NWU®

2018

Yearbook

FACULTY NATURAL AND AGRICULTURAL SCIENCES

Jaarboek

FAKULTEIT NATUUR- EN LANDBOUWETENSKAPPE

postgraduate • nagraads

All universities in South Africa are obligated by law to take part in a National Project driven by the external regulatory bodies (Department of Higher Education and Training (DHET), the Council on Higher Education (CHE) and the South African Qualifications Authority (SAQA)), to align all qualifications with the Higher Education Qualifications Sub-Framework (HEQSF). It follows that the NWU is continuously in process of aligning our qualification and programme offering with the requirements of the HEQSF.

Students are advised to contact the relevant faculty to ensure that they register for the correct qualification, programme and /or curriculum, or to report any errors and/or omissions noticed. It is the duty of the student to ascertain that he/she is registering for the correct qualification, programme and /or curriculum. The University will not be held liable for any damages students may suffer as result of neglecting this responsibility.

Universiteite in Suid Afrika is regtens verplig om deel te neem aan 'n Nasionale Projek onder leiding van die eksterne regulatoriese liggame (die Departement van Hoër Onderwys en Opleiding (DHOO), die Raad op Hoër Onderwys (RHO) en die Suid-Afrikaanse Kwalifikasie-owerheid (SAKO)), ten einde alle kwalifikasies volgens die Hoëronderwys-kwalifikasiesubraamwerk (HOKSR) te belyn. Die NWU is dus deurlopend besig om die universiteit se kwalifikasie- en programaanbod met die vereistes van die HOKSR te belyn.

Studente word aangeraai om met die relevante fakulteit in verbinding te tree om te verseker dat hulle vir die korrekte kwalifikasie, program en/of kurrikulum registreer, of in geval hulle enige foute en/of weglatings wil aanmeld. Die onus lê op die student om seker te maak dat hy/sy vir die regte kwalifikasie, program en/of kurrikulum registreer. Die Universiteit sal dus nie aanspreeklik gehou word vir enige skade wat studente mag ly indien hulle nie hierdie verantwoordelikheid nakom nie.

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PLEASE MENTION YOUR UNIVERSITY NUMBER IN ALL CORRESPONDENCE.

The General Academic Rules of the University, to which all students have to subject themselves and which apply to all the qualifications offered by the University, appear in a separate publication and are available on the web page at: http://www.nwu.ac.za/yearbooks.

Please note: Although the information in this Calendar has been compiled with the utmost care and accuracy, the Council and the Senate of the University accept no responsibility whatsoever for errors that may occur. Before students finally decide on the selection of modules, they must consult the class timetable. If a clash occurs in the planned selection of a student, the relevant module combination is not permitted.

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Die Algemene Akademiese Reëls van die Universiteit, waaraan alle studente hulle moet onderwerp en wat op al die kwalifikasies wat die Universiteit aanbied, van toepassing is, verskyn in 'n afsonderlike bundel op die web by: http://www.nwu.ac.za/yearbooks.

Let Wel: *Ofskoon die inligting wat in hierdie Jaarboek opgeneem is so noukeurig moontlik saamgestel is, aanvaar die Raad en die Senaat van die Universiteit hoegenaamd geen aanspreeklikheid vir onjuisthede wat hierin mag voorkom nie. In die besonder bly dit elke student se verantwoordelikheid om hom/haar deeglik te vergewis van die klasrooster en moontlike roosterbotsings voordat hy/sy finaal oor die keuse van modules besluit. Indien daar 'n botsing by 'n student se voorgenome keuse voorkom, is die betrokke kombinasie van modules ontoelaatbaar.*

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Faculty of Natural and Agricultural Sciences / *Fakulteit Natuur- en Landbouwetenskappe*

Prof EE Ebenso

Faculty of Theology / *Fakulteit Teologie*

Prof RS Letš**o**sa (acting/*waarnemend*)

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Vaaltriangle: Miss D Gerber, Hons BSc Mathematics (NWU), MSc Mathematics (NWU)

School of Computer Science and Information Systems / *Skool vir Rekenaarwetenskap en Inligtingstelsels*
Vacant / *Vakant*

School of Geo- and Spatial Sciences / *Skool vir Geo- en Ruimtelike Wetenskappe*
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School of Environmental and Health Sciences
Mafikeng: Prof LG Palamuleni, MSc (Univ of Malawe), PhD (UJ)

School of Physical and Chemical Sciences / *Skool vir Fisiese en Chemiese Wetenskappe*
Potchefstroom: Prof CA Strydom, Pr Sci Nat, PhD (UP)

School of Mathematical and Physical Sciences

Mafikeng: Prof A Mawire, BSc Hons, (NUST, Zimbabwe), MSc (UKZN), PhD (NWU)

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Centre for Space Research (Centre of Excellence) / *Sentrum vir Ruimtenavorsing (Sentrum van Uitnemendheid)*
Potchefstroom: Prof SES Ferreira, PhD (PU for CHE)

Focus Area for Chemical Resource Beneficiation / *Fokusarea vir Chemiese Hulpbronveredeling*
Potchefstroom: Prof HCM Vosloo, Hons BSc (UOVS), PhD (PU for CHE), HED (UOVS)

Focus Area: Human Metabolomics / *Fokusarea vir Menslike Metabolomika*
Potchefstroom: Prof DT Loots, PhD (NWU)

Focus Area for Material Science Innovation and Modelling / *Fokusarea vir Materiaalwetenskap Innovasie en Modellering*
Mafikeng: Prof EE Ebenso BSc (Hons)(Calabar), MSc (Ibadan), PhD (Calabar)

Niche area for Food Safety and Security / *Nisarea vir Voedselveiligheid en Sekuriteit*
Mafikeng: Prof OO Babalola, BSc Hons (Ogun), MSc, PhD (Univ of Ibadan)

Niche area for Technology Enhanced Learning and Innovation Education and Training in South Africa (TELIT SA) / *Nisarea vir Tegnologie-verbeterde Leer en Innoverende Onderwys en Opleiding in Suid-Afrika (TELIT SA)*

Vaaltriangle: Vacant / *Vakant*

School of Research and Postgraduate Studies

Mafikeng: Prof U Useh BSc. Hons Physiotherapy(University Of Ibadan), LLB (NWU) , M.Ed Exercise Physiogy (University Of Ibadan), PhD (UNIVEN) PGD in Education (University Of Plymouth) Fellow Higher Education Academy (UK), PgDip in HR (NWU)

Unit for Business Mathematics and Informatics / *Eenheid vir Bedryfswiskunde en Informatika*
Potchefstroom: Prof HM Huisman, BSc (PU for CHE), Hons BSc (PU for CHE), MSc (PU for CHE),PhD (PU for CHE)

Unit for Environmental Sciences and Management / *Eenheid vir Omgewingswetenskappe en -bestuur*
Potchefstroom: Prof N Smit, PhD (UOFS)

- **Africa Centre for Disaster Studies / *Afrika Sentrum vir Rampstudies***

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CENTRE DIRECTORS / *SENTRUMDIREKTEURE*

Centre for Applied Radiation Science and Technology / *Sentrum vir Toegepaste Stralingswetenskap en –tegnologie*
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Centre for Environmental Management / *Sentrum vir Omgewingsbestuur*
Potchefstroom: Prof JG Nel, BA (Ed), Hons BA (UPE), MA (UPE)

Centre for Human Metabolomics / *Sentrum vir Menslike Metabolomika*
Potchefstroom: Prof BC Vorster, MMed (Chem Paths), (UP)

Centre for Indigenous Knowledge Systems / *Sentrum vir Inheemse Kennissisteme*
Mafikeng: Prof SA Materechera, BSc Agric (Malawi), MSc Soil Sci (McGill,Canada), PhD (Adelaide, South Australia)

Centre for Water Science and Management / Sentrum vir Waterwetenskappe en -bestuur
Potchefstroom: Prof I Dennis, PhD (UFS)

Academic Support Services / *Akademiese Ondersteuningsdienste*

Instrument making / *Instrumentmakery*
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Agronomy and Horticulture
Mafikeng: Prof F Kutu, BSc. Agriculture; MSc. Agronomy (Soil Science) & PhD Agronomy (University of Ibadan, Nigeria)

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Animal Science
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Botany / *Plantkunde*
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Ms J Larney, BSc, MCom, FASSA, FIA, CERA

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MSc in Business Mathematics and Informatics with specialisation in above fields

Prof H Raubenheimer, BSc, MSc, PhD (NWU

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Mafikeng: Prof N Gasela, MSc(USSR) MSc (Abertay,Dundee) PhD (NUST, Zimbabwe)
VTC: Dr C Venter, PhD (NWU)

Geography and Environmental Management / Geografie en Omgewingsbestuur
Potchefstroom: Dr DP Cilliers, PhD (NWU)

Mafikeng: Dr M Manjoro BSc.Ed (ISP,EJV, Cuba), BSc. Hons-GIS/RS (UFH), MSc. (UNAH, Cuba), PhD (NMMU)

Geology / *Geologie*
Potchefstroom: Dr DM van Tonder MSc (UP), PhD (TUT)

Mathematics and Applied Mathematics / *Wiskunde en Toegepaste Wiskunde*
Potchefstroom: Prof DG Kubayi, PhD (Wits)
Mafikeng: Prof SC Noutchie, MSc (UNISA), PhD (UKZN)
VTC: Dr I Takaidza, DTech (CPUT)

Microbiology / *Mikrobiologie*
Potchefstroom: Prof S Claassens, PhD (NWU)
Mafikeng: Prof E Mukwevho, BSc (Univen), BSc Hons (UL), MSc (UCT), PhD (UCT), Cert in Financial Management (UCT), Cert in Project Management (UCT).

Physics/ *Fisika*
Potchefstroom: Prof SI Loubser, BSc (NWU), MSc (NWU), PhD (UCLan, UK)
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Statistics and Operational Research
Potchefstroom: Prof L Santana, PhD (NWU)
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Potchefstroom: Prof EJ Cilliers, Pr Pln, PhD (NWU)

Zoology / *Dierkunde*
Prof MS Maboeta, PhD (Stellenbosch University)

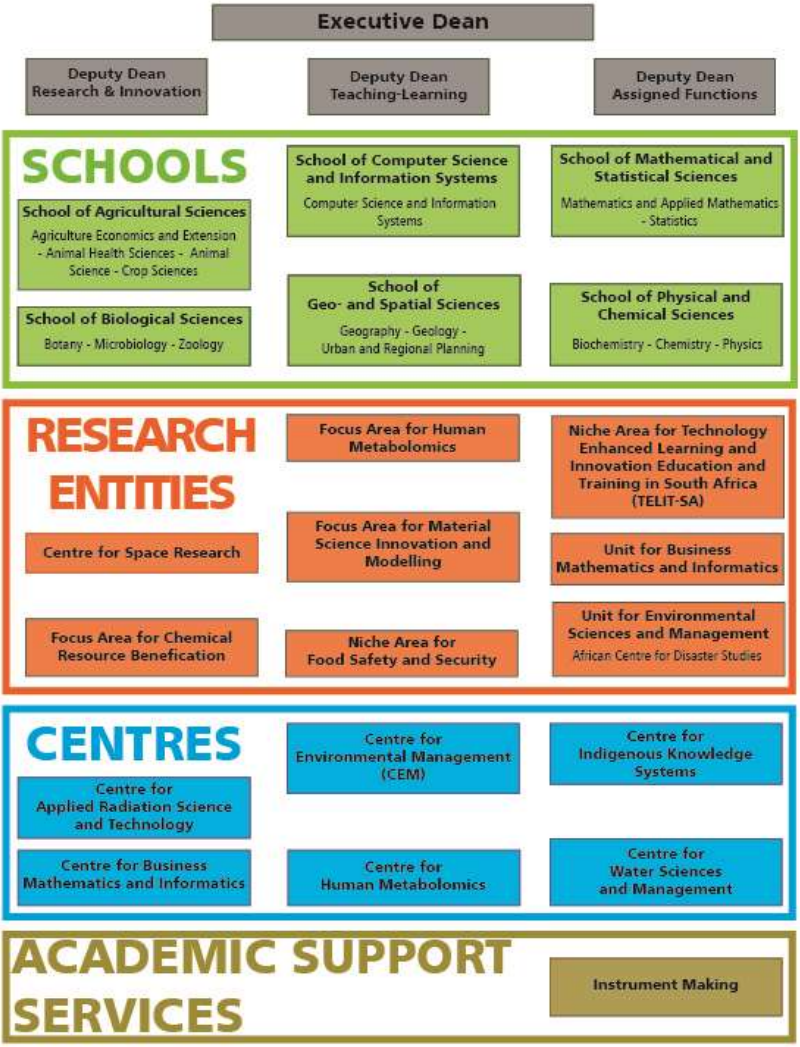
FACULTY BOARD / *FAKULTEITSRAAD*

The Faculty Board is comprised of of the following members / *Die Fakulteitsraad word verteenwoordig deur die volgende lede*:

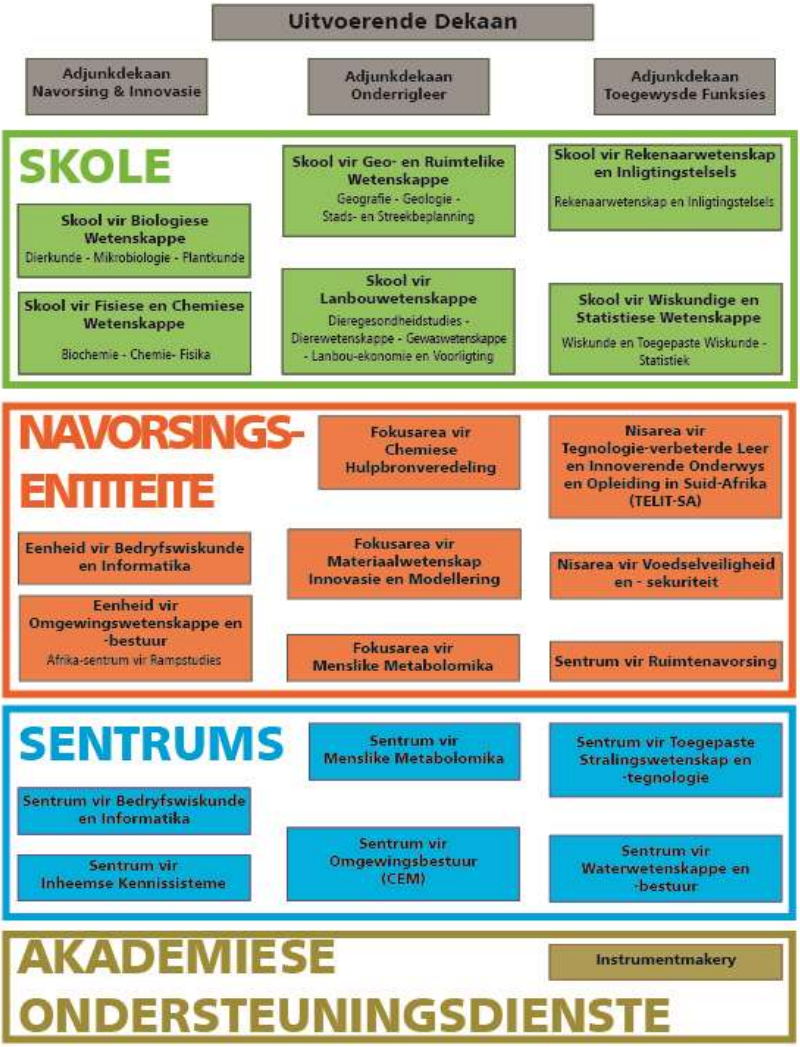
- The Executive Dean / *Uitvoerende Dekaan*
- Deputy Deans / *Adjunk Dekane*
- Directors (School/Centre and Research Entity Directors) / *Direkteure (Skool-/Sentrum- en Navorsings- Entiteitdirekteure*
- Academic employees elected by the academic employees with due account to the
  geographic representation of the Faculty, the positions within the faculty as well as
  representation in terms of race, gender and disability. Three-year term. / *Akademiese werknemers verkies deur die akademiese werknemers, met inagneming van die geografiese verteenwoordiging van die Fakulteit, die posisies binne die fakulteit, sowel as verteenwoordiging in terme van ras, geslag en gestremdheid. Drie-jaar termyn.*
- Faculty Administator / *Fakulteitsadministrateur*
- Student representation by means of a representative of formally constituted substructures of the Student Representative Council (SRC) and designated annually by the SRC/.
  Studenteverteenwoordiging, deur middel van 'n verteenwoordiger van die formeel saamgestelde sub-strukture van die Verteenwoordigende Studenteraad (VSR) soos jaarliks deur die VSR aangewys word.

Note: There was not sufficient time to have properly constituted Faculty Boards in terms of the prescripts of the Statute arranged ready for reporting back to Senate on 1 November 2017.
The constitution of the new Faculty Board will be finalised once the election of academic members have been concluded.
Re MEMO Prof MM Verhoef; 20-10-2017

FACULTY OF NATURAL AND AGRICULTURAL SCIENCES



FAKULTEIT NATUUR- EN LANDBOUWETENSKAPPE



NAS.1 FACULTY RULES / *FAKULTEITSREËLS*

NAS.1.1 AUTHORITY OF THE GENERAL RULES / *GESAG VAN DIE ALGEMENE AKADEMIESE REËLS (A-REËLS)*

The faculty rules valid for the different qualifications, programmes and curricula of this faculty and contained in this faculty calendar are subject to the General Rules of the University, as determined from time to time by the Council of the University on recommendation by the Senate. The faculty rules should therefore be read in conjunction with the General Rules.

A-Rules available on the web page at:
http://www.nwu.ac.za/webfm_send/57621

Die Fakulteitsreëls, wat ten aansien van die verskillende kwalifikasies, programme en kurrikulums van hierdie Fakulteit geld en in hierdie Fakulteitsjaarboek opgeneem is, is onderhewig aan die Algemene Reëls van die Universiteit, soos dit van tyd tot tyd deur die Raad van die Universiteit op aanbeveling van die Senaat vasgestel word, en moet dus met daardie Algemene Reëls saamgelees word.

Die Algemene Akademiese Reëls verskyn op die Universiteit se Tuisblad by:

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NAS.1.2 MODULES AND CREDITS / *MODULES EN KREDIETE*

Subjects are presented in modules, of which everyone is awarded a specific credit value**. Each module must be passed individually** (See General Rules).Each module has a code and a descriptive name, for example FSKN111. The meaning of the digital codes of these names is explained in General Rules.
In the description of each qualification and programme a number of possible curricula, from which the student must select one, are set out. An explanation is also given in what way the modules of each curriculum have to be divided into the different semesters of each study year. The curricula are compiled for a minimum period of one or two years, as applicable to the relevant qualification. A student may apply to distribute the modules of a curriculum over a longer period. Exceeding the maximum study period of a curriculum as a result of the student not progressing satisfactorily will only be granted in exceptional cases.
The order in which modules are taken in a curriculum is not voluntary, but has been designed to ensure that ensuing learning will always be built on prior learning. / *Vakke word aangebied volgens modules waaraan 'n bepaalde kredietwaarde toegeken is (Kyk Algemene Reël).* ***Elke module moet afsonderlik geslaag word.*** *Modules het 'n kode en 'n beskrywende naam, byvoorbeeld FSKN611. By sekere kwalifikasies en programme word 'n aantal moontlike kurrikulums, waaruit die student een moet kies, beskryf en*

word aangedui hoe die modules in elke kurrikulum oor die verskillende semesters van elke studiejaar versprei moet word. Die kurrikulums is saamgestel vir die minimum tydperk van een of twee jaar soos van toepassing vir die betrokke kwalifikasie. 'n Student kan aansoek doen om die modules van 'n kurrikulum ook oor 'n langer tydperk te versprei. Oorskryding van die maksimum studietydperk van 'n kurrikulum, omdat die student nie na wense gevorder het nie, sal slegs in uitsonderlike gevalle toegelaat word.
Die volgorde waarin modules in 'n kurrikulum geneem moet word, is nie willekeurig nie, maar ontwerp om te verseker dat volgende leer altyd op vorige leer voortbou

NAS.1.3 RECOGNITION OF PRIOR LEARNING (A-RULE 1.6) / *ERKENNING VAN VORIGE LEER (A REËL 1.6)*

North-West University accepts the principle underlying outcomes-based, source-based and lifelong learning, in which considerations of articulation and mobility play a significant role, and subscribes to the view that recognition of prior learning, whether acquired by formal education programmes at this or another institution, or informally (from experience), is an indispensable element in deciding on admission to and awarding credits with a view to placement in an explicitly selected teaching-learning programme of the University. / *Die Noordwes-Universiteit aanvaar die beginsel onderliggend aan uitkomsgerigte, brongebaseerde en lewenslange leer, waarin artikulasie en mobiliteit 'n betekenisvolle rol speel, en onderskryf die siening dat erkenning van vorige leer, hetsy dit in formele onderrigprogramme by hierdie of 'n ander instelling, of informeel (deur ervaring) opgedoen is, 'n onontbeerlike element by die besluit oor toelating tot en kredietverlening met die oog op plasing binne 'n uitdruklik gekose onderrigleerprogram van die Universiteit uitmaak.*

Recognition of prior learning concerns the provable knowledge and learning that an applicant has acquired, whether by having completed formal education programmes, or from experience. At all times the question will be what the level of the skills is, and skills will be assessed in the context of the exit level skills required by the intended teaching-learning programme or modules in the programme, or the status for which the applicant applies, and not merely by virtue of the experience recorded by the applicant. Recognition of prior learning will therefore take place in terms of applied competencies demonstrated by the applicant in his/her application, taking into consideration the exit level outcomes that have to be obtained by means of the selected teaching-learning programme. / *By die erkenning van vorige leer handel dit oor die bewysbare kennis en leer wat 'n aansoeker opgedoen het, hetsy deur formele onderrigprogramme, of deur ervaring. Ten alle tye sal die vraag wees watter vlak van vaardigheid, beoordeel in die konteks van die uittreevlakvaardighede wat vereis word vir die beoogde onderrigleerprogram of modules daarbinne, of status waarvoor die aansoeker aansoek doen, en nie bloot om die ervaring wat 'n aansoeker kan boekstaaf nie. Erkenning van vorige leer*

geskied dus in terme van die toegepaste bevoegdhede wat die aansoeker in die aansoek gedemonstreer het, met inagneming van die uittreeuitkomste wat met die gekose onderrigleerprogram bereik moet word.

North-West University accepts that recognition of prior learning can and must take place in a valid, trustworthy and fair way, within the normal existing policy on awarding credits to prospective and existing students, whether they are from this or another institution. / *Die Noordwes-Universiteit aanvaar dat die erkenning van vorige leer binne die normale, bestaande beleid oor die toelating van kredietverlening aan voornemende of bestaande studente – hetsy van hierdie of 'n ander instelling – op 'n geldige, betroubare en billike wyse kan en moet geskied.*

For processing an application for recognition of prior learning a non-refundable administrative levy is payable as determined by the University from time to time. / *Vir die hantering van 'n aansoek om erkenning van vorige leer is daar 'n nie-terugbetaalbare administratiewe fooi, wat van tyd tot tyd deur die Universiteit bepaal word, betaalbaar.*

NAS.1.4 ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

Registration is the prescribed completed process a student has to follow to register as a student of North-West University (see A Rule 3.2, 4.5, 5.5)./

On taking an appropriate baccalaureus degree students are not automatically admitted to the postgraduate programmes of the Faculty. Admission and registration for postgraduate programmes take place in accordance with the General Rules.

Prospective postgraduate students are advised to consult the University's *Manual for Postgraduate Studies* carefully beforehand.

Registrasie is die voorgeskrewe voltooide proses wat 'n student deurloop het om as student van die Universiteit te registreer (Kyk Algemene Reëls 3.2, 4.5, 5.5).

Studente word nie outomaties na die verwerwing van 'n toepaslike vierjarige B-graad tot die Fakulteit se nagraadse programme toegelaat nie. Die toelating tot en registrasie vir nagraadse programme geskied in ooreenstemming met die Algemene Reëls
Voornemende nagraadse studente word baie sterk aangeraai om die Universiteit se Handleiding vir Nagraadse Studie vooraf noukeurig te bestudeer.

Registration of additional modules / *Registrasie van bykomende modules*

Apart from the required modules of the relevant programme, a student may take additional modules in terms of the provision in the General Rule 2.3.3. Must be request by way of a student request form and is subject to the approval of the Executive Dean. /
'n Student kan in enige studiejaar, benewens die vereiste modules van die betrokke kurrikulum, bykomende modules neem ooreenkomstig die bepalings in Algemene Reël 2.3.3.

NAS.1.5 APPROVAL OF STUDY PROGRAMMES / *GOEDKEURING VAN STUDIEPROGRAMME*

Approval of study programmes for Master's (MSc) and Doctorate (PhD) degrees is given in accordance with General Rule 4.2 and 5.2. **Prospective postgraduate students are advised to study these rules carefully beforehand.**
Die goedkeuring van studieprogramme vir M- en PhD-grade geskied in ooreenstemming met die Algemene Reël 4.2. en 5.2. ***Voornemende nagraadse studente word sterk aangeraai om hierdie reëls vooraf noukeurig te bestudeer.***

NAS.1.6 EXAMINATIONS AND PASS REQUIREMENTS / *EKSAMINERING EN SLAAGVEREISTES*

Admission to examinations, the number of examination opportunities, pass requirements of modules and curricula, repetition of endorsed modules and the requirements that mini-dissertations, dissertations and theses must conform to are extensively discussed in the General Rules. **Prospective postgraduate students are advised to study these rules carefully beforehand.** The University's Manual for Post-graduate Studies also contains very useful information in this regard.
The Faculty of Natural and Agricultural Sciences stipulates that in all honours curricula and in master's and PhD curricula that contain endorsed modules each endorsed module must be passed individually before the degree will be conferred on the student.
Die toelating tot eksamens, die aantal eksamengeleenthede, slaagvereistes vir modules en kurrikulums, die herhaling van gedoseerde modules, die vereistes waaraan skripsies, verhandelinge en proefskrifte moet voldoen, word in die Algemene Reëls breedvoerig uiteengesit. ***Voornemende nagraadse studente word sterk aangeraai om hierdie reëls vooraf noukeurig te bestudeer.***
Die Universiteit se Handleiding vir Nagraadse Studie bevat in hierdie verband ook nuttige inligting.
Die Fakulteit Natuur- en Landbouwetenskappe het bepaal dat in alle Honneurskurrikulums en in die geval van M- en PhD-kurrikulums waarin daar gedoseerde modules voorkom, elke gedoseerde module afsonderlik geslaag moet word, alvorens die graad verwerf kan word

Relation between credits and examination papers / Verhouding tussen kredietpunte en eksamenvraestelle

The duration of an examination paper of a 8 and12-credit module is usually two hours and the duration of examination papers that count for 16, 24 or 32 credits is usually three hours. /
Die eksamenvraestel vir 'n 8 en 12 kredietpunt module duur gewoonlik twee uur en die eksamenvraestelle van modules wat 16, 24 of 32 kredietpunte tel, duur gewoonlik drie uur.

NAS.1.7 DEADLINES / *KEERDATUMS*

Students must beforehand make sure of the official deadlines for submitting examination documents, i.e. mini-dissertations, dissertations and theses. These dates are determined annually. A student who submits his examination documents after the prescribed deadline will most probably not receive his degree at the next graduate ceremony and he/she will have to wait to the next graduation ceremony. The implication of this negligence will be that the student will have to register and pay class fees for another year. / *Studente moet hulle vooraf deeglik vergewis van die amptelike keerdatums vir die inhandiging van eksamenstukke, dit wil sê, skripsies, verhandelinge en proefskrifte. Hierdie datums word jaarliks vasgestel. 'n Student wat sy/haar eksamenstuk ná die voorgeskrewe keerdatum inhandig sal waarskynlik nie die graad by die eersvolgende gradeplegtigheid ontvang nie en sal dan tot 'n volgende gradeplegtigheid moet oorstaan. Die implikasie hiervan is dat die student dan vir 'n verdere jaar sal moet registreer en klasgeld betaal.*

NAS.1.8 TERMINATION OF STUDIES / *BEËINDIGING VAN STUDIES*

In terms of the General Rule 1.18.1, the rules below apply in the Faculty of Natural and Agricultural Sciences.

