full-time

(BCM 901) Trends in Biochemical Research 901 (18 credits)

1 lecture per week in both semesters

Study and discussion of topical research results from recent scientific publications.

(BCM 990) Research project and thesis 990 (minimum 295 credits)

(BCM 751) Enzyme Regulation Strategies 751 (9 credits)

2 lectures per week, first semester

Thermodynamic principles; the thermodynamic and kinetic structure of metabolic pathways; regulatory sites in metabolic pathways; compartmentalisation; isozymes; energy charge; simple and cooperative feedback regulation; substrate cycles; reversible covalent modification; allosteric regulation; stimulatory and inhibitory proteins, protein degradation; activation by proteolytic cleavage; blood clotting cascade and regulation; role of Vit K and antagonists; fibrinogen conversion into fibrin and fibrin dissolution.

(BCM 752) Specialised Cellular Events 752 (9 credits)

1 lecture per week, first semester

Cell to cell signalling: Hormones and receptors; second messengers; multiple signalling pathways; regulation of cell surface receptors; regulation of gene transcription; signal

transducers and activators of transcription (STATs); regulation and integration of mammalian energy metabolism.

Nerve cells: Nerve systems and neuron structure; membrane rest potentials; generation and propagation of action potentials; synaptic transmission; sensory transduction systems; memory and neurotransmitters.

Muscle and cell motility: Structure of muscle; ultrastructure and organisation of a myofibril; sliding filament model; composition and properties of myosin; actin and actomyosin; biochemical mechanism of muscle contraction; actin and myosin in non-muscle cells.

(BCM 753) Literature Seminar 753 (9 credits)

1 lecture per week, first semester

Preparation and presentation of reviews of biochemical literature.

(BCM 771) Trends in Biochemical Research 771 (18 credits)

1 lecture per week in both semesters

Study and discussion of topical research results from recent scientific publications.

(BCM 772) Biochemical Research Methodology 772 (18 credits)

2 lectures per week, both semesters

Lectures and self-study on advanced biochemical research methods and techniques.

(BCM 773) Research Project and Report 773 (64 credits)

Both semesters

(BCM 801) Trends in Biochemical research 801 (18 credits)

1 lecture per week in both semesters

Study and discussion of topical research results from recent scientific publications.

(BCM 802) Literature Seminar 802 (9 credits)

1 lecture per week, first semester

Preparation and presentation of reviews of biochemical literature.

(BCM 890) Research project and dissertation 890 (206 credits)

(BIF 701) Bioinformatics Theory and Applications 701 (32 credits)

2 lectures per week, 2 practicals per week, both semesters

General concepts in bioinformatics; sequence motifs and features; sequence databases; common bioinformatics tools; programming in Python; the bioinformatics toolkit for Python; pairwise and multiple sequence alignments; genome analysis; data visualisation; specialised statistics for bioinformatics; specialised algorithms for bioinformatics; nucleic acid modelling; transcription analysis; microarray data analysis; genome annotation; phylogenetics; mapping and markers; structural modelling.

(BIF 702) Trends in Bioinformatics and Literature Seminar 702 (9 credits)

1 lecture per week, both semesters

Study and discussion of topical research results from recent scientific publications.

(BIF 703) Research project and report 703 (35 credits)

Both semesters

(BIF 704) Introduction to Molecular Biology for Bioinformatics 704 (18 credits)

1 lecture per week, both semesters (elective)

Atoms and molecules; the chemistry of life, organisation of the cell; energy; chromosomes; heredity; DNA; RNA and protein synthesis; gene regulation; genetic engineering; genomes; genes and development; evolution; speciation; diversity.

(BIF 801) Seminar in Bioinformatics 801 (18 credits)

A literature seminar in the field of bioinformatics compiled from recent scientific publications.

(BIF 802) Trends in Bioinformatics 802 (9 credits)

1 lecture per week, both semesters

Study and discussion of topical research results from recent scientific publications.

(BIF 803) Research project and report 803 (213 credits)

(BIF 901) Trends in Bioinformatics Research 901 (18 credits)

1 lecture per week in both semesters

(BIF 990) Research Project and Thesis 990 (A minimum of 302 credits)

(BME 120) Biometry 120 (16 credits) **or equivalent modules in Mathematical Statistics**

Prescribed for honours students who have not already passed the module during undergraduate study.

(BME 780) Introduction to Mathematical Statistics for Bioinformatics 780 (18 credits)

(1 lpw) (28 weeks) Both semesters

Sampling and statistical descriptive methods, indices, correlation and curve fitting. Elementary probability and distribution theory. Statistical distributions. Statistical inference: Estimation and hypothesis testing, including analysis of variance, categorical data analysis and distribution-free methods. Use of statistical computer packages with application in bioinformatics. Report writing.

(BNG 700) Investments 700 (40 credits)

The module covers a whole range of finance and investment related topics within the framework of the actuarial control cycle: Principles and objectives of investment management and analysis of investors' needs. Principal investment assets and the markets in such assets as well as the economic influences on these. Asset modelling. The underlying legislative, taxation and regulatory framework for investment management and the securities industry. Actuarial techniques for assessing capital investment projects. Constructing investment indices. Developing appropriate investment strategies. Valuing individual investments and portfolios and understanding its appropriateness in different situations. Portfolio management (including risk control techniques) and performance appraisal of investment portfolios. Project management. Credit risk and credit ratings.

(BOT 712) Plant Nomenclature 712 (10 credits)

The regulations of the International Code for Botanical Nomenclature. Principles of nomenclature, history of plant collecting. Type specimen.

(BOT 714) Seed Ecology 714 (10 credits)

Basic terminology and background regarding additions and losses in the seed bank (predation, dormancy, germination mechanisms, seed dispersal). Seed bank. Role of seed bank in management, conservation and rehabilitation.

(BOT 717) Plant Morphology 717 (10 credits)

Speciation in flowering plants; plant variation. Sex determination in flowering plants. Reproductive systems in flowering plants.

(BOT 718) Introduction to Plant Biotechnology 718 (10 credits)

Plant genome: Structure and composition of the plant genome (nuclear, mitochondrial and chloroplast); applications in plant biotechnology: Plant tissue culture (micropropagation, somatic embryogenesis and cell suspension cultures). Genetic manipulation and gene transfer technology (Agrobacterium-based and other) and DNA-marker technology.

(BOT 719) Primary Plant Metabolism 719 (10 credits)

Regulation and interaction of primary plant metabolic pathways on the sub-cellular and whole plant level.

(BOT 721) Plant Community Ecology 721 (10 credits)

The study of vegetation, theory and practical applications, methods of data collection, data analysis and data management to study plant communities and vegetation gradients. Classification and ordination. Plant-environment interaction and environmental interpretation of plant communities.

(BOT 722) General Plant Ecology 722 (10 credits)

Essays on relevant new ideas in plant ecology.

(BOT 741) Plant Taxonomy 741 (10 credits)

Classification, identification and nomenclature, methodology of a revision study, analysis and presentation of taxonomic information, evolution, phylogeny and cladistics.

(BOT 742) Plant Classification 742 (20 credits)

Sources of taxonomic information; morphology, anatomy, chemotaxonomy, cytogenetics, reproductive biology, plant geography, palynology, ethnobotany and paleobotany. Importance of different characteristics, methods to obtain information and interpretation of observed patterns in variation.

(BOT 746) Applications in Plant Biotechnology 746 (10 credits)

Creation of genetically modified plants and their impact on modern agriculture.

(BOT 748) Phytopharmacology 748 (10 credits)

Pharmacological action of low molecular plant constituents and high molecular weight compounds. Plant constituents as anticancer, antibacterial, antiviral, hypoglycaemic, free-radical scavengers, hypotensive and as anti-inflammatory agents. Cell culturing, cell growth and apoptosis, cell mediated immune responses. Drug development in TB as models for research. Enzymes, receptors and plant constituents. The unique challenges of plant-based medicines.

(BOT 749) Pharmacognosy/Phytotherapy 749 (10 credits)

Basic concepts of toxicology. Systemic, developmental, genetic and organ-specific toxic effects. Hallucinogenic, allergenic, teratogenic and other toxic plants. Plant constituents,

contradictions and interactions. Phytotoxicity unrelated to plant constituents. Safety and efficacy issues of commonly used Phyto-drugs with emphasis on pharmaceutical applications. Practical aspects related to the manufacture of good quality plant-based medicines. Phyto-drug formulation, standardisation and aspects concerning different dosage forms.

(BOT 761) Advanced Phytomedicine 761 (10 credits)

Metabolism and functions of secondary compounds such as tannins, alkaloids, terpenoids, flavonoids and free amino acids. Importance of secondary compounds in the defence mechanisms of plants. Isolation and identification of medicinal bioactive compounds from plants. Their current scope and potential applications in ethnobotany. Strategies to discover new pharmaceuticals from ethnomedicine.

(BOT 781) Veld evaluation and management 781 (10 credits)

Analysis of pattern and dynamics of vegetation. Qualitative and quantitative analysis. Analytical and synthetical characteristics of the woody and herbaceous components. Biomass. Productivity. Veld condition and grazing capacity.

(BOT 782) Project 782 (50 credits)

Teaching and planning, execution and documentation of a research project.

(BOT 783) Seminar 783 (20 credits)

Literature study of a subject related to the main discipline.

(BOT 784) Seminar 784 (20 credits)

Literature study of a subject related to one of the elective disciplines..

(BOT 785) Vegetation of South Africa 785 (10 credits)

Veld types with special reference to management and conservation.

(BOT 786) Plant taxonomy 786 (10 credits)

Plant taxonomy with special reference to identifying taxons. Variation in seed plants with reference to production systems, intra-specific variation and ecotypes.

(BOT 787) Vegetation dynamics and phenology 787 (10 credits)

Plant succession, types, causes, paths and tendencies in succession. Methods for monitoring of vegetation change, primary and secondary succession (examples), climax and stability are discussed.

This is followed by a discussion of periodicity, climate, phenophases, seasonality, phenomic analysis of plants, applications and nutritional and habitat preferences of ruminants.

(BOT 788) Vegetation classification 788 (10 credits)

The theory and practice of plant survey techniques, data analysis and classification of vegetation are discussed. Specific themes include: aerial photograph interpretation, habitat analysis and measuring of relevant habitat factors, identification of homogeneous vegetation units, plant classification, determining vegetation and habitat gradients within homogeneous areas, vegetation degradation and the influences of such degradation on veld condition.

(BOT 802) Plant Systematics 802 (30 credits)

Plant variation and evolution; theory and practice of plant classification; concept of

categories in the taxonomic hierarchy; sources and handling of taxonomic data; taxonomic collections (herbaria and curating of collections); the process of plant identification; code of nomenclature; taxonomic publication.

(BTW 701) Biotechnology in the Workplace 701 (18 credits)

Introduction to the principles and realities of working in the field of Biotechnology. Discussions on various aspects, including entrepreneurship; intellectual property; patent rights; financial management; grant applications and product marketing. The module will be assessed by way of a simulated grant application for the development of a hypothetical biotechnological venture.

(DEK 802) Seminar meetings 802 (15 credits)

30 hours of scheduled seminar activities. Topics will be evaluated in consultation with the Head: Human Nutrition Division; written evaluation.

(DEK 803) Literature studies 803 (15 credits)

Literature studies in human nutrition.

(ENO 811) Foundations of Environmental Education 811 (20 credits)

Environmental education, paradigms, philosophies, ideologies, ethos, social vs environmental paradigms, ecocentrism, anthropocentrism, techno-centrism, empirical, hermeneutic and critical theories. Environmental education principles, issues, symptoms, own learning experience. Individual environmental responsibility, cooperation, complexity, critical, creative, cognitive skills. Experiential learning activities, ethical principles, social principles, ecological principles. Economics, science and politics in environmental issues. Personal commitment of care and respect for the environment.

(ENO 821) Teaching and Learning Strategies for Environmental Education 821
(20 credits)

Facilitating learning, lifelong learning and environmental education: concept and learning. Environmental education learning task: foundation of initiating learning. Learning task design process: criteria, format, presentation. Engagement. Sustainability as object, meta-learning: strategies. Multiple intelligences. Teaching styles and strategies. Learning theories and learning styles. Thinking modes: planning, monitoring, evaluating, novel assessment tools, creativity. Products, resources, personality, the environment and process, creative problem solving, mega life skills, cooperative learning and requirements: group size, composition, positive interdependence, individual accountability, promoting interaction, evaluation, roles and functions, learning to cooperate. Cooperative learning and meta-learning, cooperative life skills. Continuous assessment, sharing meaning with facilitator. Learner responses: observation, reflecting, recognition. Feedback: encouragement and support, challenging, elicitation and evolving and guidance to resources. Process feedback, consolidative feedback.

(ENS 811) Environment and Development 811 (20 credits)

Interrelationships between societal and environmental dynamics. Social structure, culture, politics, education, migration, production, urbanisation, demographics and social institutions impact upon the environment, environmental change impacts on social aspects. Analysis of complex interrelationships between society and the environment, societal-environmental linkages and multiplier effects.

(ENS 822) Strategic Environmental Management 822 (20 credits)

Strategic environmental planning: introduction, objectives and principles, levels, South

African overview, guidelines: national and international, strategy and management, structure, strategy and agency, SA guidelines, diagnostic tools, RESP analysis, strategic resource planning, applications, implementation and control, development and policy implementation, SA environmental policy, evaluation frameworks, portfolio analysis, competitive forces, alliances, business benefits, intangibles, survival and catalytic contributions, SA legislation and regulations.

(ENS 823) Environment and Land Reform 823 (20 credits)

The need and purpose of land reform in South Africa and its contribution towards sustainable social-environmental interaction. An overview of the global variety of land tenure systems, and tenure reform programmes in other countries. Overview of previous systems of land tenure in South Africa. Land reform policy in South Africa: restitution, redistribution, and tenure reform. Critical assessment of progress in terms of land reform objectives. Evaluation of the contribution of the South African land reform programme towards creating sustainable environments.

(ENS 824) Social Modelling and Assessment 824 (20 credits)

In this module students will be introduced to the various methods of modelling and assessing social impacts. Specific emphasis will be placed upon modelling societal-economic-environmental interactions, formulating stochastic and dynamic models of population-development-environment interactions, conducting research to determine possible impacts of environmental changes on communities and performing social impact surveys. Students will be introduced to both quantitative as well as qualitative methods of conducting social impacts assessments.

(ENS 825) Sustainable resource management 825 (20 credits)

Conceptual basis and terminology: resources, environmental crisis, humans as ecological dominants, resource management, determinism, possibilism, holism, sustainability, carrying capacity, compatibility, spatial standards; historical context: conservation, sustainability; components of the environmental system; natural resource base of South Africa (overview): biotic, abiotic; South African biomes (selection); ecosystems (selection); land use management (tourism, greenbelts and conservation areas as examples with special attention to the South African situation).

(ENV 810) Environmental paradigms 810 (20 credits)

Environmental philosophy and ethics, environmental ecology, environment, society and development, environmental economics, environmental management, critical resources management: water utilisation, air quality control, land-use planning: soil characteristics, biodiversity planning, critical resource management: determinism vs co-evolutionary environmental frameworks, research methodology and practice.

(ENV 811) Environmental governance 811 (20 credits)

Presented every second year only for the Master's in Environmental Education.

Next intake: 2009

Environmental advocacy, diplomacy and politics, environmental management tools: SEA, EIA, EMPR, ISO 14000, EMF, environmental accounting, guiding principles: precautionary, polluter pays, subsidiarity, equity, democracy, freedom of information; Frameworks for socio-environmental development: GEAR, RDP, IDP, SA Land Reform Programme; Urban development framework, SDI's. Environmental business administration: environmental leadership, green business, environmental auditing, site management, business management, environmental law: command and control vs incentive approaches, perverse subsidies, environmental decision making, international agree-

ments, environmental education, Participatory Role Appraisal, negotiation and environmental conflict resolution.

(ENV 812) Environmental analysis, assessment and modelling 812 (20 credits)

Fundamentals of univariate statistics, classification and ordination, multivariate statistics, introduction to GIS and remote sensing tools for environmental analysis, spatial statistics, interpolation, kriging, trend surfaces, spatial autocorrelation, regression, risk assessment, social impact assessment.

(ENV 823) International environmental management systems 823 (40 credits)

The ISO framework, environmental risks and opportunities for companies, global environmental concerns, environmental legislation, identification of environmental impacts, environmental certification and auditing, follow-up activities, the Forestry Stewardship Council framework, chain of custody requirements, production standards, FSC reporting.

(ENV 891) Research Project 891 (100 credits)

The student needs to conduct a research project under the supervision of an academic member of staff associated with the Centre for Environmental Studies. This project needs to be of a sufficient quality to be publishable in the open scientific literature. The research report is examined as a manuscript for a suitable journal.

(EWM 810) Water Quality Management 810 (20 credits)

Severity of waterborne disease, accurate risk analysis, emergence of pathogens resistant to disinfection, the use of indicator organisms, toxicity risks, viral and protozoal contamination, water borne diseases surveillance, epidemiology of water borne diseases, water quality standards and monitoring, education.

(EWM 821) Water Conservation and Demand Management 821 (20 credits)

Public access to information regarding water quality, water supply sustainability and public education, demand projections, water management efficiency systems approach to water management, watershed protection, drinking water treatment and distribution, wastewater collection and treatment, effects of deforestation and treatment, and complex water system developments, destruction of wetlands, effects of recreation, agriculture and aquaculture on eutrophication.

(EWM 822) Water supply and sanitation 822 (20 credits)

Low technology water treatment options, sanitary engineering, high technology options, water disinfection methods, selection of treatment regimes, stormwater management.

(FBS 811) Financial Management 811 (10 credits)

Introduction to Financial Management and Financial Statements. Analysis and interpretation of financial statements. Valuations. Budgets. Sources of financing. Working capital management. Time value of money. Risk and return. Cost of capital. Practical applications.

(FBS 821) Financial Management 821 (10 credits)

Fundamentals in Cost and Management Accounting. Cost elements. Marketing costs. The manufacturing facility and cost flows. Product and process cost systems. Costing systems in service and merchandising enterprises. The relationship between the financial and costing ledgers. Short-term and long-term decisions. Budgets. Standard cost. Quality and time. Divisional performance evaluation.

(FIL 886) Philosophy of the Environment 886 (20 credits)

Fundamental attitudes towards the environment. The Cartesian-Newtonian paradigm: the unconstrained domination and exploitation of the environment by humankind. The idea of humans as stewards of nature. The emerging systems paradigm: humankind's unity. Conflicting views on development: the underlying ethical values. Guidelines for policy making, striking the balance between environmental quality and human development.

(FNI 700) Finance and Investment 700 (40 credits)

Students may only take FNI 700 if they are simultaneously registered for BNG 700.

The application of modern techniques in financial management to the financing of corporate entities and the management of assets. Topics include: the theory of finance, valuation of investments, asset modelling, capital structure and the cost of capital, portfolio management, capital project appraisal and performance management.

(FST 700) Research Methodology and Seminars 700 (20 credits) (Year module)

(Provision in timetable for 2 lectures and assignments over 28 weeks)(First and second semester)

Lectures and assignments: Research methodology. Literature study and seminar presentations on topics in Food Science and/or Technology. The candidate must also pass an oral examination at the end of the module.

(FST 701) Animal Food Technology 701 (20 credits)

(Provision in timetable for 2 lectures and 1 practical over 28 weeks)(First and second semester)

Dairy technology: The technology of fluid, concentrated, dried, frozen and fermented dairy products and starter cultures. Requirements for milk supply and other ingredients. Principles for the manufacturing of products in this category. Possible defects, causes and prevention.

Practical work: Preparation of condensed milk, custard, ready-to-eat milk-based desserts, flavoured milk beverages, dairy-fruit juice mixtures; ice cream and other frozen desserts; yoghurt and cultured milk products; cheeses. Evaluation and analysis of the products. Effect of processing on the nutritional value of dairy products. Factory visits.

Meat, poultry, fish and egg technology: Meat, poultry, fish and egg processing and equipment. Meat emulsion, curing, dehydration and fermentation technology. Preservation and storage. Packaging. Legislation. Quality control and hygiene. Effect of processing on the nutritional value of meat products.

Practical work: Manufacturing of dried, cured, fermented and emulsion type products. Visits to processing factories.

(FST 702) Plant Food Technologies 702 (20 credits)

(Provision in timetable for 2 lectures and 1 practical over 28 weeks)(First and second semester)

Fruit and vegetable technology: Extension of shelf life of minimally processed fruits and vegetables. Pre-processing. Processing and preservation: canning, freezing, dehydration, concentration, juice extraction, irradiation and fermentation. Effect of processing on nutritional, sensory and microbiological quality.

Practical work: Practical execution of the processes described above in pilot factory; factory visits; execution and reporting of a practical project on extended shelf life of fresh juice or of minimally processed fruits and vegetables.

Cereal technology: Dry and wet milling extraction processes. Bread baking technology. Soft wheat products technologies. Malting and brewing technology. Production of RTE

(ready-to-eat) breakfast cereals. Pasta and noodle technology. Alternative uses of cereals. Traditional African cereal products.

Practical work: Visits to mills, bakeries and breweries. Experiments to determine the milling and baking quality of wheat. Rheological, chemical and baking tests of wheat. Small-scale processing, factory visits, basic analytical methods and quality control of cereal products.

Oilseeds and legumes technologies: Processability, functional characteristics and food applications of the most important legumes and oil seeds (soy beans, peanuts, sunflower seeds).

Practical work: Visits to food factories; small-scale processing of oilseeds and legumes. Impact of processing technologies on nutritional value of fruit, vegetables, cereal and legume foods.

(FST 712) Sensory Evaluation 712 (10 credits)

(Provision in timetable for 1 lecture and 1 practical over 14 weeks)(First semester)

Lectures: Principles and applications of sensory evaluation. Types of panels, tests and test conditions and their functions. Selection and training of panellists for descriptive sensory evaluation. Instrumental sensory quality measurements. Statistical analysis and interpretation of data.

Practicals: Practical aspects and execution of sensory evaluation techniques, analysis and interpretation of data. Instrumental sensory quality measurements.

(FST 713) Product Development & Quality Management 713 (30 credits)

(Provision in timetable for 3 lectures and 1 practical over 14 weeks)(First semester)

Lectures: Principles involved and steps that are followed to develop new food products that are safe, tasty, nutritious and cost effective. Application of the theory of food product development. Quality management systems with specific reference to Good Manufacturing Practices, HACCP and ISO 9000. National and international standards, Codex Alimentarius, FDA. Application of food legislation. Food packaging.

Practicals: A product development project will be planned, conducted and presented. Application and implementation of HACCP.

(FST 720) Advanced Food Science 720 (20 credits)

(Provision in timetable for 2 lectures over 14 weeks) (Second semester)

Discussion classes in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion.

(FST 763) Research project 763 (40 credits) (year module)

A short research project on an approved topic in Food Science and/or Technology is planned, executed and presented in the form of a written report.

(FST 801) Advanced Food Science 801 (20 credits)

Any one module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

(FST 890) Dissertation 890 (220 credits)

Each candidate must write a dissertation on his/her research project in Food Science and/or Food Technology and at least a concept research paper for publication in a peer-reviewed scientific journal.

(GDK 771) Soil Chemistry 771 (30 credits)

Advanced theoretical and experimental soil chemistry, including the organic fraction.

(GDK 772) Soil Physics 772 (30 credits)

Advanced theoretical soil physics with the emphasis on water and salt flow and computer models.

(GDK 773) Plant Nutrition, Soil Biology and Soil Fertility 773 (30 credits)

Study of the newest trends and developments.

(GDK 774) Pedology and Soil Mineralogy 774 (30 credits)

More in-depth study of soil genesis, soil classification and clay mineralogy.

(GDK 779) Basic Soil Science 779 (10 credits)

This module is a basic introduction to Soil Science, designed for postgraduate students in Plant Science and Wildlife Management. The module will be presented as 12 lecture periods and one day excursion.

(GDK 780) Soil Classification and Land Capability Evaluation (15 credits)

Soil classification : A taxonomic system for South Africa; general principles of the USDA soil taxonomy; principles of land capability evaluation; some important land capability evaluation systems; concepts such as soil potential, ecotope, land type, etc.; land requirements and tolerances of some important land uses.

(GDK 781) Land-use Planning (15 credits)

Principles and techniques for collection and interpretation of physical, social and economic data required for the compilation of a land-use plan; principles of interaction with experts from various fields; compilation of an integrated land-use plan; consideration of alternatives; systems approach to land-use planning; planning with, and not for, people.

(GDK 782) Resource Surveying (15 credits)

Techniques for conducting detailed soil surveys (including field work and compilation of maps and reports); analysis of climatic data; veld and carrying capacity determinations; analysis of water resources. Practical exercises in all of these.

(GDK 783) Project in Land-use Planning (15 credits)

Practical compilation of a land-use plan for a selected study area; defence of the proposed plan during an oral examination by a panel of examiners.

(GDK 801) Advanced Course Work (120 credits)

(GDK 891) Essay: Soil Science (120 credits)

(GGY 701) Selected Theme 701 (20 credits)

(1) A self-study module selected in consultation with the head of department from (a) the modules not selected, or (b) themes not covered in existing options (e.g. environmental perception and behaviour; the spatial impact of decision-making; environmental hazards and disasters, remote sensing), or (c) educational subjects or themes; or (2) an appropriate module from another subject.

(GGY 702) Geography Project 702 (30 credits)

An approved individual research project, carried out under the guidance of a lecturer. The project culminates in a research report in the format of a research paper. The student is expected to obtain the respective skills (theoretical and practical research techniques, data analysis, communication and computer skills) necessary for the research topic.

(GGY 703) Research and Presentation Skills 703 (10 credits)

A module zooming in on research methodologies, data capturing techniques as well as visual and oral presentation skills. A significant part of the module assessment is constituted by the final presentation of the honours project contents.

(GGY 710) Evolution of Geographical Thought 710 (20 credits)

The module presents an overview of the contents and structure of modern geographical science, with particular reference to the development and impact of paradigms, the interdependence of systems within space and time, and to holistic concepts. The historical, philosophical and methodological development of geography and its interaction with other disciplines is also discussed, including the development of environmental concepts. Contemporary schools of thought and the role of specific subdisciplines are critically investigated.

(GGY 711) Environmental Principles 711 (20 credits)

The module provides a critical review of the structures and paradigms in which the environmental sciences are practiced. The historical and philosophical development, current thought and principles of the environmental sciences and the manner in which environmental issues are dealt with, are addressed.

(GGY 718) South African Geomorphology 718 (20 credits)

This module involves investigating contemporary issues in southern African Geomorphology. Topics that may be studied include: geomorphic response to environmental change, soil erosion and conservation, weathering, slope processes and geomorphological hazards.

(GGY 719) Special Regional Focus 719 (20 credits)

This module discusses applied research topics with a specialised regional focus from a geographical and/or environmental perspective. The emphasis is on the application of interdisciplinary concepts for regional issues.

(GGY 727) Environmental Compliance 727 (20 credits)

Tools for achieving environmental compliance, constitutional and administrative requirements, environmental legislative requirements, criminal legislative requirements, business entities and liability, mandate and powers of environmental inspectors, enforcement ethics, networks and resources, conflict management.

(GGY 728) Conservation Environmental Enforcement 728 (20 credits)

Health and safety during conservation enforcement, compliance inspection principles in biodiversity conservation, principles of investigation, approaches and procedures during prosecution.

(GGY 729) Industrial Environmental Enforcement 729 (20 credits)

Health and safety during industrial enforcement, compliance inspection principles in industry, principles of investigation, environmental sampling and chain of custody of samples, interaction with ISO 14001, procedures during prosecution.

(GGY 780) Urban Geography of Southern Africa 780 (30 credits)

Urbanisation, urban function and urban living in southern Africa are the themes studied. Aspects under review include the urbanisation process, urban morphology and function; the administrative structure and functioning of cities, and the quality of urban life.

(GGY 785) Environmental Impact Assessment and Auditing 785 (20 credits)

Determining the impact of human activities on the natural environment, as well as monitoring, auditing and evaluating environmental management principles are central to this module.

(GGY 789) Environmental Change 789 (30 credits)

This module involves the study of the causes and consequences of environmental change from multidisciplinary perspectives. A focus of this module is human-environmental interaction. Past processes leading to environmental change will also be discussed. In any given year, one or more of the following will be investigated: principles of environmental change, causes and consequences of environmental change, climate change, global warming: causes and consequences, land use and land cover change, environmental change and infectious diseases, contemporary research into environmental change, and a field trip at the end of the module.

(GGY 793) Geography of Land Reform 793 (30 credits)

The module aims to provide students with a basic understanding and knowledge of contemporary land reform issues against the background of international land reform experiences. The module also touches on other rural development strategies and ultimately aims to enhance the student's ability to conceptualise and analyse policy.

(GGY 795) Arid Environments 795 (30 credits) (Not offered in 2009)

The module deals with the global distribution of arid and semi-arid environments and their (past and present) climatic, hydrological and geomorphic characteristics as well as with human-environmental interaction in agricultural, pastoral and urban settings, including land degradation and desertification. The module includes the scientific preparation of, and participation in, a field trip to the arid regions of southern Africa (e.g. Namibia).

(GLY 702) Fluid-rock Interaction 702 (16 credits)

Sources of fluids; mineral reactions; solubility and transport in fluids; metasomatism; thermodynamics of mineral-fluid equilibria; case studies.

(GLY 703) Basin Analysis 703 (16 credits)

Principles of basin analysis; controls on sea level change; subsurface analytical methods; basin mapping methods; subsidence analysis (decompaction and sediment loading, subsidence curves); sequence stratigraphy; sedimentation systems in different basin types; Precambrian basins. Tectonic models for basin formation; fault systems; tectonics of intrusions.

(GLY 704) Crustal evolution 704 (16 credits)

Precambrian crustal evolution: origin of continental crust; crustal growth rates; Precambrian plate tectonics; global magmatic events and catastrophic density overturns; the continental freeboard concept; sea level changes in the Precambrian; supercontinent cycles; Precambrian geological development of Africa: Eburnean, Kibaran and Pan-African events. Advanced plate tectonics; palaeomagnetism; palaeoclimates and the fossil record; plate tectonism through geological time.

(GLY 706) Mining Methods 706 (8 credits)

Controlling legislation and infrastructural requirements. Mining methods: open cast and underground. Metallurgical treatment, metallurgical plants and waste disposal. Pollution acid drainage and acid rain.

(GLY 707) Mapping Camp 707 (8 credits)

Mapping and analysis of a geologically complex area using different techniques.

(GLY 710) Honours Project 710 (32 credits)

Independent acquisition of geological field and/or laboratory data, treatment and interpretation thereof, and writing of an honours essay.

(GLY 711) Igneous Petrology and Geochemistry 711 (16 credits)

Interpretation and application of advanced petrogenetic tools: the Rb/Sr and Sm/Nd isotopic systems, quantitative interpretation of binary and ternary phase diagrams, assimilation-fractional crystallisation – partial melting. Abundance of elements in the crust, crust-forming models. Hydrous geochemistry. Recognition of geochemical anomalies. Analytical methods and the treatment of geochemical data.

(GLY 712) Metamorphic Petrology and Geochemistry 712 (16 credits)

Geothermometers and geobarometers, PT-t loops. Studies of major African and other mobile belts: Limpopo, Natal-Namaqua, Pan-African and Hoggar.

(GLY 713) Economic Geology 713 (16 credits)

Basic remote sensing methods and their applications to geology; basic geophysical and geochemical exploration techniques; exploration target generation – philosophies and methods; professional geological practice; the SAMREC and similar codes; geologists in the business environment.

(GLY 714) Mineralogy 714 (16 credits)

Ore microscopy-based identification of ore minerals (oxides, sulphides etc.), evaluation of ore textures (intergrowths, exsolutions, replacements) and assemblages for genetic and beneficiation evaluation with the use of phase diagrams. Compositional variation of ore minerals and their implications. Instrumental techniques for the identification and evaluation of ore minerals (electron microprobe, laser ablation ICPMS and QuemScan etc.).

(GTK 701) Advanced Genetics 701 (40 credits)

This module aims to enable students to analyse and interpret genetic data, to read and write scientific papers, and to converse in a scientific environment. Study themes are selected from different sub-disciplines in genetics on the basis of actuality and high profile in current literature. Students partake in mentored discussions groups. Assessment is through written examinations, assignments and peer review of informal presentations.

(GTK 702) Seminar Course 702 (20 credits)

Students are guided to collect relevant literature from disparate papers and to condense and collate this into a written seminar. Seminars are presented, along with formal article talks. Themes and articles in the Seminar Course form part of the written examination upon completion of the module.

(GTK 703) Research project 703 (70 credits)

A mini-dissertation with well-defined limits is undertaken under the guidance of a lecturer. The students are allowed to choose from a number of projects from the different research programmes in the Department. The project is preceded by a techniques course during which the student is familiarised with core techniques not covered in undergraduate training. The project is concluded with a progress report, presented in the format of a short publication, as well as a poster and an oral presentation.

(GTK 704) Trends in Genetics 704 (12 credits)

Discussions and essays focusing on recent advances in the field of Genetics, as well as contextualising these developments within the broader framework of the Biosciences and its role in modern society.

(GTX 713) Site Investigation Project 713 (16 credits)

Field work which includes mapping, soil and rock description, joint surveys, borehole testing, water sampling, interpretation of laboratory test results and compilation of site investigation reports.

(GTX 714) Engineering Geology of South Africa 714 (16 credits)

Overview of site investigation phases, site investigation techniques, soil profiling and rock core description. Literature study and compilation of reports on the stratigraphy of South African rock types and the engineering problems of rocks and soils within different stratigraphic units and climatic regions.

(GTX 715) Environmental Geochemistry 715 (16 credits)

Principles of low temperature geochemistry; geochemistry and origin of acid mine water; acid-mineral reactions; industrial effluents, remediation methods, waste disposal, environmental sampling and data analysis; geochemical modelling.

(GTX 716) Environmental Management 716 (8 credits)

Principles of integrated environmental management; environmental impact assessment; environmental management systems (ISO 14000 series); water resource management; environmental legislation.

(GTX 717) Environmental Project 717 (32 credits)

Pollution studies which include field work, mapping, water and/or soil sampling, interpretation of laboratory tests, development of a rehabilitation plan and compilation of a report.

(GTX 718) Hydrogeological Modelling 718 (16 credits)

Finite-difference methods; numerical solution of the flow and transport equations; spatial and temporal discretisation, stability criteria; development of conceptual models; introduction to PMWIN/Modflow.

(GTX 719) Contaminant Transport 719 (16 credits)

Theory of contaminant transport in porous and fractured aquifers, determination of transport parameters; boundary conditions; analytical solutions of 1-, 2- and 3-dimensional transport equations for porous aquifers; analytical solutions for fractured aquifers; introduction to transport modelling with PMWN and PHREEQC.

(GTX 721) Construction Materials 721 (16 credits)

Requirements for and use of concrete aggregates, road and dam construction materials; site investigation and site development methods; quality control.

(GTX 722) Rock Engineering 722 (16 credits)

Mapping, description (core logging and discontinuity surveys) and classification of rock masses; engineering properties of rock masses including deformability, shear strength of discontinuities, in situ strength and permeability of rock masses; effects, theoretical derivation and practical measurements of in situ stresses.

(GTX 723) Engineering Applications 723 (16 credits)

The influence of geology on construction projects with specific reference to the requirements of dams, tunnels, slopes, waste disposal and urban development.

(GTX 726) Rock and Soil Improvement 726 (16 credits)

Grouting materials and procedures; rock and soil anchors; rock and soil compaction; drainage methods.

(GTX 727) Mining Project 727 (32 credits)

At least two months of work on a mine which involves surface and underground studies, mapping, drill core logging, discontinuity surveys, rock mass classification, stability analyses, interpretation of laboratory tests and report writing.

(GVK 800) Large Stock Science 800 (30 credits)

Management programmes and systems for beef cattle, dairy cattle and horses. Optimal use of breeds and regional adaptation of cattle. The stud industry and commercial units. Indigenous breeds and production development. The application of animal science practices and the practise of techniques for breed improvement. Seminars, class discussions, literature studies and assignments on certain fields. Research and production techniques. Agro-economic, agro-ecological and socio-economic assignments can be prescribed.

(HSC 783) Topics in Horticultural Science (15 credits)

Studies of topics such as tree quality, water relations, fertiliser requirements, disease susceptibility, weed control and crop physiology.

(HSC 788) Production Systems : I Tropical Fruit Production (15 credits)

Integrating the seasonal phenology of tropical fruit crops with management systems by studying the botany, biochemistry and physiology, as well as the climate, soil, water, diseases, etc., aimed at maximizing yield, quality and profit.

(HSC 789) Production Systems : II Temperate Fruit Production (15 credits)

Integrating the seasonal phenology of temperate fruit crops with management systems by studying the botany, biochemistry and physiology, as well as the climate, soil, water, diseases, etc., aimed at maximizing yield, quality and profit.

(HSK 810) Theoretical Frameworks in Cultural Studies 810 (15 credits)

The interaction between the nature of man as a living being and the environment, in which he has to survive, is studied from a cultural and an existential approach. The interrelationships between beliefs, values and attitudes are studied as well as the socio-cultural adjustments that man has to make when cultures come into contact.

(HSK 812) Theoretical Frameworks in Consumer Studies 812 (15 credits)

Consumer orientation is a study of consumer behaviour within a systems theory approach. Special emphasis is placed on inter-related factors that influence consumers' decision-making and consumer socialisation, as well as processes during which a consumer's general behaviour is shaped. Models used to structure the consumer's decision-making process as well as the South African consumer within the context of the global market, are studied.

(HSK 813) Symbolic Interactionism: Social Cognition and a Life Course Perspective 813 (15 credits)

Symbolic interactionism focuses on the nature of interaction and the dynamic social activities taking place between persons. The human being is understood as acting in the present, influenced by what is happening now. Human beings are seen as active and dynamic. Interaction is not only what is happening between people, but also what is happening within the person.

A social cognitive perspective focuses primarily on how people form impressions about one another and about one self. The process through which people seek knowledge about others is called social perception, while the process through which people make judgments about others and themselves are called social cognition.

The life course perspective is used in the field of social studies where explanations of continuity and change are needed. It addresses the dynamic interface between lives and social structures over time. The life course perspective views peoples' lives across their lifespan, emphasizing life course trajectories (paths) and transitions (changes) while taking into account life stage, social structure and events throughout peoples' lives.

(IAS 712) Liabilities 712 (40 credits)

Professionalism. Stakeholders and providers of benefits. Risks and uncertainties. Risk management and monitoring. Marketing. Life insurance products. General insurance products. Reinsurance. Regulation, regulatory regimes and the external environment. Capital management. Introduction to contract design. Valuation of benefits and the discount rate. Input validation. Valuation assumption setting. Provisioning. Product design: costing, pricing and funding. The relationship between assets and liabilities. Development of expected values. Reporting of actual results. Maintaining profitability. Asset management. Surplus management. Mergers, acquisitions, insolvency and closure. Options and guarantees.