In terme van die Algemene Reël 1.18 geld die volgende reëls in die Fakulteit Natuur- en Landbouwetenskappe

NAS.1.9 ATTAINMENT OF QUALIFICATION / VERWERWING VAN KWALIFIKASIE

A degree is obtained when a student has passed in the examination of all the modules prescribed in the curriculum concerned. (General Rule 3.6, 4.15, 5.14)/

'n Graad word verwerf wanneer 'n student in die eksamen van al die voorgeskrewe modules wat in die betrokke kurrikulum voorgeskryf word, geslaag het.(Algemene Reël 3.6, 4.15, 5.14)

NAS.1.10 PROFESSIONAL STATUS / *PROFESSIONELE STATUS*

Any person who has obtained one of the following qualifications in a natural science field at a university in South Africa and has acquired experience as indicated below, may register as a Professional Natural Scientist (Pr.Sci.Nat.) with the South African Council for Natural Scientific Professions:

- 4-year BSc or Hons BSc (that preferentially includes a research module), plus three years of experience in a natural science profession;
- MSc and two years of experience in a natural science profession;
- DSc or PhD plus one year of experience in a natural science profession.

First year of study: 70% of the modules passed, should be in Natural and Agricultural Sciences, namelyBiology I (Botany I and Zoology I), Chemistry I, Mathematics I, Physics I or another natural science subject such as Geology 1.

Second and third year **of study:** 80% of the modules passed should be in the Natural and Agricultural Sciences of which 50% should be in the respective discipline or directly supportive of the discipline. (Exit level for registration as a Certified Natural Scientist).

Fourth year of study (Honours level): Preferably, 100% of the modules passed should be in the Natural and Agricultural Sciences of which 80% should be in the respective discipline or directly supportive to nthe discipline. (Exit level for registration as Candidate and Professional Natural Scientist)

Students who have obtained an honours qualification or higher, in Biochemistry may apply to the Health Professions Council of South Africa for registration as an intern medical scientist through an institution that offers such internships. Upon completion of the internship the candidate will be eligible for registration as a medical scientist.

Students who have **registered for** the BSc in Urban and Regional Planning qualification may apply for registration as a Candidate Planner, according to the regulations (Planning Professions Act, 36 of 2002) of the South African Council for Planners (SACPLAN). After a minimum of two years in practice and completion of the instructions for registration, such a student will be able to register as a Professional Planner [TRP (SA)/SS(SA)]. /

Enige persoon wat 'n toepaslike vierjarige kwalifikasie in 'n natuurwetenskaplike rigting aan 'n universiteit in Suid-Afrika verwerf het en oor die dienooreenkomstige jare ervaring beskik, kan as

Professionele Natuurwetenskaplikes (PrSciNat) by die Suid-Afrikaanse Raad vir Natuurwetenskaplike Professies registreer:

- *'n 4-jarige BSc of 'n Hons BSc (wat verkieslik 'n navorsingsmodule insluit), plus drie jaar ervaring in 'n natuurwetenskaplike professie;*
- *'n MSc en twee jaar ervaring in 'n natuurwetenskaplike professie;*
- *'n DSc of PhD plus een jaar ervaring in 'n natuurwetenskaplike professie;*

Eerstejaar van studie: *70% van die modules wat geslaag word, moet in die natuurwetenskappe wees, naamlik Biologie I (Plantkunde I en Dierkunde I), Chemie I, Fisika I, Wiskunde I, of 'n ander natuurwetenskapvak, soos Geologie I.*

Tweede- en derdejaar van studie: *80% van die modules wat geslaag word moet in die natuurwetenskappe wees, waarvan 50% in die onderskeie dissipline is of direk ondersteunend tot die dissipline. (Uittreevlak vir registrasie as Gesertifiseerde Natuurwetenskaplike).*

Vierdejaar van studie (honneursvlak): *Verkieslik 100% van die modules wat geslaag word, moet in die natuurwetenskappe wees, waarvan 80% in die onderskeie dissipline is of direk ondersteunend tot die dissipline. (Uittreevlak vir registrasie as Kandidaat en Professionele Natuurwetenskaplike).*

Studente wat 'n honneurskwalifikasie of hoër, in Biochemie verwerf het, kan aansoek doen by die Raad vir Gesondheidsberoepe van Suid-Afrika om geregistreer te word as 'n intern mediese wetenskaplike deur 'n instansie wat so 'n internskap aanbied. Na voltooiing van die internskap sal die kandidaat in aanmerking kom vir registrasie as 'n mediese wetenskaplike.

NAS.1.11 WARNING AGAINST PLAGIARISM / *WAARSKUWING TEEN PLAGIAAT*

Assignments are individual tasks and not group activities (unless explicitly indicated as group activities). For further details see:

http://www.nwu.ac.za/content/policy_rules

Werkstukke is individuele take en nie groepsaktiwiteite nie (tensy dit uitdruklik aangedui word as 'n groepsaktiwiteit). Vir meer besonderhede gaan na:

http://www.nwu.ac.za/af/content/beleide-en-reels

NAS.1.12 CAPACITY STIPULATION / *KAPASITEITSBEPERKINGS*

Please take cognizance of the fact that, owing to specific capacity constraints, the University reserves the right to select candidates for admission to certain fields of study. This means that prospective students who comply with the minimum requirements may not necessarily be admitted to the relevant courses. /
Neem asb. kennis dat die Universiteit a.g.v. spesifieke kapasiteitsbeperkings hom die reg voorbehou om kandidate vir toelating tot bepaalde studierigtings te keur. Dit beteken dat voornemende studente wat aan die minimum toelatingsvereistes voldoen, nie noodwendig tot die betrokke kursusse toegelaat sal word nie. A.g.v. kapasiteitsbeperkinge en die ooraanbod van studente in bepaalde studierigtings, sal studente o.g.v. hulle skolastiese prestasie gekeur word vir toelating tot hierdie rigtings.

NAS.1.13 LANGUAGE MEDIUM / TAALMEDIUM

Mafikeng and Vaal Triangle: The language of instruction in all undergraduate contact sessions is English.
Mafikeng en Vaaldriehoek: Die onderrigtaal in alle voorgraadse kontaksessies is Engels.
Potchefstroom: The language of instruction in all undergraduate contact sessions is Afrikaans, unless otherwise indicated. Educational interpreting to English will be available in all modules (where requested). All study guides, tests and examination papers are made available to students in both Afrikaans and English. Students may answer any written or oral test or examination in either Afrikaans or English. /
Potchefstroom: *Die onderrigtaal in alle voorgraadse kontaksessies is Afrikaans, tensy anders aangedui. Opvoedkundige tolking na Engels is in alle modules beskikbaar (waar versoek). Alle studiegidse, toetse en eksamenvraestelle word egter in beide Afrikaans en Engels aan studente beskikbaar gestel. Dit staan studente in alle modules vry om enige skriftelike of mondelinge toets of eksamen in Afrikaans of Engels af te lê.*

NAS.2 DEGREES QUALIFICATIONS / *KWALIFIKASIES*

North West University is authorised to award a number of postgraduate degrees in the Faculty of Natural and Agricultural Sciences. These degrees are not necessarily presented in all subjects and also not necessarily full-time and/or part-time in all subjects. They are: / *Die Universiteit is bevoeg om in die Fakulteit Natuur- en Landbouwetenskappe die nagraadse grade in die tabel hieronder toe te ken. Dié grade word nie noodwendig in alle programme aangebied nie. Alle programme word ook nie noodwendig voltyds en/of deeltyds aangebied nie:*

Research in the Faculty is managed in research entities The research entities are further responsible for the master's (MSc) and doctorate (PhD) training programmes, i.e. programmes that contain a significant research component. / *Navorsing word in die Fakulteit bestuur in navorsingsentiteite. Die navorsingsentiteite is verder verantwoordelik vir die Magister- en PhD-opleidingsprogramme; dit wil sê programme wat 'n beduidende navorsingskomponent bevat.*

NAS.2.1 QUALIFICATIONS, PROGRAMMES AND CURRICULA / *KWALIFIKASIES, PROGRAMME EN KURIKULUMS:*

Different qualifications (degrees) may be taken in the Faculty of Natural and Agricultural Sciences. A specific qualification may be taken in one or more different programmes (the term programme indicates a specific direction of study), and in each programme one or more curricula are available.

NB: Lectures for lectured honours and master's modules are with one exception presented full-time only. The only exception is the lectured modules of N824P for the Master's in Environmental Sciences degree. Lectures for these modules are presented after hours only.

In die Fakulteit Natuur- en Landbouwetenskappe kan verskillende nagraadse kwalifikasies (grade) verwerf word. 'n Bepaalde kwalifikasie kan in een of meer verskillende programme (die term program dui 'n bepaalde studieprogram aan) verwerf word en in elke program is daar weer een of meer kurrikulums beskikbaar.

NB: Lesings vir gedoseerde honneurs- en magistermodules word in die Fakulteit Natuur- en Landbouwetenskappe, op een uitsondering na, slegs voltyds aangebied. Die enigste uitsondering is die gedoseerde modules van die kurrikulum N824P vir die graad Magister in Omgewingsbestuur. Lesings vir hierdie modules word slegs na-uurs aangebied.

North West University is authorised to award a number of postgraduate degrees in the Faculty of Natural and Agricultural Sciences. These degrees are not necessarily presented in all subjects and also not necessarily full-time and/or part-time in all subjects. They are :

Die Universiteit is bevoeg om in die Fakulteit Natuur- en Landbouwetenskappe die nagraadse grade in die tabel hieronder toe te ken. Dié grade word nie noodwendig in alle programme aangebied nie. Alle programme word ook nie noodwendig voltyds en/of deeltyds aangebied nie:

Legend:
MOD – Method of deliver / Metode van Aflewering
C / K – Campus / Kampus
NQFL – National Qualification Framework Level / Nasionale Kwallifikasieraamwerk Vlak
F/P – Full-time or Part-time / Voltyds of deeltyds
PO – Phasing out / Uitfaseer
SS – Merge / Saamsmelt

DIPLOMAS					
Qualification / *Kwalifikasie*	**Specialisation / *Spesialiseer***	**Code / *Kode:***	**MOD**	**C/K**	**NQFL**
Postgraduate Diploma in Agricultural Economics ***Nagraadse Diploma in Landbou Ekonomie***					
Postgraduate Diploma in Agricultural Economics		**2FB D01 N501M (Old code – 272 100 N501M)**	F/P	MC	7
Postgraduate Diploma in Agricultural Extension ***Nagraadse Diploma in Landbouvoorligting***					
Postgraduate Diploma in Agricultural Extension		**2 FC D01 (Old code – 272 100 N502M)**	F/P	MC	7
Postgraduate Diploma in Disaster Risk Management ***Nagraadse Diploma in Ramp Risikobestuur***					
Postgraduate Diploma in Disaster Risk Management		**2GC D01 N501P**	F/P	PC	7
BACHELOR OF SCIENCE HONOURS DEGREES / BACCALAUREUS SCIENTIAE HONNEURS					
Qualification / *Kwalifikasie*	**Specialisation / *Spesialiseer***	**Code / *Kode:***	**MOD**	**C/K**	**NQFL**
BSc Hon in Agricultural Economics ***BSc Hon in Landbou Ekonomie***					
Bachelor of Science Honours in Agriculture	in Agricultural Economics	**(Old code - 276 103 N602M)**	F/P	MC	8
			Phasing out		
BSc Hon in Agricultural Extension ***Bsc Hon in Landbou***					
Bachelor of Science Honours in	in Agricultural Extension	**(Old code - 276 104 N603M)**	F/P	MC	8

Agriculture					
BSc Hon in Agriculture in Animal Health ***BSc Hon in Landbou in Dieregesondheid***					
Bachelor of Science Honours in Agriculture	with Animal Health	(Old code - 276 100 N605M)	F/P	MC	8
Bachelor of Science Honours in Agriculture	in Animal Health	(**Old code - 276 101 N605M)**	F/P	MC	8
Bachelor of Science Honours in Agriculture	in Animal Health	(**Old code - 276 101 N660M)**	F/P	MC	8
Bachelor of Science Honours in Agriculture	in Animal Health	**(Old code - 276 101 N661M)**	F/P	MC	8
Bachelor of Science Honours in Agriculture	in Animal Health	**(Old code - 276 101 N662M)**	F/P	MC	8
Bachelor of Science Honours in Agriculture	in Animal Health	**(Old code - 276 101 N663M)**	F/P	MC	8
BSc Hon in Agriculture in Crop Science ***BSc Hon in Landbou in Gewaswetenskap***					
Bachelor of Science Honours in Agriculture	in Crop Science	**(Old code – 276 102 N606M)**	F/P	MC	8
BSc Hon in Applied Radiation Science ***BSc Hon in Toegepaste Stralingswetenskap***					
Bachelor of Science Honours in Applied Radiation Science		**2EK L01 N601M (Old code - 202 145 N609M)**	F/P	MC	8
BSc Hon in Botany ***BSc Hon in Plantunde***					
Bachelor of Science Honours in Botany		**2EL L01 N601M** **(Old code - 202 141 N610M)**	F/P	MC	8

Bachelor of Science Honours in Biology		**(Old code - 202 141 N664M)**	F/P	MC	8
			PO To merge with Biochemistry		
BSc Hon in Biochemistry ***Bsc Hon in Biochemie***					
Bachelor of Science Honours in Biochemistry / *Baccalaureus Scientiae Honneurs in Biochemie*		**2DW L01** **N601 P/M**	F/P	MC /PC	8
			MC and PC		
BSc Hon in Microbiology ***BSc Hon in Mikrobiologie***					
Bachelor of Science Honours in Microbiology		**2ES L01 N601M** **(Old code - 202 143 N640M)**	F/P	MC	8
BSc Hon in Chemistry ***Bsc Hon in Chemie***					
Bachelor of Science Honours in Chemistry		**(Old code - 202 117 N623M)**	F/P	MC	8
				PO	
Bachelor of Science Honours in Chemistry/ *Baccalaureus Scientiae Honneurs in Chemie*		**2GH L01 N601P/M** **(Old code –** **202117 N651P)**	F/P	MC/PC	8
			SS MC AND PC		
BSc Hon in Computer Science and Information Systems ***Bsc Hon in Rekenaarwetenskap en Inligtingstelsels***					
Bachelor of Science Honours in Computer Science		**2EM L01 N601M** **(Old code - 202 142 N612M)**	F/P	MC	8
Bachelor of Science Honours in Computer and Information Sciences / *Baccalaureus*	Computer Science and Information Systems / *Rekenaarwetenskap en Inligtingstelsels*	**2EN L01 N601P/V** **(Old code – 202134 N653P**	F/P	PC/VC	8

Scientiae Honneurs in Rekenaar-wetenskap en Inligtingstelsels		**202134 N653V)**			
BSc Hon in Physics with Electronics ***Bsc Hon in Fisika met Elektronika***					
Bachelor of Science Honours in Physics	with Electronics	**2GJ L02 N601M (Old code - 202 146 N613M)**	F/P	MC	8
BSc Hon in Physics ***Bsc Hons in Fisika***					
Bachelor of Science Honours in Physics/ *Baccalaureus Scientiae Honneurs in Fisika*		**2GJ L01 N601P/M** **(Old code - 202 121 N652P)**	F/P	PC/MC	8
			SS MC and PC		
Bachelor of Science Honours in Physics		**(Old code - 202 144 N616M)**	F/P	MC	8
			SS MC and PC		
BSc Hon in Mathematical Statistics ***Bsc Hon in Wiskundige Statistiek***					
Bachelor of Science Honours in Mathematical Statistics/ *Baccalaureus Scientiae Honneurs in Wiskundige Statistiek*		**2GD L01 N601P** **(Old code – 202 135 N654P)**	F/P	PC	8
BSc Hon in Applied Mathematics ***Bsc Hon in Toegepaste Wiskunde***					
Bachelor of Science Honours in Applied Mathematics		**(Old code - 202 140 N609M)**	F/P	MC	8
			SS MC and PC		
Bachelor of Science Honours in Applied Mathematics / *Baccalaureus Scientiae Honneurs in Toegepaste Wiskunde*		**2EJ L01 N601P/M** **(Old code – 202 136 N601P)**	F/P	PC/MC	8
			SS MC and PC		
BSc Hon in Mathematics ***Bsc Hon in Wiskunde***					

Bachelor of Science Honours in Mathematics		**(Old code - 202 119 N613M)**	F/P	MC	8
			SS MC and PC		
Bachelor of Science Honours in Mathematics/ *Baccalaureus Scientiae Honneurs in Wiskunde*		**2ER L01 N601P/M** **(Old code – 202 137 N601P)**	F/P	PC/MC	8
			SS MC and PC		
BSc Hon in Actuarial Science ***BSc in Aktuariële-wetenskappe***					
Bachelor of Science Honours In Actuarial Science / *Baccalaureus Scientiae Honneurs in Aktuariële-wetenskappe*		**ON HOLD** **(Old code - 202 126 N609P)**	F/P	PC	8
BSc Hon in Quantitative Risk Management ***Bsc Hons in Kwantitatiewe Risikobestuur***					
Bachelor of Science Honours / *Baccalareus Scientiae Honneurs*	in Quantitative Risk Management / *in Kwantitatiewe Risikobestuur*	**2DP L01 N601P**	F/P	PC	8
BSc Hon in Financial Mathematics ***BSc Hon in Finansieële-wiskunde***					
Bachelor of Science Honours in Financial Mathematics / *Baccalareus Scientiae in Finansieële-wiskunde*		**2DQ L01 N601P**	F/P	PC	8
BSc Hon in Business Analytics ***Bsc Hon in Bedryfsanalise***					
Bachelor of Science Honours in Business Analytics/ *Baccalaureus Scientiae Honneurs in Bedryfsanalise*		**2FP L01 N601P** **(Old code – 202 129 N612P**	F/P	PC	8
BSc Hon in Geography					

BSc Hon in Geografie					
Bachelor of Science Honours in Geography		**2EP L01 N601M (Old code - 202 118 N614M)**	F/P	MC	8
BSc Hon in Environmental Sciences ***BSc Hon in Omgewingswetenskappe***					
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Geography and Environmental Management / *Geografie en Omgewingsbestuur*	**2DM L07 N602P**	F/P	PC	8
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Ecological Interactions and Ecosystem Resillience / *Ekologiese Interaksies en Ekosisteem Veerkragtigheid*	**2DM L01 N601P**	F/P	PC	8
Bachelor of Science Honours in Environmental Sciences / Baccalaureus Scientiae Honneurs in Omgewingswetenskappe	Biodiversity and Conservation Ecology / *Biodiversiteit en Bewaringsekologie*	**2DM L02 N601P**	F/P	PC	8
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Aquatic Ecosystem Health / *Akwatiese Ekosisteemwelstand*	**2DM L03 N601P**	F/P	PC	8
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Integrated Pest Management / *Geintegreerde Plaagbestuur*	**2DM L04 N601P**	F/P	PC	8
Bachelor of Science Honours in Environmental	Environmental Geology / *Omgewingsgeologie*	**2DM L05 N601P**	F/P	PC	8

Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*					
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Hydrology and Geohydrology/ *Hidrologie en Geohidrologie*	**2DM L06 N602P**	F/P	PC	8
Bachelor of Science Honours in Environmental Sciences / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe*	Waste Management / *Afvalbestuur*	**2DM L08 N601P**	F/P	PC	8
BACHELOR OF COMMERCE HONOURS / *BACCALAUREUS COMMERCII HONNEURS*					
Bachelor of Commerce Honours in Informatics/ *Baccalaureus Commercii Honneursin Inligtingstelsels*		**2GF L01 N601P (Old code – 504 143 N658P**	F/P	PC	8
MASTER OF SCIENCE DEGREES / MAGISTER SCIENTIAE GRADE					
Qualification / Kwalifikasie	**Specialisation / Spesialiseer**	**Code / Kode:**	**MOD**	**C/K**	**NQFL**
MSc in Agricultural Economics ***MSc in Landbou Ekonomie***					
Master of Science in Agricultural Economics / *Magister Scientiae in Landbou Ekonomie*		**2CG N01 N801P/M**	F/P	MC /PC	9
MSc in Agricultural Extension ***MSc in Landbouvoorligting***					
Master of Science in Agricultural Extension		**2CJ N01 N801M**	F/P	MC	9
MSc in Animal Health					

MSc in Dieregesondheid					
Master of Science in Animal Health		**2CE N01 N801M**	F/P	MC	9
MSc in Animal Science ***MSc in Dierewetenskap***					
Master of Science in Animal Science		**2CK N01 N801M**	F/P	MC	9
MSc in Agronomy ***Msc in Agronomie***					
Master of Science in Agronomy		**2CF N01 N801M**	F/P	MC	9
MSc in Computer Science ***MSc in Rekenaarwetenskap***					
Master of Science in Computer Science		**2DB N01 N801M/V** **(Old code 203-180 – N808M/N802V)**	F/P	MC/VC	9
Master of Science in Computer Science / *Magister Scientiae* in Rekenaar-wetenskap		**ON HOLD** **(Old code – 203 155 N861P)**	F/P	PC	9
MSc in Business Statistics ***MSc in Bedryfstatistiek***					
Master of Science in Business Statistics		**ON HOLD** **(Old code – 203 180 - N801V**	F/P	VC	9
MSc in Mathematical Statistics ***MSc in Wiskundige Statistiek***					
Master of Science in Mathematical Statistics / *Magister Scientiae in Wiskundige Statistiek*		**2CY P01 N801P**	F/P	PC	9
MSc in Applied Mathematics ***MSc in Toegepaste Wiskunde***					

Master of Science in Applied Mathematics	By Research	**2FL N01 N801M (Old code – 203 121 N804M)**	F/P	MC	9
Master of Science in Applied Mathematics / Magister Scientiae in Toegepaste Wiskunde	by Coursework / deur Navorsing	**2FK P01 – N801P (Old code – 203-157 – N863P)**	F/P	PC	9
MSc in Mathematics ***MSc in Wiskunde***					
Master of Science in Mathematics / *Magister Scientiae in Wiskunde*	By Coursework	**Old code - 203-135 N806M**	F/P	MC	9
			PO		
Master of Science in Mathematics / *Magister Scientiae in Wiskunde*	By Coursework	**2GA P01 N801P (Old code – 203 158 N863P**	F/P	PC	9
Master of Science in Mathematics	By Research	**2CV N01 N801M (Old code – 203 -135 N830M)**	F/P	MC	9
MSc in Natural Science Teaching ***MSc in Natuurwetenskap Onderwys***					
Master of Science in Natural Science Teaching / *Magister Scientiae in Natuurwetenskap-onderwys*		**2CU N01 N801P**	F/P	PC	9
MSc in Risk Analytics ***MSc in Risiko Analiese***					
Master of Science in Risk Analytics / *Magister Scientiae in Risiko Analise*		**2ED P01 N801P (Old code– 203 127 N865P)**	F/P	PC	9
MSc in Business Mathematics and Informatics ***MSc in Bedryfswiskunde en Informatika***					

Master of Science in Business Mathematics and Informatics / *Magister Scientiae in Bedryfswiskunde en Informatika*	(Qantitative Risk Management) / *(Kwantitatiewe Risikobestuur)*	**ON HOLD** **(Old code – 203 181 N809P)**	F/P	PC	9
Master of Science in Business Mathematics and Informatics / *Magister Scientiae in Bedryfswiskunde en Informatika*	(Financial Mathematics) / *(Finansieële Wiskunde)*	**ON HOLD** **(Old code – 203 182 N810P)**	F/P	PC	9
Master of Science in Business Mathematics and Informatics / *Magister Scientiae in Bedryfswiskunde en Informatika*	(Business Analytics) / *(Bedryfsanalise)*	**ON HOLD** **(Old code – 203 183 - N811P)**	F/P	PC	9
MSc in Physics ***MSc in Fisika***					
Master of Science in Physics		**2CW N01 N801M**	F/P	MC	9
MSc in Astrophysical Sciences ***MSc in Astrofisiese Wetenskappe***					
Master of Science in Astrophysical Sciences / *Magister Scientiae in Astrofisiese Wetenskappe*		**2CQ P01 N801P**	F/P	PC	9
MSc in Astrophysics and Space Science ***MSc in Astrofisika en Ruimtewetenskap***					
Master of Science in Astrophysics and Space Science / *Magister Scientiae in Astrofisika en Ruimtewetenskap*		**2CR P01 N801P**	F/P	MC /PC	9
MSc in Chemistry					

Msc in Chemie					
/MMaster of Science in Chemistry		**2CM N01 N805M**	F/P	MC	9
Master of Science in Chemistry / *Magister Scientiae in Chemie*		**2CN P01 N801P**	F/P	PC	9
MSc in Applied Radiation, Science and Technology ***MSc in Toegepaste Stralings, Wetenskap en Tegnolgie***					
Master of Science in Applied Radiation, Science and Techlogy		**ON HOLD** **(Old code – 285 100 N881M)**	F/P	MC	9
MSc in Biochemistry ***MSc in Biochemie***					
Master of Science in Biochemistry / *Magister Scientiae in Biochemie*		**2EF P01 N801P/M (Old code – 203 132 N869P)**	F/P	MC/PC	9
MSc in Environmental Sciences ***MSc in Omgewingswetenskappe***					
Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*		**2CT N02 N801P**	F/P	PC	9
Master of Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*		**2CT N01 N801M**	F/P	MC	9
Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*	with Atmospheric Chemistry / *met Atmosferiese Chemie*	**2CT N03 N801P**	F/P	PC	9
Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*	with Disaster Risk Sciences / met *Ramprisiko Wetenskap*	**2CT N07 N801P**	F/P	PC	9
Master of Science in Environmental	with Integrated Pest Management / *met*	**2CT N05 N801P**	F/P	PC	9

Sciences / *Magister Scientiae in Omgewingswetenskappe*	*Geïntegreerde Plaagbestuur*				
Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*	with Mining Hydrolgy / *met Mynhidrologie*	**2CT N06 N801P**	F/P	PC	9
Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*	with Hydrology and Geohydrology / *met Hidrologie and Geohidrologie*	**2CT N04 N801P**	F/P	PC	9
MSc in Zoology ***MSc in Dierkunde***					
Master of Science in Zoology / *Magister Scientiae in Dierkunde*		**2DD N01 N801P**	F/P	PC	9
MSc in Geography ***MSc in Geografie***					
Master of Science in Geography		**2CP N01 N806M**	F/P	MC	9
MSc in Geography and Environmental Management ***MSc in Geografie en Omgewingsbestuur***					
Master of Science in Geography and Environmental Management / *Magister Scientiae in Geografie en Omgewingsbestuur*		**2DG N01 N801P**	F/P	PC	9
MSc in Microbiology **Msc in Mikrobiologie**					
Master of Science in Microbiology / *Magister Scientiae in Mikrobiologie*		**2DE N01 N801P**	F/P	PC	9
MSc in Biology ***MSc in Biologie***					
Master of Science in		**2CL N01**	F/P	MC	9

Biology		**N804M**			
MSc in Botany ***MSc in Plantkunde***					
Master of Science in Botany/ *Magister Scientiaein Plantkunde*		**2DF N01 N801P**	F/P	PC	9
Master of Environmental Management ***Magister in Omgewingsbestuur***					
Master of Environ-mental Management / *Magister in Omgewingsbestuur*		**2CD P01 N801P**	F/P	PC	9
Master of Environmental Management / *Magister in Omgewingsbestuur*	with Environ-mental Water requirements / met Omgewingswater vereisters	**2CD P02 N801P**	F/P	PC	9
Master of Environmental Management / *Magister in Omgewingsbestuur*	with Waste Management / *met Afvalbestuur*	**2CD P03 N801P**	F/P	PC	9
Master of Indigenous Knowledge Systems ***Magister in Inheemse Kennisstelsels***					
Master of Indigenous Knowledge Systems		**2AA N01 N801M**	F/P	MC	9
Master of Science in Urban and Regional Planning / *Magister Scientiae in Stads-en Streekbeplanning*		**2DH N01 N801P**	F/P	PC	9
MASTER OF COMMERCE / MAGISTER COMMERCII					
Master of Commerce in Computer Science and Information Systems/ *Magister Commercii in Rekenaarwetenskap en Inligtingstelsels*		**Old code – 505 138 N870P**	F/P	PC	9
DOCTOR OF PHILOSOPHY DEGREES / DOCTOR PHILOSOHIAE GRADE					