(ITW 880) Interior Merchandising 880 (30 credits)

Prerequisites: ITW 221 (*Interior merchandise*) or similar module
ERG 282 (*Ergonomics*) or similar module
HSK 812 (*Theoretical frameworks in Consumer studies*) or
KHB 780 (*Retail management*)

The buying function in interior retail with special reference to buyer responsibility, merchandise and purchase planning; analysis and evaluation of the national and international markets and trends. A special focus on the South African market: consumer needs, market trends and responsibilities. Learners are exposed to the retail practice, case and research studies.

(ITW 881) Equipment Studies 881 (30 credits)

Prerequisites: ITW 221(*Interior merchandise*) or similar module
ERG 282 (*Ergonomics*);
VBF 411 (*Consumer facilitation*) or similar module
HSK 812 (*Theoretical frameworks in Consumer studies*)

The following study themes are included:

- A global perspective towards the selection and use of household appliances and merchandise;
- A comparative study of the energy consumption and operation principles of household appliances and merchandise;
- Applied ergonomics.

(ITW 882) Socio-psychological aspects of housing and interior 882 (30 credits)

Prerequisites: ITW 221 (Interior merchandise) or similar module

VBF 411 (Consumer facilitation) or similar module

HSK 810 (Theoretical frameworks in cultural studies) or

HSK 813 (Symbolic Interactionism: Social Cognition and a Life Course Perspective)

Understanding the social, psychological and cultural aspects of housing and purchasing of interior products: a South African perspective.

(KLD 880) Social Aspects of Clothing 880 (30 credits)

Prerequisites: HSK 810 and HSK 813

A social-psychological and cultural study of the interaction between the individual, his/her dress and the social environments as well as the emergent meanings.

(KLD 883) Clothing: Product Development 883 (30 credits)

The focus is on aspects primarily concerned with product development, for instance product analysis, line planning and line development, product standards and specifications, costs and product implications. Study methods and projects are planned in such a way that the student can gain first-hand experience.

(KLD 884) Clothing Merchandising 884 (30 credits)

Prerequisites: BEM 310 & 320 (Marketing management 310 and 320) or similar module

KHB 780 (Retail management)

The South African clothing retail industry, including traditional and developing/new marketing channels, are studied. Analysis and evaluation of the present situation in the South African clothing retail industry. Developing forms of retailing and marketing in the clothing industry in South Africa with emphasis on the informal sector and direct marketing are also studied.

(KTV 700) Short-term Insurance 700 (40 credits)

Insurance companies, the actuarial control cycle, general insurance products, general insurance markets. The following aspects of the operation of a general insurance company: Actuarial investigations, outstanding claims reserves, reserves for IBNR and unexpired risks, reserving bases, premium rating, rating bases. Reinsurance products and applications, modelling for financial planning, investment, asset-liability modelling, accounting principles, interpreting accounts, claims analysis, other analyses.

(KVK 800) Small Stock Science 800 (30 credits)

Advanced aspects of the small stock industry. The wool, fur and meat production potential of South Africa. Production trends and factors influencing them. Production systems. The influence of flock composition on production. Discussions, seminars and prescribed scientific literature studies on various aspects of the small stock industry.

(LEK 702) Introduction to Agribusiness Management (20 credits)

The course will expose the learner to the following aspects of agribusiness management:

- The environment for decision-making
- Elements of agribusiness management
- Operating decisions in agribusiness management
- Agricultural finance and investment decisions in the agribusiness

Only offered full-time – students attend classes LEK 320 and LEK 421

(LEK 711) Agricultural Economics 711 (Advanced Production Economics)

(20 credits)

Prerequisites: EKT 713 & MIE 780

- a) Primal approach: Structure of the production technology and properties, elasticity of substitution, homogeneity and returns to scale, separability, estimation of technology parameters and testing hypothesis about properties, functional forms.
- b) Normative supply analysis: Applications of linear programming to farm supply decisions.
- c) Dual approach: The profit function, the cost function, duality and technology structure, estimation and hypothesis testing.
- d) Positive supply analysis: Econometric specification of output supply and factor demand, restrictions from technology structure (homogeneity, etc.), aggregate supply analysis.
- e) Risk and uncertainty: Mean-variance analysis applications in agricultural production, stochastic dominance; MOTAD and quadratic programming.

(LEK 712) Agricultural Economics 712 (Agricultural Policy) (15 credits)

Reasons and effect of government intervention in agriculture. The economic theory of policy evaluation. Interdependence between trade, macroeconomic and agricultural policy. Welfare considerations. Public choice theory and agricultural policy. Game Theory. Policy Analysis Matrix. Quantitative policy analysis. Seminars.

(LEK 713) Agricultural Economics 713 (Agricultural Marketing) (15 credits)

The nature, development and conceptualisation of marketing and marketing study; the marketing environment, nationally and internationally; the functional and institutional approaches to marketing study; price discovery and margins; dynamics of marketing channels; competition and concentration on horizontal and vertical level; conflict and power relationships in marketing; consumption economics, consumer behaviour and consumer action; market segmentation; price, product, promotional and distributional policy; marketing analysis and planning. Global food marketing issues, contracting and changing global food retail patterns.

(LEK 720) Agricultural Economics 720 (Strategic Management in Agriculture)

(15 credits)

Dynamics of agricultural management. Entrepreneurship. Environmental scanning. Productivity measurement and improvement thereof by the organisation of manpower, capital and financial sources. Business growth. Formulation and implementation of competitive strategy. Corporate governance, strategic analysis and strategic choice, strategy implementation, balanced scorecard.

(LEK 722) Agricultural Economics 722 (Agricultural Finance) (15 credits)

Economic theory underlying agricultural finance and agricultural finance institutions. Supply and demand of agricultural financial services. Servicing the farm and the agricultural business firm. Agricultural finance within the broader financial market in South and Southern Africa.

(LEK 723) Agricultural Economics 723 (Agricultural development) (15 credits)

Contribution of agriculture and agricultural growth to economic development. The inter-relationship between growth and the evolution of the agrarian structure. The agrarian question. Microeconomic theory of the peasant household. Agricultural policy issues for developing countries. Constraints and transaction cost barriers facing poor farmers. Land reform.

(LEK 725) Quantitative Methods for Agricultural Economics (20 credits) (Not offered in part-time block week)

Pre-requisite: STK 210 or equivalent

Tools for mathematical economic analysis.

Calculus: functions, differentiation, exponentials, matrix algebra.

Optimisation techniques and mathematical integration, growth functions and programming: constrained and unconstrained optima.

Introduction to econometrics: probability and sampling distributions, hypothesis testing, linear transformations, linear regression, ordinary least squares in simple and multiple linear regressions.

Research planning and methodology

(LEK 726) Agricultural Economics 726 (Environmental Valuation and Policy) (15 credits)

Prerequisites: MIE 780 and EKT 713 or equivalents

This module will review the basic principles of microeconomic theory needed for understanding and analysis of environmental problems, introduce market and non-market techniques of valuation of natural resources and environmental services (hedonic pricing, contingent valuation, transport cost, willingness-to-pay, cost-based techniques, etc.), public goods and environmental externalities, property rights regimes and selection of appropriate environmental policy instruments for management of environmental externalities.

(LEK 780) Agricultural Economics 780 (Introduction to Natural Resource and Environmental Economics) (15 credits)

This module reviews the origins and evolution of natural and environmental resource economics. It describes and studies the application of economic principles and analytical methods for sustainable development of renewable, non-renewable and environmental economics. Examine sources of inefficiency and causes as well as indicators of environmental degradation. The economics of pollution management: Concepts, policies and instruments. Sustainable management of natural and environmental resources. Introduction to Natural and Environmental Resource Policy. Economic valuation of natural and environmental resources.

(LEK 782) Agricultural Economics 782 (International Agricultural Trade and Policy) (15 credits)

WTO/GATT-1994 and agriculture related Agreements and Understandings. Regionalism and trade blocks. International trade and economic development. RSA's agricultural trade policy. RSA's involvement in bilateral and plurilateral agreements, i.e. SADC, EU/South Africa Trade, Development and Cooperation Agreement for the 21st century, SACU and others. Application of international market analysis tools.

(LEK 783) Agricultural Economics 783 (Research methodology and thesis design) (20 credits)

Research in perspective. The research process. Formulating research problems, hypotheses and objectives. Developing a conceptual framework. Review of literature. Methods and procedures. Data collection, processing and analysis. Developing a good research proposal. Writing and presenting a good research report.

(LEK 784) Agricultural Economics 784 (Advanced Rural Finance) (15 credits)

Economic theory underlying rural financial markets and institutions. Economic growth and financial services. Supply and demand of financial services in rural areas. Rural financial

institutions and application to South and Southern Africa.

(LEK 785) Agricultural Economics 785 (Project planning and appraisal) (15 credits)

Planning and priority setting. The project concept. Project cycle: Identification, preparation and appraisal, implementation, evaluation. Development programming. Decision making in public projects. Policy vs project analysis. Cost-benefit analysis. Impact assessment.

(LEK 810) Agricultural Economics 810 (Econometrics) (20 credits)

Prerequisite: LEK 725 or equivalent

Linear regression: assumptions of the linear regression model, OLS estimators and properties, hypothesis testing (single and multiple restrictions), forecasting, dummy variables. Violations of the linear model assumptions: multi-collinearity, heteroscedasticity, serial correlation and distributed lag models (GLS estimators). Advanced topics: Quantitative response models (logit, tobit and probit analysis) co-integration, instrumental variables and 2-stage least squares.

(LEK 814) Agricultural Economics 814 (Quantitative Models for Agricultural Policy and Planning) (15 credits)

Multi-sector models: Input-output and programming models and social accounting matrices for consistent production planning, growth, income distribution and trade policy analysis. Multi-market analysis. Computable general equilibrium models.

(LEK 820) Applied Trade Analysis 820 (15 credits)

Prerequisite: EKT 723 or LEK 810

This module focuses on the modelling of agricultural commodity markets, price determination, policy and trade. The main objective is to provide the fundamental skills for partial-equilibrium model building and an opportunity to apply these skills. The approach will include: (1) Economic Theory: The theoretical foundations of each modelling component of a typical commodity balance sheet and set of prices will be emphasised in the design and specification of models; (2) Applied Research: Basic steps in modelling will be emphasized. Throughout the module, applied modelling research will be conducted and presented to gain experience with methods discussed in class. The course applies economic theory and quantitative methods to analyse food and agricultural market, price, trade and policy issues. The module examines problem formulation, model structure, estimation, and model evaluation applied to demand and supply and to trade and policy interventions.

(LEK 882) Institutional and Behavioural Economics 882 (15 credits)

Prerequisites: MIE 780. This module will expose students to the principles of the New Institutional Economics paradigm and how it can be utilised to improve the analysis of agricultural economic and agricultural development problems and issues. Major themes covered are: The agricultural development challenge: stylised features; new institutional economics: distinctive features and concepts; institutions and development: A Historical and Macro Perspective; Techno-Economic Characteristics and Agricultural Systems and Products in Poor Countries; NIE Analysis of Markets and Market Structures; The State: Political and institutional determinants of agricultural policy; collective action; transaction costs in smallholder agriculture; case studies.

(LEK 883) Agricultural Supply Chain Management 883 (15 credits)

Explore the evolution of supply chain management in the global food industry. Establish the different ways in which supply chain management can provide a source of

competitive advantage at industry level and for individual firms. Examine the cross-functional and multidisciplinary nature of supply chain management as it applies in the global food industry. Introduce the core elements of the theoretical literature on supply chain management and consider applications in different sectors. Provide students with practical experience in applying the principles of supply chain management to the exploitation of a marketing opportunity, using case examples from the fresh produce and meat sectors. Provide students with practical experience of undertaking a supply chain audit, with a view to establishing an appropriate business strategy for a food manufacturing company.

(LEK 886) Agricultural Economics 886 (The Economics of Natural Resources Management) (15 credits)

Prerequisites: LEK 780 and LEK 810 or equivalents

This course will introduce students to the techniques of optimisation overtime, optimal allocation and management of non-renewable and renewable resources, with case studies from Africa. The influence of property rights regimes on optimal natural resource use will also be stressed. The course consists of three main sections: Methods of dynamic optimisation; Theory of exhaustible and renewable resources and growth models; and Property rights and natural resource use with case studies from Africa.

(LEK 887) Agricultural Economics 887 (Selected Topics in Environmental Economics) (15 credits)

Prerequisites: MIE 780 and EKT 713 or equivalents

This module will introduce students to various issues of special importance in environmental economics and policy with special emphasis on international dimensions. Examples of key themes to be covered include trade and the environment, trans-boundary externalities, global public goods, multi-lateral environmental agreements, international aid, economic growth and environmental change, poverty and the environment, etc. The main objective of the module is to equip students with the appropriate tools for analysing the linkages between economic development, trade and globalisation, poverty, economic and environmental policy and environmental change.

(LEK 890) Dissertation 890 (180 credits)

A dissertation based on research under the guidance of a member of the academic staff of the Department of Agricultural Economics, Extension and Rural Development.

(LEK 900) Agricultural Economics (80 credits)

(LEK 990) Thesis: Agricultural Economics (400 credits)

(LEW 700) Life Insurance 700 (40 credits)

The following aspects of the operation of a life insurance company are covered:

General business environment; products offered; asset shares for life insurance contracts; with-profits surplus distribution; actuarial funding; models; setting of assumptions; aspects of products design; alterations to contracts; development and maintenance; investment; risk management procedures including reinsurance and underwriting; cost of guarantees; policy data checks; capital management and the actuarial control cycle. Modelling and monitoring policy cashflows for purposes of pricing, profit analysis, statutory valuation reserves and ongoing solvency.

(LMO 710) Linear Models 710 (20 credits)

Projection matrices and sums of squares of linear sets. Estimation and the Gauss-Markov theorem. Generalised t - and F - tests

(LMO 720) Linear Models 720 (20 credits)

The singular normal distribution. Distributions of quadratic forms. The general linear model. Multiple comparison. Analysis of covariance. Generalised linear models. Analysis of categorical data.

(LOB 800) Rural Development Governance (20 credits)

Defining the theory and practice of rural governance; public management and development; public sector initiatives for development; administering the Reconstruction and Development Programme in rural areas; rural governance (case studies - international experience); defining rural society and the role players (civil society, traditional authorities; public and private sector initiatives, NGO's and CBO's; power relationship in rural society; rural/urban interaction.

(LUP 900) Examination: Land-Use Planning 900_ (60 credits)

(LUP 990)Thesis: Land-Use Planning 990 (300 credits)

(MBY 751) Virology 751 (18 credits)

Specialist topics in virology.

(MBY 752) Applied biotechnology 752 (18 credits)

Specialist topics in applied biotechnology.

(MBY 753) Microbial systematics 753 (18 credits)

The phylogenetic approach, techniques used and their implication towards microbial systematics.

(MBY 754) Prokaryote molecular biology 754 (18 credits)

Specialist topics in current topics of molecular biology of prokaryotes.

(MBY 756) Research project 756 (50 credits)

Research undertaken in a specific topical area in microbiology.

(MBY 757) Literature review 757 (10 credits)

An in-depth review of current literature regarding the research topic.

(MBY 755) Advanced Techniques in Microbiology 755 (10 credits)

Lectures and hands-on experience in advanced techniques as utilised in microbiological research and analysis.

(MLB 721) Molecular and Cellular Biology 721(18 credits)

(28 lectures and 14 practicals)

An advanced study of the principles of molecular biology and the methodology of recombinant DNA technology; various biotechnological applications of this in agriculture and in veterinary and medical sciences. This module includes intermediate advanced practical training in the basic methodology involved in recombinant DNA technology and is jointly presented by the departments of Biochemistry, Genetics, and Microbiology and Plant Pathology.

(MVA 710) Multivariate Analysis 710 (20 credits)

Matrix algebra. Multivariate distributions. Samples from multivariate normal populations. The Wishart distribution. Hotelling's T^2 statistic. Beta-type distributions.

(MVA 720) Multivariate Analysis 720 (20 credits)

The matrix normal distribution, correlation structures and inference of covariance matrices. Principal component analysis, factor analysis, discriminant analysis.

(NBP 780) Settlement Planning (20 credits)

Historical overview; determinants of settlement location, structure, growth and behaviour; description of settlement structure and growth patterns; transportation, communication and services; residential areas; specialized activity areas; problems; prospects; planning principles; design processes; and lay-out standards.

(NLB 780) Animal population dynamics 780 (5 credits)

Selected wildlife management philosophies, principles and concepts, followed by aspects of the population dynamics of animals applicable to wildlife management. The principles and application of the following are discussed amongst others: General population characteristics, the density concept, mortality, natality, life tables, population growth, harvesting quotas, population regulation, population structure, dispersal, dispersion, aggregation, isolation and territoriality, competition and predator-prey relationships.

(NLB 781) Wildlife management principles and techniques 781 (5 credits)

The most important techniques applicable to wildlife management and wildlife research are discussed. The principles, applications and restrictions of the following are discussed amongst others: wildlife counts, age determination, age and sex ratios, translocation of animals, chemical immobilisation, mechanical capture techniques, transport of wildlife, land-use, predator control and predator-prey studies.

(NLB 782) Wildlife nutrition 782 (10 credits)

The digestive functioning of selected ruminant and non-ruminant herbivores. Physiology and fermentation are discussed, followed by the role of secondary chemicals and toxins in plants, measures against toxic plants and symptoms of poisoning. Energy balance, mineral shortages, supplemental feeding and the nutritional requirements of unweaned animals are related to sicknesses and diseases associated with poor nutrition.

(NLB 783) Parasites, diseases and the capture of wild animals 783 (10 credits)

An overview of veterinary aspects with reference to important parasites and diseases of wild animals. The capture of wildlife and the stress-related consequences of the capture of wild animals. The module content includes a discussion of all the different chemicals used to immobilise wild animals, darting, and handling of wild animals under sedation. The internal and external parasites, most important contagious wildlife diseases and the prevention of capture related diseases are discussed.

(NLB 784) Man and natural resources 784 (5 credits)

The interaction between man and the renewable natural resources. Conservation-based development of rural communal communities.

(NLB 785) Seminar 785 (15 credits)

A seminar on an ecological or wildlife management topic.

(NLB 795) Research project 795 (50 credits)

A research protocol, field work and project report based on an ecological or wildlife management topic.

(NLB 871) The philosophy, principles and ethics of wildlife management 871

(10 credits)

Ethics must be seen as a distillation of past experience, made available for future decisions. This confirms the inter-relatedness between ethics and principles in that all principles must be applied with judgement derived from ethics. Fundamentally, principles can be stated simply, but they may be complex concepts because all principles are interrelated.

(NLB 872) Man and conservation 872 (5 credits)

Humans continue to seek an optimally satisfactory fit that involves both nature and culture. Culture is carved out against a backdrop of, and from nature with the resultant dimensions of conflict between man and nature. Every organism of this world is set against its world, and culture intensifies this opposition. It therefore stands to reason that the opposition will cause degradation of the habitat that humans occupy.

(NLB 873) Veld management 873 (7 credits)

Even when veld management is based on thorough knowledge of plant communities, correct management is not consistently definable. The task of quantitatively assessing the various combinations of enterprises and management systems available to the wildlife manager, is both daunting and unachievable. Veld management is therefore based on a philosophy of adaptive management.

(NLB 874) Plant identification 874 (5 credits)

Grasses and trees that occur in southern Africa are dealt with in a systematic order, describing their main features and position within the taxonomic systems. This module is supported with visuals of the flowering stages of the various plants.

(NLB 875) Vegetation dynamics 875 (5 credits)

The determination of the grazing and browsing capacity for a given area creates considerable problems, since old ideas on fixed figures and large-animal stock unit equivalents appear to have little or no use in practice. The grazing and browsing capacity of large natural areas is based on the habitat diversity, veld condition and plant composition peculiar to that particular area.

(NLB 876) Reptile biology and identification 876 (5 credits)

The herpetological classification of snakes and their biological features such as habitat selection, breeding behaviour and feeding. Toxicity of certain species is dealt with and how they can affect humans and the treatments of snakebites. The biology of other reptiles is also dealt with, in particular those of economic importance such as crocodiles. The principles of crocodile farming are discussed.

(NLB 877) Mammalogy 877 (5 credits)

In this module, the emphasis lies on large mammals, dealing with the systematic classification and biology of antelopes and carnivores. Descriptions of habitat preferences, reproductive behaviour, feeding behaviour and predator-prey interactions are given.

(NLB 878) Wildlife nutrition 878 (10 credits)

The functioning of the ruminant digestive system is far more complex than the hind-gut fermenting system that is found in monogastric species. Food selection and the composition of food resources determine the efficiency with which herbivores can transform this source of energy and nutrients. The balance between production and consumption of vegetation is important in wildlife management. Physical and chemical defense in plants is discussed and how they influence feed selection and digestion in herbivores. The feeding ecology of wildlife in confined conditions through supplementary feeding is discussed.

(NLB 879) Wildlife management techniques 879 (6 credits)

The practical aspects of wildlife management includes burning programmes of vegetation, correct counting techniques, calculating ecological capacity, provision of water, wildlife capture techniques for various species and the handling of these species. Important aspects are holding bomas, care of animals in confinement, construction of containers and transportation and different harvesting techniques. The use of tick control methods, tracking of animals and GPS use are also dealt with in this module.

(NLB 880) Parasites and diseases of wildlife 880 (5 credits)

Wildlife is less subjected to diseases than is the case in domestic stock. This holds true in particular with free-ranging wildlife. However, where wildlife comes into contact with domestic stock, diseases are often transmitted through parasites such as foot-and-mouth disease, tuberculosis, anthrax, heartwater and corridor disease. The taxonomic classification of parasites is discussed, as well as their life-cycles, hosts and treatment for the diseases that they transmit.

(NLB 881) Game ranch and nature reserve economics 881 (5 credits)

Management of wildlife ranches and nature reserves do not only entail looking after animals, but these areas also have to be managed economically if they are to be sustained. Most of the private wildlife ranches, and even smaller national parks, operate on meagre profits, usually because their operations are too small or because they have an insufficient focus on multiple-use. Simple economic principles are discussed to assist the manager of a wildlife reserve or ranch.

(NLB 882) Animal population dynamics 882 (7 credits)

The main aspects of animal populations that are particularly important in wildlife ranch management are the growth, age and sex composition, social organisation and behaviour of that population. These aspects can act singly or in combination, but all are linked to the population's potential to increase, through the balance between natality (births) and mortality (deaths) in the population.

(NLB 883) Ecotourism 883 (7 credits)

Within African conservation, ecotourism is extremely important in sustaining conservation efforts. Minimum impact of tourism infrastructure is discussed as well as the tourism capacity of nature reserves. Practical aspects such as hiking trails, 4x4 routes, horse trails, game drive etiquette and placement of hides for optimal viewing make the outdoor experience memorable. Tourism will ensure the future of wildlife conservation in Africa.

(NLB 884) Wildlife and the law 884 (7 credits)

Although many regulations and laws exist to regulate the wildlife industry, proper enforcement of these laws is essential. A wildlife manager must have knowledge of the laws regulating this industry in order to be successful.

(NLB 885) Wildlife utilisation 885 (7 credits)

Modern man has put wildlife in confined areas to protect and ensure the survival of species. Utilisation becomes an important issue in these fenced-in areas. Ecotourism can be viewed as non-consumptive wildlife utilisation. Harvesting of wildlife is defined as consumptive wildlife utilisation. This module addresses aspects concerning these principles.

(NLB 886) Practical studies 886 (60 credits)

Further to the above web-based theoretical but visible modules, a 21 day full-time practical module must be completed. This is viewed as one module under a single code. This module deals with the following practical topics in the field:

1. Wildlife capture techniques (8 credits)
2. Veld condition assessment methods (8 credits)
3. Plant identification methods (5 credits)
4. Wildlife tracking of big game (5 credits)
5. Visits to sustainable use programmes (5 credits)
6. Off-road driving skills and first aid (3 credits)
7. Bird identification and habitat management (3 credits)
8. Practical wildlife management techniques (7 credits)
9. Interaction with communal rural communities related to nature conservation (8 credits)
10. Ecotourism hospitality (8 credits)

(NLB 887) Research project 887 (84 credits)

The dissertation is based on an individual research project by each candidate, including a module on research methodology.

(NME 814) Research Methodology 814 (30 credits)

The aim of this module is to analyse the core concepts in social research and to provide a conceptual framework of the research process. It includes the following topics: a conceptual model of social science research, the logic of the research process, the different forms of scientific reasoning, and the stages in the research process being the formulation of the research problem, research design, conceptualisation, operationalisation, sampling, data-collection and data-analysis. After the completion of this section, an introduction to interpretive approaches and qualitative research methods are given and contrasted with quantitative methods. This module also includes the main types of research designs and notions such as validity and reliability as well as the ethics and politics of research. In conclusion the writing of a research proposal receives attention.

(NPJ 780) Research Project 780 (20 credits)

The research project is compulsory. A detailed project proposal should be submitted to the head of Department by a prescribed date for approval, as described in the departmental document in this regard.

(OMR 882) Environmental Law 882 (20 credits)

Duty of care and sustainable development in environmental law, Water Law and the protection of the environment in South African law. Protecting South African biodiversity, atmospheric pollution, hazardous substances and waste management, mining and the environment, energy law, planning law and the environment in South African law, marine and coastal environment, environmental assessment.

(OMS 881) Environmental change 881 (40 credits)

Principles of environmental change: geomorphology and environmental change, climate change, environmental change and its impact on human habitation, human impact on environmental change, contemporary research into environmental change.

(OMS 883) Polar and Mountain Environments 883 (20 credits)

Mountain and polar environments are investigated from one or more perspectives. The topic will involve the study of the following in mountain and polar environments: environmental change, climate and weather, geomorphological processes, settlement and human habitation, and cultural geography.

(PFS 700) Production Physiology 700 (22 credits)

Specialised study of physiological and anatomical factors that influence growth, development, production and product quality. Stress and intensification effects on product quality. Animal Science pharmacology. (Theoretical components include VKF411 and VSX420.)

(PFS 801) Production Physiology 801 (30 credits)

Specialised study of physiological and anatomical factors that influence growth, development, reproduction and production. Stress and intensification effects on the metabolism of animals. The mechanisms of disease and erosion losses and the modification of reproduction and growth.

(PFS 802) Production Physiology 802 (30 credits)

A study of specific topics by way of literature, seminars, discussions and research assignments. Each student does a research project and compiles a research paper.

(PGW 701) Plant Production 701 (30 credits)

Plant production systems. Integration of ecological, agronomic, edaphic, climatological and economical knowledge in production systems in Agronomy/Horticulture/Pasture Science which emphasise optimum sustainable utilisation of natural resources. Case studies.

(PGW 702) Scientific Communication 702 (30 credits)

Principles of the scientific process. Literature accessing and article assessment. Manuscript preparation and presentation of seminars. Use of visual aids.

(PGW 704) Research Methodology 704 (15 credits)

Basic experimental designs. Measurements and control over experimental error. Factorial experiments and interactions. Analysis of variance (ANOVA) and data interpretation.

(PHY 701) Mathematical Methods 701 (15 credits)

Analytical functions and singularities. Advanced contour integrals. Series solutions of differential equations – ordinary and Frobenius series. Sturm-Liouville theory. Bessel, Legendre, Laguerre, Hermite, Jacobi, Chebyshev and other systems of orthogonal functions. Integral transforms. Delta and Green functions.

(PHY 702) Classical Mechanics 702 (15 credits)

Constraints, generalised coordinates, D'Alembert's principle and Lagrange's equations. Advanced variational calculus. Generalised momenta and conservation laws. Coupled oscillations, normal modes and generalised principal axis transformations. Legendre transformation and Hamilton's and Routh's laws of motion. Canonical transformations: via

a variational principle and a generating function, symplectic formalism, Poisson brackets as canonical invariants, Poisson bracket form of the equations of motion, infinitesimal and continuous transformations, active and passive views of a continuous transformation, constants of motion and generators of transformations that keep H invariant. Hamilton Jacobi theory.

(PHY 703) Quantum mechanics (I) 703 (15 credits)

Wave packets and the motion of free particles. Wave and Schrödinger equations. Linear harmonic oscillator. Partially constant potentials. WKB-approximation. Principles of wave mechanics. Central forces and angular momentum. Hydrogen atom. Scattering.

(PHY 704) Statistical physics 704 (15 credits)

Micro-canonical, canonical and grand ensembles; Bose and Fermi systems.

(PHY 705) Electrodynamics (I) 705 (15 credits)

Poisson's equation; Green-functions; Maxwell's equations.

(PHY 706) Project and Seminar 706 (15 credits)

A theoretical or an experimental project can be done. The project must be approved by the head of department. The project must be summarised in the form of an open seminar.

(PHY 707) Quantum mechanics (II) 707 (15 credits)

Linear vector spaces in quantum mechanics. Quantum dynamics. Rotation and other symmetry operators. Rotation group. Angular momentum coupling. Spherical tensors and the Wigner-Eckart theorem. Bound state perturbation theory. Time-dependent perturbation theory.

(PHY 708) Many body physics 708 (15 credits)

Second quantisation. Coherent states. Single particle behaviour. Hartree-Fock – perturbation – linearisation of operators. Quasi-particles, effective mass and applications: atom physics, electron gas, one dimensional delta function. Collective behaviour. Tamm-Dancoff approximation: linearisation. Time dependent Hartree-Fock. Random phase approximation. Applications: giant dipole resonance, screening in an electron gas, correlation energy in an electron gas, plasma oscillations, zero sound. Canonical transformation – Cooper pairs, BCS theory. Thomas-Fermi theory. Density functional theory. Superconduction. Ginzberg-Landau theory. Zero field finite temperature BCS.

(PHY 709) Electrodynamics (II) 709 (15 credits)

Static electromagnetic fields in matter. Waves in matter. Radiation of a localised oscillating source. Lienard-Wiechert potentials. Relativistic covariance of electrodynamics. Radiation physics.

(PHY 710) Numerical physics 710 (15 credits)

Numerical nature of physical problems such as atomic structure, electric fields, harmonic oscillators (classic and quantum mechanics), heat conduction, hydrodynamics, Ising model, molecular vibrations, order and chaos, potential scattering, Schrödinger equation, wave equation.

(PHY 711) Solid State Physics 711 (15 credits)

Electronic band structure, vibration properties of solids, electronic properties of defects, electric transport, optical properties, quantum confinement.

(PHY 712) Quantum Optics 712 (10 credits)

Coherent states $|\alpha\rangle$ of free and forced oscillators. Semi-classical electrodynamics (including time dependent perturbations and stimulated transitions). Mode composition of the electromagnetic field. Properties of laser light. Resonators and modes. Laser types (ruby, Nd^{+3} , CO_2 , He-Ne, excimer and GaAs).

(PHY 713) Electronic materials 713 (15 credits)

Structure, electrical and optical properties of semiconductors; semiconductor metal contacts; Ohmic and Schottky contacts; influence of impurities and defects on properties of the contacts; quantum well semiconductor structures.

(PHY 714) Analytical physics 714 (15 credits)

Review of surface analytical techniques, surface structure determinations, surface topography techniques, theory of contrast in electron microscopy; electron microscopic surface and interface techniques; scanning tunnelling microscopy; electrical and electro-optical characterisation of semiconductors; determination of defects and impurities in semiconductors; propagation of laser rays; photoluminescence.

(PHY 715) Nuclear solid state physics 715 (10 credits)

Mössbauer effect; positron annihilation; perturbed angular correlations; neutron scattering; RBS; channeling; nuclear reaction analyses.

(PHY 716) Group theory 716 (10 credits)

Introduction to group theory needed in physics. Thirty-two crystallographic point groups; selected groups; full rotation groups; applications such as classification of spectral terms; selection rules; Clebs-Gordon coefficients.

(PHY 718) Experimental physics 718 (15 credits)

Five different experiments. These experiments will be determined by the head of department.

(PHY 781) Foundations of Physics 781 (10 credits)

Conceptual basis of physics: The nature of Laws of Physics, basic concepts and misconceptions. Nature of physics, its history, nature of evidence, paradigms, current views and controversies of the nature of the physics enterprise. Indigenous knowledge in the field of physics, and alternative world views, physics in society. Limits and abuses of the results of Modern Physics.

(PHY 782) Current trends in Physics 782 (30 credits)

Prerequisites: Completion of core components of the BSc(Hons)

A chosen field of physics that is linked to the research specialisations of groups within the Physics Department. Approaches and trends in research advances in new topics in physics. The module follows a format of guided advanced readings, seminars and discussion sessions.

(PHY 891) Relevant Courses 891 (30 credits)

Relevant study courses as prescribed by the head of department.

(PJB 801) Project Management 801 (20 credits)

Introduction to project management. Organisational and project structures. The Project Team and roles of members including motivation and team building techniques. Variables for success. Negotiation and conflict handling skills. Communication and

conducting meetings. Quality management. Project risk management. Trade-off analyses. Project scope (planning) management.

(PJB 802) Project Management 802 (20 credits)

Project finances. Project cost management including earned value. Project time management, including critical chain. Project procurement management. Project management throughout the planning and construction processes. Project plans and reports. Project integration and communication management. Project close out.

(PLG 751) Research Project in Plant Pathology 751 (60 credits)

20 h/week for 28 weeks

A research project is undertaken under the leadership of a supervisor. The project includes a study of all relevant literature, actual execution of research, and submission of results in the form of a concept article. It is also expected that the student will present the work in the form of an oral presentation.

(PLG 753) Molecular Plant Pathology 753 (18 credits)

This module will address the use of biotechnology and molecular genetic approaches in plant pathology. Evaluation of conventional and novel strategies for obtaining durable resistance to plant diseases will be discussed. This will include the use of plant tissue culture techniques for crop improvement. A number of host/pathogen systems will be selected for in-depth analysis of disease resistance and susceptibility.

(PLG 754) Crop Diseases 754 (9 credits)

This module will provide an overview of the most important plant diseases associated with selected crops in South Africa. An emphasis will be put on diagnosis, factors affecting development of the diseases, and management strategies.

(PLG 783) Advanced Plant Disease Control 783 (18 credits)

Advanced aspects of chemical and biological control of plant diseases as well as disease resistance.

(PLG 789) Specialist topics 789 (9 credits)

Critical and in-depth review of existing literature on two topics from the following fields: Seed Pathology; Forest Pathology; Plant Virology; Plant Nematology; Phyto bacteriology; Postharvest Pathology.

(PLG 790) Current Concepts in Plant Pathology 790 (18 credits)

This module will address the most recent concepts in plant pathology.

(PLG 801) Elective module 801 (140 credits)

Advanced modules in Postharvest Technology (and related subjects) chosen in consultation with the Director of the School and the Head of the Department.

(PLG 802) Mini-dissertation 802 (80 credits)

Each candidate must write a mini-dissertation on his/her research project in Postharvest technology.

(PNP 720) Parametric and Nonparametric Stochastic Processes 720 (20 credits)

Parametric Stochastic Processes:

Queuing processes: M/M/1; M/M/S; M/G/1 queues and variants; limiting distribution of the queue length and waiting times. Queuing networks. Some stochastic inventory and

storage processes.

Nonparametric Stochastic Processes:

Linear rank statistics and their application in testing problems in one, two and multi-sample cases as well as in the independence problem.

(PNS 700) Pensions 700 (40 credits)

Providers of pension and related benefits. Needs of beneficiaries and sponsors. State sponsored vs. private sector sponsors. Presentation and reporting of benefits and contributions. Professional guidance. General and detailed benefit design, risk and uncertainty in pension funds. Methods of financing, pension fund investment and investment matching. The actuarial control cycle in the pension fund industry. Asset valuation, asset-liability modelling. Funding methods. Valuation, valuation data, basis assumption setting and analysis of experience. Discontinuance, options and guarantees, pension fund risk benefits.

(PPR 712) Plant Production : Herbicides (15 credits)

Weeds and their importance in Southern Africa. Properties and uses of herbicides. Herbicides in soils and their mode of action in plants.

(PPR 713) Agro-forestry (15 credits)

Agro-ecological zones (climate and soil); trees for fruit, fodder, fuel and/or timber; inter-cropping or alley cropping with grains, vegetables or pastures; management (including aspects such as nursery production, establishment, fertilization, pest control) and utilization/marketing.

(PPT 761) Risk Assessment and Sanitary and Phytosanitary issues (20 credits)

The three pillars of Risk Analysis i.e. Risk Assessment, Risk Communication and Risk Management are covered in this course. Risk Assessment (RA) is important in determining Fair Trade principles and scientifically sound import regulations and requirements. Theory and application of RA in terms of market access and international trade requirements are covered. Qualitative and quantitative approaches to the determination of probabilities are discussed. Focus falls on handling probabilities and reduction of risk in the export of locally produced fresh commodities. Sanitary and Phytosanitary (SPS) issues as possible Technical Barriers to trade in fresh produce are dealt with. Background to international standards for SPS includes pest risk analysis to set up import regulations, export certification systems, quality assurance, food safety and guidelines for surveillance. The International Plant Protection Convention and CODEX are discussed. Harmonization of trade protocols, production practices, standards, grades and quality assurance and its implications in the SADC region are also covered in the module.

(PPT 780) General Plant Pathology (20 credits)

General principles in plant pathology. Aspects of mycology, bacteriology, virology and plant microbe interaction. Basic principles of disease control, scripts on selected topics and reports on field visits to nurseries, packhouses and farms. Seminars on selected topics in Plant Pathology.

(PPT 781) Plant Pathology : Disease Control (20 credits)

Principles of disease control. Chemical, physical and biological control and principles of plant quarantine. Modern chemotherapy, properties and applications of fungicides and discussions on special topics pertaining to disease control.

(PPT 802) Advanced Courses (120 credits)

Advanced courses in Plant Protection and/or related subjects chosen in consultation with the Director of the School and the head of Plant Pathology. It is strongly advised that all candidates do AGR 783 and AGR 784.

(PPT 803) Elective Courses (120 credits)

Advanced courses in either field of specialization which can include Plant Pathology, Entomology, Weed Science or Plant Quarantine chosen in consultation with the Director of the School and the head of the department.

(PPT 892) Mini Dissertation (120 Credits)

Each candidate must write a mini-dissertation on his/her project in plant protection. The mini-dissertation can be either factor- or strategic research and case studies. The candidate must have at least one paper submitted to a peer-reviewed journal.

(PPT 893) Mini Dissertation (120 credits)

Each candidate must write a mini-dissertation on his/her research project in either field of specialisation and at least a concept research paper for publication in a suitable peer reviewed journal.

(PPT 900) Crop Protection Examination (50 credits)

Oral examination in Crop Protection and related areas at the doctoral level by national and internationally renowned experts.

(PPT 990) Thesis (350 credits)

Each candidate must write a thesis on his/her project in Plant Protection. The thesis can be either factor- or strategic research or case studies. The candidate must have at least one paper accepted/published in a peer-reviewed journal.

(PUR 820) International Environmental Law 820 (50 credits)

Sources of environmental law: international agreements, international precedent, non-binding instruments: international bodies and declarations, relationship between international environmental law and South African law, applications of international environmental law in South African law, South African policy regarding international environmental law.