Qualification / Kwalifikasie	Specialisation / Spesialiseer	Code / Kode:	MOD	C/K	NQFL
PhD in Agriculture ***Phd in Landbou***					
Doctor of Philosophy in Agriculture	with Agricultural Economics	**2EA R03 N901P/M**	F/P	PC / MC	10
Doctor of Philosophy in Agriculture	with Agriculture Extension	**2EA R04 N901M**	F/P	MC	10
Doctor of Philosophy in Agriculture	with Animal Science	**2EA R01 N901M**	F/P	MC	10
Doctor of Philosophy in Agriculture	with Agronomy	**2EA R02 N901M**	F/P	MC	10
PhD in Animal Health ***PhD in Dieregesondheid***					
Doctor of Philosophy in Animal Health		**2CA R01 N901M**	F/P	MC	10
PhD in Computer and Information Sciences ***Phd in Rekenaarwetenskap en Inligtingstelsels***					
Doctor of Philosophy in Computer and Information Sciences / *Doctor Philosophiae in Rekenaar- en Inligtingswetenskappe*	with Computer Science and Information Sciences/ *met Rekenaarwetenskappe en Inligtingswetenskappe*	**2CB R02 N901P/M**	F/P	PC/MC	10
Doctor of Philosophy in Computer and Information Sciences	with Information Technology	**2CB R01 N901V (Old code- 204 130 N973V)**	F/P	VC	10
PhD in Science with Statistics ***PhD in Wetenskap met Statistiek***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Statistics / *met Statistiek*	**2CC R20 N901P**	F/P	PC	10
PhD in Science with Applied Mathematics ***Phd in Wetenskap met Toegepaste Wiskunde***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Applied Mathematics / met *Toegepaste Wiskunde*	**2CC R25 N901P/M (Old code – 204 139 N903P 204 123 N934M)**	F/P	PC	10
			SS PC and MC		
PhD in Science with Mathematics ***PhD in Wetenskap met Wiskunde***					

Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Mathematics / met *Wiskunde*	**2CC R24 N901P/M (Old code – 204 140 N904P 204 122 N933M)**	F/P	PC	10
			SS PC and MC		
PhD in Natural Science Education ***PhD in Natuurwetenskap Onderwys***					
Doctor of Philosophy in Science	with Natural Science Educaton	**2CC R09 N901P**	F/P	P/F	10
PhD of Philosophy in Science with Business Mathematics ***PhD in Wetenskap met Bedryfswiskunde***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Business Mathematics / met *Bedryfswiskunde*	**2CC R01 N901P**	F/P	PC	10
PhD of Philosophy in Science with Risk Analysis ***PhD in Wetenskap met Risiko-analise***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Risk Analysis / met *Risiko-analise*	**2CC R15 N901P**	F/P	PC	10
PhD in Science with Space Physics ***Phd in Wetenskap met Ruimtefisika***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Space Physics / *met Ruimtefisika*	**(Old code – 204 112 N906P)**	F/P	PC	10
			SS PC and MC		
PhD in Science with Physics ***PhD in Wetenskap met Fisika***					
Doctor of Philosophy in Science	with Physics	**2CC R23 N901 P/M (Old code – 204 124 N935M)**	F/P	MC	10
			SS PC and MC		
PhD in Science with Chemistry ***Phd in Wetenskap met Chemie***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Chemistry / *met Chemie*	**2CC R11 N901P / N901M**	F/P	MC/PC	10
PhD in Science with Atmospheric Chemistry ***Phd in Wetenskap met Atmosferiese Chemie***					
Doctor of Philosophy in Science / *Doctor Philosophiae in*	wih Atmospheric Chemistry / *met Atmosferiese*	**2CC R05 N901P**	F/P	PC	10

Wetenskap	*Chemie*				
PhD in Science with Environmental Sciences ***PhD in Wetenskap met Omgewingswetenskappe***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Environmental Sciences / *met Omgewings-wetenskappe*	**2CC R04 N901P**	F/P	PC	10
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Environmental Sciences and Management	**2CC R03 N901M**	F/P	MC	10
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Disaster Risk Sciences / *met Ramprisikoweten-skappe*	**2CC R14 N901P**	F/P	PC	10
PhD in Science with Zoology ***PhD in Wetenskap met Dierkunde***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Zoology / met *Dierkunde*	**2CC R18 N901P**	F/P	PC	10
PhD in Science with Environmental Sciences and Management ***PhD in Wetenskap met Omgewingswetenskappe en Betuur***					
Doctor of Philosophy in Science	with Environmental Sciences and Management	**2CC R26 N901M**	F/P	MC	10
PhD in Science with Geography ***PhD in Wetenskap met Geografie***					
Doctor of Philosophy in Science	with Geography	**2CC R12 N901M**	F/P	MC	10
PhD in Science with Geography and Environmental Management ***PhD in Wetenskap met Geografie en Omgewingsbestuur***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Geography and Environmental Management / *met Geografie en Omgewingsbestuur*	**2CC R19 N901P**	F/P	PC	10
PhD in Science with Microbiology ***PhD in Wetenskap met Mikrobiologie***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Microbiology / met *Mikrobiologie*	**2CC R17 N901P**	F/P	PC	10
PhD in Science with Botany ***PhD in Wetenskap met Plantkunde***					

Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	wih Botany / met *Plantkunde*	**2CC R16 N901P**	F/P	PC	10
PhD in Science with Biochemistry ***PhD in Wetenskap met Biochemie***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Biochemistry / met *Biochemie*	**2CC R08 N901P**	F/P	MC/PC	10
Doctor of Philosophy in Science	with Biology	**2CC R10 N901M**	F/P	MC	10
PhD in Science with Hydrology and Geohydrology ***PhD in Wetenskap met Hidrologie en Geohidrologie***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Hydrology and Geohydrology / *met Hidrologie en Geohidrologie*	**2CC R06 N901P**	F/P	PC	10
PhD in Science with Operational research ***PhD in Wetenskap met Bedryfsnavorsing***					
Doctor of Philosophy in Science	with Operational research	**2CC R21 N901V**	F/P	VC	10
PhD in Science with Radiation Science ***PhD in Wetenskap met Stralingswetenskap***					
Doctor of Philosophy in Science	with Radiation Science	**2CC R22 N901M**	F/P	MC	10
PhD in Social Science with Indigenous Knowledge Systems ***PhD in Sosialewetenskap met Inheemse Kennisstelsels***					
Doctor of Philosophy in Social Science	with Indigenous Knowledge Systems	**1CC R13 L901M (Old code – 104 136 N908M)**	F/P	MC	10
PhD in Science with Urban and Regional Planning ***PhD in Wetenskap met met Stads- en Streekbeplanning***					
Doctor of Philosophy in Science / *Doctor Philosophiae in Wetenskap*	with Urban and Regional Planning / met *Stads- en Streekbeplanning*	**2CC R07 N901P**	F/P	PC	10

NAS.3 LIST OF MODULES/ *MODULELYS*

POSTGRADUATE DIPLOMAS / NAGRAADSE DIPLOMAS			
Module code ***Modulekode***	**Descriptive name** **Beskrywende naam**	**Credits** ***Krediete***	**NQF-level** ***vlak***
DRRS511	Disaster Risk Studies and Climate Change Adaptation	16	8
DRRS512	Socio-Ecological Resilience	16	8
DRRS513	Hazards	16	8
DRRS514	Disaster Risk Assessment	16	8
DRRS515	Research Methodology	16	8
DRRS521	Urban Disaster Risk	16	8
DRRS522	Preparedness and Response	16	8
DRRS523	Planning and Project Management	16	8
DRRS524	Research Project	16	8
ECOM515	Agriculture and Economic Development	16	8
ECOM516	Agricultural Statistics Research I	16	8
ECOM517	Quantitative Methods in Agricultural Economics	8	8
ECOM518	Agriculutural Micro-Economics	12	8
ECOM519	Agricutural Production Economics	16	8
ECOM520	Agricutural Marketing	12	8
ECOM525	Agricultural Production Economics	16	8
ECOM526	Agricultural Project Appraisal	16	8
ECOM527	Agricultural Macro Economics	12	8
ECOM528	Agricultural Marketing	8	8
ECOM529	Research methods and Project	16	8
ECOM613	Land Resource & Enviro Man	18	8
EXTM514	Rural Community Development	16	8
EXTM515	Essentials of Agricultural Extension	16	8

EXTM516	Elements of Communication in Extension	16	8
EXTM525	Research Methods and Projects	24	8
EXTM526	Change in Agriculture	16	8
EXTM527	Leadership Development in Extension	16	8
HONOURS / *HONNEURS*			
Module code *Modulekode*	**Descriptive name Beskrywende naam**	**Credits *Krediete***	**NQF-level *vlak***
AHAM611	Diseases I	12	8
AHAM612	Adv App Vet Science I	12	8
AHAM613	Research Mathadology	6	8
AHAM614	Vet External Parasites	12	8
AHAM615	Research Project I	18	8
AHAM616	Veterinary Nutrition I	18	8
AHAM618	Virology And Immunology	12	8
AHAM619	Research Project	6	8
AHAM621	Vet Immunology	12	8
AHAM623	Adv App Vet Science II	12	8
AHAM624	Molecular Biology II	12	8
AHAM625	Research Project II	18	8
AHAM626	Veterinary Nutrition II	12	8
APMM611	Fluid Dynamics I		
APMM612	Financial Modelling II	18	8
APMM613	Numerical Analysis	18	8
APMM614	Financial Modelling I	18	8
APMM615	Fluid Dynamics Ii	18	8
APMM616	Fluid Dynamics I	18	8
APMM621	Symmetries Of Differential Equations II	18	8
APMM622	Advanced Numerical Analysis	18	8
APMM623	Calculus Of Variations	18	8

APMM624	Industrial Mathematics	18	8
APMM625	Project	30	8
APPM611	Symmetries of differential equations I	12	8
APPM612	Numerical Analysis	12	8
APPM613	Theory of partial differential equations	12	8
APPM614	Financial Modelling I	12	8
APPM615	Theory of ordinary differential equations	12	8
APPM616	Calculus of Variations	12	8
APPM617	Fluid Dynamics I	12	8
APPM618	Biomathematics	12	8
APPM619	Applied Matrix Analysis	12	8
APPM621	Symmetries of Differential equations II	12	8
APPM622	Advanced Numerical Analysis	12	8
APPM623	Numerical methods for partial differential equations	12	8
APPM624	Financial Modelling II	12	8
APPM625	Financial modelling III	12	8
APPM626	Control Theory	12	8
APPM627	Fluid Dynamics II	12	8
APPM628	Industrial Mathematics	12	8
APPM671	Project	32	8
ARSM611	Nuclear Physics	24	8
ARSM612	Nuclear Chemistry	24	8
ARSM671	Research Project	32	1
ASCM612	Pasture Management	12	8
ASCM613	Crop and Qyantitative Genetics	12	8
ASCM614	Ruminant Prod Science	12	8

ASCM615	Feed Evaluation & Feeding Practices	12	8
ASCM616	Research Project	24	8
ASCM621	Rangeland (Veld) Management	12	8
ASCM622	Conservation & Management Of Wildlife	12	8
ASCM623	Advanced Livestock Breeding	12	8
ASCM624	Monosgastric Animal Prod	12	8
ASCM625	Digestive Physiology	12	8
ASCM626	Research Project	24	8
BCHN611	Analytical Biochemistry	24	8
BCHN612	Advanced Metabolism	24	8
BCHN621	Advanced Molecular Biology	24	8
BCHN622	Bioenergetics	24	8
BCHN623	Advanced Drug Discovery	24	8
BCHN671	Biochemistry research project	32	8
BEHM622	Further Animal Behaviour	24	2
BMCM613	Bacteriology	24	8
BMCM614	Virology And Immunology	24	8
BMCM621	Mycology	24	2
BMCM622	Environmental And Industrial Microbiology	24	2
BWIA671	Actuarial Risk Management (A301/CA1)	80	8
BWIB611	Statistical Learning I	16	8
BWIB612	Introduction to Business Intelligence	12	8
BWIB613	Problem Solving using Simulation	12	8
BWIB621	Statistical Learning II	16	8
BWIB622	Forecasting for Business	16	8

BWIN611	Quantitative Risk Analysis I	16	8
BWIN613	Financial Engineering I	16	8
BWIN614	Investment Theory I	16	8
BWIN615	Financial Modelling and Optimisation	16	8
BWIN621	Quantitative Risk Analysis	16	8
BWIN622	Pricing of Derivatives A	16	8
BWIN623	Financial Engineering II	16	8
BWIN625	Financial Modelling Optimisation	16	8
BWIR622	Research Module: Financial Engineering and Pricing of Derivatives	32	8
BWIR671	Research Module: Financial Engineering and Financial Modelling	32	8
BWIR672	Research Module: Financial Modelling and Optimisation	32	8
CHEN611 will become NCHE611	Advanced organic Chemistry	16	8
CHEN612 will become NCHE612	Advanced physical Chemistry	16	8
CHEN613 Will become NCHE613	Advanced inorganic Chemistry	16	8
CHEN614 Will become NCHE621	Molecular modelling (Elective)	8	8
CHEN671	Research Project	48	8
CHEN621 Will become NCHE672	Homogeneous catalysis (Elective)	8	8

CHEN622 Will become NCHE628	Coal chemistry (Elective)	8	8
CHEN623 will become NCHE629	Membrane science and technology (Elective)	8	8
CHEM621 will become NCHE622	Polymer chemistry (Elective)	8	8
CHEM622 will become NCHE 623	Advanced structural clarification(Elective)	8	8
CHEM623 will become NCHE624	Environmental chemistry (Elective)	8	8
CHEM624 will become NCHE625	Techniques for organic synthesis (Elective)	8	8
CHEM626 will become NCHE626	Electrochemistry (Elective)	8	8
CISM611	Algorithms and data structures	24	8
CISM612	Programming languages and objects	24	8
CISM613	Operating Systems	24	8
CISM624	Networks to Net-Centric Computing	24	8
CISM625	Database Systems	24	8
CISM626	Artificial Intelligence	24	8
CISM671	Project	24	8
CNRM615	Conservation of natural resources		8
CNRM625	Further conservation of natural		8

	resources		
ECON623	Risk Management	16	8
ELEM611	Embedded Systems		8
ELEM612	Analogue Communication Systems		8
ELEM613	Electronic Instrumentation		8
ELEM614	Optoelectronics and Optical Communications		8
ELEM625	Control Systems		8
ELEM626	Engineering Electromagnetics		8
ELEM627	Digital Communications Systems		8
ELEM628	Power Electronics		8
ELEM671	Project		8
ELYM611	Microprocessor Systems Design	18	8
ELYM612	Signals, Circuits And Systems	18	8
ELYM613	Electronic Instrumentation - Sensors And Transducers	18	8
ELYM624	Computational Methods	18	8
ELYM625	Embedded Controllers	18	8
ELYM626	Electromagnetics	18	8
ELYM671	Honours Project	30	8
ENTM616	Applied Entomology	24	8
FSCM611	Agricultural Statistics	12	8
FSKH611 will become NPHY611	Classical Mechanics	16	8

FSKH612 will become NPHY612	Quantum Mechanics I	16	8
FSKH613 will become NPHY613	Electrodynamics	16	8
FSKH614 will become NPHY631	Plasma Physics (elective)	16	8
FSKH671 Will become NPHY671	Project I	8	8
FSKH621 Will become NPHY636	Quantum Mechanics II Will become Quantum Physics II (Elective)	16	8
FSKH622 Will become NPPHY621	Statistical Mechanics	16	8
FSKH623 Will become NPHY622	Computer Physics	16	8
FSKH672	Project II Will phase out / be cancelled	8	8
GEOM611	Geography, Ideas And Methods	24	8
GEOM612	Selected Fields In Human Geography	24	8
GEOM613	GIS Techniques	24	8
GEOM614	Environmental Problems & Management in Africa	24	8
GEOM621	Techniques And Methods In Geography	24	8
GEOM622	Selected Fields in Physical Geography	24	8
GEOM623	Applications In Geographic Information System	24	8
GEOM624	Rural Geography	24	8
GEOM671	Research Project	24	8

GGFS671	Introduction to Earth Observation	20	8
GGFS672	Air pollution	20	8
HDGH611	Geohydrology	16	8
HDGH612	Environmental Hydrology	16	8
HDGH613	Spatial Analysis	16	8
HDGH621	Hydrochemistry	16	8
ITRI611	Data Warehouses I	12	8
ITRI612	Linear Programming I	12	8
ITRI613	Databases I	12	8
ITRI614	Information Systems Engineering I	12	8
ITRI615	Computer Security I	12	8
ITRI616	Artificial Intelligence I	12	8
ITRI617	Image Processing I	12	8
ITRI618	Decision Support Systems I	12	8
ITRI621	Data Warehouses II	12	8
ITRI622	Linear Programming II	12	8
ITRI623	Databases II	12	8
ITRI624	Information Systems Engineering II	12	8
ITRI625	Computer Security II	12	8
ITRI626	Artificial Intelligence II	12	8
ITRI627	Image Processing II	12	8
ITRI628	Decision Support Systems II	12	8
ITRI671	Project	32	8
ITWV671	Research Methodology And Project	32	8
MARS621	Radiation and Environment	24	8
MARS622	Radioactive Waste Minimisation and Management	24	8

MAYM611	Abstract Algebra I	18	8
MAYM612	Theory Of Ordinary Differential Equations	18	8
MAYM613	Measure And Integration Theory I	18	8
MAYM614	Topology	18	8
MAYM615	Complex Function Theory	18	8
MAYM621	Functional Analysis I	18	8
MAYM622	Abstract Algebra Ii	18	8
MAYM623	Evolution Of Mathematical Ideas	18	8
MAYM624	Fundamentals Of Mathematics	18	8
MAYM625	Project	30	8
MCHE611	Physical Chemistry I	12	8
MCHE612	Inorganic Chemistry I	12	8
MCHE613	Organic Chemistry I	12	8
MCHE614	Analytical Chemistry I	12	8
MCHE625	Physical Chemistry II	12	8
MCHE626	Inorganic Chemistry II	12	8
MCHE627	Organic Chemistry II	12	8
MCHE628	Analytical Chemistry II	12	8
MCHE629	Research Project	12	8
MCHE671	Research Project	36	8
MTHS611	Fundamentals of Mathematics	12	8
MTHS612	Abstract Algebra I	12	8
MTHS613	Matrix Analysis	12	8
MTHS614	Measure and integrationTheory I	12	8
MTHS615	Functional Analysis I	12	8
MTHS619	Real & Complex Analysis	12	8
MTHS621	Topology	12	8
MTHS622	Abstract Algebra II	12	8
MTHS623	Complex Function Theory	12	8

MTHS624	Measure and integrationTheory II	12	8
MTHS625	Functional Analysis II	12	8
MTHS626	Evolution of Mathematical Ideas	12	8
MTHS671	Research project	32	8
NCHE611	Advanced Organic Chemistry	16	8
NCHE612	Advanced Physical Chemistry	16	8
NCHE613	Advanced Inorganic Chemistry	16	8
NCHE614	Advanced Analytical Chemistry	16	8
NCHE621	Molecule Modelling (Elective)	8	8
NCHE622	Polymer Chemistry (Elective)	8	8
NCHE623	Advanced Structural Clarification (Elective)	8	8
NCHE624	Environmental Chemistry (Elective)	8	8
NCHE625	Techniques for Organic Synthesis (Elective)	8	8
NCHE626	Electrochemistry (Elective)	8	8
NCHE627	Homogeneous catalysis (Elective)	8	8
NCHE628	Coal Chemistry (Elective)	8	8
NCHE629	Membrane Science and Technology (Elective)	8	8
NCHE630	Electronic structure methods and solvation models (Elective)	8	8
NCHE631	Thermodynamics of Solution (Elective)	8	8
NCHE632	Applied Materials Chemistry (Elective)	8	8
NCHE633	Introduction to nanomedicine (Elective)	8	8
NCHE634	Natural products in drug discovery (Elective)	8	8
NCHE635	Electrochemical sensors (Elective)	8	8
NCHE671	Research Project	32	8

NPHY611	Classical Mechanics	16	8
NPHY612	Quantum Mechanics	16	8
NPHY613	Electrodynamics	16	8
NPHY621	Statistical Mechanics	16	8
NPHY622	Computational Physics	16	8
NPHY631	Plasma Physics (Elective)	16	8
NPHY632	Introduction to General Relativity (Elective)	16	8
NPHY633	Introduction to Stellar Astrophysics (Elective)	16	8
NPHY634	Nuclear Physics (Elective)	16	8
NPHY635	Solid State Physics (Elective)	16	8
NPHY636	Quantum Physics II (Elective)	16	8
NPHY671	Research project	32	8
OMBE622	Applied Hydrology	16	8
OMBE623	Groundwater Geology	16	8
OMBE624	Geohydrology	16	8
OMBE625	Introduction to Hydrology and Integrated Water Resources Management	16	8
OMBE673	Research Project	32	8
OMBO611	Introduction to Environmental Management	16	8
OMBO613	Introduction to GIS	16	8
OMBO614	GIS Applications	16	8
OMBO678	Environmental Management I	20	8
OMBO679	Environmental Analysis I	20	8
OMBO681	Environmental Assessment I	20	8
OMBW611	Fundamentals of Waste Management	20	8
OMBW612	Waste Management Law and Governance	16	8

OMBW621	New Waste Management Solutions	16	8
OMSA622	Weeds: interactions and control	16	8
OMSA623	Plant pathology	16	8
OMSB611	Conservation Ecology	16	8
OMSB621 will become OMSB629	Genome Analysis and Bio-informatics	16	8
OMSB624 will become OMSB 613	Biodiversity Planning	16	8
OMSB625 will become OMSB614	Biomonitoring and Risk Assessment	16	8
OMSB627	Herpetology in Practise	16	8
OMSB628	Coral Reef Ecology	16	8
OMSE611	Environmental Soil Science (full-time only, GDKN 122, GDKN 211 and GDKN 221 are pre-requisites for this module)	16	8
OMSE612	Introduction to Landscape ecology	16	8
OMSE613	Resilience Thinking in Ecology	16	8
OMSE621	Restoration of degraded ecosystems	16	8
OMSE622	Urban Ecology	16	8
OMSE623	Plant ecophysiology and stress physiology	16	8
OMSE625	Advanced Ecotoxicology	16	8
OMSE626	Microbial Ecology	16	8
OMSE674	Research Project	32	8

OMSG611	Environmental geochemistry (full-time only, GLGN 122 and GLGN311 are pre-requisites for this module)	16	8
OMSG621	Environmental Mineralogy (GLGN 122 and GLGN211 are pre-requisites for this module)	16	8
OMSG622	Applied environmental geology (GLGN 112, GLGN221 and GLGN321 are pre-requisites for this module)	16	8
OMSP611	Principles of integrated pest management	16	8
OMSP622	GM crops and integrated pest management	16	8
OMSP623	Nematodes and crops	16	8
OMSP624	Arthropoda/plant interactions	16	8
OMSW611	Aquatic Ecosystems: Pollution and Ecotoxicology	16	8
OMSW622	Phycology	16	8
OMSW624	Environmental Hydrology	16	8
OMSW625	Limnology	16	8
OMSW626	Animal ecology	16	8
OMWE611	Rehabilitation of disturbed areas (full-time only, GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module)	16	8
OMWP611	Pest phenology and damage symptoms	16	8
OMWP613	Economic damage and threshold values	16	8

OMWW611	Physical, chemical and biological properties of inland water	16	8
OMWW614 will become OMWW 617	Zoonoses	16	8
OMWW616	Estuarine and near shore marine ecology	16	8
OMWW629 will become OMWW621	Advanced waste water treatment	16	8
PARM 617	Parasitology	24	8
PARM627	Ecological Parasitology	24	8
PCPM611	Selected Topic In Crop Science/Research Project I	24	8
PCPM612	Applied Crop Physiology	12	8
PCPM613	Crop Protection	12	8
PCPM614	Agro-Meteorology	12	8
PCPM621	Crop Production Systems	12	8
PCPM622	Soil Plant Water Relations	12	8
PCPM623	Horticultural Science	12	8
PCPM624	Advanced Plant Breeding	12	8
PCPM625	Selected Topic In Crop Science/Research ProjectsII	24	8
PHYM611	Statistical Mechanics	12	8
PHYM612	Quantum Mechanics	18	8
PHYM613	Classical Mechanics	18	8
PHYM614	Electromagnetism	18	8
PHYM615	Nuclear Physics	12	8
PHYM624	Astrophysics	12	8
PHYM626	Solid State Physics	12	8
PHYM627	Computational Physics	24	8
PHYM628	Project or Prescribed Experiment	24	8

PSRM611	Research Projects 1	24	8
PSRM612	Soil Microbiology	12	8
PSRM613	Land and Water Management	12	8
PSRM614	Agro-Meteorology	12	8
PSRM621	Research projects II (For Land Management)	24	8
PSRM622	Soil Classification And Land Use Planning	12	8
PSRM623	Irrigation Management	12	8
PTSM618	Higher Plant Taxonomy And Systematics	24	8
PTSM628	Further Higher Plant Taxonomy And Systematics	24	8
RESM671	Project	32	8
SGSS614	Research Methods	1	16
STFM611	Schochastic Models	15	8
STFM612	Advanced Probability Theory	15	8
STFM613	Multivariate Analysis	15	8
STFM614	Statistical Quality Control	15	8
STFM615	Decision Theory	15	8
STFM616	Applied Regression Analysis	15	8
STFM621	Design Of Experiments and Samp	15	8
STFM671	Research Projects	30	8
STTN611	Research Project I (Practice Directed	16	8
STTN612	Statistical Data-analysis I: Models	12	8
STTN613	Resampling	12	8
STTN614	Statistical Inference	12	8

STTN615	Stochastic Processes I	12	8
STTN617	Mathematical and Computer-intensive methods I	12	8
STTN618	Financial-driven Statistics I	12	8
STTN619	Nonparametric methods	12	8
STTN621	Research Project I (Research Journal Directed)	16	8
STTN622	Statistical Data-analysis II: Time Series	12	8
STTN623	Multivariate Statistics	12	8
STTN624	Discrete Data-analysis	12	8
STTN625	Stochastic Processes II	12	8
STTN626	Probability Theory	12	8
STTN627	Mathematical and Computer-intensive methods II	12	8
STTN628	Financial-driven Statistics II	12	8
STTN671	Research Project	32	
TGWN612	Numerical Analysis I	12	8
TGWN613	Partial Differential Equations I	12	8
TGWN614	Financial Mathematics Modelling I	12	8
TGWN615	Modelling I	12	8
TGWN616	Control Theory I	12	8
TGWN617	Fluid Dynamics I	12	8
TGWN622	Numerical Analysis II	12	8
TGWN623	Partial Differential Equations II	12	8
TGWN624	Financial Mathematics Modelling II	12	8
TGWN625	Modelling II	12	8
TGWN626	Control Theory II	12	8
TGWN627	Fluid Dynamics II	12	8
TGWN671	Project	32	8

WISK613	Topology of Metric and Normed Spaces	8	8
WISK615	Differential Equations	16	8
WISN612	Abstract Algebra I	12	8
WISN613	Complex Function Theory	12	8
WISN614	Measure and Integration theory I	12	8
WISN615	Functional Analysis I	12	8
WISN616	Fundamentals of Mathematics	12	8
WISN622	Abstract Algebra II	12	8
WISN623	Fourier/Harmonic/Analysis	12	8
WISN624	Measure and Integration theory II	12	8
WISN625	Functional Analysis II	12	8
WISN626	Evolution of Mathematical Ideas	12	8
WISN627	Matrix Analysis	12	8
WISN628	Topology	12	8
WISN671	Project	32	8

MASTERS / MAGISTER			
Module code Module kode	**Descriptive name Beskrywende naam**	**Credits Krediete**	**NQF-level NQF-vlak**
BCHN872	Dissertation	135	9
BCHN877	Advanced Biochemistry	45	9
BIYM 871	Dissertation	180	9
BWIA811	Enterprise-Wide Risk Management	24	9
BWIA812	Enterprise-Wide Risk Management I	24	9
BWIA821	Enterprise-wide Risk Management II	12	9
BWIB818	Business Intelligence	16	9
BWIB821	Data Mining Techniques	12	9
BWIB822	Contemporary Issues in Business Analytics	12	9
BWIB823	Multiple Criteria Decision Making	12	9
BWIN811	Practical Risk Management SAS RD	16	9
BWIN812	Pricing of Derivatives B	24	9
BWIN813	Practical Data Mining	16	9
BWIN815	Industry Integration Project	32	9
BWIN816	Modern Portfolio Theory	16	9
BWIN817	Retail Credit Risk	16	9
BWIN818	Topical Research issues in Risk Analysis	16	9
BWIR826	Industry Directed Research Project	80	9
BWIN872	Dissertation	132	9
CHEM871	Dissertation	180	9
CHEN872	Dissertation	132	9