(PVK 800) Poultry Science and Aviculture 800 (30 credits)

Specialised study of the management of hatcheries, broiler and layer production units, broiler breeding parent farms, ostriches, cage bird, game bird and waterfowl units, as well as threatened species in conservation programmes. Planning of production units and facilities. Determining ventilation requirements, disease control and biosecurity systems. Product quality, marketing and promotion of birds and their products. Computer aided management systems and product projection. Execution of projects in certain areas of specialisation. Studies aimed at optimising production efficiency and minimising risk.

(RSG 720) Land Law and Administration

Introduction to the law and the South African legal system, the South African Constitution, human rights with special reference to the constitutional protection of property; ownership, possession, sectional titles and limited real rights; the sale and transfer of ownership in land; the South African system of land registration, section 25 of the South African Constitution and expropriation; the history of settlement and statutory land tenure in South Africa; customary tenure and land control; land reform, restitution, land

redistribution and land tenure reform; land related taxes levied by national, provincial and local governments; agrarian reform.

(SFT 720) Sampling Techniques 720 (20 credits)

Simple random sampling. Estimation of proportions and sample sizes. Stratified random sampling. Ratio and regression estimators. Systematic and cluster sampling.

(SPC 780) Statistical process control 780 (20 credits)

Modern approach to quality control. Control charts. Process capability analysis. Measurement systems. Acceptance sampling. Experimental design. Implementation of quality control. Computer applications.

(TBE 710) Strategic Hotel and Tourism Management 710 (20 credits)

The overall focus of this module is on providing a sound knowledge and practical orientation with regard to the strategic management and destination marketing process as it pertains to the tourism industry; to explore key trends and the strategic implications of changes in the macro, competitive and market environments; and to study (with a practical orientation) the development and implementation of strategic tourism management and destination marketing plans (including strategies and tactics) to achieve a tourism organisation's mission and goals in a dynamically changing environment.

(TKS 881) Textiles and Quality Control 881 (30 credits)

The module focuses on the product and the consumer. Quality dimensions and end-use characteristics of the apparel product/household textiles product targeted for selling or buying are studied. Consumer perceptions of the quality of a product as influenced by aesthetics, end-use, cultural, demographic and psycho-graphic differences, individual standards and price, are investigated. Insights gained from this study are valuable to both the marketer and the consumer of apparel and household textile products.

(TLR 700) Animal Breeding and Genetics 700 (24 credits)

Qualitative characteristics. Calculation of population criteria and the interpretation in the industry. Specific problems with relation to the selection and breeding of cattle, small stock, pigs and poultry. The application of genetic theory in practice with relation to heritability of quantitative characteristics. (Theoretical components include TLR 410 and TLR 420)

(TLR 801) Animal Breeding and Genetics 801 (30 credits)

Qualitative characteristics. Calculation of population criteria and the interpretation in the industry. Specific problems with relation to the selection and breeding of cattle, small stock, pigs and poultry. The application of genetic theory in practice with relation to heritability of quantitative characteristics.

(TLR 802) Animal Breeding and Genetics 802 (30 credits)

Seminars, literature study and discussion of selected topics relating to the industry/specialisation programme. Discussion of research methods and results under local conditions. Policies regarding animal breeding.

(TWS 890) Dissertation Applied Mathematics 890 (120 credits)

(UNI 763) Internet GIS 763 (20 credits)

The module provides an overview of how Geographic Information can be distributed over the Internet and intranets. It will show how GIS functionality can be provided to a wide

range of network-based applications in business, government, education, etc. Students will learn how to develop web-based maps using basic software tools now available to realise the potential of GIS on the Internet.

(UNI 766) Spatial Statistics 766 (20 credits)

Introductory exploratory analysis of spatial data (EDA), advanced Multivariate EDA, EDA and Geovisualisation, Rate mapping, Spatial Weighting, Global and Local Spatial Autocorrelation, Spatial regression analysis and diagnostics, Spatial Lag and Error models, modelling Spatial Dependence.

(UNI 780) GIS Introduction 780 (20 credits)

The module introduces GIS and places it within the broader context of managing and working with spatial data. It establishes key definitions and outlines some of the key concepts underpinning GIS. The module considers the historical development of GIS and its current role and applications. Terminology and components for GIS are introduced followed by an overview of current GI technology. The module concludes with a discussion of spatial reference systems, emphasising the importance of positioning with coordinate systems, and introducing map projections and scale.

(UNI 781) Data Modelling and Data Structures 781 (20 credits)

This module introduces the concepts of spatial thinking and how this translates into the modelling of spatial information. It introduces basic spatial entities, which are the building blocks of any GIS project and provides insight into the specifics of modelling spatial information. It also considers concepts of spatial data models and spatial data structures and illustrates their relevance for data capture, storage and manipulation in GIS applications.

(UNI 783) Geographic Databases 783 (20 credits)

This module focuses on geographic data organisation and database management systems. It teaches the techniques and tools for the design of use of databases with special emphasis on relational, object-oriented and object-relational databases. The module also explores the techniques to handle spatial data and covers concepts of warehousing and data mining.

(UNI 785) Spatial Analysis 785 (20 credits)

The module examines the range of GIS functions available to analyse spatial data. It will cover the theoretical concepts and provide exposure to GIS software in a problem-solving setting.

(UNI 787) Data Acquisition and Quality 787 (20 credits)

This module covers the principles and methods for acquiring spatial data and managing the quality of the collected data. It focuses on the relationship between data quality and their fitness for use in GIS applications. The module covers issues of data needs, data sources, data capture techniques, data integration, data standards, metadata, legal aspects and ethical issues.

(UNI 788) Data Quality 788 (30 credits)

This module seeks to characterise data quality and explain the implications of data quality for decision making and problem solving with GIS. It considers the problem of data quality, sources of error, and methods for modelling error and managing uncertainty in GIS.

(UNI 789) Concepts for Spatial Thinking 789 (30 credits)

The conceptual and theoretical basis for spatial analysis and its role in investigation and modelling are introduced. The module also seeks to establish the nature and role of visual material, particularly maps, for information transfer, explanation and modelling.

(UNI 790) Visualisation 790 (20 credits)

The module covers the range of media to communicate the results of the various analytical procedures in GIS. It explains the principles and pitfalls of presenting information, the rules of map design and how visualisation controls the information transfer.

(UNI 791) GIS and Organisations 791 (20 credits)

The module introduces the organisational aspects of GIS: how it fits into an organisation, critical success factors and people issues. It also covers the process of GIS application development: planning, data requirement specification, system design, implementation and maintenance. The module also looks at the GIS profession: professional bodies, registration, business practice, and ethics.

(UNI 792) GIS Project 792 (30 credits)

This module provides the student with the opportunity to build a GIS application. Project stages include: problem and hypothesis generation, project methodology, data, needs analysis, database design, data analysis and communication of final information products.

(VBF 811) Consumer Facilitation 811 (30 credits)

*Prerequisites: VBF 410 (Consumer facilitation) or similar module
HSK 812 (Theoretical frameworks in Consumer studies)*

Focusing on consumer satisfaction, various aspects whereby the needs and wants of consumers may be met are addressed. Family decision-making, consumerism and consumer education also receive attention.

(VDB 880) Menu Planning 880 (30 credits)

Prerequisites: VDS 322 and VDB 321 or similar modules or appropriate and practical experience in food services

Menu planning for different food service systems are studied, which includes the following topics:

- Client and management related factors to consider in menu planning.
- Principles and methods of menu planning.
- Menu planning for different client groups, cultures, occasions and types of food services.
- Evaluation criteria for menus of different food service systems.
- Computerised menu planning.

(VDB 881) Quality Management in Food Service Systems 881(30 credits)

Prerequisites: VDB 410 or appropriate practical experience in food services

The application of Total Quality Management in the various subsystems of the food service system such as food procurement, food production, food safety and hygiene, food service is studied. The importance of developing, implementing and monitoring quality control systems in food services receives attention.

(VDG 880) Contemporary Aspects of Nutrition 880 (30 credits)

Prerequisites: VDG 211 & 321 Nutrition (Principles of basic nutrition and nutrition during the life cycle) or similar modules

The study of preventative nutritional care in the community. The emphasis is on preventative measures, programmes, training manuals and support measures as applied to life-cycle nutrition and malnutrition. An understanding of the multidisciplinary nature of public health will be developed.

(VDG 881) Nutritional Assessment and Status 881 (15 credits)

Prerequisites: VDG 211 & 320 Nutrition or similar modules

Study of nutritional assessment to evaluate the nutritional status of individuals and populations. This will include topics such as:

- nutrition assessment methods;
- nutrition monitoring;
- nutrition survey methodology;
- computerised dietary analysis systems;
- application of nutritional assessment in disease prevention.

(VDS 713) Recipe Development and Standardisation 713 (30 credits)

*(Provision in time-table for 3 lectures and 2 practicals (1x3h; 1x2h) over 14 weeks)
(First semester)*

Recipe development process. Development of appropriate recipes and food products for a given situation. Standardisation of recipes. Food styling and food photography.

(VDS 723) Food Consumerism and Product Advice 723 (15 credits)

(Provision in timetable for 3 lectures over 14 weeks)(Second semester)

Factors influencing food consumption, consumer behaviour and food choice. Food product advice. Consumer advice, marketing of food products, consumer education.

(VDS 880) Social Aspects of Foods 880 (15 credits)

Prerequisite: HSK 810 (Theoretical frameworks in cultural studies)

The interaction between food and culture as well as factors influencing food habits and food choice of various cultural and ethnic groups in South Africa will be studied. Sensory properties of food and techniques for measuring and modelling food choice and acceptability will receive attention.

(VDS 881) Food Merchandising 881 (15 credits)

Prerequisite: KHB 780 (Merchandising orientation)

The South African food retail industry, including traditional and developing/new marketing channels. Analysis and evaluation of the present situation in the South African food retail industry. In-depth study of developing forms of retailing and marketing in the food industry in South Africa with emphasis on the informal sector and direct marketing.

(VDS 883) Consumer Aspects of Food Product Design and Development 883
(15 credits)

*Prerequisites: HSK 810 and/or 812 (Theoretical frameworks in cultural or consumer studies)
KHB 780 (Retail management)*

Factors to consider when designing and developing food products for human consumption such as sensory attributes, socio-cultural, nutritional, lifestyle, economic, technological and convenience aspects will be addressed.

(VGE 703) Animal Nutrition 703 (50 credits)

Advanced study with specialisation in the nutrition of monogastric species for example poultry, dogs and pigs. Advanced study of foregut and hindgut digestive processes and flow dynamics. Manipulation of digestion, end-product metabolism, ad libitum and controlled feed intake. Energy, protein, mineral and vitamin requirements and standards for beef and dairy cattle, small stock and horses. Appropriate ration formulation. The study embodies lectures, seminars, practical assignments and a research project with the results reported in a research paper. (Theoretical components include VGE 411, VGE 421 and VGE 423.)

(VGE 801) Monogastric Nutrition 801 (30 credits)

Advanced study with specialisation in the nutrition of monogastric species for example poultry, dogs, pigs, aquaculture species, pets, cage birds, game birds and waterfowl as well as monogastric species in zoos and game breeding ranches. The study entails research, seminars and practical assignments.

(VGE 802) Ruminant Nutrition 802 (30 credits)

Advanced study of foregut and hindgut digestive processes and flow dynamics. Manipulation of digestion, end-product metabolism, ad libitum and controlled feed intake. Energy, protein, mineral and vitamin requirements and standards for beef and dairy cattle, small stock and horses. Appropriate ration formulation. The study entails lectures, seminars, practical assignments and a research project with the results reported in a research paper.

(VKD 800) Pig Science 800 (30 credits)

Specialised study concerning pig production, considerations when planning pig production units, policy planning and market conditions. Production physiology, housing, nutritional management, breeding practices, diseases and hygiene. Products. Practical scientific and industry orientation through different assignments.

(VKU 700) Animal Science 700 (70 credits)

The study of animal-environment and genotype-environment interactions and the impact on natural resources. Adaptational mechanisms of breeds and species. The formulation of optimal farming systems with respect to adaption. The determination of biological outputs and the classification of animal breeds and species in terms of biological traits. A study of specific topics by way of literature, seminars, discussions and research assignments. Each student does a research project and compiles a research paper. Research and study assignments are executed taking the academic needs of the candidates into consideration. (Theoretical components GVK 420, KVK 420, PVK 420, VKD 410, VKU 411, VKU 412 and WKE 420.)

(VLE 801) Meat Science 801 (30 credits)

Advanced study of carcass and meat quality characteristics as influenced by breeding, nutrition, physiology, growth and development as well as treatment and processing technology. Cattle, sheep, goats, pigs, poultry and game. Processing. Saleability, marketing methods, consumer profiles. Organisation and legislation.

(VLE 802) Meat Science 802 (30 credits)

Meat quality control from the farm to the retail distribution counter, processing and packaging. Intensive and extensive meat production units, abattoirs, wholesale and retail trade. Nutritional value of meat and meat products. The module consists of lectures,

discussion groups, seminars and an industry-orientated research project with the results presented in a research paper.

(VMT 710) Distribution-free Methods 710 (20 credits)

Equal in distribution technique. Counting and ranking statistics. One and two sample U -statistics. Additional distribution-free procedures. Multi-sample distribution-free tests.

(VNE 800) Livestock Ecology 800 (30 credits)

The study of animal-environment and genotype-environment interactions and the impact on natural resources. Adaptational mechanisms of breeds and species. The formulation of optimal farming systems with respect to adaptation. The determination of biological outputs and the classification of animal breeds and species in terms of biological traits. Research and study assignments are executed taking the academic needs of the candidates into consideration.

(VWV 720) Advanced Nutrition and Food Science 720 (20 credits)

(Provision in timetable for 2 lectures over 14 weeks)(Second semester)

Discussion classes in advanced level Nutrition and Food Science. Problem solving and literature discussion.

(VWV 763) Research Project 763 (45 credits)

(Provision in timetable for 2 lectures and 3 practicals over 28 weeks)

(First and second semester)

A short research project on an approved topic in Nutrition and Food Science is planned, executed and presented in the form of a written report.

(VWV 765) Micronutrient Malnutrition 765 (20 credits)

(Provision in timetable for 2 lectures and 1 practical over 14 weeks) (Second semester)

Introduction to malnutrition in sub-Saharan Africa. Selected micronutrients (i.e. vitamin A, Fe, iodine, Zn): Their role as micronutrients and their significance in health, deficiency disorders and prevention thereof. Conceptual framework for understanding micronutrient deficiencies. Nutritional epidemiology. Micronutrients in nutritional support of individuals with HIV/Aids. *The module is not presented every year.

(WIS 890) Dissertation Mathematics 890 (120 credits)

(WDE 701) Range Management in Wildlife Systems 701 (10 credits)

Range evaluation and utilisation with the emphasis on aspects important in wildlife production, and integrated wildlife/livestock production systems.

(WDE 781) Rangeland Management (15 credits)

The development of rangeland management strategies integrating ecological and physiological principles with economic and sociological constraints to achieve desired objectives whilst ensuring the conservation, and where necessary, the recuperation of natural resources.

(WDE 782) Pasture Science (15 credits)

The identification of adapted pasture and fodder species (including grasses, legumes, fodder trees and drought tolerant crops) for different agro-ecological areas. The establishment, fertilization and irrigation requirements of different pastures. The management requirements when utilized as green grazing, standing hay or conserved feed.

(WDE 783) Integrated Plant and Animal Production (15 credits)

The role of crop rotations and ley crops in marginal cropping conditions to ensure sustained production. The integration of pastures and silvicultural/ horticultural crops (eg. Agro-forestry) to produce timber, firewood, fruits/nuts and livestock products. Provision of feed requirements for both commercial and communal livestock enterprises by combining livestock requirements and feed supply in a process of economic optimization and emphasizing the importance of records and responses in the process of implementation.

(WKD 701) Dynamic and synoptic meteorology 701 (20 credits)

Acceleration in rotating co-ordinates, fundamental forces, momentum equation, one-, two- and three-dimensional flow balance, conservation of mass, heat equation, thermodynamic energy equation. Scale analyses and simplification of the basic equations. The geostrophic, thermal and gradient wind. The vorticity equation and divergence, Tendency and Omega equations. Model of a baroclinic system. Introduction to numerical models. Introduction to the use of PC-GRIBS.

(WKD 702) Physical and applied meteorology 702 (20 credits)

Equation of state. The first law of thermodynamics. Entropy, aerological diagrams. Clapeyron's equation. Adiabatic process for saturated air. Hydrostatic equation. Stability and instability. CAPE. Interpretation of tephigrams: stability and instability, identification of different weather systems, forecasting of maximum temperatures and turbulence. Analyses and interpretation of surface, shipping and upper air synoptic charts.

(WKD 703) Seasonal climate modelling 703 (20 credits)

Introduction to seasonal climate modelling. Ocean-atmosphere interaction. Probability theory. Matrix algebra. Empirical orthogonal function (EOF) analysis. Canonical correlation analysis (CCA). Singular value decomposition. Forecast verification. Practical seasonal forecasts.

(WKD 704) Numerical modelling: Applications 704 (20 credits)

Short-term numerical modelling: Initial atmospheric state, observation network, data assimilation, initialisation, parameterisation, numerical models, post-processing. Long-term numerical modelling: Ensemble methods, probability forecasting, sea-surface temperature anomalies, evaluation of deterministic and categorical forecasts. Mesoscale numerical modelling: Basic principles of mesoscale modelling including: Domains and grids; nesting of models; initial and boundary conditions; dynamical equations, physical equations and parameterisation.

(WKD 705) Numerical modelling: Basic concepts 705 (20 credits)

Numerical weather prediction. Equations and coordinates. Scale and energy conservation. Equation sets for operational systems. Grid point methods: finite difference, time differencing, the advection equation, the gravity wave equation, economic schemes. Function expansion methods: spectral modelling, finite element modelling. Initial conditions. Boundary conditions.

(WKD 706) Dynamic meteorology 706 (20 credits)

Atmospheric Oscillations: Linear perturbation theory. Baroclinic instability. Two-layer model. Energetics of Baroclinic waves. Fronts and frontogenesis. Symmetric instability. Zonally averaged circulation. Angular momentum budget. Introduction to and scale-analysis of tropical circulations. Introduction to structure and circulation of middle atmosphere.

(WKD 708) Cloud microphysics 708 (20 credits)

An overview of our natural and polluted environment. Aerosol particle formation and removal processes. Tropospheric aerosols and weather. Formation of cloud droplets. Droplet growth by condensation. Initiation of rain in non-freezing clouds. Formation and growth of ice particles. Rain and snow. Weather modification with specific reference to South Africa.

(WKD 709) Tropical and mesoscale meteorology 709 (20 credits)

Prerequisite: WKD 714

An introduction covering the special meteorological features, the climatology and the mesoscale and synoptic weather systems of the tropics. Instability, energetics in the tropics and tropical cumulus and tropical cyclones. Interpretation of tropical cloud systems and tropical cyclones in satellite imagery. An introduction to mesoscale meteorology. Surface mesoscale features, rain bands and conditional symmetric instabilities, severe storm classification and the forecasting of thunderstorms, flooding and flash flooding events.

(WKD 713) Research methodology 713 (20 credits)

Research mythology: identification of an appropriate research project, compilation of research proposal, literature survey, acquisition and manipulation of information. Introduction to innovative strategy and research management. Preparation of research report (paper). Presentation of research at conferences etc.

(WKD 714) Remote sensing 714 (20 credits)

Prerequisites: WKD 701

Fundamentals of radar. Propagation of electromagnetic waves. Weather radar equation. Attenuation. Precipitation measurement with radar. Convective storm analysis with radar. Overview of the basic principals of satellite imagery. Types of meteorological satellites. Basic principles of radiation. The different images available, their resolution, and the advantages and limitations of each image. Image interpretation. Operation of equipment to display images.