CHEN874	Advanced Chemistry	48	9
CISM871	Dissertation	180	9
DRKN871	Dissertation	180	9
DRRS871	Dissertation	180	9
ECOM871	Dissertation	240	9
EXTM871	Dissertation	180	9
FSKB874	Plasma Physics	12	9
FSKB875	Magnetohydrodynamics	12	9
FSKB877	Cataclysmic variables	12	9
FSKB878	Extragalactic astronomy	12	9
FSKB879	Advanced General Relativity	12	9
FSKB880	High-energy astrophysics and pulsars	12	9
FSKB882	Stellar structure and -evolution	12	9
FSKB885	Geomagnetism and Aeronomy	12	9
FSKB886	Computational Astrophysics	12	9
FSKB887	Radio Interferometry	12	9
FSKB888	Time Series and Data Analysis	12	9
FSKB889	Space Weather	12	9
FSKB890	Observational Cosmology	12	9
FSKB891	Theoretical Cosmology	12	9
FSKM811	Astrophysics I	16	9
FSKM812	Transport Theory	16	9
FSKM813	Astrophysics II	16	9
FSKM814	Heliospheric Physics	16	9
FSKM815	General Physics	16	9
FSKM821	General Relativity	16	9
FSKS872	Dissertation	132	9

GGFN871	Dissertation	180	9
HDGH871	Dissertation	180	9
HDMG871	Dissertation	180	9
IPMM871	Dissertation	180	9
ITRN872	Dissertation	100	9
ITRW876	Databasis	32	9
ITRW877	Decision Support Systems	32	9
ITRW878	Artificial Intelligence	32	9
ITRW883	Image Processing	32	9
ITRW884	Information Systems Engineering	32	9
ITRW885	Computer Security	32	9
ITRW886	Data Warehouses	32	9
MARS 811	Radioanalytical Applications	12	9
MARS 812	Environmental Applications	12	9
MARS 813	Radioactive Waste Minimisation and Management	12	9
MARS 814	Industrial Applications	12	9
MARS 815	Science And Technology Management	12	9
MARS 873	Research Project	60	9
MENV871	Research Project		9
MGEO871	Research Project		9
MIKS 871	Master in Indigenous Knowledge Systems	180	9
MKBN871	Dissertation	180	9

NWON871	Dissertation	180	9
OMBO873	Mini dissertation	100	9
OMBO878	Environmental Management 2	40	9
OMBO879	Environmental Analysis 2	40	9
OMBO880	Management of Ecological Drivers in Aquatic Systems	40	9
OMBO881	Management of Ecological Responders in Equatic Systems	40	9
OMBO882	Integrated Waste Management	40	9
OMBO883	Waste Management Law And Governance	40	9
OMWN871	Dissertation	180	9
ORMS873	Mini-Dissertation	180	9
ORMS874	Operational Research Methodologies	180	9
ORMS875	Business Devlopment And Implementation	180	9
ORMS876	Operational Research: Business Analysis	180	9
ORMS877	Business Statistics	180	9
PLKN871	Dissertation	180	9
PHYM871	Dissertation	180	9
RSWW811	Research Method	8	9
RSWW821	Research Communication	8	9
SBEL871	Dissertation	180	9
STTK874	Advanced Resampling Methods	32	9
STTK875	Advanced Statistical Models	32	9
STTK876	Advanced Multivariate Statistics	32	9
STTK877	Advanced Probability Theory	32	9

STTK878	Advanced Time Series Models	32	9
STTK879	Advanced Stochastic Processes	32	9
STTN872	Dissertation	100	9
STTN874	Advanced Survival Models	32	9
TGWN872	Dissertation	100	9
TGWN881	Applicable Analysis I	32	9
TGWN882	Applicable Analysis II	32	9
TGWN883	Modelling I	32	9
TGWN884	Modelling 2	32	9
TGWN887	Principles and Paradigms:Applied Mathematics	32	9
WISK872	Dissertation	100	9
WISN881	Abstract Analysis I	32	9
WISN882	Abstract Analysis II	32	9
WISN883	Algebra I	32	9
WISN884	Algebra II	32	9
WISN885	Discrete Structures I	32	9
WISN886	Discrete Structures 2	32	9
WISN887	Principles and Paradigms: Pure Mathematics	32	9

DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*			
Module code **Module kode**	**Descriptive name** **Beskrywende naam**	**Credits** **Krediete**	**NQF-level** **NQF-vlak**
AECM971	Thesis	360	10
BCHN971	Thesis	360	10
BWIN971	Thesis	360	10
BWIR971	Thesis	360	10
CHEN971	Thesis	360	10
CHEM971	Thesis	360	10
DRKN971	Thesis	360	10
DRRS971	Thesis	360	10
FSKN971	Thesis	360	10
GGFN971	Thesis	360	10
HDGH971	Thesis	360	10
HIKS971	Thesis	360	10
IKMS971	Thesis	360	10
ITRW971	Thesis	360	10
MKBN971	Thesis	360	10
NWON971	Thesis	360	10
OMWN971	Thesis	360	10
ONAV 971	Thesis	360	10
PLKN971	Thesis	360	10
SBEL971	Thesis	360	10
STTK971	Thesis	360	10
TGWS971	Thesis	360	10
WISK971	Thesis	360	10

NAS.4 POSTGRADUATE DIPLOMA

NAS.4.1 RULES FOR THE POSTGRADUATE DIPLOMA / *REËLS VIR DIE NAGRAADSE DIPLOMA*

The postgraduate diploma follows on an appropriate baccalaureus degree. The studies may be taken full-time or part-time.

Prospective students must, before the date set by the director involved, apply to the director involved for selection and formal admission to the intended programme in the following year (see General Rules). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to the programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group.

Die nagraadse diploma volg op 'n geskikte baccalaureus graad. Die studies mag voltyds of deeltyds geneem word.

Voornemende student moet, voor die vasgestelde datum bepaal deur direkteur, aansoek doen by die betrokke direkteur vir die geskikte program in die daaropvolgende haar (sien Algemene Reëls). Slegs twee studente, op grond van hul akademiese rekord en ander relevante onderrig kwalifikasies, word beoordeel wat 'n realistiese kans staan om aanvaar te word in die program waarvoor aansoek gedoen word. Die agtergrond en die potensiaal van die student word ook in ag geneem tydens die aansoek proses. Laat aansoeke sal slegs oorweeg word as 'n addisionele student geakkommodeer kan word in die betrokke vakgroep.

Duration (minimum and maximum duration) / *Duur van die studie (minimum- en maksimumduur)*

The minimum duration of the studies is one year full-time and two years part-time. The maximum duration is two years full-time and three years part-time

Die minimumduur vir studies is een jaar voltyds en twee jaar deeltyds. Die maksimum duur is twee jaar voltyds en drie jaar deeltyds.

Admission requirements for the qualification / *Toelatingsvereistes vir die kwalifikasie*

The studies may be undertaken in a study programme approved by the Faculty Board of the Faculty of Natural and Agricultural Sciences. These study programmes are set out in N.2.1. See A Rules 3.

If the applications for a programme received are more than what the specific group in a school can handle, the group of students who, in the judgment of the school director has the greatest chance of success for the programme, are selected. The background of study and potential of students in this selection process, will also be taken into account./

Die studies mag onderneem word in 'n studieprogram wat aanvaar word deur die Fakulteitsraad van die Fakulteit van Natuur en Landbouwetenskappe. Die studieprogramme is uiteengesit in N.2.1. Sien A Reês 3.

As die getal aansoeke vir 'n program die kapasiteit van die skool oorskrei, word slegs die studente, op grond van die skool direkteur se diskresie, wat die grootste kans staan om die program suksesvol te voltooi, geselekteer. Die agtergrond van die studie en die potensiaal van die student in die keuringsproses sal ook in aanmerking gebring word.

Faculty-specific requirements / *Fakulteit spesifieke vereistes*

The student has already obtained an appropriate baccalaureus degree of which he has taken at least 60 module credits at NQR level 7 in the core subject of the relevant honours programme for which he intends to register.

If the student does not comply with provision a) the school director may, if necessary in consultation with the Dean and with notice to the Faculty Board, decide whether the candidate may be admitted to the Hons BSc studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

Die student het reeds 'n toepaslike baccalaureusgraad met ten minste 60 krediet modules op 'n NKR-vlak 7 in die hoof vak van die toepaslike honneursprogram waarvoor die student wil registreer.

Indien die student nie aan die vereistes voldoen nie a) mag die skooldirekteur, indien nodig konsulteer met die Dekaan en met kennisgewing aan die Fakuteitsraad, besluit of the kandidaat aanvaar mag word vir die Hons Bsc studies gebasseeer op die kennis en vaardighede, erkenning vir voorafgaande geleerdheid en toepaslike werkservaring van die kandidaat.

NAS.5 POSTGRADUATE DIPLOMAS

NAS.5.1 POSTGRADUATE DIPLOMA IN AGRICULTURAL IN ECONOMICS AND MANAGEMENT / *NAGRAADSE DIPLOMA IN LANDBOU IN EKONOMIE EN BESTUUR*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N501M

CODE: **272-100**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old programme: Postgraduate Diploma In Agricultural in Economics and Management / *Nagraadse Diploma in Landbou en Ekonomie in Ekonomie en Bestuur*

Module code	Descriptive name	Credits
1 Semester		
ECOM 515	Agriculture and Economic Development	16
ECOM 516	Agricultural Statistics Research I	16
ECOM 517	Quantitative Methods in Agricultural Economics	08
ECOM 518	Agriculutural Micro-Economics	12
EXTM 514	Rural Community Development	16
		68
2 Semester		
ECOM 525	Agricultural Production Economics	16
ECOM 526	Agricultural Project Appraisal	16
ECOM 527	Agricultural Macro Economics	12
ECOM 528	Agricultural Marketing	08
ECOM 529	Research methods and Project	16
		68
Total number of credits		**136**

NAS.5.2 POSTGRADUATE DIPLOMA IN AGRICULTURAL ECONOMICS / *NAGRAADSE DIPLOMA IN LANDBOU EKONOMIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2FB-D01 N501M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: : Full time

Compilation of new programme: Postgraduate Diploma in Agricultural Economics / ***Nagraadse Diploma in Landbou Ekonomie***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
ECOM 518	Agricultural Micro-Economics	12
ECOM 517	Quantitative Methods in Agricultural Economics	8
ECOM 516	Agricultural Statistics Research I	16
ECOM 515	Agriculture and Economic Development	16
ECON 519	Agricultural Production Economics	16
EXTM 514	Rural Community Development	16
		Total credits 84
2 Semester		
ECOM 529	Research Methods And Project	16
ECOM 520	Agricultural Marketing	12
ECOM 527	Agricultural Macro-Economics	12
ECOM 526	Agricultural Project Appraisal	16
		Total credits 56
Total number of credits		**140**

NAS.5.1 POSTGRADUATE DIPLOMA IN AGRICULTURAL IN EXTENSION / *NAGRAADSE DIPLOMA IN LANDBOU-EKONOMIE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N502M

CODE: **272-101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Postgraduate Diploma In Agricultural in Extension / *Nagraadse Diploma In Landbou-Ekonomie*

Module code	Descriptive name	Credits
1 Semester		
EXTM 514	Rural Community Development	16
EXTM 515	Essentials of Agricultural Extension	16
EXTM 516	Elements of Communication in Extension	16
ECOM 515	Agriculture and Economic Development	16
64		
2 Semester		
EXTM 525	Research Methods and Projects	24
EXTM 526	Change in Agriculture	16
EXTM 527	Leadership Development in Extension	16
ECOM 526	Agricultural Project Appraisal	16
		72
Total number of credits		**136**

NAS.5.2 POSTGRADUATE DIPLOMA IN AGRICULTURAL EXTENSION / *NAGRAADSE DIPLOMA IN LANDBOU-EKONOMIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2FC-D01 N501M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of new programme: Postgraduate Diploma in Agricultural Extension / *Nagraadse Diploma In Landbou-Ekonomie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
EXTM 515	Essentials of Agricultural Extension	16
EXTM 516	Elements of Communication in Agricultural Extension	16
ECOM 515	Agriculture and Economic Development	16
EXTM 514	Rural Community Development	16
		Total credits 64
2 Semester		
ECOM 526	Agricultural Project Appraisal	16
EXTM 526	Change in Agriculture	16
EXTM 527	Leadership Development in Agricultural Extension	16
EXTM 525	Research Methods and Project	16
		Total credits 72
Total number of credits		**136**

NAS.5.3 POSTGRADUATE DIPLOMA IN DISASTER RISK MANAGEMENT / *NAGRAADSE DIPLOMA IN RAMPRISIKOBESTUUR*

Programme outcomes/*Programuitkomste:*

After completion of the Postgraduate diploma in Disaster Risk Management qualification, the candidate will demonstrate the following / *Na suksesvolle voltooiing van die Nagraadse Diploma in Ramprisikobestuur, sal kandidate die volgende demostreer:*

- integrated knowledge of and engagement in the field of disaster risk management and climate change adaptation and a critical understanding and application of the theories and principles relevant to the study area; / *Geïntegreerde kennis en begrip van, asook betrokkenheid by, verskillende teorieë en beginsels wat betrekking het op ramprisikobestuur en klimaatsverandering aanpassing, leierskap en bestuur binne die veld van ramprisikobestuur, asook die vermoë om sodanige kennis en begrip toe te pas met die oog daarop om wêreldwye en plaaslike studies binne hierdie konteks krities te analiseer en te evalueer;*

- an ability to critically interrogate multiple sources of knowledge within the field of disaster risk management and climate change adaptation, and critically evaluate and review that knowledge and the manner in which the knowledge was produced;/ *n Vermoë om veelvuldige kennisbronne aan kritiese vraagstelling te onderwerp, veral gepubliserde joernaalartikels oor studies binne die veld van ramprisikobestuur en klimaatsverandering, en om krities navorsingsmetodes te beoordeel en evalueer, asook die resultate en aanbevelings wat deur sodanige navorsing voortgebring word;*

- ability to select, evaluate and apply a range of different but appropriate disaster risk management skills and scientific methods of enquiry to reflect on and then address complex or abstract problems and contribute to positive change within practice;/ '*n Vermoë om verskeidenheid verskillende maar toepaslike bestuursvaardighede en wetenskaplike ondersoekmetodes te selekteer en toe te pas, daaroor na te dink en dan komplekse en abstrakte probleme aan te spreek, waardeur 'n bydrae gelewer word tot positiewe verandering binne die praktyk van ramprisikobestuur en ten voordele van alle lede van die gemeenskap;*

- the ability to engage with and address ethical issues pertaining to the academic environment, disaster risk management practice and society to effect change in conduct and adaptation where necessary; / *n Vermoë om betrokke te raak by etiese kwessies met betrekking tot die akademiese omgewing, openbare bestuurspraktyke en die gemeenskap en dit aan te spreek, ten einde waar nodig verandering in gedrag en aanpassing teweeg te bring*

- accurate, coherent, appropriate and creative presentation and communication of innovative and new professional ideas and methods to practitioners and academics in the disaster risk reduction related field with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism;/ *Die vermoë om 'n akkurate, samehangende, toepaslike en kreatiewe aanbieding en kommunikasie van innoverende en nuwe professionele idees, metodes en navorsinsbevindings te lewer aan beleidmakers, praktisyns,*

ander rolspelers en adademici binne die veld van ramprisikovermindering, met begrip van en respek vir intellektuele eiendomskonvensies, kopiereg en reëls oor plagiaat

- the ability to work effectively as part of a team to solve discipline-related problems and to take responsibility for task-specific outcomes and appropriate use of relevant resources; and / Die vermoë om effektief the werk as deel van 'n span om die dissiplineverwante *probleme op te los en verantwoordelikheid te neem vir taak-spesifieke uitkomste en die toekomstige gebruik van toepaslike hulpbronne; en*

- the ability to apply, in a self critical manner, appropriate learning strategies to effectively address professional and lifelong learning./ *Die vermoë om op 'n selfkrities wyse, topaslike leerstrategieë toe te pas ten einde 'n professionele lewenslange leerproses aan te spreek terwyl toerekenbaarheid vir die benutting van hulpbronee ontwikkel word.*

Admission requirements for the programme / *Toelatingsvereistes van die program*

(a) In order to be eligible to apply for the Postgraduate Diploma in Disaster Risk Management, an applicant must have completed a bachelor degree or an equivalent Qualification obtained with an average mark of 60%. / *n B-graad, Gevorderde Diploma, met 'n gemiddeld van 60% is 'n vereiste om in aanmerking te kom vir die Nagraadse Diploma in Ramprisikobestuur*

(b) Candidates that do not comply with this minimum requirement may apply to the School Director for an interview by an admissions panel. The panel is compiled by the School Director and may consider admission in light of the interview and other relevant considerations. / *Kandidate wat nie aan die minimum vereistes voldoen nie, kan by die Skool Direkteur aansoek doen om 'n onderhoud deur 'n paneel. Die paneel word saamgestel deur die Skool Direkteur en die paneel sal op grond van die onderhoud en ander oorwegings was as relevant beskou word, toelating oorweeg.*

(c) A limited number of candidates will be admitted to the programme annually, depending upon the availability of the School's personnel capacity. All applications will be strictly judged according to academic merit. / *'n Beperkte aantal kandidate sal jaarliks tot die program toegelaat word. Die getal kandidate wat toegelaat word sal afhang van die beskikbare personeel in die skool. Alle aansoeke sal streng volgens akademiese meriete beoordeel word.*

(d) All admitted candidates must attend an introductory and orientation meeting at the Potchefstroom Campus on a date determined by the School Director. / *All kandidate wat toegelaat word, moet op 'n datum wat deur die Skool Direkteur vasgestel word, 'n inleidende en oriënterende byeenkoms op die Potchefstroomkampus bywoon.*

Each applicant is obliged to supply the following documentation together with the application: */ Elke aansoeker moet die volgende dokumentasie saammet die aansoekvorm indien:*

- A curriculum vitae / *'n curriculum vitae*

- A photocopy of the certificate of undergraduate degree / A *kopie van die sertifikaat of voorgraadse kwalifikasie*

- A list of results received for undergraduate modules / *Akademiese rekord*
- At least two letters of recommendation. / *Tenminste twee aanbevelings briewe*

CODE/ *KODE* : 2GC D01 N501P

CAMPUS/ *KAMPUS*: Potchefstroom (Afrikaans, English)

DELIVERY MODE/ *AFLWERINGSMETODE*: Full Time or Part time / *Voltyds of deeltyds*

Compilation of programme: Postgraduate Diploma In Disaster Risk Management / *Samestelling van program Nagraadse Diploma In Ramprisikobestuur:*

Module code *Module kode*	**Descriptive name *Beskrywende naam***	**Credits *Krediete***
Full-time (1 Year) / *Voltyd (1 Jaar)*		
1 Semester		
DRRS511	Disaster Risk Studies and Climate Change Adaptation / *Ramp Risiko studies en Klimaatsverandering*	16
DRRS512	Socio-Ecological Resilience / *Sosiale Ekologiese Veerkragtigheid*	16
DRRS513	Hazards / *Risikos*	16
DRRS514	Disaster Risk Assessment / *Ramp Risiko assesserings*	16
DRRS515	Research Methodology / *Navorsings metodologie*	16
2 Semester		
DRRS521	Urban Disaster Risk / *Streeks Ramp Risiko*	16
DRRS522	Preparedness and Response / *Voorbereiding en Reaksie*	16
DRRS523	Planning and Project Management / *Beplanning en Projekbestuur*	16
DRRS524	Research Project / *Navorsingsprojek*	16
Module code / *Module kode*	**Descriptive name: Beskrywende naam**	**Credits / *Krediete***
Part-time (2 Years) / *Deeltyds (2 jaar)*		
1 Semester – First year / Eerstejaar		
DRRS511	Disaster Risk Studies and Climate Change Adaptation /	16

	Ramp Risiko Studies en Klimaatsverandering	
DRRS512	Socio-Ecological Resilience / *Sosiale Ekologiese Veerkragtigheid*	16
DRRS513	Hazards / *Risikos*	16
2 Semester – First year/ Eerstejaar		
DRRS521	Urban Disaster Risk / *Streeks Ramp Risiko*	16
DRRS522	Preparedness and Response / *Voorbereiding en Reaksie*	16
1 Semester – Second year / Tweedejaar		
DRRS514	Disaster Risk Assessment / *Ramp Risiko assesserings*	16
DRRS515	Research Methodology / *Navorsings metodologie*	16
2 Semester – Second year / Tweedejaar		
DRRS523	Planning and Project Management / Beplanning en Projekbestuur	16
DRRS524	Research Project / *Navorsingsprojek*	16
Total credit points / Totale kredietpunte		144

NAS.6 BACHELOR OF SCIENCE HONOURS / *BACCALAUREUS SCIENTIAE HONNEURS*

NAS.6.1 RULES FOR THE DEGREE BACHELOR OF SCIENCE HONOURS / *REËLS VIR DIE GRAAD BACCALAUREUS SCIENTIAE HONNEURS*

The honours degree follows on an appropriate baccalaureus degree. The studies may be taken full-time or part-time.

Prospective students must, before the date set by the director involved, apply to the director involved for selection and for-mal admission to the intended programme in the following year (see General Rules 3.2). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to the programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group.

Die Honneursgraad volg op 'n baccalaureusgraad. Die studie kan voltyds of deeltyds gedoen word.

Voornemende studente moet, voor die keerdatum soos deur die toepaslike skooldirekteur bepaal, by die toepaslike skooldirekteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reël 3.2). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke vakgroep beskikbaar is.

NB: Lesings vir honneursmodules word in die Fakulteit Natuur- en Landbouwetenskappe slegs voltyds aangebied.

DURATION (MINIMUM AND MAXIMUM DURATION)

The minimum duration of the studies is one year full-time and two years part-time. The maximum duration is two years full-time and three years part-time

Duur Van Die Studie

Die minimum duur van studie is een jaar voltyds en twee jaar deeltyds. Die maksimum duur is twee jaar voltyds en drie jaar deeltyds.

ADMISSION REQUIREMENTS FOR THE QUALIFICATION

The studies may be undertaken in a study programme approved by the Faculty Board of the Faculty of Natural and Agricultural Sciences. These study programmes are set out in N.2.1.

If the applications for a programme received are more than what the specific group in a school can handle, the group of students who, in the judgment of the school director has the greatest chance of success for the programme, are selected. The background of study and potential of students in this selection process, will also be taken into account

TOELATING EN REGISTRASIE

Die studie kan onderneem word in 'n studieprogram wat deur die Fakulteitsraad goedgekeur is. Hierdie studieprogramme word in N.2.1 uiteengesit.

Indien meer aansoeke vir 'n program ontvang word as wat die betrokke vakgroep in 'n skool kan hanteer, word die groep studente wat volgens die oordeel van die skooldirekteur die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.

ASSUMED PRIOR LEARNING

The student has already obtained an appropriate baccalaureus degree of which he has taken at least 60 module credits at NQR level 7 in the core subject of the relevant honours programme for which he intends to register
If the student does not comply with provision a) the school director may, if necessary in consultation with the Dean and with notice to the Faculty Board, decide whether the candidate may be admitted to the Hons BSc studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning

Honours Programmes	Undergraduate Codes
For admission to the following programs in Business Mathematics and Informatics a further learning requirement above and beyond the assumed learning, as mentioned above, will be that a student must have taken the BSc qualification in Business Mathematics and Informatics or the BCom qualification in Quantitative Risk Management, subject to the following prerequisites:Honours programmes	
2DP L01 N601P (N610P) Bachelor of Science Honours in Quantitative Risk Management	2FT H01 N301P (N134P) 2FQ H01 N301P (N137P)
2DQ L01 N601P (N611P) Bachelor of Science Honours in Financial Mathematics	2FS H01 N301P (N135P)
New code (N612P) Bachelor of Science Honours in Business	2FT H01 N301P (N134P)

Analytics	2FR H01 N301P (N136P)

a) A minimum prerequisite for registration for the postgraduate BMI qualifications above is that students must have obtained an average mark of at least 60% in the core modules of the third year of the relevant undergraduate curriculum. Exceptions to this rule will be considered according to individual merits and must be approved by the director of the Centre for Business Mathematics and Informatics. Note that the BMI Selection Committee will have the final authority in allowing students into all BMI and actuarial honours programmes.

b) Students in Actuarial Science who passed the programme 2FQ H01 N301P (N137P) and obtained five or more exemption recommendations for levels A1 and A2 subjects from the Actuarial Society of South Africa (or equivalent CT subjects from the Institute and Faculty of Actuaries) may be admitted to the curriculum N609P.

c) Prospective students in Actuarial Science must make certain of the provisions that apply to studies in Actuarial Science and are obtainable from the director of the Centre for Business Mathematics and Informatics.

AANNAMES OOR VORIGE LEER

Die student beskik oor 'n gepaste baccalaureusgraad, waarin minstens 60 module-krediete op NKR-Vlak 7 in die kernvak van die betrokke honneursprogram waarvoor die student wil inskryf, aangebied is.
Indien die student nie aan die bepaling van a) voldoen nie bepaal die skooldirekteur, indien nodig, na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die Hons BSc-studie toegelaat kan word.

Honneurs Programme	***Voorgraadse kodes***
Vir toelating tot die programme Bedryfswiskunde en Informatika word bo-en-behalwe vir die aannames oor vorige leer soos bo vermeld, ook nog vereis dat 'n student die BSc-kwalifikasie in Bedryfswiskunde en Informatika of die BCom-kwalifikasie in Kwantitatiewe Risikobestuur verwerf het, en wel onderhewig aan die volgende spesifieke voorvereistes:	
2DP L01 N601P (N610P) Baccalareus Scientiae Honneurs in Kwantitatiewe Risikobestuur	2FT H01 N301P (N134P) 2FQ H01 N301P (N137P)
2DQ L01 N601P (N611P) Baccalareus Scientiae Honneurs in Finansieële-wiskunde	2FS H01 N301P (N135P)
New code (N612P) Baccalaureus Scientiae Honneurs in Bedryfsanalise	2FT H01 N301P (N134P) 2FR H01 N301P (N136P)

a) *'n Minimum voorvereiste vir registrasie vir die nagraadse BWI-kwalifikasies is dat studente 'n gemiddelde modulepunt van minstens 60% vir die kernmodules in die derdejaar van die betrokke voorgraadse kurrikulum behaal het. Uitsonderings op hierdie reël sal op individuele meriete oorweeg word en moet deur die Direkteur van die Sentrum vir Bedryfswiskunde en Informatika goedgekeur word. Neem kennis dat die BWI keuringskomittee die laaste sê het met die toelating van studente in al die BWI en aktuariële honneurs programme.*

b) *Studente in Aktuariële Wetenskap wat die kurrikulum 2FQ H01 N301P (N137P) geslaag het en vrystellingaanbevelings in ten minste 5 van die Aktuariële Genootskap van Suid-Afrika se A1 en A2 vlak-vakke (of ekwivalente Institute and Faculty of Actuaries se CT-vakke), kan tot kurrikulum N609P toegelaat word.*

c) *Voornemende studente in Aktuariële Wetenskap moet hulle vergewis van die voorskrifte wat vir studie in Aktuariële Wetenskap geld en wat by die Direkteur van die Sentrum vir Bedryfswiskunde en Informatika beskikbaar is.*

ATTAINMENT OF THE DEGREE

- **Qualification with distinction**

Referring to General Rule 3.5.2 the honours degree is conferred with distinction where the student completes the degree in the minimum period and obtained a weighted average of at least 75% in all the modules achieved.

VERWERWING VAN DIE GRAAD

- ***Kwalifikasie met onderskeiding***

Met verwysing na Algemene Reël 3.5.2 verwerf 'n student 'n honneursgraad met onderskeiding, indien die graad binne die minimum tydperk voltooi is en 'n geweegde gemiddeld van minstens 75% in al die modules verwerf is.

EXIT LEVEL OUTCOMES

The outcomes described regarding the first Baccalaureus Scientiae degree are still striven after in this Honours Bachelor of Science, with special reference to a specific discipline or a few disciplines from Natural and Agricultural Sciences. At the end of these honours studies the knowledge, skills, values and attitudes that the student has acquired will be further rounded off, with more emphasis on accompanying research skills.

UITTREEVLAKUITKOMSTE

Die uitkomste soos beskryf by die eerste Baccalaureus Scientiae-graad word steeds by hierdie Honneurs Baccalaureus Scientiae-graad nagestreef, met toespitsing op 'n besondere dissipline of enkele dissiplines uit die natuurwetenskappe. Aan die einde van hierdie honneursstudie sal die kennis, vaardighede, waardes en houdings waaroor die student reeds beskik, verder afgerond wees, met meer klem op gepaardgaande navorsingsvaardighede.

Natural Science (Including Mathematical And Computer) and Technology Problem Solving

At the end of the studies the student will be able to identify, evaluate and solve certain convergent and divergent problems in relevant disciplines from the health sciences and technology in a creative and innovative way.

Natuurwetenskaplike (Insluitend Wiskundige en Rekenaarkundige) en Tegnologiese Probleemoplossing

Aan die einde van die studie is die student in staat om sekere konvergente en divergente probleme in die betrokke dissipline uit die natuurwetenskaplike, gesondheidswetenskaplike en tegnologiese veld te identifiseer, te evalueer, en kreatief en innoverend op te los.

APPLYING FUNDAMENTAL AND EXPERT KNOWLEDGE

At the end of the studies the student will have abilities to integrate a basic knowledge and techniques from natural science and information technology in such a way that he/she will be able to investigate human and natural phenomena and to solve accompanying problems. These abilities will include the following:
Application of natural science knowledge and methods (with emphasis on those of the specific discipline) to problems by the appropriate use of -

- formal analysis and modelling of human activities and natural phenomena, systems and problems;
- communication of theories, concepts and ideas;
- discussions and conceptualisation of human activities and natural phenomena, systems and problems;
- management of uncertainties and risks by utilising statistical principles and methods;
- computer skills and information technology;

Implementation of principles, laws and techniques of Natural and Agricultural Sciences and health sciences (with emphasis on those of the specific discipline) at the fundamental level to –

- identify and solve open business and community problems;
- identify and utilise applications;
- make use of common fundamental expertise across the boundaries of disciplines.

TOEPASSING VAN FUNDAMENTELE EN SPESIALIS-KENNIS

Aan die einde van die studie is die student in staat om basiese kennis en tegnieke van die natuurwetenskap en die inligtingstegnologie te integreer om menslike verskynsels en verskynsels in die natuur te kan ondersoek en gepaardgaande probleme te kan oplos. Dit sluit die volgende in:

- *Pas natuurwetenskaplike kennis en metodes (met toespitsing op dié van die besondere dissipline) toe op probleme deur toepaslike aanwending van formele analise en modellering van menslike aktiwiteite en natuurverskynsels, -stelsels en -probleme;*
- *kommunikering van teorieë, konsepte en idees;*
- *beredenering en konseptualisering van menslike aktiwiteite en natuurverskynsels, -stelsels en -probleme;*

- *hantering van onsekerhede en risiko's deur gebruik van statistiese beginsels en metodes;*
- *rekenaarvaardigheid en inligtingstegnologie.*
- *Gebruik die beginsels, wette en tegnieke van die natuurwetenskap (met toespitsing op dié van die besondere dissipline) op fundamentele vlak om oop bedryfs- en samelewingsprobleme te identifiseer en op te los;*
- *toepassings te identifiseer en aan te wend;*
- *oor dissiplinegrense heen met gemeenskaplike fundamentele kundigheid te werk.*

INVESTIGATIONS, EXPERIMENTING AND DATA ANALYSIS

At the end of the studies the student will be able to -
a) plan and perform investigations and experiments by utilising scientific modelling techniques;
b) analyse, interpret and derive information from data.
The student will have a limited knowledge of the fundamental research methodology of the specific discipline.

ONDERSOEKE, EKSPERIMENTERING EN DATA-ANALISE

Aan die einde van die studie is die student in staat om:
a) ondersoeke en eksperimente te beplan en uit te voer deur gebruikmaking van wetenskaplike modelleringstegnieke;
b) inligting vanuit data te analiseer, te interpreteer en af te lei.
Die student sal beskik oor beperkte kennis van die fundamentele navorsings-metodologie van die besondere dissipline.

SCIENTIFIC METHODS, SKILLS AND INFORMATION TECHNOLOGY

At the end of the studies the student will be able to -
a) apply appropriate scientific methods and to evaluate the results obtained;
b) use computer software for calculations, modelling, simulation and handling of information, including -
- the evaluation of the appropriateness and limitations of software;
- the correct application and functioning of software;
- the critical evaluation of the end product delivered by software;

c) manage computers, networks and information infrastructures in evaluating, processing, managing and storing information to improve personal productivity and team work;
d) implement basic techniques and knowledge of business management and health, safety and environmental conservation in business practice.

WETENSKAPLIKE METODES, VAARDIGHEDE EN INLIGTINGSTEGNOLOGIE

Aan die einde van die studie is die student in staat om:
a) toepaslike wetenskaplike metodes aan te wend en die resultate wat dit lewer, te evalueer;
b) rekenaarpakkette vir berekenings, modellering, simulasie en hantering van inligting te gebruik, wat insluit:
- evaluering van die toepaslikheid en beperkings van die pakket
- korrekte toepassing en werking van die pakket
- kritiese evaluering van die eindproduk deur die pakket gelewer;

c) rekenaars, netwerke en inligtingsinfrastrukture te gebruik vir evaluering, prosessering, bestuur en berging van inligting om persoonlike produktiwiteit en spanwerk te verbeter;
d) basiese tegnieke en kennis van besigheidsbestuur en gesondheids- en veiligheids- en omgewingsbewaring aan te wend op bedryfspraktyk.

PROFESSIONAL AND GENERAL COMMUNICATION

At the end of the studies the student will be able to -
a) communicate effectively both orally and in writing with scientists (with emphasis on the specific discipline) and the community by using the appropriate structure, style and graphic and electronic aids;
apply methods of information communication for use by others, especially in the world of Natural and Agricultural Sciences and economic sciences (with emphasis on those methods of the specific discipline).

PROFESSIONELE EN ALGEMENE KOMMUNIKASIE

Aan die einde van die studie is die student in staat om:
sowel mondeling as skriftelik, effektief met wetenskaplikes (met toespitsing op dié van die besondere dissipline) en die gemeenskap te kommunikeer, deur gebruikmaking van die gepaste struktuur, styl en grafiese en elektroniese ondersteuning;
metodes van inligtingverskaffing vir gebruik deur ander in veral die wêreld van die natuurwetenskappe en ekonomiese wetenskappe (met toespitsing op dié van die besondere dissipline) toe te pas.

IMPACT OF NATURAL SCIENCE ACTIVITIES ON THE COMMUNITY AND ENVIRONMENT

The student will be critically aware of -
a) the impact of natural science activities (especially those of the specific discipline) on the community and the environment;
b) the necessity to take into account in natural science activities
• the impact of technology on the community and
• the personal, social and cultural values and expectancies of those people on whom scientific activities have an influence.

IMPAK VAN NATUURWETENSKAPLIKE AKTIWITEIT OP DIE GEMEENSKAP EN DIE OMGEWING

Die student is krities bewus van
a) die impak van natuurwetenskaplike aktiwiteit (veral dié van die besondere dissipline) op die gemeenskap en die omgewing;
b) die noodsaaklikheid om by natuurwetenskaplike aktiwiteite
• *die impak van tegnologie op die gemeenskap, en*
• *die persoonlike, sosiale, en kulturele waardes en verwagtinge van diegene wat deur wetenskaplike aktiwiteite geraak word, in ag te neem.*

TEAM AND MULTIDISCIPLINARY WORK

At the end of the studies the student will be able to work ef-fectively as an individual, in teams and in multidisciplinary environments and to exercise leadership and other critical functions.

SPAN- EN MULTIDISSIPLINÊRE WERK

Aan die einde van die studie is die student in staat om effektief as individu, in spanne en in multidissiplinêre omgewings te werk en leiers- en ander kritiese funksies te verrig.

LIFELONG LEARNING

The student understands the necessity to ensure continuing competency and to remain at the forefront of the latest tech-nology and techniques, and he/she will have the ability to stay involved in lifelong learning by means of well-developed learning skills.

LEWENSLANGE LEER

Die student verstaan die noodsaaklikheid om voortgesette bekwaamheid te verseker en om aan die voorpunt van die jongste tegnologie en tegnieke te bly, en is in staat om in lewenslange leer deur goed ontwikkelde leervaardighede betrokke te bly.

PROFESSIONAL ETHICS AND PRACTICE

The student is critically aware of the necessity to act in a pro-fessional and ethical way and to assume responsibility within his/her own limitations and skills, while he/she is able to make judgements according to his/her knowledge and experience. Articulation possibilities

a) On successfully completing the Hons BSc programme the student may be admitted to further learning for the MSc degree in an appropriate and approved programme. Pro-gramme specific articulation possibilities, if any will be stated in the description of the relevant curricula.

b) Credits will be awarded for modules from other faculties and institutions, on condition that the outcomes and total credit requirements for this programme are totally met with.

c) The basic and applied skills acquired by the student with this qualification in one of the disciplines in which it may be taken will equip him/her to continue with further learning in several specialist areas at other universities

PROFESSIONELE ETIEK EN PRAKTYK

Die student is krities bewus van die noodsaaklikheid om professioneel en eties op te tree en om verantwoordelikheid binne eie beperkings en vaardighede te aanvaar, en is in staat om oordele te vel in verhouding tot kennis en ervaring.
Artikulasiemoontlikhede:

a) Na die suksesvolle voltooiing van die Hons BSc program kan die student toegelaat word tot verdere leer vir die MSc -graad in 'n toepaslike en goedgekeurde rigting. Programspesifieke artikulasiemoontlikhede, indien enige, sal by die betrokke kurrikulums vermeld word.

b) Krediet sal verleen word vir modules van ander fakulteite en inrigtings, op voorwaarde dat die uitkoms- en totale kredietvereistes vir hierdie program as geheel nagekom word.

c) Met die basiese en toepasbare vaardighede wat die student met hierdie kwalifikasie in die verskillende dissiplines waarvoor dit verwerf kan word, opgedoen het, sal die student toegerus wees om met verdere leer voort te gaan in verskeie spesialisasiegebiede aan ander inrigtings.

NAS.6.2 EXAMINATION / EKSAMINERING

The examination opportunities and relevant related rules apply in congruence with General Rule 3.5. */ Die eksamengeleenthede en verbandhoudende reëls geskied in ooreenstemming met Algemene Reël 3.5.*

Composition Of The Participation Mark / *Samestelling Van Die Deelnamepunt*

A participation mark for a module (General Rule 3.5) can be compiled from tests, worksheets and other forms of evaluation*. / 'n Deelnamepunt vir 'n module (Algemene Reël 3.5) kan saamgestel word uit toetse, werkstukke en ander vorms van evaluering.*

Module Mark / *Modulepunt*

The module mark (General Rule 2.4.2) is calculated in the ratio that is applied where the evaluation method is applicable on a specific module combined, as is in the study guide of that module / *Die modulepunt (Algemene Reël 2.4.2) word bereken in die verhouding waarin evalueringsmetodes van toepassing vir 'n spesifieke module gekombineer word, soos in die studiegids vir die module uiteengesit.*

Pass Requirements / *Slaagvereistes*

a) The stipulations of General Rule 3.6 applies*. / Die bepalings van Algemene Reël 3.6 is van toepassing.*

b) The subminimum of the exam, for all modules wherein exam is written, is 40%. / *Die subminimum in die eksamen, vir alle modules waarin eksamen geskryf is, is 40%.*

c) The pass requirement for a module is a module mark of 50%. / *Die slaagvereiste vir 'n module is 'n modulepunt van 50%.*

d) A programme is passed by passing every module that the programme consists of respectively */ 'n Program word geslaag deur al die modules waaruit die program saamgestel is, afsonderlik te slaag.*

e) A module is passed with distinction if a pass mark of at least 75% is acquired. The degree is passed with distinction if the average module mark, weighed according to credit marks of every module in the curriculum, is at least 75%*. / 'n Module word met onderskeiding geslaag indien 'n modulepunt van minstens 75% behaal is. Die graad word met onderskeiding geslaag indien die gemiddelde punt, geweeg volgens die kredietpunte van elke module in die kurrikulum, minstens 75 % is.*

Number Of Exam Opportunities For Repeating Of Modules / *Aantal Eksamengeleenthede En Herhaling Van Modules*

A once off repeating of modules that are not passed, as well as further examination opportunities, only occurs according to the stipulations of General Rule 3.5.2./ *2.*

NAS.6.3 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN AGRICULTURAL ECONOMICS / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN LANDBOU-EKONOMIE*

CURRICULUM: N602M

CODE: **276 103**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programp: Honours Bachelor of Science in Agriculture in Agricultural Economics / *Honneurs Baccalaureus Scientiae in Landbou in Landbou-Ekonomie*

Module code		Credits
1 Semester		
ECOM611	Agric Business Management	18
ECOM612	Agric Organization and Administration	18
ECOM613	Land Resource Economics	18
ECOM614	Agric Finance Management	18
ECOM615	Introduction to Linear Programming	18
Total 1st semester		**90**
2 Semester		
ECOM621	Food Security and Policy Analysis	18
ECOM622	Introduction to Econometrics	18
ECOM623	Research Project	18
Total 2nd semester		**54**
Total number of credits		**144**

NAS.6.4 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN AGRICULTURAL EXTENSION / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN LANDBOU-EKONOMIE*

CURRICULUM: N603M

CODE: **276 104**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Agriculture in Agricultural Extension / *Honneurs Baccalaureus Scientiae in Landbou in Landbou-Ekonomie*

Module code		Credits
1 Semester		
EXTM611	Agric Extension Analysis	18
EXTM612	Issues in Agric Development	18
EXTM613	Res Meth in Extension	18
EXTM614	Farm System Analysis	18
Total 1st semester		**72**
2 Semester		
EXTM621	Programme Planning and Evaluation Extension	18
EXTM622	Com Agric Techn Trans	18
EXTM623	Human Resource Development	18
EXTM624	Research Project	18
Total 2nd semester		**72**
Total number of credits		**144**

NAS.6.1 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL HEALTH / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN DIEREGESONDHEID*

CURRICULUM: N605M

CODE: 276 100

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Agriculture in Animal Health / *Honneurs Baccalaureus Scientiae in Landbou in Dieregesondheid*

Module code		Credits
1 Semester		
AHAM611	Diseases I	12
AHAM612	Adv App Vet Science I	12
AHAM613	Research Mathadology	6
AHAM614	Vet External Parasites	12
AHAM615	Research Project I	6
Total 1st semester		**48**
2 Semester		
AHAM621	Vet Immunology	12
AHAM622	Vet Internal Parasites	18
AHAM623	Adv App Vet Science II	12
AHAM624	Molecular Biology II	12
AHAM625	Research Project II	18
Total 2nd semester		**72**
Total number of credits		**120**

NAS.6.2 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL SCIENCE / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN DIEREWETENSKAP*

CURRICULUM: N605M

CODE: **276 101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Agriculture in Animal Science / *Honneurs Baccalaureus Scientiae in Landbou in Dierewetenskap*

Module code	Descriptive name	Credits
1 Semester		
Semester1: Compulsary		
ASCM616		24
Electives depends on the area of specialisation		
FSCM 611	Agricultural Statistics	12
ASCM 612	Pasture Management	12
ASCM 613	Crop and Qyantitative Genetics	12
ASCM 614	Ruminant Prod Science	12
ASCM 615	Feed Evaluation & Feeding Practices	12
2 Semester		
Semester II: Compulsary		
ASCM626	Research Project	24
Electives depends on the area of specialisation		
ASCM 621	Rangeland (Veld) Management	12
ASCM 622	Conservation & Management Of Wildlife	12
ASCM 623	Advanced Livestock Breeding	12
ASCM 624	Monosgastric Animal Prod	12
ASCM 625	Digestive Physiology	12
Total number of credits		**120**

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NAS.6.3 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL HEALTH / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN DIERE-GESONDHEID*

CURRICULUM: N660M

CODE: **276 101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Agriculture in Animal Health / *Honneurs Baccalaureus Scientiae in Landbou in Diere-Gesondheid*

Module code		**Credits**
1 Semester		
Semester1: Compulsary		
ASCM612	Pasture Management	12
FSCM611	Agricultural Statistics	12
ASCM616	Research Project	24
Any one of the following electives		
ASCM 613	Crop and Qyantitative Genetics	12
ASCM 614	Ruminant Prod Science	12
ASCM 615	Feed Evaluation & Feeding Practices	12
2 Semester		
Semester II: Compulsary		
ASCM621	Rangeland (Veld) Management	12
ASCM626	Research Project	24
Any two of the following electives		
ASCM 623	Advanced Livestock Breeding	12
ASCM 624	Monosgastric Animal Prod	12
ASCM 625	Digestive Physiology	12
Total number of credits		**120**

NAS.6.4 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL HEALTH / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN DIERE-GESONDHEID*

CURRICULUM: N661M

CODE: **276 101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program Honours Bachelor of Science Agricultural in Animal Health / *Honneurs Baccalaureus Scientiae in Landbou in Diere-Gesondheid*

Module code	Descriptive name	Credits
1 Semester		
Semester1: Compulsary		
ASCM613	Crop and Qyantitative Genetics	12
FSCM611	Agricultural Statistics	12
ASCM616	Research Project	24
Any one of the following electives		
ASCM 612	Pasture Management	12
ASCM 614	Ruminant Prod Science	12
ASCM 615	Feed Evaluation & Feeding Practices	12
2 Semester		
Semester II: Compulsary		
ASCM623	Advanced Livestock Breeding	12
ASCM626	Research Project	24
Any two of the following electives		
ASCM 621	Rangeland (Veld) Management	12
ASCM 624	Monosgastric Animal Prod	12
ASCM 625	Digestive Physiology	12
Total number of credits		**120**

NAS.6.5 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL HEALTH / *HONNEURS BACCALAUREUS SCINETIAE IN LANDBOU IN DIEREGESONDHEID*

CURRICULUM: N662M

CODE: **276 101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science Agricultural in Animal Health / *Honneurs Baccalaureus Scientiae in Landbou in Diere-Gesondheid*

Module code	Descriptive name	Credits
1 Semester		
Semester1: Compulsary		
ASCM614	Ruminant Prod Science	12
FSCM611	Agricultural Statistics	12
ASCM616	Research Project	24
Any one of the following electives		
ASCM 612	Pasture Management	12
ASCM 613	Crop and Qyantitative Genetics	12
ASCM 615	Feed Evaluation & Feeding Practices	12
2 Semester		
Semester II: Compulsary		
ASCM624	Monosgastric Animal Prod	12
ASCM626	Research Project	24
Any two of the following electives		
ASCM 621	Rangeland (Veld) Management	12
ASCM 623	Advanced Livestock Breeding	12
ASCM 625	Digestive Physiology	12
Total number of credits		**120**

NAS.6.6 HONOURS BACHELOR OF SCIENCE IN AGRICULTURE IN ANIMAL HEALTH / *HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU IN DIEREGESONDHEID*

CURRICULUM: N663M

CODE: **276 101**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Agricultural in Animal Health / *Honneurs Baccalaureus Scientiae in Landbou in Dieregesondheid*

Module code		**Credits**
1 Semester		
Semester1: Compulsary		
ASCM615	Feed Evaluation & Feeding Practices	12
FSCM611	Agricultural Statistics	12
ASCM616	Research Project	24
Any one of the following electives		
ASCM 612	Pasture Management	12
ASCM 613	Crop and Qyantitative Genetics	12
ASCM 614	Ruminant Prod Science	12
2 Semester		
Semester II: Compulsary		
ASCM625	Digestive Physiology	12
ASCM626	Research Project	24
Any two of the following electives		
ASCM 621	Rangeland (Veld) Management	12
ASCM 623	Advanced Livestock Breeding	12
ASCM 624	Monosgastric Animal Prod	12
Total number of credits		**120**

NAS.6.7 HONOURS BACHELOR OF SCIENCE IN AGRICULTURAL IN CROP SCIENCE */ HONNEURS BACCALAUREUS SCIENTIAE IN LANDBOU EN GEWASWETENSKAP*

CURRICULUM: N606M

CODE: **276 102**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science Agricultural in Crop Science */ Honneurs Baccalaureus Scientiae in Landbou en Gewaswetenskap*

Module code		**Credits**
1 Semester		
Compulsary		
FSCM611	Agricultural Statistics	12
Electives		
PCPM611	Selected Topic In Crop Science/Research Project I	24
PCPM612	Applied Crop Physiology	12
PCPM613	Crop Protection	12
PCPM614	Agro-Meteorology	12
PSRM612	Soil Microbiology	12
PSRM613	Land and Water Management	12
2 Semester		
Compulsary		
PCPM625	Selected Topic In Crop Science/Research ProjectsII	24
EXTM622	Com Agric Techn Trans	18
PCPM621	Crop Production Systems	12
PCPM622	Soil Plant Water Relations	12
PCPM623	Horticultural Science	12
PCPM624	Advanced Plant Breeding	12
PSRM622	Soil Classification And Land Use Planning	12
PSRM623	Irrigation Management	12
Total number of credits		**120**

NAS.6.1 BACHELOR OF SCIENCE HONOURS IN APPLIED RADIATION SCIENCE / *BACCALAUREUS SCIENTIAE HONNEURS IN TOEGEPASTE STRALINGSWETENSKAP*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N609M

CODE: **202 145**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program Honours Bachelor of Science in Applied Radiation Science / *Baccalaureus Scientiae Honneurs in Toegepaste Stralingswetenskap*

Module code	Descriptive name	Credits
1 Semester		
ARSM611	Nuclear Physics	24
ARSM612	Nuclear Chemistry	24
ARSM671	Research Project	32
Total 1 Semester		**80**
2 Semester		
MARS621	Radiation and Environment	24
MARS622	Radioactive Waste Minimisation and Management	24
Total 2 Semester		**48**
Total number of credits		**128**

NAS.6.2 BACHELOR OF SCIENCE HONOURS IN APPLIED RADIATION SCIENCE / *BACCALAUREUS SCIENTIAE HONNEURS IN TOEGEPASTE STRALINGSWETENSKAP*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2EK L01 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full Time

Compilation of new programme: Bachelor Of Science Honours in Applied Radiation Science / *Baccalaureus Scientiae Honneurs in Toegepaste Stralingswetenskap*

Module code	Descriptive name	Credits
1 Semester		
ARSM611	Nuclear Physics	24
ARSM612	Nuclear Chemistry	24
ARSM673	Research Project	32
Total 1 Semester		**80**
2 Semester		
MARS621	Radiation and Environment	24
MARS622	Radioactive Waste Minimisation and Management	24
Total 2 Semester		**48**
Total number of credits		**128**

NAS.6.3 HONOURS BACHELOR OF SCIENCE IN BIOLOGY / *HONNEURS BACCALAUREUS SCIENTIAE IN BIOLOGIE*

OLD PROGRAMME (PHASING OUT)
PROGRAMME WILL CHANGE TO BACHELOR OF SCIENCE HONOURS IN BOTANY

CURRICULUM: N610M

CODE: **202 141**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Biology / *Honneurs Baccalaureus Scientiae In Biologie*

Module code	Descriptive name	Credits
1 Semester		
CNRM615	Conservation of natural resources	24
PTSM618	Higher Plant Taxonomy And Systematics	24
Total 1 Semester		**48**
2 Semester		
CNRM625	Further conservation of natural resources	24
PTSM628	Further Higher Plant Taxonomy And Systematics	24
RESM671	Project	24
Total 2 Semester		**72**
Total number of credits		**120**

NAS.6.4 BACHELOR OF SCIENCE HONOURS IN BOTANY / *BACCALAUREUS SCIENTIAE HONNEURS IN PLANTKUNDE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

HONOURS BACHELOR OF SCIENCE BIOLOGY HAS CHANGED TO BACHELOR OF SCIENCE HONOURS BOTANY

CODE: **2EL L01 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full Time

Compilation of new programme: Bachelor of Science Honours in Botany / *Baccalaureus Scientiae Honneurs In Plantkunde*

Module code	Descriptive name	Credits
1 Semester		
NRCM611	Conservation of natural resources	24
PTSM618	Higher Plant Taxonomy And Systematics	24
Total 1 Semester		**48**
2 Semester		
NRCM621	Further conservation of natural resources	24
PTSM628	Further Higher Plant Taxonomy And Systematics	24
RESM672	Project	32
Total 2 Semester		**80**
Total number of credits		**128**

NAS.6.5 HONOURS BACHELOR OF SCIENCE IN BIOLOGY / *HONNEURS BACCALAUREUS SCIENTIAE IN BIOLOGIE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N664M

CODE: **202 141**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Program: Honours Bachelor of Science in Biology / *Honneurs Baccalaureus Scientiae in Biologie*

Module code	Descriptive name	Credits
1 Semester		
BMCM622	Environmental And Industrial Microbiology	24
ENTM616	Applied Entomology	24
PARM617	Parasitology	24
Total 1 Semester		**72**
2 Semester		
BEHM622	Further Animal Behaviour	24
PARM627	Ecological Parasitology	24
RESM671	Project	24
Total 2 Semester		**72**
Total number of credits		**144**

NAS.6.6 BACHELOR OF SCIENCE HONOURS IN BIOCHEMISTRY / *BACCALAUEUS SCIENTIAE HONNEURS IN BIOCHEMIE*

Admission requirements for the programme / *Toelatingsvereistes vir program*

Students may be admitted to the Honours qualification in Biochemistry given that they are in possession of a BSc degree with Biochemistry passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential / *Studente kan tot die Honnours kwalifikasie in Biochemie toegelaat word indien hul n BSc graad met Biochemie op NQF vlak 7 geslaag het met ten minste 60%. Keuring vind plaas op grond van die student se akademiese rekord, vorige leer asook die student se agtergrond en potensiaal.*

CODE: 2DW L01 N601P/M

CAMPUS: Mafikeng / *Potchefstroom*

DELIVERY MODE: Full Time / *Voltyds*
Compilation of new programme: Bachelor of Science Honours in Biochemistry ***Samestelling van die nuwe program Baccalureus Scientiae Honneurs in Biochemie***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
BCHN611	Analytical Biochemistry / Analitiese Biochemie	24
BCHN612	Advanced Metabolism / Gevorderde Metabolisme	24
2 Semester		
BCHN621	Advanced Molecular Biology / Gevorderde Molekulêre Biologie	24
Choose either of the following modules:		
BCHN622 **	Bioenergetics / Bio-energetika	24
BCHN623 *	Advanced Drug Discovery	24
Year Module		
BCHN671	Biochemistry Research Project / *Biochemie Navorsingsprojek*	32
	Total number of credits / Totale krediete	**128**

* Offered at Mafikeng
** Offerred at Potchefstroom / *Aangebied Potchefstroom*

NAS.6.7 HONOURS BACHELOR OF SCIENCE IN MICROBIOLOGY / *HONNEURS BACCALAUREUS SCIENTIAE IN MIKROBIOLOGIE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM*:* N640P

CODE: **202 143**

CAMPUS: Mafikeng (English)

DELIVERY MODE*:* Full time

Compilation of old Program: Honours Bachelor of Science in Microbiology / *Honneurs Baccalaureus Scientiae in Mikrobiologie*

Module code		Credits
1 Semester		
BMCM 613	Bacteriology	24
BMCM 614	Virology And Immunology	24
Total 1st semester		**48**
2 Semester		
RESM 671	Project	24
BMCM 621	Mycology	24
BMCM 622	Environmental And Industrial Microbiology	24
Total 2st semester		72
Total number of credits		**120**

NAS.6.8 BACHELOR OF SCIENCE HONOURS IN MICROBIOLOGY / *BACCALAUREUS SCIENTIAE HONNEURS IN MIKROBIOLOGIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2ES L01 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full Time

Compilation of new programme: Bachelor of Science Honours in Microbiology / *Baccalaureus Scientiae Honneurs in Mikrobiologie*

Module code		Credits
1 Semester		
BMCM 613	Bacteriology	24
BMCM 614	Virology And Immunology	24
Total 1st semester		**48**
2 Semester		
RESM 672	Project	32
BMCM 621	Mycology	24
BMCM 622	Environmental And Industrial Microbiology	24
Total 2st semester		80
Total number of credits		**128**

NAS.6.9 HONOURS BACHELOR OF SCIENCE IN CHEMISTRY / *HONNEURS BACCALAUREUS SCIENTIAE IN CHEMIE*

OLD PROGRAMME (PHASING OUT) / *OU KURRICULUM (FASEER UIT)*

CURRICULUM*:* **202-117**

CODE: **N623M**

CAMPUS: Mafikeng (English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time

Compilation of old Program: Honours Bachelor of Science in Chemistry / *Honneurs Baccalaureus Scientiae in Chemie*

Module code		Credits
1 Semester		
MCHE611	Physical Chemistry I	12
MCHE612	Inorganic Chemistry I	12
MCHE613	Organic Chemistry I	12
MCHE614	Analytical Chemistry I	12
Total 1 Semester		**48**
2 Semester		
MCHE625	Physical Chemistry II	12
MCHE626	Inorganic Chemistry II	12
MCHE627	Organic Chemistry II	12
MCHE628	Analytical Chemistry II	12
MCHE671	Research Project	36
Total 2 Semester		**72**
Total number of credits		**132**

OLD PROGRAMME (PHASING OUT) / *OU KURRICULUM (FASEER UIT)*

CURRICULUM/*KURRIKULUM*: 202-117

CODE/*KODE*: N651P

CAMPUS/ *KAMPUS*: Potchefstroom (Afrikaans / English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time

Compilation of old Program: Honours Bachelor of Science in Chemistry / *Honneurs Baccalaureus Scientiae in Chemie*

Module code	Descriptive name	Credits
First Semester		
CHEN611	Advanced organic chemistry	16
CHEN612	Advanced physical chemistry	16
CHEN613	Advanced inorganic chemistry	16
CHEN614	Molecular modelling	8
CHEN671	Project	48
Second Semester		
Select THREE of the following optional modules in consultation with the subject chairperson:		
CHEN621	Homogeneous catalysis	8
CHEN622	Coal chemistry	8
CHEN623	Membrane science and technology	8
CHEM621	Polymer chemistry	8
CHEM622	Advanced structural elucidation	8
CHEM623	Environmental chemistry	8
CHEM624	Techniques for organic synthesis	8
CHEM626	Electrochemistry	8
Total number of credits		**128**

NAS.6.10 BACHELOR OF SCIENCE HONOURS IN CHEMISTRY / *BACCALAUREUS SCIENTIAE HONNEURS IN CHEMIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Programme outcomes / *Programuitkomstes*

This curriculum is designed in view of training chemists as natural scientists. / Hierdie program is ontwerp met die oog op die opleiding van chemici as Natuurwetenskaplike.