(WKD 715) Extra tropical meteorology and classical forecasting techniques 715 (20 credits)

Prerequisites: WKD 701

An introduction to mid-latitude meteorology covering the climatology and weather systems of the mid-latitudes. Synoptic and satellite imagery interpretation of mid-latitude weather patterns and practical exercises. Classical forecasting techniques cover the quasi-geostrophic theory in forecasting and the quasi-geostrophic system of diagnostic equations, the development of baroclinic cyclones and anti-cyclones, the self-development process, A-geostrophic motion, Q-vectors, and isentropic analysis as a synoptic tool.

(WKD 716) Marine forecasting 716 (20 credits)

Prerequisite: WKD 709

Physical properties of sea water. Circulation in the oceans. Coastal oceanography. Air-sea interaction. Ice in the ocean. Surface gravity waves. Remote sensing of the marine atmosphere and ocean surface. Wave prediction under various extreme weather conditions. Atmospheric effects with sea temperature changes during upwelling.

(WKD 717) Aviation forecasting 717 (20 credits)

Prerequisite: WKD 709

Turbulence. Clear air turbulence (CAT) and mountain wave CAT. Thunderstorms. Mist, fog, visibility and volcanic ash. Ice accretion. Vapour trails. Glider forecasting. Altimetry and density. Cloud conditions, VFR rules and accident reports. Weather codes and documentation for aviation.

(WKD 718) Specialised forecasting 718 (20 credits)

Prerequisites: WKD 709

Evaluation and interpretation of actual and model data. Identification of the weather systems. The progression of weather systems. Comparison of satellite and radar imagery to actual and model data. Identification of upper jet streams and temperature troughs. Formulation and compilation of the forecast. Practical tasks including the "dummy" issuing of general, aviation and marine forecasts, presentation of discussions and telephonic queries.

(WKD 719) Boundary layer meteorology 719 (20 credits)

Introduction to the boundary layer. Importance of the boundary layer. Transfer of heat (molecular and turbulent). The implications of the turbulent nature of the boundary layer on the dynamic atmospheric equations. Closure models.

(WKD 751) Instrumentation and general meteorology 751 (20 credits)

Meteorological instrumentation and practical observations. Introduction to basic concepts in meteorology: Composition of the atmosphere. Pressure. Temperature. Radiation and the greenhouse effect. Ozone. Forces in the atmosphere. Hydrostatic assumption. Geostrophic flow. ITCZ. Fronts. Tropical cyclones. First law of thermodynamics. Adiabatic change. Vapor pressure and dew point temperature. Cloud development. Microstructure of clouds. The boundary layer. Typical weather conditions over Southern Africa. Basic climatology.

(WKD 761) Basic concepts of remote sensing 761 (20 credits)

Basic principles and characteristics of the weather radar and satellite. The weather radar and satellite as remote sensing tools. Doppler effect. The influence of the atmosphere on the propagation of electro-magnetic waves. The influence of attenuation on observations. The estimation of precipitation by using radar and satellite images. Identification of weather systems using radar and satellite technology.

(WKD 781) Cloud dynamics 781 (20 credits)

Scaling and interpretation of equations of motion for mesoscale processes. The role of stability and other trigger actions on initial cloud formation and the evolution of clouds. Shallow and deep convective processes. Gravity and lee wave effects. Tropical and mid-latitude cloud generation processes and characteristics. Cloud splitting. Cumulus convective schemes in numerical models.

(WLK 800) Wool Science 800 (30 credits)

Discussions and literature studies on advanced subjects concerning wool and fibre. Factors influencing wool and mohair production. The influence of environment, nutrition and breeding on the chemical and physical composition of wool and mohair. Factors influencing classing, processing and marketing of wool. Discussions and seminars on techniques in quantifying physical and chemical characteristics of wool and mohair, relevant literature and research techniques. Evaluation of variation in skin and fibre.

(WST 795) Essay 795 (20 credits)

(WTW 710) Functional Analysis 710 (20 credits)

An introduction to the basic mathematical objects of linear functional analysis will be presented. These include metric spaces, Hilbert spaces and Banach spaces. Subspaces, linear operators and functionals will be discussed in detail. The fundamental theorems for normed spaces: The Hahn-Banach theorem, Banach-Steinhaus theorem, open mapping theorem and closed graph theorem. Hilbert space theory: Riesz' theorem, the basics of projections and orthonormal sets.

Prerequisite: *Real analysis on third-year level*

(WTW 731) Algebra 731 (20 credits)

The following topics will be covered: Galois theory and solving equations by radicals, introduction to the theory of R-modules, direct sums and products, projectivity and injectivity, finitely generated modules over Euclidean domains, primary factorisation, applications to Jordan and rational canonical forms of matrices.

Prerequisite: *Algebra on third-year level*

(WTW 732) Mathematical Models of Financial Engineering 732 (20 credits)

Introduction to markets and instruments. Futures and options trading strategies, exotic options, arbitrage relationships, binomial option pricing method, mean variance hedging, volatility and the Greeks, volatility smiles, Black-Scholes PDE and solutions, derivative disasters.

(WTW 733) Numerical Analysis 733 (20 credits)

An analysis as well as an implementation (including computer programmes) of methods are covered. Numerical linear algebra: Direct and iterative methods for linear systems and matrix eigenvalue problems: Iterative methods for nonlinear systems of equations. Finite difference method for partial differential equations: Linear elliptic, parabolic, hyperbolic and eigenvalue problems. Introduction to nonlinear problems. Numerical stability, error estimates and convergence are dealt with.

(WTW 734) Measure Theory and Probability 734 (20 credits)

Measure and integration theory: The Caratheodory extension procedure for measures defined on a ring, measurable functions, integration with respect to a measure on a σ -ring, in particular the Lebesgue integral, convergence theorems and Fubini's theorem.

Probability theory: Measure theoretic modelling, random variables, expectation values and independence, the Borel-Cantelli lemmas, the law of large numbers. L^1 -theory, L^2 -theory and the geometry of Hilbert space, Fourier series and the Fourier transform as an operator on L^2 , applications of Fourier analysis to random walks, the central limit theorem.

Prerequisite: *Real analysis on third-year level*

(WTW 762) Mathematical Models of Financial Engineering 762 (20 credits)

Exotic options, arbitrage relationships, Black-Scholes PDE and solutions, hedging and the Miller-Modigliani theory, static hedging, numerical methods, interest rate derivatives, BDT model, Vasicek and Hull-White models, complete markets, stochastic differential equations, equivalent Martingale measures.

Prerequisite: *WTW 732*

(WTW 763) Finite Element Method 763 (20 credits)

An analysis as well as an implementation (including computer programmes) of methods is covered. Introduction to the theory of Sobolev spaces. Variational and weak formulation of elliptic, parabolic, hyperbolic and eigenvalue problems. Finite element approximation of problems in variational form, interpolation theory in Sobolev spaces, convergence and error estimates.

Prerequisite: *WTW 733 is strongly recommended*

(WTW 764) Stochastic Calculus 764 (20 credits)

Mathematical modelling of Random walk. Conditional expectation and Martingales. Brownian motion and other Lévy processes. Stochastic integration. Ito's Lemma. Stochastic differential equations. Application to Finance.

Prerequisite: *WTW 734*

(WTW 772) Mathematical Methods and Models 772 (20 credits)

This module aims at using advanced undergraduate mathematics and rigorously applying mathematical methods to concrete problems in various areas of natural science and engineering.

The module will be taught by several lecturers from UP, industry and public sector. The content of the module may vary from year to year. The list of areas from which topics to be covered will be selected, includes: Systems of differential equations; dynamical systems; discrete structures; Fourier analysis; methods of optimisation; numerical methods; mathematical models in biology, finance, physics, etc.

Prerequisite: *Real analysis on third-year level*

(WTW 776) Partial Differential Equations of Mathematical Physics 776 (20 credits)

Field-theoretic and material models of mathematical physics. Distributions and the Friedrichs-Sobolev spaces. Energy methods and Hilbert spaces, weak solutions – existence and uniqueness. Eigenvalue problems and eigenfunction expansions. The regularity theorems for elliptic forms (without proofs) and their applications. Weak solutions for the heat/diffusion and related equations. Weak solutions for wave propagation problems written as symmetric-hyperbolic systems.

Prerequisites: *WTW 710 and WTW 734*

(WTW 787) Continuum Mechanics 787 (20 credits)

Analysis of spatial versus material description of motion. Conservation laws. Derivation of stress tensors. Analysis of finite strain and rate of deformation tensors. Stress and strain invariants. Energy. Linear and nonlinear constitutive equations. Applications to boundary value problems in elasticity and fluid mechanics.

(WTW 790) Topology 790 (20 credits)

General topology: Concepts such as convergence, compactness, connectedness, separation axioms and continuity are introduced in topological spaces. Their basic properties are treated. Important topologies like the product topology and the quotient topology are discussed.

Algebraic topology: Homotopy, the fundamental group, covering spaces, homotopy type.

(WTW 792) Project 792 (20 credits)

(WTW 795) Essay 795 (20 credits)

(WTW 812) Convergence Spaces 812 (40 credits)

Filters. Convergence of filters, sequences and nets in a topological space. Convergence structures, basic properties and constructs. Continuous convergence, c -embedded convergence spaces. Order convergence on lattices and posets. Convergence vector spaces and completions. Continuous convergence and duality on locally convex spaces. The Hahn-Banach theorem in convergence spaces.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisites: *Topology, Measure Theory and Functional Analysis on honours level*

(WTW 831) Mathematical and Computational Finance 831 (40 credits)

Stochastic Calculus: Multidimensional Itô formula, correlated Wiener processes, the infinitesimal operator, SDE's, PDE's, the Kolmogorov equations, martingales, stochastic integral representations and Gisanov's theorem. The martingale approach to arbitrage theory. Bonds and interest rates: Martingale models, standard models, the Heath-Jarrow-Morton framework. Monte Carlo methods. Finite difference methods.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisite: *Financial Engineering on honours level*

(WTW 832) Advanced Methods of Financial Engineering 832 (40 credits)

Interest rate derivatives. Stochastic volatility models. Models to improve on the flaws in the Black-Scholes model. Principles of deal structuring. Principles of mathematical models. Specialised methods for interest rate and exotic derivatives. Application of numerical methods to relevant practical problems.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisite: *Financial Engineering on honours level*

(WTW 833) Quantitative Risk Management 833 (40 credits)

Risk in perspective. Traditional RiskMetrics. Methods to calculate VaR. Designing scenario analyses and stress analysis. Risk measures based on loss distributions. Aggregate risk measures which include coherent risk measures. Extreme value theory. Correlation, copulas and dependence. Credit risk management.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisite: *Financial Engineering on honours level*

(WTW 881) Abstract Analysis 881 (40 credits)

Capita selecta from the following: Duality theory. Weak and Weak* topologies. The Krein-Milman theorem. The Stone-Weierstrass theorem. Fixed point theorems. Banach Algebras and the Gelfand transform. C^* -algebras and their representations. Semigroups of operators. Functional analysis applied to probability theory and stochastics.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisites: *Measure Theory and Functional Analysis on honours level*

(WTW 884) Advanced Measure Theory 884 (40 credits)

Lebesgue integral in a general measure space: Basic properties, convergence theorems, convergence in measure. L^p spaces: Completeness, approximation by continuous functions. Complex measures: Absolute continuity, Random-Nikodym Theorem,

representation of bounded linear functionals on L^p , Riesz Representation Theorem for bounded linear functionals on $C_0(X)$, where X is a locally compact Hausdorff space. Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisites: *Measure Theory and Functional Analysis on honours level*

(WTW 887) Dynamical Systems 887 (40 credits)

Finite dimensional dynamical systems: Autonomous and non-autonomous systems of differential equations, dynamical systems, linear and nonlinear systems, existence and uniqueness of solutions, extension of solutions, maximal solution and maximal interval of existence, phase space and phase portrait. Stability theory for equilibria and periodic orbits using linear approximation, Liapunov's method and other energy methods and discrete dynamical systems (Poincaré map). Introduction to strange attractors. Application to mechanics and population models. Infinite dimensional dynamical systems: Semigroups, first and second order abstract differential equations, Sobolev spaces, finite dimensional approximation. Application to heat conduction and mechanical vibration. Examples of nonlinear systems.

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.

Prerequisites: *Functional Analysis, Partial Differential Equations and Finite Element Method on honours level*

(WTW 892) Dissertation Mathematics of Finance 892 (120 credits)

(WTW 893) Dissertation Mathematics Education 893 (80 credits)

(WTW 894) Dissertation Financial Engineering 894 (120 credits)

(ZEN 701) Project and seminars 701 (80 credits)

Project and seminars

(ZEN 702) Research methods 702 (16 credits)

This module provides students with the planning, data handling, writing and presentation skills required in zoological research. *Philosophy of science*. What science is and how it differs from other philosophies. *Experimental design*. The procedures involved in planning and executing a well designed research programme. *Mathematical techniques for biologists*. The concepts and applications of data manipulation procedures used in biological research. *Scientific writing*. The writing style and formats required for research proposals, report writing and scientific publications. *Scientific public speaking*. The elements of a good scientific presentation.

(ZEN 703) Systematics, evolution and biogeography 703 (16 credits)

The object of this module is to introduce students to several contemporary problem areas in systematics, evolutionary theory and biogeography, and to use this as a basis for exploring current approaches and methods in systematics.

(ZEN 704) Environmental physiology 704 (16 credits)

Major environmental variables, such as day length, temperature, water and energy, have been selected and their action on the physiology of selected animals will be examined. Selected aspects of ecophysiology which are currently active research areas will be discussed and the importance of these environmental variables at different levels are shown.

(ZEN 705) Ecology 705 (16 credits)

The module focusses on the dynamics of populations and communities from a demographic, conservation and evolutionary perspective. Special attention is given to the consequences of habitat fragmentation, long-term dynamics, viability, and the processes involved in maintaining the structure and function of communities in the African context. Group discussions, also during a field excursion, provide opportunities to apply theoretical principles and design research projects directed at solving environmental problems.

(ZEN 707) Integrated pest management in Africa 707 (16 credits)

Pest outbreaks and the role of integrated pest management; the socio-economic implications of these actions; estimates, monitoring and yield loss assessment of pests; approaches and objectives of different control methods like chemical, physical, cultural and biological control. The use of semiochemicals and genetic engineering as interference methods; politics, legislation and philosophy of IPM; pest models; expert systems; application and use of computer technology in pest management decisions (databases, modelling); decision tools and techniques.

(ZEN 710) Large mammal ecology 710 (16 credits)

This module will provide the foundation of understanding required by honours students who wish to either move directly into a career involving the management of large mammals, or else advance into field research and further postgraduate studies on the ecology of large mammals in African savannas. The key principles upon which the ecological understanding of large mammals currently rests at population, community and ecosystem levels in the African savanna biome will be discussed. Tutorials will be based on readings within the following topics: Scaling and large mammal ecology: the influence of body size on the determination of dietary tolerance; the Jarman-Bell principle and its up-scale implications; dynamics of large mammal populations: population growth; ecological and economic carrying capacity; sustained yield harvesting; culling; feeding ecology: foraging theory; ontogeny of feeding behaviour; conditioned taste aversions; plant defences and herbivore counter-adaptations; grazing lawns and pruning effects; determinants of community structure: relationships between rainfall, soil nutrients, vegetation and herbivores in arid-eutrophic and moist-dystrophic savannas; predation and predator intraguild relations; feedback effects of large mammals on ecosystem processes: nutrient cycling through grazer and browser guilds; the keystone megaherbivore concept; conservation and management of large mammals: conservation biology of large mammals; sustainable use and community-based wildlife management; principles and logic of wildlife management in African savannas.

(ZEN 712) Behavioural ecology 712 (16 credits)

The module will cover key disciplines currently enjoying prominence in the field of behavioural ecology.

Animal communication: Sensory bases of communication, communication and the environment, evolution of communication, communication in social groups, dominance and dominance hierarchies. *Living in groups:* Why do animals live in groups? The influence of group size, predation and vigilance, foraging ecology, co-operation and kin selection, role sharing, reproductive suppression, incest avoidance. *Hormones and behaviour:* Sexual differentiation in the brain of the late embryo and its role in determining behaviour. Physiology of social suppression of reproduction, aggression and associated hormones. *Mate choice:* Patterns and processes of sexual competition, sexual conflict of interest, alternative tactics of mate selection, the role of parasites, sperm competition, fluctuating asymmetry, reproductive success and fitness. *Evolution of behaviour:*

selfishness and altruism, coevolution, neuronal networks and cognitive abilities, alternative approaches to understanding the evolution of behaviour. *Carnivore behavioural ecology*: feeding ecology, social structure and spatial organisation, communication patterns and social interactions, life-history strategies, relatedness in carnivore societies.

(ZEN 713) Scientific communication 713 (16 credits)

Essays must be completed from a selected list of essay topics presented by staff members. Each student will have an oral examination at the end of the year. Students will be examined on general aspects of Zoology, prescribed reading and on their individual research project. The panel will comprise internal staff and the external examiner.

(ZEN 802) Applied insect and plant disease ecology 802 (30 credits)

Importance of an ecological approach to pest and disease management.

Insect ecology: Traditional and novel approaches to the study of population dynamics; the population regulation debate; the ecology, life history and phylogeny of outbreak and non-outbreak species; hypotheses on plant-herbivore interactions; interspecific interactions in disturbed environments; diversity and stability.

Disease ecology: Principles of microbial ecology with specific reference to plant pathogenic organisms; factors affecting micro-organisms; mutual relationships between micro-organisms and the role they play in different ecosystems such as soil and plant surface ecosystems; plant-microbe interactions; techniques in microbial ecological studies.

(ZEN 803) Biological control 803 (30 credits)

Biological control (b.c.) of insects, plant diseases and weeds in South Africa. Classical biological control; history of biological control; procedures followed in classical biological control programmes; exploration for b.c. agents; selection of b.c. agents; biology and host-specificity of b.c. agents; importation methods and quarantine procedures; propagation, distribution and evaluation of b.c. agents.

(ZEN 804) Integrated pest and plant disease management 804 (30 credits)

Concepts and rationale behind integrated pest and disease management; economic levels; major pesticide groups and their mode of action; pesticide legislation and registration of compounds; international residue standards; environmental effects of chemical compounds; insect and pathogen resistance; cultural control methods (of pests and diseases); genetic control and plant resistance; microbial control.

(ZEN 805) Selected case studies of pests and diseases of cultivated plants 805 (30 credits)

Pests, diseases, and their management on e.g. citrus, subtropical fruit, deciduous fruits, vegetables, lawns and garden plants, grain crops, forestry.

(ZEN 806) Phylogenetics: morphological and molecular approaches 806 (30 credits)

Introduction to morphological and molecular systematics; species concepts; theory and practice of biological classification; collections; identification keys; systematic publications; biological nomenclature; taxonomic characters; systematic techniques that will include principles of cladistics and Hennigian philosophy; numerical phenetics, compatibility analysis and maximum likelihood.

(ZEN 807) Morphometrics 807 (30 credits)

Morphological approaches will include morphometrics, and will cover historical backgrounds to morphometrics; fundamental concepts in morphometrics; traditional morphometrics; geometric morphometrics; discussion and criticism of morphometrics; data acquisition; methodology and software applications.

Skills: Use of available morphometric analysis programmes such as NTSYS, TPS, and SAS.

(ZEN 808) Conservation planning and monitoring 808 (30 credits)

Biodiversity survey techniques; data and information management; data assessment; principles of data extrapolation; inventories; biodiversity risk assessment (PHVA, small and declining population paradigms, prioritisation); principles of reserve selection; surrogacy; reserve design; integrated land-use planning.