Admission requirements for the programme / Toelatingsvereistes vir program

Admission to the Honours programme is open to approved students who have been awarded a BSc degree with Chemistry at NQF level 7. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe. With the permission of the Senate, candidates not in possession of the qualifying courses may be considered, provided they undertake to complete prescribe introductory courses. / *Toelating tot die Honneursprogram is oop vir goedkeurde student wat 'n BSc grad in Chemie het met 'n NKR vlak 7. Die Senaat kan vereis dat enige kandidaat, voor toelating tot die Honneursprogram, verplig word om enige voorgraadse kursus of dele van 'n baccalaureus kurrikulum te neem soos deur 'n Senaatsbesluit voorgeskryf. Met die toestemming van die Senaat, kan kandidate wat nie in besit is van die kwalifiserende kursusse nie, oorweeg word, indien hulle onderneem om die voorgeskrewe inleidende kursusse.*

Programme outcomes/Programuitkomste:

This programme is designed to train chemists as natural scientists. / *Hierdie program is vir die opleiding van chemici as natuurwetenskaplikes ontwerp.*

CODE/*KODE:* **2GH L01 N601P/M**

CAMPUS/*KAMPUS*: **Mafikeng / Potchefstroom** (Afrikaans / English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full Time / *Voltyds*

Compilation of new programme: Bachelor of Science Honours in Chemistry / *Samestelling van die nuwe program Baccalaureus Scientiae Honneurs in Chemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
NCHE611	Advanced Organic Chemistry / *Gevorderde Organiese Chemie*	16
NCHE612	Advanced Physical Chemistry / *Gevorderde Fisiese Chemie*	16
NCHE613	Advanced Inorganic Chemistry / *Gevorderde Anorganiese Chemie*	16
NCHE614	Advanced Analytical Chemistry / *Gevorderde Analitiese Chemie*	16
2 Semester		
Select FOUR of the following modules in consultation with the subject chairperson / *Kies VIER van die modules in konsultasie met die vakvoors:*		
NCHE621	Molecular Modelling / *Molekuulmodellering*	8
NCHE622	Polymer Chemistry / *Polimeerchemie*	8
NCHE623	Advanced Structural Eludidation / *Gevorderde strukstuuropklaring*	8
NCHE624	Environmental Chemistry / *Omgewingschemie*	8
NCHE625	Techniques for Organic Synthesis / *Tegnieke vir organiese sintese*	8
NCHE626	Electrochemistry / *Elektrochemie*	8
NCHE627	Homogeneous Catalysis / *Homogene katalise*	8
NCHE628	Coal Chemistry / *Steenkoolchemie*	8
NCHE629	Membrane Science and Technology / *Membraanwetenskap -en tegnologie*	8
NCHE672	Electronic Structure Methods and Solvation Models /	8
NCHE673	Thermodynamics of Solutions	8
NCHE674	Applied Materials Chemistry	8
NCHE675	Introduction to Nanomedicine	8
NCHE676	Natural Products in Drug Discovery	8
NCHE677	Electrochemical Sensors	8
Year module / Jaar module		
NCHE671	Research Project / Navorsingsprojek	32
Total credits / *Totale krediete*		**128**

NAS.6.11 HONOURS BACHELOR OF SCIENCE COMPUTER SCIENCE / *HONNEURS BACCALAUREUS SCIENTIAE IN REKENAARWETENSKAP*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N612M

CODE: **202-142**

CAMPUS: M**afikeng (**English)

DELIVERY MODE: F**ull time**

Compilation of old Programme: Honours Bachelor of Science in Computer Science / ***Honneurs Baccalaureus Scientiae in Rekenaarwetenskap***

Module code	Descriptive name	Credits
1 Semester		
COMPULSORY		
CISM 671		24
ELECTIVES		
CISM 611	Alogrithms and Data Structures	24
CISM 612	programming Languages and Objects	24
CISM 613	Operating Systems	24
Total 1st semester		60
2 Semester		
ELECTIVES		
CISM 624	Net-Centric Computing	24
CISM 625	Databases	24
CISM 626	Artificial Intelligence	24
Total 2nd semester		**60**
Total number of credits		**120**

NAS.6.12 BACHELOR OF SCIENCE HONOURS IN COMPUTER SCIENCE / *HONNEURS BACCALAUREUS SCIENTIAE IN REKENAARWETENSKAP*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2EM L01 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of new programme: Bachelor of Science Honours in Computer Science / *Honneurs Baccalaureus Scientiae in Rekenaarwetenskap*

Module code	Descriptive name	Credits
1 Semester		
Compulsory		
CISM 670	Reseach Project	16
CISM 614	Algorithms and Data Structures	16
CISM 615	Programming Languages and Objects	16
CISM 616	Operating Systems	16
Total 1st semester		64
2 Semester		
CISM 670	Research Project	16
CISM 621	Advanced Data Base Systems	16
CISM 622	Databases	16
CISM 623	Machine Learning	16
Total 2nd semester		**64**
Total number of credits		**128**

NAS.6.13 HONOURS BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND INFORMATION SYSTEMS / HONNEURS *BACCALAUEUS SCIENTIAE IN REKENAARWETENSKAP EN INLIGTINGSTELSELS*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N653P

CODE/*KODE:* **202-134**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans / English)

DELIVERY MODE/ *AFLEWERINGSMETODE*: **Full time/*Voltyds***

Compilation of old Programme: Honours Bachelor of Science in Computer Science and Information Systems / Honneurs *Baccalaueus Scientiae in Rekenaarwetenskap en Inligtingstelsels*

Module code	Descriptive name	Credits
1 Semester		
ITRI671	Project	32
And FOUR of the following modules in consultation with the school director:		
ITRI611	Data Warehouses I	12
ITRI612	Linear Programming I	12
ITRI613	Databases I	12
ITRI614	Information Systems Engineering I	12
ITRI615	Computer Security I	12
ITRI616	Artificial Intelligence I	12
ITRI617	Image Processing I	12
ITRI618	Decision Support Systems I	12
1 Semester		
And FOUR of the following modules in consultation with the school director:		
ITRI621	Data Warehouses II	12
ITRI622	Linear Programming II	12
ITRI623	Databases II	12
ITRI624	Information Systems Engineering II	12
ITRI625	Computer Security II	12
ITRI626	Artificial Intelligence II	12
ITRI627	Image Processing II	12
ITRI628	Decision Support Systems II	12
	Elective module*	12
Total number of credits of this curriculum		128

CURRICULUM: N653V

CODE: **202-134**

CAMPUS: VAAL-TRIANGLE**(**English)

DELIVERY MODE: **Full time and Part-time**

Compilation of old programme Honours Bachelor of Science in Computer Science and Information Systems / ***Honneurs Baccalaueus Scientiae in Rekenaarwetenskap en Inligtingstelsels***

Module code	Descriptive name	**Ct**
First Semester		
**ITRI612*	**Linear Programming I*	**12*
**ITRI617*	**Image Processing I*	**12*
ITRI611	Data Warehouses I	12
ITRI613	Databases I	12
ITRI614	Information Systems Engineering I	12
ITRI615	Computer Security I	12
ITRI616	Artificial Intelligence I	12
ITRI618	Decision Support Systems I	12
ITRI671	Project	32
Second Semester		
**ITRI622*	**Linear Programming II*	**12*
**ITRI627*	**Image Processing II*	**12*
ITRI621	Data Warehouses II	12
ITRI623	Databases II	12
ITRI624	Information Systems Engineering II	12
ITRI625	Computer Security II	12
ITRI626	Artificial Intelligence II	12
ITRI628	Decision Support Systems II	12
Credit total for the curriculum		**128**

Please note: ***An asterisk (*) indicates that the module won't be offered in 2018 at the VTC campus***

NAS.6.14 BACHELOR OF SCIENCE HONOURS IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY WITH COMPUTER AND INFORMATION SYSTEMS / *BACCALAUEUS SCIENTIAE HONNEURS IN REKENAARWETENSKAP EN INLIGTINGSTEGNOLOGIE MET REKENAAR- EN INLIGTINGSTELS*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir program*:

This curriculum grants admission to MSc studies in Computer Science and Information Systems / *Hierdie kurrikulum gee toelating tot MSc-studie in Rekenaarwetenskap en Inligtingstelsels*

Curriculum requirements / Kurrikulum vereistes:

Students may be admitted to the Honours qualification in Computer Science and Information Technology given that they are in possession of a BSc degree with Computer Science and Information Technology passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential

CODE/*KODE:* **2EN L01 N601P / 2EN L01 N601V**

CAMPUS/*KAMPUS*: Potchefstroom / Vaaldriehoek(Afrikaans / English)

DELIVERY MODE/ *AFLEWERINGSMETODE*: Full time/*Voltyds*

Compilation of new Programme: Bachelor of Science Honours in Computer Science and Information Technology with Computer and Information Systems ***/ Baccalaueus Scientiae Honneurs in Rekenaarwetenskap en Inligtingstegnologie met Rekenaar- en Inligtingstels***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
Select FOUR of the following modules in consultation with the subject chairperson / ***Kies VIER van die modules in konsultasie met die vakvoorsitter:***		
ITRI611	Data Warehouses I / *Datapakhuise I*	12
ITRI612*	Linear Programming I / *Lineêre Programmering I*	12
ITRI613	Databases I / *Databasisse I*	12
ITRI614	Information Systems Engineering I / *Inligtingstelselingenieurswese*	12
ITRI615	Computer Security I / *Rekenaarsekuriteit I*	12
ITRI616	Artificial Intelligence I / *Kunsmatige Intelligensie I*	12
ITRI617*	Image Processing I / *Beeldverwerking I*	12
ITRI618	Decision Support Systems I / *Besluitsteunstelsels I*	12
2 Semester		
Select FOUR of the following modules in consultation with the subject chairperson /*Kies VIER van die modules in konsultasie met die vakvoorsitter:*		
ITRI621	Data Warehouses II / *Datapakhuise II*	12
ITRI622*	Linear Programming II / *Lineêre Programmering II*	12
ITRI623	Databases II / *Databasisse II*	12
ITRI624	Information Systems Engineering II / *Inligtingstelselingenieurswese II*	12
ITRI625	Computer Security II / *Rekenaarsekuriteit II*	12
ITRI626	Artificial Intelligence II / *Kunsmatige Intelligensie II*	12
ITRI627*	Image Processing II / *Beeldverwerking II*	12
ITRI628	Decision Support Systems II / *Besluitsteunstelsels II*	12
Year module / Jaar module		
ITRI671	Project I / *Projek I*	32
Total number of credits / Totale krediete		**128**

Please note: An asterisk (*) indicates that the module won't be offered in 2018 at the VTC campus

NAS.6.15 HONOURS BACHELOR OF SCIENCE PHYSICS IN ELECTRONICS / *HONNEURS BACCALAUREUS SCIENTIAE IN FISIKA IN ELEKTRONIKA*

CURRICULUM: N613M

CODE: **202-146**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old programme: Honours Bachelor of Science in Electronics / *Honneurs Baccalaureus Scientiae in Fisika in Elektronika*

Module code		Credits
1 Semester		
ELYM 611	MicroprocessorSystems Design	18
ELYM 612	Signals and Systems	18
ELYM 613	Electronic Instrumentation	18
Total 1st semester		54
2 Semester		
ELYM 624	Computational Methods	18
ELYM 625	Embedded Controllers	18
ELYM 626	Electromagnetics	18
ELYM 671	Project	30
Total 2nd semester		**84**
Total number of credits		**138**

NAS.6.1 BACHELOR OF SCIENCE HONOURS IN PHYSICS WITH ELECTRONICS / *BACCALARUEUS SCIENTIAE HONNEURS IN FISIKA MET ELEKTRONIKA*

CODE: **2GJ L02 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of new programme: Honours Bachelor of Science in Physics with Electronics / *Baccalarueus Scientiae Honneurs in Fisika met Elektronika*

Module code		Credits
1 Semester		
ELEM 611	Embedded Systems	12
ELEM 612	Analogue Communication Systems	12
ELEM 613	Electronic Instrumentation	12
ELEM 614	Optoelectronics and Optical Communications Systems	12
Total 1st semester		48
2 Semester		
ELEM 625	Control Systems	12
ELEM 626	Engineering Electromagnetics	12
ELEM 627	Digital Communications Systems	12
ELEM 628	Power Electronics	12
ELEM 671	Project	24
Total 2nd semester		**72**
Total number of credits		**120**

NAS.6.2 HONOURS BACHELOR OF SCIENCE IN PHYSICS / *HONNEURS BACCALAUREUS SCIENTIAE IN FISIKA*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N616M

CODE: **202-144**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Bachelor of Science Honours Physics / *Honneurs Baccalaureus Scientiae in Fisika*

Module code		Credits
1 Semester		
Compulsary		
PHYM612	Quantum Mechanics	18
PHYM613	Classical Mechanics	18
PHYM614	Electromagnetism	18
Electives		
PHYM611	Statistical Mechanics	12
PHYM615	Nuclear Physics	12
Total 1 Semester		**66**
2 Semester		
Compulsary		
PHYM627	Computational Physics	24
PHYM628		24
Electives		
PHYM626	Solid State Physics	12
PHYM624		12
Total 2 Semester		**54**
Total number of credits		**120**

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N652P

CODE/*KODE:* **202-121**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time/Voltyds

Compilation of old Programme: Honours Bachelor of Science in Physics / Honneurs *Baccalaureus Scientiae in Fisika*

Module code	Descriptive name	Credits
First Semester		
FSKH611	Classical Mechanics / *Klassieke Meganika*	16
FSKH612	Quantum Mechanics I / *Kwantum Meganika I*	16
FSKH613	Electrodynamics / *Elektrodinamika*	16
FSKH614	Plasma Physics / *Plasmafisika*	16
FSKH671	Project I / *Projek I*	8
Second Semester		
FSKH621	Quantum Mechanics II / *Kwantum Meganika II*	16
FSKH622	Statistical Mechanics / *Statistiese Meganika*	16
FSKH623	Computer Physics (Research) / *Rekenaarfisika (Navorsing)*	16
FSKH672	Project II / *Projek II*	8
Total credits / *Totale krediete*		**128**

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

NAS.6.3 BACHELOR OF SCIENCE HONOURS IN PHYSICS / *BACCALAUREUS SCIENTIAE HONNEURS IN FISIKA*

Admission requirements for the programme / *Toelatingsvereiste vir die program:*

Admission to this Honours qualification is open to students who have been awarded a BSc degree with at least 60% for Physics as the major subject on NQF level 7. Candidates not in possession of the qualifying modules may be considered, provided they complete prescribed modules as prescribed by the Faculty Board./ *Vir toelating tot hierdie Honneurs kwalifikasie word 'n BSc graad met 'n minimum van 60% vir Fisika as hoof-module op NQF vlak 7 vereis. Kandidate wat nie die kwalifiseerde modules het nie, kan oorweeg word indien hul die voorgeskrewe modules voltooi soos voorgeskryf deur die Fakulteitsraad.*

CODE/*KODE*: 2GJ L01 N601P/M

CAMPUS/*KAMPUS*: Mafikeng / Potchefstroom(Afrikaans / English)

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/Voltyds

Compilation of new Programme: Bachelor Of Science Honours in Physics / *Samestelling van die program Baccalaureus Scientiae Honneurs in Fisika*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
NPHY611	Classical Mechanics / *Klassieke Meganika*	16
NPHY612	Quantum Mechanics I / *Kwantum Meganika I*	16
NPHY613	Electrodynamics / *Elektrodinamika*	16
2 Semester		
NPHY621	Statistical Mechanics / *Statistiese Meganika*	16
NPHY622	Computational Physics / *Rekenaarfisika*	16
Choose one of the following / *Kies een van die volgende* :		
NPHY623	Plasma Physics / *Plasmafisika*	16
NPHY624	Introduction to General Relativity / *Inleiding tot Algemene Relatiwiteit*	16
NPHY625	Introduction to Stellar Astrophysics / *Inleidende Sterre Astrofisika*	16
NPHY626	Nuclear Physics / *Kern Fisika*	16
NPHY627	Solid State Physics / *Vastetoestand Fisika*	16
NPHY628	Quantum Mechanics II / *Kwantum Meganika II*	16
Year module / *Jaar module*		
NPHY671	Research Project I / *Navorsingsprojek I*	32
Total number of credits / *Totale krediete*		**128**

NAS.6.4 HONOURS BACHELOR OF SCIENCE IN STATISTICS / HONNEURS *BACCALAUREUS SCIENTIAE IN STATISTIEK*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N654P

CODE/*KODE*: **202-135**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans / English)

DELIVERY MODE/*AFLEWERINGSMETODE*: **Full time/Voltyds**

Compilation of old Programme: Honours Bachelor of Science in Statistics / Honneurs *Baccalaureus Scientiae in Statistiek*

Module code	Descriptive name	Credits
First Semester		
STTN611	Research project I (practice directed)	16
STTN612	Statistical Data-analysis I: Models	12
STTN613	Resampling	12
And TWO modules, in consultation with the School director and the head of subject group Statistics, from the following list:		
STTN614	Statistical Inference	12
STTN615	Stochastic Processes I	12
STTN616	Nonparametric estimation methods	12
STTN617*	Mathematical and Computer-intensive methods I	12
STTN618**	Financial-driven Statistics I	12
Second Semester		
STTN621	Research project (Research journal directed)	16
STTN622	Statistical Data-analysis II: Time Series	12
STTN623	Multivariate Statistics	12
And TWO modules, in consultation with the School director and the head of subject group Statistics, from the following list:		
STTN624	Discrete Data-analysis	12
STTN625	Stochastic Processes II	12
STTN626	Probability Theory	12

STTN627*	Mathematical and Computer-intensive methods II	12
STTN628**	Financial-driven Statistics II	12
Total number of credits of this curriculum		**128**

* Choose subject in consultation with the school director and subject chairperson on honours level, one of the following modules for the first or second semester from N653P or N601P

** Choose subject in consultation with the school director and subject chairperson on honours level, one of the following modules for the first or second semester from N609P, N610P or N611P or N612P.

NAS.6.5 BACHELOR OF SCIENCE HONOURS IN MATHEMATICAL STATISTICS / *BACCALAUREUS SCIENTIAE HONNEURS IN WISKUNDIGE STATISTIEK*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

This curriculum N654P grants admission to MSc studies in Mathematical Statistics / Die kurrikulum N654P gee toelating tot MSc-studie in Wiskundige Statistiek

Admission requirements for the programme/ Toelatingsvereistes tot die program:

Admission to the Honours programme is open to approved students who have been awarded a Bachelor of Science with Mathematical Statistics as one of the majors, or a qualification designated by the Senate as equivalent. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, as may be determined by Senate, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe. With the permission of the Senate, candidates not in possession of the qualifying courses may be considered, provided they undertake to complete prescribe introductory courses. / *Toelating tot die Honneursprogram is moontlik vir goedgekeurde studente wat 'n Baccalaureus Scientiae graad het met Wiskundige Statistiek as een van hul hoofvakke, of 'n kwalifikasie wat deur die Senaat as gelykwaardig aangewys is. Die Senaat mag enige kandidaat vereis om, alvorens hy tot die Honneursprogram toegelaat word, die voorgraadse kursusse of gedeelte van kursusse van 'n Baccalaureusgraad wat die senaat mag voorskryf, by te woon en te voltooi, soos deur die Senaat vasgestel. Met toestemming van die Senaat kan kandidate wat nie oor die kwalifiserende kursusse beskik nie, oorweeg word, mits hulle onderneem om die voorgeskrewe inleidende kursusse te voltooi.*

CODE/*KODE*: **2GD L01 N601P**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans / English)
DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/Voltyds
Compilation of new Programme: Bachelor of Science Honours in Mathematical Statistics / *Samestelling van die nuwe program Baccalaureus Scientiae Honneurs in Wiskundige Statistiek*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
STTN612	Statistical Data-analysis I: Models	12
And THREE modules, in consultation with the School director and the head of subject group Statistics, from the following list / *en DRIE modules in oorleg met die Skooldirekteur en vakgroepvoorsitter uit die volgende lys:*		
STTN613	Resampling	12
STTN614	Statistical Inference	12
STTN615	Stochastic Processes I	12
STTN617	Mathematical and Computer-intensive methods I	12
STTN618	Financial-driven Statistics I	12
STTN619	Nonparametric methods	12
2 Semester		
STTN622	Statistical Data-analysis II: Time Series	12
STTN623	Multivariate Statistics	12
And TWO modules, in consultation with the School director and the head of subject group Statistics, from the following list / *en TWEE modules in oorleg met die Skooldirekteur en vakgroepvoorsitter uit die volgende lys:*		
STTN624	Discrete Data-analysis	12
STTN625	Stochastic Processes II	12
STTN626	Probability Theory	12
STTN627	Mathematical and Computer-intensive methods II	12
STTN628	Financial-driven Statistics II	12
Year module / Jaar module		
STTN671	Project / Projek	32
Total number of credits / Totale krediete		**128**

NAS.6.6 HONOURS BACHELOR OF SCIENCE IN APPLIED MATHEMATICS / HONNEURS *BACCALAUREUS SCIENTIAE IN TOEGEPASTE WISKUNDE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N609M

CODE: **202-140**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old programme: Honours Bachelor of Science in Applied Mathematics / *Samestelling van die ou program Honneurs Baccalareus Scientiae in Toegepaste wiskunde*

Module code		Credits
1 Semester		
COMPULSORY		
APMM 616	Fluid Dynamics I	18
MAYM 612	Theory Of Ordinary Differential Equations	18
ELECTIVES – Choose one of the following		
APMM 611	Fluid Dynamics I	18
APMM 612	Financial Modelling II	18
APMM 614	Financial Modelling I	18
APMM 615	Fluid Dynamics Ii	18
APMM 613	Numerical Analysis	18
2 Semester		
COMPULSORY		
APMM 625	Project	30
ELECTIVES (2 electives are to be chosen)		
APMM 621	Symmetries Of Differential Equations II	18
APMM 622	Advanced Numerical Analysis	18
APMM 623	Calculus Of Variations	18
APMM 624	Industrial Mathematics	18
Total number of credits		**120**

CURRICULUM/*KURRIKULUM*: N601P

CODE/*KODE*: **202-136**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans/English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time/Voltyds

Compilation of old programme: Honours Bachelor of Science in Applied Mathematics / *Samestelling van die ou program Honneurs Baccalareus Scientiae in Toegepaste wiskunde*

Module code	Descriptive name	Credits
TGWN671	Project	32
First Semester		
TGWN612	Numerical Analysis I	12
TGWN613	Partial Differential Equations I	12
and TWO modules, in consultation with the school director and the head of the subject group Mathematics and Applied Mathematics, from the following list:		
TGWN614	Financial Mathematics Modelling I	12
TGWN615	Modelling I	12
TGWN616	Control Theory I	12
TGWN617	Fluid Dynamics I	12
WISN613	Complex Function Theory	12
WISN614	Measure and Integration theory I	12
WISN615	Functional Analysis I	12
Second Semester		
TGWN622	Numerical Analysis II	12
TGWN623	Partial Differential Equations II	12
and TWO modules, in consultation with the school director and the head of the subject group Mathematics and Applied Mathematics, from the following list:		
TGWN624	Financial Mathematics Modelling II	12
TGWN625	Modelling II	12
TGWN626	Control Theory II	12
TGWN627	Fluid Dynamics II	12
WISN623	Fourier/Harmonic Analysis	12
WISN624	Measure and Integration theory II	12
WISN625	Functional Analysis II	12
Total number of credits of this curriculum		**128**

NAS.6.7 BACHELOR OF SCIENCE HONOURS IN APPLIED MATHEMATICS / *BACCALAUEUS SCIENTIAE HONNEURS IN TOEGEPASTE WISKUNDE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Faculty-specific rules for the programme/*Fakulteit spesiefieke reels vir die program:*

A student who has completed BSc in 2FF H22-N301P (N152P), 2FF H24 N301P (N155P), 2FG H01 N301P (N159P) or 2FF H29 N301P (N176P) (or a similar degree), may enrol for this curriculum. This curriculum is composed of modules in the table. The curriculum is developed for training of Applied Mathematicians and consists of several Mathematics and Applied Mathematics modules, as well as a practical research project. The curriculum focuses on mathematical modelling and students may choose between financial mathematical modelling and mechanical mathematical modelling. This curriculum gives admission to MSc study in Applied Mathematics. This curriculum gives access to careers in education (secondary, tertiary), the financial sector, mining, weather and environmental modelling, engineering firms, programming, business analytics and data analytics. / *'n Student wat 'n BSc in 2FF H22-N301P (N152P), 2FF H24 N301P (N155P), 2FG H01 N301P (N159P) or 2FF H29 N301P (N176P) (of soortgelyke graad) suksesvol voltooi het, mag inskryf vir hierdie kurrikulum. Hierdie kurrikulum is saamgestel uit die modules in die tabel. Die kurrikulum is ontwerp met die oog op die opleiding van Toegepaste Wiskundiges en bevat verskeie Wiskunde en Toegepaste Wiskunde modules, asook 'n praktykgerigte navorsingsprojek. Die kurrikulum fokus op wiskundige modellering en studente kan kies tussen finansiële wiskundige modellering of meganiese wiskundige modellering. Hierdie kurrikulum gee toelating tot 'n MSc-studie in Toegepaste Wiskunde. Hierdie kurrikulum gee toegang tot loopbane in die opvoedkundige sektor (sekondêr, tersiêr), finansiële sektor, mynbou, weerkunde en omgewingsmodellering en by ingenieursfirmas en bedrywe wat spesialiste benodig in programmering, besigheidsanalise of data-analise*.

Admission requirements for the programme/*Toelatingsvereistes*

Students may be admitted to the Honours qualification in Applied Mathematics given that they are in possession of a BSc degree with Applied Mathematics passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential.

CODE/*KODE*: **2EJ L01 N601P / N601M**

CAMPUS/*KAMPUS:* Mafikeng and Potchefstroom (Afrikaans/English)

DELIVERY MODE/*AFLEWERINGSMETODE:* Full time/Voltyd

Compilation of new Programme: Bachelor of Science Honours in Applied Mathematics / *Baccalaueus Scientiae Honneurs in Toegepaste Wiskunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
APPM612	Numerical Analysis / *Numeriese Analise*	12
APPM613	Theory of Partial Differential Equations / *Teorie van Parsiële Differensiaal-vergelykings*	12
and TWO modules, selected in consultation with the School Director and the subject chairperson of Mathematics and Applied Mathematics, from the following list. (All students who have not had Real Analysis and Complex Analysis at 3rd year level MUST select MTHS619 Real & Complex Analysis as one of the options.) / *EN TWEE modules, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, gekies uit die volgende lys. (Alle studente wat nie Reële – en Komplekse Komplekse Analise op derde jaarvlak gehad het nie, MOET MTHS619 Reële & Komplekse Analise as een van die keuses kies:*		
APPM611	Symmetries of differential equations I / *Simmetrieë van differensiaalvergelykings* I	12
APPM613	Theory of Partial Differential Equations (if not already selected)/ *Teorie van Parsiële DifferensiaalVergelykings (indien nie reeds gekies nie)*	12
APPM614	Financial Modelling I / *Finansiële Modellering I*	12
APPM615	Theory of Ordinary Differential Equations (if not already chosen) / *Teorie van* Gewone *Differensiaalvergelykings (indien nie reeds gekies nie*	12
APPM616	Calculus of Variations/ Variasierekening	12
APPM617	Fluid Dynamics I / *Vloeidinamika I*	12
APPM618	Biomathematics / *Biowiskunde*	12
APPM619	Applied Matrix Analysis / *Toegepaste Matriksanalise*	12
MTHS619	Real & Complex Analysis / *Reële en Komplekse Analise*	12
MTHS614	Measure and Integration theory I / *Maat- en Integrasieteorie I*	12
MTHS615	Functional Analysis I / *Funksionaalanalise I*	12

2 Semester		
APPM622	Advanced Numerical Analysis / *Gevorderde Numeriese Analise*	12
APPM623	Numerical methods for Partial Differential Equations / *Numeriese metodes vir Parsiële Differensiaal-vergelykings*	12
and TWO modules, in consultation with the School Director and the head of the subject group Mathematics and Applied Mathematics, from the following list: / EN TWEE modules, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, uit die volgende lys:		
APPM621	Symmetries of differential equations II (if not already selected) / *Simmetrieë van differensiaalvergelykings II (indien nie reeds gekies nie)*	12
APPM622	Advanced Numerical Analysis (if not already *Gevorderde Numeriese Analise (indien nie reeds gekies nie)*	12
APPM623	Numerical methods for Partial Differential Equations (if not already selected) / *Numeriese metodes vir Differensiaalvergelykings (indien nie reeds gekies nie)*	12
APPM624	Financial Modelling II / *Finansiële Modellering II*	12
APPM625	Financial Modelling III / *Modellering III*	12
APPM626	Control Theory / *Beheerteorie*	12
APPM627	Fluid Dynamics II / *Vloeistofdinamika II*	12
APPM628	Industrial Mathematics (if not already selected) / *Industriële Wiskunde (indien nie reeds gekies nie)*	12
MTHS623	Complex Function Theory / *Komplekse Funksie Teorie*	12
MTHS624	Measure and Integration theory II / *Maat- en Integrasieteorie II*	12
MTHS625	Functional Analysis II / *Funksionaalanalise II*	12
Year module / Jaar module		
APPM671	Project / *Projek*	32
Total number of credits / Totale krediete		**128**

Important Notices:

Due to capacity restrictions the modules listed above may not all be available on all three campuses. Please contact the subject chairperson for advice on the choices that are available

The module STTN115 or equivalent is a prerequisite for both APPM624 and APPM625.

Belangrike kennisgewings:

As gevolg van kapasiteitsbeperkinge kan dit gebeur dat nie al die modules hierbo gelys op al drie kampusse beskikbaar is nie. Kontak asseblief die vakvoorsitter vir advies in die verband.

Die module STTN115 (of ekwivalent) is 'n voorvereiste vir beide APPM624 en APPM625.

NAS.6.8 HONOURS BACHELOR OF SCIENCE IN MATHEMATICS / HONNEURS *BACCALAUEUS SCIENTIAE IN WISKUNDE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N628M

CODE: **202-119**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Bachelor of Science Honours Mathematics

Module code	Descriptive name	Credits
1 Semester		
	COMPULSORY	
MAYM 611	Abstract Algebra I	18
MAYM 614	Topology	18
MAYM 612	Theory Of Ordinary Differential Equations	18
	ELECTIVES	
MAYM613	Measure And Integration Theory I	18
MAYM615	Complex Function Theory	18
2 Semester		
	COMPULSORY	
MAYM 621	Functional Analysis I	18
MAYM 625	Project	30
	ELECTIVES (1 elective is to be chosen)	
MAYM 622	Abstract Algebra Ii	18
MAYM 623	Evolution Of Mathematical Ideas	18
MAYM 624	Fundamentals Of Mathematics	18
Total number of credits		**120**

CURRICULUM/*KURRIKULUM*: N601P

CODE/*KODE*: **202-137**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans/English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time

Compilation of old Programme: Honours Bachelor of Science in Mathematics/ *Honneurs Baccalaureus Scientiae in Wiskunde*

Module code	Descriptive name	Credits
WISN671	Project	32
First Semester		
WISN612	Abstract Algebra I	12
WISN614	Measure and Integration theory I	12
WISN615	Functional Analysis I	12
and ONE module, in consultation with the school director and the head of the subject group Mathematics and Applied Mathematics, from the following list:		
WISN613	Complex Function Theory	12
WISN616	Fundamentals of Mathematics	12
TGWN614	Financial Mathematics Modelling I	12
TGWN615	Modelling I	12
Second Semester		
WISN624	Measure and Integration theory II	12
WISN625	Functional Analysis II	12
WISN627	Matrix Analysis	12
and ONE module, in consultation with the school director and the head of the subject group Mathematics and Applied Mathematics, from the following list:		
WISN622	Abstract Algebra II	12
WISN623	Fourier/Harmonic Analysis	12
WISN626	Evolution of Mathematical Ideas	12
WISN628	Topology	12
TGWN624	Financial Mathematics Modelling II	12
TGWN625	Modelling II	12
Total number of credits		**128**

NAS.6.9 BACHELOR OF SCIENCE HONOURS IN MATHEMATICS / *BACCALAUEUS SCIENTIAE HONNEURS IN WISKUNDE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Faculty-specific rules for the programme/*Fakulteit spesifieke reels:*

A student who has completed BSc in 2FF H22-N301P (N152P), 2FF H23 N301P (N154P), 2FF H09N301P (N157P), 2FG H02 N301P (N158P), 2FG H01 N301P (N159P), 2FF H29 N301P (N176P), 2FS H01N301P (N135P) (or a similar degree), may enrol for this curriculum. This curriculum is composed of modules in the table. The curriculum is developed for training of Mathematicians and consists of several Mathematics modules, as well as a practical research project. This curriculum gives admission to MSc study in Mathematics and (in combination with a post graduate education certificate and the choice of modules WISN616/626 in the programme) admission to MSc study in Natural Science Education. This curriculum gives access to careers in education (secondary, tertiary) and the financial, industrial and research sectors. /

'n Student wat 'n BSc in 2FF H22-N301P (N152P), 2FF H23 N301P (N154P), 2FF H09N301P (N157P), 2FG H02 N301P (N158P), 2FG H01 N301P (N159P), 2FF H29 N301P (N176P), 2FS H01N301P (N135P) *(of soortgelyke graad) suksesvol voltooi het, mag inskryf vir hierdie kurrikulum. Hierdie kurrikulum is saamgestel uit die modules in die tabel. Die kurrikulum is ontwerp met die oog op die opleiding van Wiskundiges en bevat verskeie Wiskunde en Toegepaste Wiskunde modules, asook 'n praktykgerigte navorsingsprojek. Hierdie kurrikulum gee toelating tot MSc-studie in Wiskunde en (in kombinasie met 'n nagraadse onderwyskwalifikasie en die modulekeuses WISN616/626 binne die program) toelating tot MSc-studie in Natuurwetenskap-Onderwys. Hierdie kurrikulum gee ook toegang tot loopbane in die opvoedkundige sektor (sekondêr, tersiêr), en in finansiële-, industriële- en navorsingsektore*.

Admission requirements for the programme/*Toelatingsvereistes vir die program*:

Students may be admitted to the Honours qualification in Mathematics given that they are in possession of a BSc degree with Mathematics passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential

CODE/*KODE*: 2ER L01 N601P/M

CAMPUS/*KAMPUS:* Mafikeng and Potchefstroom (Afrikaans/English)

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of new Programme: Bachelor of Science Honours in Mathematics / *Baccalaueus Scientiae Honneurs in Wiskunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
MTHS612	Abstract Algebra I / *Abstrakte Algebra I*	12
MTHS614	Measure and Integration theory I / *Maat en Integrasie Teorie I*	12
MTHS615	Functional Analysis I / *Funksionaalanalise I*	12
and ONE module, in consultation with the School Director and the head of the subject group Mathematics and Applied Mathematics, from the following list: / en *EEN modules, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, uit die volgende lys:*		
APPM612	Numerical Analysis / *Numeriese Analise*	12
APPM614	Financial Modelling I / *Finansiële Modellering I*	12
MTHS611	Fundamentals of Mathematics / *Grondslae van Wiskunde*	12
MTHS613	Matrix Analysis / *Matriksanalise*	12
2 Semester		
MTHS621	Topology / *Topologie*	12
MTHS623	Complex Function Theory / *Komplekse Funksie Teorie*	12
and TWO modules, in consultation with the School Director and the head of the subject group Mathematics and Applied Mathematics, from the following list: / EN TWEE modules, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, uit die volgende lys:		
APPM624	Financial Modelling II / *Finansiële Modellering II*	12
APPM625	Financial Modelling III / *Finansiële Modellering III*	12
MTHS622	Abstract Algebra II	12
MTHS624	Measure and Integration theory II / *Maat- en Integrasieteorie II*	12
MTHS625	Functional Analysis II / *Funksionaalanalise II*	12
MTHS626	Evolution of Mathematical Ideas / *Evolusie van Wiskundige Idees*	12
Year module / Jaar module		
MTHS671	Project / *Projek*	32
Total number of credits / Totale krediete		**128**

Important Notices:
Due to capacity restrictions the modules listed above may not all be available on all three campuses. Please contact the subject chairperson for advice on the choices that are available.
The module STTN115 or equivalent is a prerequisite for both APPM624 and APPM625.

Belangrike kennisgewings:
As gevolg van kapasiteitsbeperkinge kan dit gebeur dat nie al die modules hierbo gelys op al drie kampusse beskikbaar is nie. Kontak asseblief die vakvoorsitter vir advies in die verband.
Die module STTN115 (of ekwivalent) is 'n voorvereiste vir beide APPM624 en APPM625.

NAS.6.10 HONOURS BACHELOR OF SCIENCE IN ACTUARIAL SCIENCES / HONNEURS *BACCALAUEUS SCIENTIAE IN AKTUARIËLE WETENSKAPPE*

PROGRAMME ALIGNMENT AND CODING ON HOLD

Faculty-specific rules for the programme/*Fakulteit spesifieke reels vir die* program

Please note that all BMI post graduate programmes are presented in English. / *Neem asseblief kennis dat al BWI se nagraadse programme in Engels aangebied word.*
The integrated assessment of this curriculum takes place during the assessment of the module BWIR671. / *Die geïntegreerde assessering van N609P vind tydens die assessering van die module BWIR671.*/

Admission requirements for the programme

Admission to the Honours programme is open to approved students who have been awarded a Bachelor of Science in Actuarial Science, or a qualification designated by the Senate as equivalent with an average of at least 60%. Students should have obtained exemption recommendation for at least 5 of the actuarial specific subjects. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, as may be determined by Senate, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe.
CODE/*KODE:* **202 126 N609P**

CAMPUS/*KAMPUS:* Potchefstroom (

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of new Programme: Honours Bachelor of Science in Actuarial Sciences / Honneurs *Baccalaueus Scientiae in Akturiële Wetenskappe*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
BWIN611	Quantitative Risk Analysis I / *Kwantitatiewe Risiko-analise I*	16
BWIN613	Financial Engineering I / *Finansiële Ingenieurswese I*	16
BWIN614	Investment Theory I / *Beleggingsteorie I*	16
Year module / Jaar module		
BWIA671	Actuarial Risk Management (A301/CA1) / *Aktuariële risikobestuur (A301/CA1)*	80
BWIR671	Research Module: Financial Engineering and Financial Modelling / *Navorsingsmodule: Finansiële Ingenieurswese en Finansiële Modellering*	32
Total number of credits / Totale krediete		**160**

NAS.6.11 BACHELOR OF SCIENCE HONOURS IN QUANTITATIVE RISK MANAGEMENT / *BACCALAUEUS SCIENTIAE HONNEURS IN KWANTITATIEWE RISIKOBESTUUR*

Faculty-specific rules for the programme/*Fakulteit spesifieke reels vir die program:*

Please note that all BMI post graduate programmes are presented in English. / *Neem asseblief kennis dat al BWI se nagraadse programme in Engels aangebied word.*

The integrated assessment of this curriculum takes place during the assessment of the module BWIR671. / *Die geïntegreerde assessering vind tydens die assessering van die module BWIR671.*

Admission requirements for the programme/*Toelatingsvereistes vir die program:*

Admission to the Honours programme is open to approved students who have been awarded a Bachelor of Science in Quantative Risk Management, or a qualification designated by the Senate as equivalent with an average of at least 60%. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, as may be determined by Senate, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe. With the permission of the Senate, candidates not in possession of the qualifying courses may be considered, provided they undertake to complete prescribe introductory courses.

CODE/*KODE*: 2DP L01 N601P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/Voltyds

Compilation of new Programme: Bachelor of Science Honours in Quantitative Risk Management / *Baccalaueus Scientiae Honneurs in Kwantitatiewe Risikobestuur*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
BWIN611	Quantitative Risk Analysis I / *Kwantitatiewe Risiko-analise I*	16
BWIN613	Financial Engineering I / *Finansiële Ingenieurswese I*	16
BWIN614	Investment Theory I / *Beleggingsteorie I*	16
STTN 612	Statistical Data-analysis I : Models / *Statistiese Data-analise I : Modelle*	12
2 Semester		
BWIN621	Quantitative Risk Analysis / *Kwantitatiewe Risiko-analise II*	16
ECON623	Risk Management / *Risikobestuur*	16
STTN622	Statistical Data-analysis II: Time Series / *Statistiese Data-analise II: Tydreekse*	12
STTN623	Multivariate Statistics / *Meerveranderlike Statistiek*	12
Year module / Jaar module		
BWIR671	Research Module: Financial Engineering and Financial Modelling / *Navorsingsmodule: Finansiële Ingenieurswese en Finansiële Modellerin*	32
Total number of credits / Totale krediete		**148**

NAS.6.12 BACHELOR OF SCIENCE HONOURS IN FINANCIAL MATHEMATICS / *BACCALAUEUS SCIENTIAE HONNEURS IN FINANSIELE WISKUNDE*

Faculty-specific rules for the programme / *Fakulteits spesifieke reels vir die program:*

The integrated assessment of this programme takes place during the assessment of the module BWIR622. / *Die geïntegreerde assessering vind plaas tydens die assessering van die module BWIR622.*

Please note that all BMI post graduate programmes are presented in English./ *Neem asb kennis dat alle BWI programme in Engels aangebied word*

Admission requirements for the programme/*Toelatingsvereistes vir die program*

Admission to the Honours programme is open to approved students who have been awarded a Bachelor of Science in Financial Mathematics, or a qualification designated by the Senate as equivalent with an average of at least 60%. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, as may be determined by Senate, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe. With the permission of the Senate, candidates not in possession of the qualifying courses may be considered, provided they undertake to complete prescribe introductory courses.

CODE/*KODE*: 2DQ L01 N601P
CAMPUS/*KAMPUS*: Potchefstroom**.**
DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*
Compilation of new Programme: Bachelor of Science in Honours Financial Mathematics / *Baccalaueus Scientiae Honneurs in Finansiele Wiskunde*

Module code	Descriptive name	Credits
First Semester		
BWIN613	Financial Engineering I	16
STTN612	Statistical Data-analysis I: Models	12
STTN615	Stochastic Processes I	12
MTHS614	Measure Theory I	12
WISK615	Differential Equations	16
Second Semester		
BWIR622	Research Module: Financial Engineering and Pricing of Derivatives	32
STTN622	Statistical Data-analysis II: Time Series	12
STTN625	Stochastic Processes II	12
MTHS621	Topology	12
MTHS624	Measure Theory I	12
Total number of credits of this programme		**148**

NAS.6.13 HONOURS BACHELOR OF SCIENCE IN DATA MINING / *HONNEURS BACCALAUEUS SCIENTIAE IN DATA-ONTGINNING*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N612P

CODE/*KODE*: 202-129

CAMPUS/*KAMPUS*: Potchefstroom**.**Please note that all BMI post graduate programmes are presented in English./ *Neem asb kennis dat alle BWI programme in Engels aangebied word*

DELIVERY MODE/AFLEWERINGSMETODE: Full time/*Voltyds*

Compilation of old Programme: Honours Bachelor of Science Data Mining / *Honneurs Baccalaueus Scientiae in Data-Ontginning*

Module code	Descriptive name	Credits
First Semester		
STTN612	Statistical Data-analysis I: Models	12
	Elective Module[#]	12
	Elective Module[#]	12/16
	Elective Module[#]	12/16
Second Semester		
STTN623	Multivariate Statistics	12
	Elective Module[#]	12
	Elective Module[#]	12/16
	Elective Module[#]	12/16
Year Module		
BWIR672	Research Module: Financial Modelling	32
Total number of credits		**136**

[#]The elective modules in the first semester are chosen from the modules in the following table.

Module code	Descriptive name	Credits
BWIB611	Statistical Learning I	16
BWIB612	Introduction to Business Intelligence	12
BWIB613	Problem Solving using Simulation	12
BWIN614	Investment Theory I	16
STTN613	Resampling	12
ITRI611	Data Warehouses I	12
ITRI613	Databases I	12
ITRI616	Artificial Intelligence I	12
ITRI618	Decision Support Systems I	12

[#]The elective modules in the second semester are chosen from the modules in the following table.

Module code	Descriptive name	Credits
BWIB621	Statistical Learning II	16
BWIB622	Forecasting for Business	16
STTN622	Statistical Data-analysis II: Time Series	12
STTN624	Discrete Data-analysis	12
ITRI621	Data Warehouses II	12
ITRI623	Databases II	12
ITRI626	Artificial Intelligence II	12
ITRI628	Decision Support Systems II	12

The integrated assessment of this curriculum takes place during the assessment of the module BWIR672

NAS.6.14 BACHELOR OF SCIENCE HONOURS IN BUSINESS ANALYTICS / *BACCALAUEUS SCIENTIAE HONNEURS IN BESIGHEIDSANALISE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

Please note that all BMI post graduate programmes are presented in English. / *Neem asseblief kennis dat al BWI se nagraadse programme in Engels aangebied word.* / The integrated assessment of this programme takes place during the assessment of the module BWIR622. / *Die geïntegreerde assessering vind plaas tydens die assessering van die module BWIR622.*

Admission requirements for the programme

Admission to the Honours programme is open to approved students who have been awarded a Bachelor of Science in Financial Mathematics or Bachelor of Science in Quantitative Risk Management or Bachelor of Science in Actuarial Science or Bachelor of Science in Business Analytics, or a qualification designated by the Senate as equivalent with an average of at least 60%. Senate may require any candidate, before being admitted to the Honours programme, to attend and complete, as may be determined by Senate, such undergraduate courses or portion of courses of a Bachelor's curriculum as the senate may prescribe. With the permission of the Senate, candidates not in possession of the qualifying courses may be considered, provided they undertake to complete prescribe introductory courses.

CODE/*KODE*: 2FP L01 N601P

CAMPUS/*KAMPUS:* Potchefstroom.

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of new Programme: Bachelor of Science Honours in Business Analytics / *Baccalaueus Scientiae Honneurs in Besigheidsanalise*

Module code	Descriptive name	Credits
First Semester		
STTN612	Statistical Data-analysis I: Models	12
BWIB611	Statistical Learning I	16
STTN619	Nonparametric methods	12
STTN618	Financial Driven Statistics	12
Second Semester		
STTN623	Multivariate Statistics	12
BWIB621	Statistical Learning II	16
BWIB623 / STTN622	Forecasting for Business	12
STTN624	Discrete Data-analysis	12
Year Module		
BWIR672	Research Module: Financial Modelling	32
Total number of credits		**136**

[#] **The integrated assessment of this curriculum takes place during the assessment of the module BWIR672**

NAS.6.1 HONOURS BACHELOR OF SCIENCE IN GEOGRAPHY / *BACCALAUREUS SCIENTIAE HONEURS IN GEOGRAFIE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N614M

CODE: **202-118**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme Honours Bachelor of Science in Geography /*Baccalaureus Scientiae Honeurs in Geografie*

Module code		Credits
1 Semester		
ELECTIVES		
GEOM 611	Geography, Ideas And Methods	24
GEOM 612	Selected Fields In Human Geography	24
GEOM 613	GIS Techniques	24
GEOM 614	Environmental Problems & Management in Africa	24
2 Semester		
COMPULSORY		
GEOM 671	Research Project	24
ELECTIVES		
GEOM 621	Techniques And Methods In Geography	24
GEOM 622	Selected Fields in Physical Geography	24
GEOM 623	Applications In Geographic Information System	24
GEOM 624	Rural Geography	24
Total number of credits		**120**

NAS.6.2 BACHELOR OF SCIENCE HONOURS IN GEOGRAPHY / *BACCALAUREUS SCIENTIAE HONEURS IN GEOGRAFIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2EP L01 N601M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of new Programme: Bachelor of Science Honours in Geography / *Baccalaureus Scientiae Honeurs in Geografie*

Module code	Discriptive name	Credits
1 Semester		
Compulsory		
GEOG671	Research Project	32
Electives (Select 3)		
GEOG 611	Research Methods	16
GEOG612	Selected Fields In Human Geography	16
GEOG613	Geographic Information Systems Techniques	16
GEOG614	Environmental Problems & Management in Africa	16
GEOG616	Selected fields in Geomorphology	16
2 Semester		
Select 3		
GEOG621	Remote Sensing	16
GEOG622	Selected Fields In Climatology	16
GEOG623	Applications In GIS	16
GEOG624	Rural Geography	16
Total number of credits		**128**

NAS.6.3 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET GEOGRAFIE EN OMGEWINGSBESTUUR*

OLD CURRICULUM / OU KURRIKULUM

Faculty-specific rules for the programme /*Fakulteit spesifieke reëls:*

Students have to take four elective modules to a value of 72 credits. These must be made up of two 20-credit modules and two 16-credit modules. / Studente neem 4 (VIER) keusemodules ter waarde van 72 krediete. Dit word saamgestel uit twee 20-kredietmodules en twee 16-kredietmodules

Combinations of modules will advised by the post graduate lecturers, subject to approval of the School director./ Kombinasies van modules sal deur nagraadse personeel aanbeveel word, onderhewig aan goedkeuring deur die Skooldirekteur

TOTAL / TOTAAL	**Credits / Krediete**
Semester 1	92
Semester 2	36
Total year level / Totaal jaarvlak	**128**

Note: There are certain year modules that are assigned to semester ONE (1) but the credit load will be distributed over the whole year / *Let wel: Sommige van die jaarmodules is aan die eeste semester toegeken, maar die kredietlading sal gelykmatig oor die jaar versprei word.*

Admission requirements for the programme/*Toelatingsvereistes vir die program:*

Students may be admitted to the Honours qualification in Geography given that they are in possession of a BSc degree with Geography passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential. / *Studente neem 4 (VIER) keusemodules ter waarde van 72 krediete. Dit word saamgestel uit twee 20-kredietmodules en twee 16-kredietmodules. Kombinasies van modules sal deur nagraadse personeel aanbeveel word, onderhewig aan goedkeuring deur die Skooldirekteur.*

CODE/KODE: **2DM L07 N601P**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans/English)
DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/Voltyds
Compilation of the new Programme Bachelor of Science Honours in Environmental Sciences with Geography and Environmental Management / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe met Geografie en Omgewingsbestuur*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Semester**	**Credits** ***Krediete***
Compulsary modules:			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMBE673	Research project / *Navorsingsprojek*	Year	40
SGSS614	Research Methods	1	16
	Total compulsory modules/ *Totaal verpligte modules* 64		
Elective modules: Select FOUR of the following modules / *Student kies VIER van die onderstaande modules:*			
OMBO613	Introduction to GIS / *GIS Toepassings*	1	16
OMBO614	GIS Applications (full-time only) / *GIS Toepassings(slegs voltyds aangebied)*	1	16
OMBE625	Introduction to Hydrology and Integrated Water Resources Management / *Inleiding tot Hidrologie en Geïntegreerde Waterhulpbronbestuur (slegs voltyds aangebied*)	2	16
OMBO678	Environmental Management I / *Omgewingsbestuur I*	Year	20
OMBO681	Environmental assessment / *Omgewingsevaluering*	Year	20
GGFS671	Introduction to Earth Observation / *Inleiding tot Aardwaarneming*	Year	20
GGFS672	Air pollution / *Lugbesoedeling*	Year	20
OMSB613	Biodiversity planning / *Biodiversiteitsbeplanning*	1	16
	Total elective modules / Totale keusemodules 64		
Total number of credits / Totale krediete			**128**

NEW / NUWE KURRIKULUM

CODE/KODE: **2DM L07 N602P**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans/English)
DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/Voltyds
Compilation of the new Programme: Bachelor of Science Honours in Environmental Sciences with Geography and Environmental Management / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe met Geografie en Omgewingsbestuur*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Semester**	**Credits** ***Krediete***
Compulsary modules:			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMBE674	Research project / *Navorsingsprojek*	Year	32
SGSS614	Research Methods	1	16
	Total compulsory modules/ *Totaal verpligte modules* 64		
Elective modules: Select FOUR of the following modules / *Student kies VIER van die onderstaande modules:*			
OMBO613	Introduction to GIS / *GIS Toepassings*	1	16
OMBO614	GIS Applications (full-time only) / *GIS Toepassings(slegs voltyds aangebied)*	1	16
OMBE625	Introduction to Hydrology and Integrated Water Resources Management / *Inleiding tot Hidrologie en Geïntegreerde Waterhulpbronbestuur (slegs voltyds aangebied*)	2	16
OMBO682	Environmental Management I / *Omgewingsbestuur I*	Year	16
OMBO683	Environmental Analysis I/ *Omgewingsevaluering I*	Year	16
GGFS673	Introduction to Earth Observation / *Inleiding tot Aardwaarneming*	Year	16
GGFS674	Air pollution / *Lugbesoedeling*	Year	16
OMSB613	Biodiversity planning / *Biodiversiteitsbeplanning*	1	16
	Total elective modules / Totale keusemodules 64		
Total number of credits / Totale krediete			**128**

NAS.6.4 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH ECOLOGICAL INTERACTIONS AND ECOSYSTEM RESILLIENCE / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET EKOLOGIESE INTERAKSIES EN EKOSISTEEM VEERKRAGTIGHEID*

Faculty-specific rules for the programme /Fakulteit spesifieke reels vir die program:

Students are not allowed to register for more than four (4) modules in the first semester (except for the research project, which is a year module). Elective modules are selected according to required knowledge and skills for the research project. Selection of elective modules must therefore be approved by the research project mentor, as well as the School Director.