Landscape theories and models (hierarchy, percolation, metapopulation, source-sink); scaling patterns and processes across landscapes (patches, corridors, mosaics and flows); emerging patterns and processes; principles of landscape dynamics; principles of landscape conservation, management and design (transformation, fragmentation); methods in landscape ecology (numerical and spatial data processing, fractal geometry approach, GIS, remote sensing, GPS, spatially explicit population models).

Skills: GradSect, Access, Excel, Visual Basic, GIS (Arc View) reserve selection algorithms.

(ZEN 809) Biogeography and macro-ecology 809 (30 credits)

Biogeographic consequences of plate tectonics, Pleistocene southern African climatic, geological, edaphic and geomorphological patterns. Reconstructing biogeographic histories (speciation, extinction, dispersal, vicariance, endemism, provincialism and disjunction); phytogeographical patterns, biomes, vegetation types. Methodological issues in macro-ecology; patterns of body size, abundance and energetics; geographic range sizes; species dynamics in landscapes; implications of macro-ecological patterns to ecology; biogeography and evolution; macro-ecological perspectives on conservation: species richness, hierarchical diversity, hotspots, spatial and temporal patterns in diversity (genetic, taxonomic, functional); causal mechanisms, species diversity, biodiversity and global change.

(ZEN 811) Conservation and Development 811 (30 credits)

An international perspective on human resource utilisation and its global effects. The problems of implementing conservation measures in the face of human development. Conservation as an economic process.

(ZEN 871) Mammalian reproductive biology 871 (30 credits)

The factors (environmental, social, physiological) affecting/controlling reproductive function (sexual development, sexual maturity, mating, pregnancy, parturition, lactation) in representative species of African mammals. Manipulation of reproductive variables to enhance or limit population growth, through physiological, behavioural and chemical means, is addressed in the context of conservation and management.

(ZEN 872) Populations and communities: spatial and temporal variability 872 (30 credits)

Demography with emphasis on forces affecting population growth rate and regulation; competition and facilitation within and between populations; risk and risk assessment; temporal trends and extinction; management, harvesting and control with emphasis on illustrating principles using studies conducted in Africa.

Structure, composition and function of communities with emphasis on factors affecting resilience, resistance and persistence; temporal variability with emphasis on the influences of foodwebs structure and environmental variability; spatial pattern analysis; species-abundance relations; species affinities; community classification.

(ZEN 873) Mammals in terrestrial and marine ecosystems 873 (30 credits)

Overview of taxonomy of mammals of southern Africa; terrestrial mammals addressed in terms of large variation in body size; major guilds (grazers, browsers, carnivores); influence this has on resource use at various spatial and temporal scales; feed back effects on ecosystem processes; marine mammals addressed in terms of morphological, physiological and behavioural adaptations to marine environment and vulnerability to anthropogenic disturbance; impact of disease; key field techniques in mammal-oriented research.

(ZEN 874) Conservation of African mammals 874 (30 credits)

Emphasis on the management of small populations; captive propagation; control of invasive species and problem populations; restoration ecology; conservation education and involvement of local communities in conservation programmes.

(ZEN 875) Conservation in Practice 875 (30 credits)

Conceptual issues in the management of small populations; captive propagation; control of invasive species; control of problem populations; restoration of species and communities; conservation education, and involvement of local communities in conservation programmes; monitoring techniques and data handling; design and interpretation of laboratory and field experiments to solve ecological and conservation problems.

(ZEN 876) Mammals in populations and communities 876 (30 credits)

Demography with emphasis on forces affecting population growth rate and regulation; competition and facilitation within and between populations; risk and risk assessment; temporal trends and extinction; management, harvesting and control with emphasis on illustrating principles using studies conducted in Africa.

Structure, composition and function of communities with emphasis on factors affecting resilience, resistance and persistence; temporal variability with emphasis on the influences of foodwebs structure and environmental variability; spatial pattern analysis; species-abundance relations; species affinities; community classification.

(ZEN 891) Research Project 891 (120 credits)

Research projects may be based either on fieldwork, laboratory work, experiments or the analysis of existing data sets. This decision must be taken in consultation with the candidate's designated project supervisor. The choice of project topic will be determined to a very large extent by the time available for data collection and analysis.

Students should select and approach a potential supervisor based on their own interests and that of the supervisors. A list of projects may be made available, although the students may choose their own project as long as a supervisor agrees to it. Joint supervision of projects by more than one person at the University, or one person from outside the University, is also possible.

The purpose of the research project is to provide students with a thorough grounding in the planning, execution, analysis and scientific writing stages of a research project. Students must complete the background reading, design the objectives and perform the observations and/or experiments pertaining to the chosen project, as well as the analysis and compilation of the results and discussion in the form of a scientific publication. The project should be formatted for submission to a scientific journal.

MEDALS AND PRIZES AWARDED IN THE FACULTY

| Name | Donor | Award |
|--|--|--|
| ABSA Consultants & Actuaries Prize | ABSA | Best performance in IAS 712 (CA1) |
| ABSA Life Prize | ABSA Life | Best performance in FNI 700 (ST5) |
| Bruker Prize | Bruker South Africa (Pty) Ltd | For the best achievement in Physical Chemistry on the BSc(Hons) level |
| Department of Physics Prize | Department of Physics, UP | Best achievement in Physics at BSc(Hons) level. |
| Dr and Mrs Geyer Floating Trophy | Dr and Mrs J W Geyer | Awarded to a student in the Faculty of Natural and Agricultural Sciences for academic excellence as well as other achievement |
| Entomological Society of Southern Africa prize | Entomological Society of Southern Africa | For the best honours student in Entomology |
| Financial Planning Institute Prize | FPI | Best performance in Investments 700 |
| FNB Prize | FNB | Best BSc(Hons): Actuarial Mathematics research project |
| GENSEC Prize | GENSEC | Most outstanding honours student in the Financial Mathematics study programme |
| Hannover Reinsurance Prize | Hannover Reinsurance | Best performance in Actuarial Science AKM704 |
| Hollard Insurance Prize | Hollard Insurance | Best performance in Actuarial Mathematics 705 |
| Margaretha Mes Medal | Plant Science Department | For the best BSc(Hons) student who obtains the degree with a pass mark of at least 70% and whose essay is based on an aspect of Plant Physiology |
| Meiring Naudé Medal | Dr S M Naude | For the best student in BSc(Hons) with specialisation in Physics on condition that the student passes with distinction |
| Merck Merit Award for Biochemistry (Hons) | Merck Chemicals (South Africa) | To the best student who obtains the Honours degree in Biochemistry with distinction |
| Metrohm Prize | Metrohm South Africa | To the student who obtained the highest marks above 75% for MSc in Biochemistry |
| PPS Prize | PPS | Most promising BSc(Hons): Actuarial Mathematics graduate |
| Richards Bay Minerals Junior Prestige Award | Richards Bay Minerals | For best honours student in Zoology |

Natural and Agricultural Sciences 2009
Postgraduate

| Name | Donor | Award |
|--|--|--|
| Richards Bay Minerals Senior Prestige Award | Richards Bay Minerals | For best achievement in Zoology at master's level |
| Richards Bay Minerals Senior Prestige Award | Richards Bay Minerals | For best achievement in Zoology at doctoral level |
| SA Genetics Society Hofmeyer-Van Schaik Prize | South African Genetics Society | To the best BSc(Agric) or BSc(Hons) student in the fourth year of study who achieves a final mark of at least 75% in Genetics. |
| SA Mathematical Society Bronze Medal | SA Mathematical Society | Best honours student in Mathematics or Applied Mathematics. |
| SAAB Junior Medal for Plant Science | South African Association for Plant Science | For the best doctoral thesis submitted at a South African university by a person not older than 35 years |
| SASAS Prize | South African Society of Animal Science | To the most outstanding post-graduate student(s) in Animal Science at master's and doctoral level at any South African university. |
| Sasol Prize | Sasol Ltd | Best achievement in Chemistry at BSc(Hons) level. |
| Schweickerdt Medal for Plant Science | The late Prof H G W J Schweickerdt | To the best BSc(Hons) student who obtained the degree with a pass mark of at least 70% and whose essay is based on an aspect of Plant Science other than Plant Physiology. |
| Zoological Society of Southern Africa Prize | Zoological Society of Southern Africa | To the honours student who obtains the BSc(Hons) degree with the highest average mark. |
| Award in Agrarian Extension | | |
| Bronze Medal of Honour from the South African Society for Agricultural Extension | South African Society for Agricultural Extension | To the best honours student in Agricultural Extension. |
| Wildlife Management | | |
| Van Schaik Prize in Wildlife Management | J L van Schaik Publishers | For the best achievement by a BSc(Hons) student in the final examination with specialisation in Wildlife Management |
| Welder Wildlife Foundation Merit Award | Centre for Wildlife Management | To the best BSc(Hons) student with specialisation in Wildlife Management. (Specific conditions apply) |

| Name | Donor | Award |
|--|--|---|
| Not limited to the Faculty of Agricultural and Natural Sciences | | |
| SRC Honorary Medal | Student Representative Council | Student who delivered the best service to the community. |
| S ₂ A ₃ Bronze Medal | South African Society for the advancement of science (donor: Sentrachem Ltd) | To a student who completed an extremely good master's study in the field which is traditionally part of the activities of the South African Society for the Advancement of Science (S ₂ A ₃) members of the Convocation of the University of Pretoria. |

**POSTGRADUATE SCHOOL OF
AGRICULTURE AND
RURAL DEVELOPMENT**

INFORMATION AND REGULATIONS

FOR

2009

MISSION STATEMENT

*To contribute to agricultural and rural development
through excellence in teaching and learning, research
and community outreach.*

1. BACKGROUND

The Postgraduate School of Agriculture and Rural development was founded in 1991 to address the need for capacity building through teaching, research and community outreach in agricultural and rural development. The School is the largest postgraduate facility in agriculture and rural development education in southern Africa. Although most of the students enrolled for the School's academic programmes are from all over Africa, an increasing number of students from other continents enrol for postgraduate studies in the School. The School's graduates are employed in various international and local development agencies, private sector (co-operatives, banks, consultancy firms and agribusiness), higher education institutions (universities and agricultural colleges), public sector (government departments) and community-based organisations.

2. MISSION AND OBJECTIVES

The School aims to contribute to agricultural and rural development through excellence in teaching and learning, research and community outreach.

The Objectives of the School are to:

- Provide teaching and learning, conduct interdisciplinary research, and implement community outreach programmes in the fields of agricultural and rural development;
- Facilitate coordination in the presentation of programmes relating to agriculture and rural development to ensure efficiency and effectiveness;
- Support policy formulation and implementation, governance and capacity building within the context of agricultural and rural development;
- Broaden access to the services of the University of Pretoria to the wider community by implementing community outreach programmes and provision of distance learning and short courses;
- Prepare students for leadership and management roles in agriculture and rural development; and
- Maintain and/or establish partnerships with national, regional and international organisations in agriculture and rural development.

3. DEGREES

The following degrees are coordinated in the School:

Baccalaureus Honores Institutionis Agrariae : (BInstAgrar(Hons))

Magister Institutionis Agrariae : (MInstAgrar)

Philosophiae Doctor : (PhD)

3.1 **Baccalaureus Honores Institutionis Agrariae (BlnstAgrar(Hons))**

a) **Admission**

In order to be accepted for the BlnstAgrar(Hons) studies, a candidate must be in possession of an acceptable bachelor's degree. An average of 60% is required for admission. An entrance examination is necessary, although exemption may be granted under certain circumstances, as determined by the Director of the School. Specified ancillary modules, in addition to the honours modules, may be required, as determined by the Director of the School in consultation with the head of department(s) in the candidate's proposed field of specialisation.

b) **Fields of specialisation**

The BlnstAgrar(Hons) degree is awarded in the following fields of specialisation:

Agricultural Economics;

Agribusiness Management

Agricultural Extension;

Land Development;

Plant Production (majoring in Agronomy, Horticultural Sciences or Pasture Sciences);

Crop Protection;

Plant Quarantine;

Rural Development Planning;

Certain combinations of the above fields are also possible.

c) Training is offered full-time, and in certain fields of specialisation (Agricultural Economics and Extension fields) also on a part-time basis. The coursework for full-time students extends over a minimum of two semesters, while the part-time programme extends over a minimum of four semesters.

d) The curriculum consists of a minimum of 160 credits consisting of the following:

- A common core of two modules namely ARD 780 and ARD 782 that must be attended for all fields of specialisation, except in the case of the Extension major, where ARD 782 will be compulsory and ARD 781 can be taken in place of ARD 780. Recognition of equivalent modules already passed may be considered, in which case suitable alternative modules will be prescribed.
- Elective coursework that the candidate may require, will be decided upon by the Director of the School and head(s) of the particular department(s).
- Additional required modules as prescribed for the specific fields of specialisation, will be jointly determined by the Director of the School and the head(s) of the particular department(s) in question.

e) In order to obtain the degree, the candidate must achieve a minimum of 50% in each of the prescribed modules. An average of 75% in all the prescribed modules must be obtained in order to pass the degree with distinction.

3.2 **Magister Institutionis Agrariae (MlnstAgrar)**

a) **Admission**

Admission to the master's degree is dependent upon the candidate being in possession of the BlnstAgrar(Hons) degree of the University of Pretoria, or another appropriate degree equal to or higher than the status thereof, as evaluated by the Director of the School and the head(s) of the particular department(s).

b) Fields of specialisation

The same fields of specialisation apply as for the BInstAgrar(Hons).

- c)** The curriculum consists of further study in the field of specialisation and a dissertation or, alternatively a script accompanied by more coursework than that required if the dissertation option is followed. The script or mini-dissertation will consist of research done by the candidate under supervision of a member of the Faculty staff. (A dissertation comprises at least 120 of the credits required for the degree, whereas a mini-dissertation comprises 100 credits.)

3.3 Philosophiae Doctor (PhD)

a) Admission

Admission is dependent upon the candidate being in possession of the MInstAgrar degree, or an equivalent appropriate degree with the status thereof, as evaluated by the Director of the School and the head(s) of the particular department(s).

b) Fields of specialisation

The same fields of specialisation apply as for the degree of MInstAgrar.

- c)** In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a member of the Faculty staff.

4. GUIDELINES FOR ACCEPTANCE OF BTECH/M TECH STUDENTS TO POSTGRADUATE STUDY

Candidates who hold Technikon degrees are required to fulfill the following conditions:

4. Honours programmes

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that the candidate wishes to pursue for an honours programme. The student will be given conditional acceptance to an honours programme, but in order to align the student's undergraduate training with the outcomes expected of a BSc graduate, the student will be expected to undertake additional coursework at level 6. The Head of Department concerned will be required to identify specific modules. The programme of study must be recommended by the Postgraduate Studies Committee, Faculty Board and for approval to the Subcommittee of the Senate. Confirmation of candidature will be based on the successful completion of the additional course requirements during the first year of the honours programme.

The candidate must submit an official application form, together with a motivation, grade 12 certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications. The Head of Department has to identify and prescribe modules as set out above. The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

4.2 Master's programmes

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that the candidate wishes to pursue for a master's programme. The student will be given conditional acceptance to a master's programme, but in order to align the student's undergraduate training with the outcomes expected of a BSc(Hons) graduate, the student will be expected to undertake additional coursework at level 6 and 7. Additional coursework will be prescribed by the Head of Department concerned. A minimum of 70 credits at level 7 will be required. The programme of study must be recommended by the Faculty Postgraduate Studies Committee, Faculty Board and for approval to the Subcommittee of the Senate. Confirmation of candidature will be based on the successful completion of the additional module requirements during the first year of the master's programme.

The candidate must submit an official application form, together with a motivation, grade 12 certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications. The Head of Department has to identify and prescribe modules as set out above. The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

4.3 PhD programmes

The candidate must have an MTech degree and have obtained at least 60 % for the MTech dissertation. Since the PhD is clearly more demanding of a wider (philosophical) scientific background, the selection of candidates for the PhD degree must be stringent, and could include outside evaluation of the dissertation work by nominees selected by the head of department and recommended by the Faculty Postgraduate Studies Committee, evidence of peer-reviewed publication, appropriate work-related experience (i.e. in a research environment) and, where necessary, formal coursework to address deficiencies in the academic background.

The candidate must submit an official application form, together with a motivation, academic record, a copy of the MTech dissertation and a short CV. The CV should include details of appropriate work experience and list of any publications. The Head of Department will submit a motivation to support the application. The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

5. **ADVANCED UNIVERSITY DIPLOMA IN EXTENSION AND RURAL DEVELOPMENT (Code 02220044) (120 credits)**

Co-ordinated in the Department of Agricultural Economics, Extension and Rural Development

This option is offered on part-time and full-time basis.

a) Admission

In order to be accepted for the Advanced University Diploma in Extension and Rural Development studies, a candidate must be in possession of

- an appropriate initial university diploma in one of the Agricultural or other appropriate disciplines and have one year relevant extension experience, or
- an appropriate BTech degree or National Diploma plus one year of relevant extension experience, or

- an appropriate Agricultural Diploma or diploma of similar value plus five years of relevant extension experience, or
- a qualification deemed appropriate by the Senate of the University plus approved extension experience (RPL).
- Training is offered on a part-time and full-time basis. The coursework for full-time students extends over a minimum of one year, while the part-time programme extends over a minimum of two years. As all modules are not offered at every training venue, it is important to consult the Head of the Department when planning an application.
- The curriculum consists of the following six modules, each worth 20 credits: AGV 412, 413, 415, 426, 428 and 429. Recognition of equivalent modules passed may be considered, in which case suitable alternative modules will be prescribed.

This programme is offered on part-time and full-time basis.

The aim of the extension and rural development programme is to produce diplomats qualified to operate as professional extension and development agents. On completion of the Advanced Diploma the candidate will be able to design, develop and execute scientifically sound situation-specific and community adapted extension of development programmes, conforming to the principles of participatory development with maximum community involvement and impact.

To enable them to do this they should:

- Be aware and knowledgeable of the philosophies and the different concepts and approaches of development and extension as well as its organisation and management;
- Have an understanding of the principles of human behaviour with specific reference to decision-making and behaviour change and the theories involved in understanding and facilitating change;
- Be knowledgeable of the theory and practical implementation of community development, group dynamics and leadership for the formulation and execution of development plans;
- Have an understanding of the principles of communication and be skilful in the identification and use of the most appropriate communication methods and combination thereof;
- Be knowledgeable and skilful in the development, execution and evaluation of situation-specific extension programmes.

b) Programme composition:

- AGV 412 : Group dynamics, leadership and community facilitation (20 credits)
- AGV 413 : Communication (20 credits)
- AGV 415 : Principles and approaches of development and extension (20 credits)
- AGV 426 : Programme and project planning (20 credits)
- AGV 428 : Evaluation of extension and development projects (20 credits)
- AGV 429 : Behaviour change and intervention (20 credits)

Prospective students are referred to the General Regulations of the University of Pretoria as well as to the Regulations of the Faculty of Natural and Agricultural Sciences.

Further enquiries regarding admission, class fees, accommodation and bursaries may be obtained from:

The Director
Postgraduate School of Agriculture and Rural Development
Faculty of Natural and Agricultural Sciences
University of Pretoria
0002 PRETORIA
Tel. 012 420 3280 Fax 012 420 3206
Email: PGSARD@up.ac.za

6. PROGRAMMES IN DIFFERENT FIELDS OF SPECIALISATION

6.1 AGRICULTURAL ECONOMICS

Co-ordinated in the Department of Agricultural Economics, Extension and Rural Development.

6.1.1 BlnstAgrar (Hons): Agricultural Economics (Code 03242021) (160 credits)

This programme is offered on both a full-time and if numbers allow also on a part-time basis.

The purpose of this training is to prepare candidates for careers in the economics and management of agriculture and rural development. On completion of the training the candidate should be conversant and able to partake in, or render advice concerning all aspects involved in management of agriculture and rural development. These aspects involve **at least** the following:

- Agribusiness management
- Production economics
- Marketing of agricultural products and marketing services
- Agricultural policy
- Rural organisations and infrastructure
- Agriculture and rural development
- Project management and analyses
- Resources economics

The graduate should be able to integrate knowledge from different areas into operational systems. The emphasis is on improvement of human welfare. Eventually, the candidate should be able to identify problems and opportunities, analyse these and make appropriate decisions; the intention with this training is to provide to society system-directed problem solvers and opportunity selectors. In this manner, it is hoped to provide useful leaders to society and attractive, challenging careers to graduates.

Programme composition:

| | | |
|---------|---|---|
| ARD 780 | : | Rural Development Studies (40 credits) |
| ARD 782 | : | Physical-biological Resources and Development (20 credits) |
| LEK 725 | : | Quantitative Methods in Agricultural Economics (20 credits) (not offered on part-time basis) |
| LEK 713 | : | Agricultural Marketing (20 credits) |
| LEK 723 | : | Issues in Agricultural and Applied Economics (20 credits) |
| LEK 702 | : | Production Analysis (20 credits) |
| LEK 785 | : | Project Planning and Appraisal (20 credits) |

6.1.2 BInstAgrar(Hons) : Agribusiness Management (Code 03242024) (160 credits)

This programme is offered on a full-time basis only

Programme composition:

| | |
|-----------|--|
| ARD 780 | : Rural Development Studies (40 credits) |
| LEK 720 | : Strategic Management in Agribusiness (20 credits) |
| LEK 702 | : Introduction to Agribusiness Management (20 credits) |
| LEK 713 | : Agricultural Marketing (20 credits) |
| AGV 713 | : Communication (20 credits) |
| LEK 722 | : Agricultural Finance (20 credits) |
| LEK 782 | : International Agricultural Trade and Policy (20 credits) |
| or | |
| LEK 785 | : Project Planning and Appraisal (20 credits) |

6.1.3 MInstAgrar : Agricultural Economics (Code 03252021) (360 credits)

The degree can only be taken as a non-dissertation option. The candidate is required to pass at least 260 course credits (including the 160 needed for the B Inst Agrar (Hons) degree). In addition a research report (100 credits) must be submitted under the guidance of a member of the academic staff for a total of 360 credits.

The schedule below indicates modules required for the MInstAgrar degree in Agricultural Economics.

Programme composition:

| | |
|---------|---|
| ARD 780 | : Rural Development Studies (40 credits) |
| ARD 782 | : Physical-biological Resources and Development (20 credits) |
| LEK 725 | : Quantitative Methods in Agricultural Economics (not offered on part-time basis)(20 credits) |
| LEK 702 | : Production Analysis (20 credits) |
| LEK 713 | : Agricultural Marketing (20 credits) |
| LEK 723 | : Issues in Agricultural and Applied Economics (20 credits) |
| LEK 785 | : Project Planning and Appraisal (20 credits) |
| LEK 780 | : Natural Resource and Environmental Economics (not offered on part-time basis)(20 credits) |
| LEK 712 | : Agricultural Policy (20 credits) |
| LOB 800 | : Rural Development Governance 800 (20 credits) |
| LEK 720 | : Strategic Management (20 credits) |
| LEK 784 | : Advanced Rural Finance (20 credits) |
| LEK 891 | : A mini-dissertation (100 credits) |

6.1.4 PhD: Agricultural Economics (Code 03260042) (400 credits)

Candidates who choose this option must pass the following modules on a full-time basis before being admitted for the research thesis.

| | |
|---------|---|
| EKT 713 | : Econometrics (20 credits) |
| LEK 810 | : Agricultural Economics 810 (20 credits) |
| LEK 814 | : Agricultural Economics 814 (20 credits) |
| LEK 711 | : Agricultural Economics 711 (20 credits) |
| LEK 900 | : Agricultural Economics (80 credits) |
| LEK 990 | : Thesis (400 credits) |

6.2 ANIMAL PRODUCTION MANAGEMENT

Co-ordinated in the Department of Animal and Wildlife Sciences.

6.2.1 MInstAgrar: Animal Production Management (Code 03252093) (240 credits)

The programme consists of advanced studies (APZ 801) and a dissertation (APZ 802) on an appropriate research topic in the field of animal production management.

6.2.2 PhD: Animal Production Management (Code 02260545)

Programme composition:

APZ 900 : Animal Production Management
APZ 990 : Thesis

6.3 EXTENSION

Co-ordinated in the Department of Agricultural Economics, Extension and Rural Development.

6.3.1 BInstAgrar(Hons) : Extension (Code 03242011)

This programme is offered on both a full-time and part-time basis.

The aim of this degree programme is to produce graduates qualified to operate as professional extension or development agents. On completion of the degree the candidate will be able to design, develop and execute or manage scientifically sound situation-specific and community adapted extension or development programmes, conforming to the principles of participatory development with maximum community involvement and impact.

To enable them to do this they should:

- Be aware and knowledgeable of the philosophies and the different concepts and approaches of development and extension as well as its organisation and management;
- Have an understanding of the principles of human behaviour with specific reference to decision-making and behaviour change and the theories involved in understanding and facilitating change;
- Be knowledgeable of the theory and practical implementation of community development, group dynamics and leadership for the formulation and execution of development plans;
- Have an understanding of the principles of communication and be skilful in the identification and use of the most appropriate communication methods and combinations thereof;
- Be knowledgeable and skilful in the development, execution and evaluation of situation-specific extension programmes.

Programme composition:

Compulsory modules:

ARD 781 : Agricultural Development Principles: Theory and Evidence (20 credits)
ARD 782 : Physical-biological Resources and Development (20 credits)
AGV 713 : Communication (20 credits)
AGV 729 : Adoption and Diffusion (20 credits)
AGV 726 : Programme and Project Planning (20 credits)

Elective modules:

At least three of the following modules:

- AGV 711 : Extension, Philosophy, Organisation and Management (20 credits)
- AGV 712 : Leadership and Group Dynamics (20 credits)
- AGV 725 : Community Development and Rural Sociology (20 credits)
- AGV 728 : Extension Evaluation (20 credits)
- LOB 800 : Rural Development Governance (20 credits)
- AGV 715 : Principles and Approaches of Development and Extension (20 credits)

Total credits for BInstAgrar(Hons): 160 credits

A module in Agricultural Economics or any other field of specialisation may be included as an elective module, in consultation with the Director of the School and the head(s) of department(s).

6.3.2 MInstAgrar : Extension (Code 03252011)

The degree programme comprises

- a) Theoretical study : Honours modules in Extension that have not yet been taken;
- b) A dissertation in the form of a situation specific development programme or based on appropriate research in the field of extension (AGV 891).

6.3.3 PhD: Extension (Code 03262002)

Programme composition:

- AGV 900 : Agrarian Extension
- AGV 990 : Thesis

6.4 ENVIRONMENTAL MANAGEMENT

6.4.1 MInstAgrar: Environmental Management (Coursework) (Code 03252132)

a. Admission requirements

Before application for admission to the MInstAgrar: Environmental Management, candidates must be in possession of a four-year degree qualification (BInstAgrar), or equivalent degree status which includes appropriate subjects in sociology, ecology or economics. Final admission is subject to the approval of the Director of the Centre for Environmental Studies and the Director of the Postgraduate School for Rural and Agricultural Development.

b. Programme composition:

Compulsory core modules (80 credits):

- (ENV 810) Environmental paradigms 810
- (ENV 812) Environmental analysis, assessment and modelling 812
- (OMR 881) Environmental law 881

Compulsory specialisation modules (60 credits):

- (ZEN 811) Conservation and development 811
- (ENS 811) Environment and development 811
- (LEK 780) Agricultural economics 780 (Introduction to Natural Resource and Environmental Economics)

Elective module (20 credits):

At least one additional elective module must be selected in consultation with the Director of the Centre for Environmental Studies and the Director of the Postgraduate School for Rural and Agricultural Development. Options will be based on the academic background and/or anticipated career of the candidate.

Project (100 credits):

ENV 891: Research project 891

Total credits required: 260

6.5 PLANT PRODUCTION

Co-ordinated in the Department of Plant Production and Soil Science

Three focus areas are available: Agronomy, Horticultural Science and Pasture Science.

6.5.1 BlnstAgrar(Hons) : Plant Production (Code 03242031) (165 credits)

On completion of the degree candidates will have a clear understanding of all aspects relevant to the principles and practices of plant production. They should be able to design/improve/manage crop production systems for specific situations on a scientific basis. Students selecting the Pasture Science electives will also have a holistic approach to the interaction between environment, plants (rangeland and pastures) and animals enabling them to develop and implement sustainable production systems for different agro-ecological/economic conditions.

To reach this objective, they must:

- Understand the physiological basis of crop yield
- Know the botany of crop plants
- Have a thorough understanding of practices such as tillage, fertilization, cultivar selection, pest management, irrigation, harvesting and marketing of crops
- Have applicable knowledge of subjects such as plant breeding, soil science and agricultural economics,
- and with the Pasture Science electives they must have a good grounding in ecology, physiology and taxonomy of rangeland and pasture plants
- Have a thorough understanding of the principles of range management with particular reference to range condition, grazing capacity, adapted animals and the use of such management strategies as burning, resting and rotational grazing
- With respect to planted pastures, be able to make recommendations with respect to crop selection, establishment, fertilization, irrigation and method of utilization
- Be able to integrate rangeland, pastures, crops and agro-forestry into viable livestock enterprises.

Programme composition:

Compulsory modules:

ARD 780 : Rural Development Studies (40 credits)

ARD 782 : Physical-biological Resources and Development (20 credits)

PGW 702 : Scientific Communication (30 credits)

PGW 704 : Research Methodology (15 credits)

Elective modules:

Four of the following or additional modules may be selected in consultation with the Director of the School and the relevant Department Head(s). Choices will be based on the academic background and/or anticipated career of the candidate.

| | |
|---------|--|
| AGR 785 | : Crop Production Systems: I Field Crops (15 credits) |
| AGR 786 | : Crop Production Systems: II Vegetable Crops (15 credits) |
| PPR 712 | : Plant Production: Herbicides (15 credits) |
| PPR 713 | : Agroforestry (15 credits) |
| WDE 781 | : Rangeland Management (15 credits) |
| WDE 782 | : Pasture Science (15 credits) |
| WDE 783 | : Integrated Plant and Animal Production (15 credits) |
| HSC 788 | : Production Systems: I Subtropical Fruit (15 credits) |
| HSC 789 | : Production Systems II Deciduous Fruit (15 credits) |
| HSC 783 | : Topics in Horticultural Science (15 credits) |

Additional elective modules may be selected in consultation with the Director of the School and the head(s) of the relevant department(s).

6.5.2 MInstAgrar : Agronomy (Code 03252072) (240 Credits)

Programme composition:

A mini-dissertation (AGR 891) (120 credits)

Advanced modules in agronomy and related subjects in consultation with the Director of the School and the head of the department (AGR 801) (120 credits)

6.5.3 PhD: Agronomy (Code 03262164) (360 credits)

Programme composition:

AGR 900 : Agronomy (60 credits)

AGR 990 : Thesis (300 credits)

6.5.4 MInstAgrar : Horticultural Science (Code 03252082) (240 Credits)

Programme composition:

A mini-dissertation (HSC 891) (120 credits)

Advanced modules in horticultural science and related subjects in consultation with the Director of the School and the head of the department (HSC 801) (120 credits)

6.5.5 PhD: Horticultural Science (Code 02260544) (360 credits)

Programme composition:

TBK 900 : Horticultural Science (60 credits)

TBK 990 : Thesis (300 credits)

6.5.6 MInstAgrar : Pasture Science (Code 03252092) (240 credits)

Programme composition:

A mini-dissertation (WDE 891) (120 credits)

Advanced modules in pasture science and related subjects in consultation with the Director of the School and the head of the department (WDE 801) (120 credits).

6.5.7PhD: Pasture Science (Code 03262165) (360 credits)

Programme composition:

WDE 900 : Pasture Science (60 credits)

WDE 990 : Thesis (300 credits)

6.6 CROP PROTECTION

Co-ordinated in the Department of Microbiology and Plant Pathology

There are two different focus areas available: Plant Protection and Plant Quarantine.

6.6.1 BlnstAgrar(Hons) : Crop Protection (Code 03242062) (160 credits)

This programme is offered on a full-time basis only.

On completion of the degree the candidate should be able to recognise and diagnose the diseases, insect pests and weeds causing losses to economically important crops, and know in principle how to control these diseases, pests and weeds. The candidate should also have a general knowledge of the factors influencing plant health and yield and be able to implement effective plant protection measures.

In order to achieve this, the candidate must:

- Understand the basic principles of plant pathology, entomology and weed science in the context of plant protection.
- Know the economically important plant diseases in terms of symptoms and development of the disease, biological properties of the causal organisms and control measures.
- Understand the principles involved in chemical and non-chemical control of plant diseases.
- Know the environmental conditions including soil factors influencing plant health.

a) Admission requirements:

Candidates must be in possession of the following basic university subjects before admission to the BlnstAgrar(Hons) in Crop Protection:

Chemistry - Elementary, general and organic chemistry

Biology - Plant anatomy and physiology

Candidates are also expected to have the following modules, or equivalents, as background. If necessary these modules may be taken in addition to the prescribed modules during the study programme, or may be substituted for any of the BlnstAgrar(Hons): Crop Protection required modules provided the candidate has been credited for the module in question:

Soil Science - Introductory Soil Science - GKD 250/214

Microbiology - Introductory Microbiology – MBY 161

Crop Protection - Introductory Crop Protection – PLG 251

b) Programme composition:

ARD 780 : Rural Development Studies (40 credits)

ARD 782 : Physical-biological Resources and Development (20 credits)

SIZ 711 : Insect Diversity: Economical and Ecological Implications (20 credits)

PPR 712 : Plant Production: Herbicides (20 credits)

PPT 780 : Introductory Plant Pathology (20 credits)

| | | |
|---------|---|---|
| PPT 781 | : | Plant Pathology: Disease Control (20 credits) |
| SIZ 724 | : | Integrated Pest Management (20 credits) |

6.6.2 MInstAgrar : Crop Protection (Code 03252061) (240 credits)

There are three focus areas to choose from : Plant Pathology, Entomology and Weed Science.

Programmes are offered in the field of specialisation i.e. Plant Pathology, Entomology or Weed Science, in consultation with the Director of the School and/or the head of the division Plant Pathology. Choices will be based on the academic background and/or future career of the candidate. Elective modules will be selected up to 120 credits and should include AGR 783 and AGR 784 depending on the student's background.

A mini-dissertation PPT 892 (120 credits) must be done on a topic to be decided on in consultation with the Director of the School and the head of the relevant department.

6.6.3 PhD: Crop Protection (Code 03262021) (400 credits)

Programme composition:

| | | |
|---------|---|--------------------------|
| PPT 900 | : | Examination (50 credits) |
| PPT 990 | : | Thesis (350 credits) |

6.7 PLANT QUARANTINE

Co-ordinated in the Department of Microbiology and Plant Pathology

6.7.1 BInstAgrar(Hons): Plant Quarantine (Code 03242151) (160 credits)

This programme is offered on a full-time basis only.

On completion of the degree the candidate should be well versed in recognising and diagnosing plant diseases and insect pests, particularly those of quarantine importance. The candidate should also have a general knowledge of phytosanitary requirements, quarantine pest risk assessment and trade regulations internationally and locally.

In order to achieve this, the candidate must:

- Understand the basic principles of plant pathology and entomology in the context of plant quarantine.
- Know the important quarantine pests and diseases.
- Understand how these pests and diseases spread, survive and what their economic importance is.
- Comprehend the principles involved in international trade regulations.

a) Admission requirements:

Candidates must be in possession of an acceptable bachelor's degree with the following basic university subjects before admission to the BInstAgrar(Hons) in Plant Quarantine:

Chemistry - Elementary, general and organic chemistry

Biology - Plant anatomy and physiology

b) Programme composition:

- ARD 780 : Rural Development Studies (40 credits)
- ARD 782 : Physical-biological Resources and Development (20 credits)
- SIZ 711 : Insect Diversity: Economical and Ecological Implications (20 credits)
- PPT 780 : Introductory Plant Pathology (20 credits)
- PPT 781 : Plant Pathology: Disease Control (20 credits)
- PPT 761 : Risk Assessment and Sanitary and Phytosanitary Issues (20 credits)
- SIZ 724 : Integrated Pest Management (20 credits)

6.7.2 MInstAgrar : Plant Quarantine (Code 03252141) (240 credits)

Programmes are offered in the field of specialisation in consultation with the Director of the School and the head of the relevant department. Choices will be based on the academic background and/or future career of the candidate and should include AGR 783 and AGR 784 depending on the student's background. Elective modules up to 120 credits should be selected.

A mini-dissertation (PPT 893) (120 credits) on a topic to be decided on in consultation with the Director of the School and the head of the relevant department.

6.7.3 PhD: Plant Quarantine (Code 03262141) (400 credits)

Programme composition:

- PPT 900 : Plant Quarantine (50 credits)
- PPT 990 : Thesis (350 credits)

6.8 RURAL DEVELOPMENT PLANNING

Co-ordinated in the Department of Agricultural Economics, Extension and Rural Development.

6.8.1 BInstAgrar(Hons): Rural Development Planning (Code 03242023) (170 credits)

The aim of this programme is to enable graduates to participate in and lead rural development planning and management initiatives. It provides a broad based understanding of development, project planning and analysis, strategic management and planning methodology.

Programme composition:

- ARD 780 : Rural Development Studies (40 credits)
- ARD 782 : Physical-biological Resources and Development (20 credits)
- LEK 785 : Agricultural Economics (20 credits)
- RSG 720 : Land Law and Administration (20 credits)
- AGV 711 : Agrarian Extension (20 credits)
- AGV 725 : Agrarian Extension (20 credits)
- NBP 780 : Settlement Planning (20 credits)
- LOB 800 : Rural Governance (20 credits)

6.8.2 MInstAgrar: Rural Development Planning (Code 03252023)

This is a coursework degree programme. The candidate is required to pass at least 260 credits (including the 160 credits needed for the BInstAgrar(Hons) degree). In addition a research report (60 credits) must be submitted, prepared under the

guidance of a member of the academic staff. The schedule below indicates modules required for the MInstAgrar degree in Rural Development Planning.

Programme composition:

Compulsory modules:

- ARD 780 : Rural Development Studies (40 credits)
- ARD 782 : Physical-biological Resources and Development (20 credits)
- LEK 785 : Project Planning and Appraisal (20 credits)
- RSG 720 : Land Law and Administration (20 credits)
- AGV 711 : Agrarian Extension (20 credits)
- AGV 725 : Agrarian Extension (20 credits)
- NBP 780 : Settlement Planning (20 credits)
- LOB 800 : Land Development Governance (20 credits)
- GDK 781 : Land-use Planning (20 credits)

Elective modules:

Three elective modules from LEK 780, LEK 784, ARD 784, Agrarian Extension, Land-use Planning, Rural Engineering or other electives that would strengthen the rural management focus.

Mini-dissertation:

AGV 890 : A mini-dissertation on a relevant aspect of Rural Development.

6.8.3 PhD: Rural Development Planning (Code 03262023)

Programme composition:

- DPL 900 : Rural Development Planning
- DPL 990 : Thesis