CODE/*KODE:* **2DM L01 N601P**

CAMPUS/*KAMPUS*: Potchefstroom (Afrikaans/English)

DELIVERY MODE: : Full time

Compilation of Programme: Bachelor of Science Honours in Environmental Sciences with Ecological Interactions and Ecosystem Resillience / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe met Ekologiese Interaksie en Ekosisteem Veerkragtigheid*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
Compulsary modules:			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMSE613	Resilience thinking in Ecology / *Ekologiese Veerkragtigheidsdenke*	1	16
OMSE674	Research Project / *Navorsingsprojek*	Year	32
			Total compulsory modules 64
Student selects FOUR of the following modules in consultation with programme manager, research mentor and School Director / *Student kies VIER van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*			
OMWE611	Rehabilitation of disturbed areas (full-time only, GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module) / *Rehabilitasie van versteurde gebiede (word slegs voltyds aangebied, GDKN121, GDKN211*	1	16

	en GDKN221 is voorvereistes vir hierdie module)		
OMSE611	Environmental Soil Science (full-time only, GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module) / *Omgewingsgrondwetenskap (word slegs voltyds aangebied, GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module)*	1	16
OMBO613	Introduction to GIS / *Inleiding tot GIS*	1	16
OMBO614	GIS Applications (full-time only) / *GIS toepassings*	1	16
OMSB611	Conservation Ecology / *Bewaringsekologie*	1	16
OMSE621	Restoration of degraded ecosystems / *Restourasie van gedegradeerde ekostelsels*	2	16
OMSE622	Urban Ecology / *Stedelike ekologie*	2	16
OMSE623	Plant ecophysiology and stress physiology / *Plantekofisiologie en stresfisiologie*	2	16
OMSE625	Advanced Ecotoxicology / *Gevorderde ekotoksikologie*	2	16
OMSE626	Microbial Ecology / *Mikrobiese ekologie*	2	16
		Total elective modules	**64**
Total number of credits / Totale krediete			**128**

NAS.6.5 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH BIODIVERSITY AND CONSERVATION ECOLOGY / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGS-WETENSKAPPE MET BIODIVERSITEIT EN BEWARINGSEKOLOGIE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reels:*

OMSB614 - Includes a week long practical session in Potchefstroom. Part time students can only register for this module if they are willing to travel to Potchefstroom for this practical session. / *OMSB614: 'n Weeklange praktiese opleidingsessie in Potchefstroom is verpligtend. Afstandstudente kan slegs vir hierdie module registreer indien hul bereid is om na: Potchefstroom te reis vir praktiese opleiding.*

CODE/*KODE:* **2DM L02 N601P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/Voltyds

Compilation of Programme: Bachelor Of Science Honours in Environmental Sciences with Biodiversity and Conservation Ecology / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Biodiversitiet en Bewaringsekologie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
Compulsary modules:			
OMSB611	Conservation Ecology / *Bewaringsekologie*	1	16
OMSB613	Biodiversity Planning / *Biodiversiteitsbeplanning*	1	16
OMSB614	Biomonitoring and risk assessment / *Biomonitering en Risiko-analise*	1	16
OMSE674	Research project / *Navorsingsprojek*	Year	32
			Total compulsory modules 80
Elective modules / keuse modules:			
Student selects THREE of the following modules in consultation with programme manager, research mentor and School Director / *Student kies DRIE van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*			
OMBO611	Introduction to Environmental	1	16

	Management / *Inleiding tot Omgewingsbestuur*		
OMBO613	Introduction to GIS / *Inleiding tot GIS*	1	16
OMSB629	Genome Analysis and Bio-informatics / *Genoomanalise en Bio-informatika*	2	16
OMSB627	Herpetology in Practise / *Herpetologie in Praktyk*	2	16
OMSB628	Coral Reef Ecology / *Koraalrifekologie*	2	16
OMSE621	Restoration of degraded ecosystems / *Restourasie van gedegradeerde ekostelsels*	2	16
OMSE622	Urban Ecology / *Stedelike ekologie*	2	16
OMSE625	Advanced Ecotoxicology / *Gevorderde Ekotoksikologie*	2	16
OMSP624	Arthropod/plant Interactions / *Arthropood/plant-interaksies*	2	16
		Total elective modules	**48**
Total number of credits / Totale krediete			**128**

NAS.6.6 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH AQUATIC ECOSYSTEM HEALTH / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET AKWATIESE EKOSISTEEMWELSTAND*

Faculty-specific rules for the programme/*Fakulteit spesifieke reels:*

Students are not allowed to register for more than four (4) modules in the first semester (except for the research project, which is a year module). Elective modules are selected according to required knowledge and skills for the research project. Selection of elective modules must therefore be approved by the research project mentor, as well as the School Director / *Studente mag nie vir meer as vier (4) modules in die eerste semester registreer nie (uitgesluit die navorsingsprojek wat 'n jaarmodule is). Keuses word uitgeoefen na gelang van kennis en vaardighede wat benodig word vir die navorsingsprojek. Die navorsingsprojekleier, programbestuurder asook die Skooldirekteur moet dus skriftelik die student se keuses goedkeur*

** Includes a week long practical session in Potchefstroom. Part time students can only register for this module if they are willing to travel to Potchefstroom for this practical session. / * 'n Weeklange praktiese opleidingsessie in Potchefstroom is verpligtend. Afstandstudente kan slegs vir hierdie module registreer indien hul bereid is om na Potchefstroom te reis vir praktiese opleiding.*

*** Full-time – only students involved in Arkansas State University exchange programme may register for this module. / ** Voltyds – slegs studente wat by die Arkansas Sate University uitruilprogram betrokke is mag vir die module registreer*

CODE: **2DM L03 N601P**

CAMPUS/*KAMPUS:* Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of Programme: Bachelor Of Science Honours in Environmental Sciences with Aquatic Ecosystem Health / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe met Akwatiese Ekosisteemwelstand*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
Compulsary modules:			
OMWW611	Physical, chemical and biological properties of inland water / *Fisies-chemies en biologiese eienskappe van binnelandse waters*	1	16
OMSW611	Aquatic Ecosystems: Pollution and Ecotoxicology / *Akwatiese ekosisteme: besoedeling en ekotoksikologie*	1	16
OMSE674	Research project / *Navorsingsprojek*	Year	32

			Total compulsory modules 64
Elective modules / keuse modules:			
Student selects FOUR of the following modules in consultation with programme manager, research mentor and School Director / *Student kies VIER van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMWW614 (Pipe line) OMWW617* (2018 new students)	Zoonoses* / *Soönoses**	1	16
OMWW616	Estuarine and near shore marine ecology / *Estuariene en naby-kuslyn mariene-ekologie*	1	16
OMWW629 (Pipe line) OMWF621 (2018 new students)	Advanced waste water treatment / *Gevorderde afvalwaterbehandeling*	2	16
OMSW622**	Phycology** / *Fikologie***	2	16
OMBE625	Introduction to hydrology and integrated water resources management / *Inleiding tot Hidrologie en Geïntegreerde Waterhulpbronbestuur*	2	16
OMSW624	Environmental Hydrology (full-time only) / *Omgewingshidrologie (slegs voltyds aangebied)*	2	16
OMSB621(Pipe line) OMSB629 (2018 new students)	Genome analysis and bio-informatics / *Genoomanalise en Bio-informatika*	2	16
OMSE625	Advanced ecotoxicology / *Gevorderde ekotoksikologie*	2	16
OMSE626	Microbial Ecology / *Mikrobiese Ekologie*	2	16
OMSW625	Limnology** / *Limnologie***	2	16
OMSW626**	Animal Ecology**/ *Dierekologie***	2	16
			Total elective modules 64
Total number of credits / Totale krediete			**128**

NAS.6.7 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH INTEGRATED PEST MANAGEMENT / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET GEÏNTEGREERDE PLAAGBESTUUR*

Faculty-specific rules for the programme

Students are not allowed to register for more than four (4) modules in the first semester (except for the research project, which is a year module). Elective modules are selected according to required knowledge and skills for the research project. Selection of elective modules must therefore be approved by the research project mentor, as well as the School Director. / Studente mag nie vir meer as vier (4) modules in die eerste semester registreer nie (uitgesluit die navorsingsprojek wat 'n jaarmodule is). Keuses word uitgeoefen na gelang van kennis en vaardighede wat benodig word vir die navorsingsprojek. Die navorsingsprojekleier, programbestuurder asook die Skooldirekteur moet dus skriftelik die student se keuses goedkeur

** This module includes a week long practical session in Potchefstroom. Part time students can only register for this programme if they are willing to travel to Potchefstroom for this practical session. / * 'n Weeklange praktiese opleidingsessie in Potchefstroom is verpligtend. Afstandstudente kan slegs vir hierdie module registreer indien hul bereid is om na Potchefstroom te reis vir praktiese opleiding.*

CODE/*KODE*: 2DM L04 N601P

CAMPUS/*KAMPUS:* Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of Programme: Bachelor of Science Honours in Environmental Sciences with Integrated Pest Management / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe met Geïntegreerde Plaagbeheer*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
Compulsary modules:			
OMSP611	Principles of integrated pest management / *Beginsels van geïntegreerde plaagbestuur*	1	16
OMWP611	Pest phenology and damage symptoms / *Plaagfenologie en skadesimptome*	1	16
OMSE674	Research project / *Navorsingsprojek*	Year	32
			Total compulsory modules 64
Elective modules / keuse modules:			
Student selects FOUR of the following modules in consultation with			

programme manager, research mentor and School Director / *Student kies VIER van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMWW617*	Zoonoses* / *Soönoses**	1	16
OMWP613	Economic damage and threshold values / *Ekonomiese skade en drempelwaardes*	1	16
OMSP622	GM crops and integrated pest management /*GM-gewasse en geïntegreerde plaagbestuur*	2	16
OMSP623	Nematodes and crops / *Nematode en gewasse*	2	16
OMSP624	Arthropoda/plant interactions / *Arthropoda/plant-interaksies*	2	16
OMSB629	Genome analysis and Bio-informatics / *Genoomanalise en Bio-informatika*	2	16
OMSA622	Weeds: interactions and control / *Onkruid: interaksies en beheer*	2	16
OMSA623	Plant pathology / *Plantpatologie*	2	16
		Total elective modules	**64**
Total number of credits / Totale krediete			**128**

NAS.6.8 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH ENVIRONMENTAL GEOLOGY/ *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET OMGEWINGS-GEOLOGIE*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

Students are not allowed to register for more than four (4) modules in the first semester (except for the research project, which is a year module). Elective modules are selected according to required knowledge and skills for the research project. Selection of elective modules must therefore be approved by the research project mentor, as well as the School Director. / *Studente mag nie vir meer as vier (4) modules in die eerste semester registreer nie (uitgesluit die navorsingsprojek wat 'n jaarmodule is). Keuses word uitgeoefen na gelang van kennis en vaardighede wat benodig word vir die navorsingsprojek. Die navorsingsprojekleier, programbestuurder asook die Skooldirekteur moet dus skriftelik die student se keuses goedkeur.*

CODE/*KODE* **2DM L05 N601P**

CAMPUS/KAMPUS:: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* *:* Full time/*Voltyds*

Compilation of Programme: Bachelor of Science Honours in Environmental Sciences with Environmental Geology/ *Baccalaueus Scientiae Honneurs in Omgewings-Wetenskappe met Omgewingsgeologie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
Compulsary modules:			
OMSG611	Environmental geochemistry (full-time only, GLGN 112 and GLGN311 are pre-requisites for this module) / *Omgewingsgeochemie (word slegs voltyds aangebied, GLGN122 en GLGN311 is voorvereistes vir hierdie module)*	1	16
OMWE611	Rehabilitation of disturbed areas (full-time only, GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module) / *Rehabilitasie van versteurde gebiede (word slegs voltyds aangebied, GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module)*	1	16
OMSE674	Research project / *Navorsingsprojek*	Year	32
			Total compulsory modules 64

Elective modules / keuse modules:			
Student selects FOUR of the following modules in consultation with programme manager, research mentor and School Director / *Student kies VIER van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*			
OMBO611	Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur*	1	16
OMSE611	Environmental Soil Science (full-time only, GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module) / *Omgewingsgrondwetenskap (word slegs voltyds aangebied, GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module)*	1	16
OMWW611	Physical, chemical and biological properties of inland water / *Fisies-chemies en biologiese eienskappe van binnelandse waters*	1	16
OMBO613	Introduction to GIS / *Inleiding tot GIS*	1	16
OMBO614	GIS Applications / *GIS Toepassings*	1	16
OMSG621	Environmental Mineralogy (GLGN 112 and GLGN 211 are pre-requisites for this module) / *Omgewingsmineralogie (GLGN122 en GLGN211 is voorvereistes vir hierdie module)*	2	16
OMSG622	Applied environmental geology (GLGN 112 and GLGN211 are pre-requisites for this module) / *Toegepaste omgewingsgeologie (GLGN112, GLGN221 en GLGN321 is voorvereistes vir hierdie module)*	2	16
OMSE621	Restoration of degraded ecosystems / *Restourasie van gedegradeerde ekostelsels*	2	16
		Total elective modules/ Totaal keuse modules	**64**
Total number of credits / Totale krediete			**128**

NAS.6.9 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH HYDROLOGY AND GEOHYDROLOGY / *BACCALAUEUS SCIENTIAE IN HONNEURS OMGEWINGSWETENSKAPPE MET HIDROLOGIE EN GEOHIDROLOGIE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls:*

To qualify for this program, a student needs to have any of the following or a combination the following third year modules: Geology, Chemistry, Applied Mathematics or Physics.

CODE/*KODE*: **2DM L06 N602P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time /*Voltyds*

Compilation of Programme: Bachelor of Science Honours in Environmental Sciences with Hydrology and Geohydrology / *Baccalaueus Scientiae Honneurs in Omgewingswetenskappe Hidrologie en Geohidrologie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**S**	**Credits** *Krediete*
Year Module / *Jaar Module*			
OMSE674	Research Project / Navorsingsprojek	Y	32
Total credits / *Totale krediete*			**32**
1 Semester			
HDGH611	Geohydrology / *Geohidrologie*	1	16
HDGH612	Environmental Hydrology / *Omgewingshidrologie*	1	16
HDGH613	Spatial analysis / *Ruimtelike analise*	1	16
Total compulsory credits in the first semester			**48**
2 Semester			
HDGH621	Hydrochemistry / *Hidrochemie*	2	16
OMBE623	Groundwater Geology / *Grondwater Geologie*	2	16
OMBE622	Applied Hydrology* / *Toegepaste Hidrologie**	2	16
Total compulsory credits in the second semester			**48**
Total credits / Totale krediete			**128**

NAS.6.10 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH WASTE MANAGEMENT / *BACCALAUEUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET AFVALBESTUUR*

Faculty-specific rules for the programme/Fakulteit spesifieke reels:

There are certain year modules that are assigned to semester 1 but the credit load will be distributed over the whole year. / *Let wel: Sommige van die jaarmodules is aan die eeste semester toegeken, maar die kredietlading sal gelykmatig oor die jaar versprei word.*

CODE/*KODE*: **2DM L08 N601P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: : Full time/*Voltyds*

Compilation of Programme: Bachelor of Science Honours in Environmental Sciences with Waste Management / *Baccalaueus Scientiae in Honneurs Omgewingswetenskappe met Afvalbestuur*

Module code / ***Module kode***	**Descriptive name** / ***Beskrywende naam***	**S**	**Credits** / ***Krediete***
Compulsory 1 Semester			
OMBO611	Introduction to Environmental Management	1	16
OMBW611	Fundamentals of Waste Management / *Grondbeginsels van Afvalbestuur*	1	20
OMBW612	Waste Management Law and Governance / *Afvalbestuur: Wetgewing en Owerheidsbestuur*	1	16
Total compulsory modules 1 semester /			**52**
Compulsory 2 Semester			
OMBW621	New Waste Management Solutions /	2	16
Total compulsory modules 2 semester /			**36**
Year module			
OMBE673	Research Project / *Navorsingsprojek*	Year	40
OMBO679	Environmental Analysis I	Year	20
		Total year modules/ Totaal jaarmodules	**40**
Total number of credits / Totale krediete			**128**

NAS.7 BACHELOR OF COMMERCE HONOURS / *BACCALAUREUS COMMERCII HONNEURS*

NAS.7.1 RULES FOR THE DEGREE BACHELOR OF COMMERCE HONOURS / *REËLS VIR DIE GRAAD HONNEURS BACCALAUREUS COMMERCII*

The honours degree follows on a baccalaureus degree or on the approval of the school director that the candidate's knowledge and skills acquired by prior learning and experience are adequate to be admitted to the Hons BCom studies. The studies may take place full-time or part-time. / Die Honneursgraad volg op 'n baccalaureusgraad of nadat die *skooldirekteur die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die Hons BCom-studie toegelaat het. Die studie kan voltyds of deeltyds gedoen word.*

Involved for selection and formal admission to the intended programme in the following year (see General Rules). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to the programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group. / *Voornemende studente moet voor die keerdatum, soos deur die toepaslike skooldirekteur bepaal, by die toepaslike skooldirekteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reël). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke vakgroep beskikbaar is.*

NB: Lectures for honours modules in the Faculty of Natural Science is only offered full-time. / *NB: Lesings vir honneursmodules word in die Fakulteit Natuur- en Landbouwetenskappe slegs voltyds aangebied*.

DURATION OF THE STUDIES / *DUUR VAN DIE STUDIE*

The minimum duration of the studies is one year full-time and two years part-time. The maximum duration is two years full-time and three years part-time. / *Die minimum duur van studie is een jaar voltyds en twee jaar deeltyds. Die maksimum duur is twee jaar voltyds en drie jaar deeltyds*

ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

Honours studies may be undertaken in a study programme that has been approved by the Faculty Board and is set out in NAS.2.1. Apart from the provisions in General Rule 3.2, the specific requirements stated in the description of the relevant curricula in N.6.2.4 must additionally be complied with. / *Die honneursstudie kan onderneem word in 'n studieprogram wat deur die Fakulteitsraad goedgekeur is en in NAS.2.1. uiteengesit word. Benewens die bepalings van die Algemene Reël 3.2, moet*

bykomend voldoen word aan die spesifieke vereistes wat by die betrokke kurrikulums in N.6.2.4 gestel word.

If the applications for a programme received is more than what the specific group in a school can handle, the group of students who, in the judgment of the school director has the greatest chance of success for the programme, are selected. The background and potential of students in this selection process, will also be taken into account. / *Indien meer aansoeke vir 'n program ontvang word as wat die betrokke vakgroep in 'n skool kan hanteer, word die groep studente wat volgens die oordeel van die skooldirekteur die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.*

ASSUMED PRIOR LEARNING / AANNAMES OOR VORIGE LEER

The student has already obtained an appropriate baccalaureus degree of which he has taken at least 60 module credits at NQF level 7 in the core subject of the relevant honours programme for which he intends to register. / *Die student beskik oor 'n gepaste baccalaureusgraad, waarin minstens 60 module-krediete op NKR-Vlak 7 in die kernvak van die betrokke honneursprogram waarvoor die student wil inskryf, aangebied is.*

If a prospective student does not conform to N.2.3 he may be admitted to the Hons BCom studies by the school director on the strength of knowledge and skills acquired by prior learning and work experience that led to learning. / *Indien 'n voornemende student nie aan die bepaling hierbo voldoen nie, kan die student deur die skooldirekteur op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die HonsBCom - studie toegelaat word.*

STUDY PROGRAMMES / *STUDIEPROGRAMME*

This honours degree may be taken in Computer Science-Information Systems./ *Hierdie honneursgraad word in die studieprogram Rekenaarwetenskap-Inligtingstelsels verwerf.*

GENERAL EXIT LEVEL OUTCOMES / ALGEMENE UITTREEVLAKUITKOMSTE

The outcomes described in General Rules 3.6 are still striven after in this Honours Bachelor of Commerce, with emphasis on a specific discipline or a few disciplines from the Natural and Agricultural Sciences. At the end of the honours studies the knowledge, skills, values and attitudes that the student already has attained will be further rounded off with greater emphasis on the accompanying research skills. / *Die uitkomste soos beskryf Algemene Reëls 3.6 word steeds by hierdie Honneurs Baccalaureus Commercii nagestreef, met toespitsing op 'n besondere dissipline of enkele dissiplines uit die natuurwetenskappe. Aan die einde van hierdie honneursstudie sal die kennis, vaardighede, waardes en houdings waaroor die student reeds beskik, verder afgerond wees, met meer klem op gepaardgaande navorsingsvaardighede*

NAS.7.2 HONOURS BACHELOR OF COMMERCE IN INFORMATICS/ *HONNEURS BACCALAUEUS COMMERCII IN INFORMATIKA*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM:* N658P

CODE/*KODE*: **504 143**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*METODE VAN AFLEWERING*: Full time/*Voltyds*

Compilation of Programme: Bachelor of Commerce Honours in Informatics / *Baccalaueus Commercii Honneurs in Informatika*

Module code *Modulekode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
ITRI671	Project / *Projek*	32
And another FOUR of the following modules in consultation with the school director: ***Kies nog VIER van die volgende modules, in oorleg met die skooldirekteur:***		
ITRI611	Data Warehouses I *Datapakhuise I*	12
ITRI613	Databases I *Databasisse*	12
ITRI614	Information Engineering Systems I *Inligtingstelselingenieurswese I*	12
ITRI615	Computer Security I *Rekenaarsekuriteit I*	12
ITRI616	Artificial Intelligence I *Kunsmatige Intelligensie I*	12
ITRI618	Decision Support Systems I *Besluitsteunstelsels I*	12
2 Semester		
And FOUR of the following modules in consultation with the school director: **En VIER van die volgende modules, in oorleg met die skooldirekteur:**		
ITRI621	Data Warehouses II *Datapakhuise II*	12
ITRI623	Databases II *Databasisse II*	12

ITRI624	Information Systems Engineering II *Inligtingstelselingenieurswese II*	12
ITRI625	Computer Security II *Rekenaarsekuriteit II*	12
ITRI626	Artificial Intelligence II *Kunsmatige Intelligensie II*	12
ITRI628	Decision Support Systems II *Besluitsteunstelsels II*	12
Total credits / *Totale krediete*		**128**

NAS.7.3 BACHELOR OF COMMERCE HONOURS IN INFORMATICS / *BACCALAUEUS COMMERCII HONNEURS IN INFORMATIKA*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Admission requirements for the programme

Students may be admitted to the Honours qualification in Informatics given that they are in possession of a BSc degree with Informatics passed at NQF level 7 with at least 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background and potential.

CODE/*KODE*: 2GF L01 N601P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Bachelor of Commerce Honours in Informatics / ***Baccalaueus Commercii Honneurs in Informatika***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
Compulsory 1 Semester		
ITRI671	Project / *Projek*	32
Total compulsory modules 1 semester /		32
And another FOUR of the following modules in consultation with the school director / ***Kies nog VIER van die volgende modules, in oorleg met die skooldirekteur:***		
ITRI611	Data Warehouses I / *Datapakhuise I*	12
ITRI613	Databases I / *Databasisse I*	12
ITRI614	Information Engineering Systems I / *Inligtingstelselingenieurswese I*	12
ITRI615	Computer Security I / *Rekenaarsekuriteit I*	12
ITRI616	Artificial Intelligence I / *Kunsmatige Intelligensie I*	12
ITRI618	Decision Support Systems I / *Besluitsteunstelsels I*	12
2 Semester		
And FOUR of the following modules in consultation with the school director / En VIER van die volgende modules, in oorleg met die skooldirekteur::		
ITRI621	Data Warehouses II / *Datapakhuise II*	12
ITRI623	Databases II / *Databasisse II*	12
ITRI624	Information Systems Engineering II / *Inligtingstelselingenieurswese II*	12
ITRI625	Computer Security II / *Rekenaarsekuriteit II*	12
ITRI626	Artificial Intelligence II / *Kunsmatige Intelligensie II*	12
ITRI628	Decision Support Systems II / *Besluitsteunstelsels II*	12
Total number of credits / ***Totale krediete***		**128**

NAS.8 MASTER OF SCIENCE / *MAGISTER SCIENTIAE*

NAS.8.1 RULES FOR THE DEGREE MASTER OF SCIENCE / *REËLS VIR DIE GRAAD MAGISTER SCIENTIAE*

The MSc degree is a qualification that may follow on a four year bachelors degree, a Honours BSc or another recognised degree approved by the Dean. / *Die MSc-graad is 'n graad wat kan volg op 'n vierjarige BSc of 'n Hons BSc-graad of 'n ander erkende graad wat deur die dekaan goedgekeur is.*

Studies may be taken full-time or part-time. / *Die studie kan voltyds of deeltyds geskied.*

Prospective students must, before the date as set by the relevant academic director, apply to the relevant academic director for selection and formal admission to the intended programme in the following year (see General Rules 4.3). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to the programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group. / *Voornemende studente moet voor die keerdatum, soos deur die toepaslike akademiese direkteur bepaal, by die relevante akademiesedirekteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reël 4.3). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke program beskikbaar is.*

NB: Lectures for the lectured modules for this degree in the Faculty of Natural and Agricultural Sciences are with a single exception presented full-time only./ *NB: Lesings vir die gedoseerde modules van hierdie graad word in die Fakulteit Natuur- en Landbouwetenskappe slegs voltyds aangebied.*

INTRODUCTION / *INLEIDING*

Research and postgraduate education in the Faculty of Natural and Agricultural Sciences is mostly managed in research entities. The research entities deal with the master's and PhD training curricula, i.e. curricula that contain a considerable research component. In some cases this is done in schools or centres/ *Navorsing en nagraadse studie word in die Fakulteit Natuur- en Landbouwetenskappe meestal in navorsingsentiteite bestuur. Die navorsingsentiteite hanteer die magister- en PhD-opleidingskurrikulums, dit wil sê kurrikulums wat 'n beduidende navorsingskomponent bevat*. In sommige gevalle geskied dit in skole of sentrums.

At the moment, there is one centre of excellence in Space Research, two research units, viz. Business Mathematics and Informatics, Environmental Sciences and Management, the three research focus areas, viz. Chemical Resource Beneficiation, Human Metabolomics and Material Science Innovation and Modelling, two niche areas, viz. Food Safety and Security and Technology Enhanced Learning and Innovation Education and Training in South Africa as well

as five centres, viz. 1) Applied Radiation Science and Technology, 2) Human Metabolomics, 3) Business Mathematics and Informatics, 4) Indigenous Knowledge Systems and 5) Water Science and Management. / *Tans is daar een sentrum van uitnemendheid, naamlik die Sentrum van Uitnemendheid in Ruimtenavorsing, twee navorsingseenhede, naamlik Bedryfswiskunde en Informatika; Omgewingswetenskappe en -Bestuur; drie navorsingsfokusareas naamlik Chemiese Hulpbronveredeling, Materiaalwetenskap Innovasie en Modellering en Menslike Metabolomika, twee nisareas naamlik Tegnologieverbeterde Leer en Innoverende Onderwys en Opleiding en Voedselveiligheid en – sekuriteit, asook die volgende vyf Sentrums: Bedryfswiskunde en Informatika*. Inheemse Kennissisteme, *Menslike Metabolomika; Toegepaste Stralingswetenskap en –tegnologie en Waterwetenskappe en –bestuur.*

DURATION OF THE STUDIES / *DUUR VAN DIE STUDIE*

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is two years full-time and three years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rule 1.14, a student may apply for an extension of the study period. / *Die minimum duur van die studie is een jaar voltyds en twee jaar deeltyds en die maksimum duur is twee jaar voltyds en drie jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 1.14, aansoek gedoen word om 'n verlenging van die studietermyn.*

ASSUMED PRIOR LEARNING / *AANNAMES OOR VORIGE LEER*

The student has already obtained an appropriate four year baccalaureus degree. / *Die student beskik oor 'n toepaslike vierjarige baccalaureusgraad.*

If the student does not conform to the provision the research director determines in consultation with the school director, and if necessary after consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to the MSc studies on the strength of knowledge and skills acquired by prior learning and work experience. / *Indien die student nie aan die bepaling voldoen nie, bepaal die navorsingsdirekteur in oorleg met die skooldirekteur, en indien nodig na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die MSc-studie toegelaat kan word.*

Programme-specific assumed prior learning is, where applicable, indicated in each of the programme descriptions./ *Programspesifieke aannames word, waar van toepassing, by elk van die programbeskrywings aangedui*

ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rule 4.7. / *Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reël 4.7.*

The relevant research director in consultation with the school director, may refuse admission to a programme if the standard of competence previously attained by the prospective student in the subject(s) in which he/she wishes to continue his/her studies, does not conform to the relevant programme requirements. / *Die betrokke*

navorsingsdirekteur, in oorleg met die skooldirekteur, kan toelating tot 'n program weier indien die standaard van bekwaamheid wat die voornemende student tevore in die betrokke vak(ke) waarin die student verder wil studeer, bereik het, nie aan die betrokke programvereistes voldoen nie.

If the applications received for a programme are more than the relevant research entity can handle in that programme, the group of students who, in the opinion of the research director in consultation with the school director, has the greatest chance of success will be selected for the relevant programme. The background and potential of students will also be taken into account in this selection process. / *Indien meer aansoeke vir 'n program ontvang word as wat die betrokke navorsingsentiteit in daardie program kan hanteer, word die groep studente wat volgens die oordeel van die navorsingsdirekteur, in oorleg met die skooldirekteur, die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.*

APPROVAL OF THE STUDY PROGRAMME / *GOEDKEURING VAN DIE STUDIEPROGRAM*

Approval of the study programme takes place in terms of the provisions in the General Rules and the relevant provisions in the Manual for Postgraduate Studies. Prospective students must consult this manual carefully./ *Goedkeuring van die studieprogram geskied na aanleiding van die bepalings in die Algemene Reël en die tersaaklike bepalings in die Handleiding vir Nagraadse Studie. Voornemende studente moet hierdie handleiding baie deeglik raadpleeg.*

ARTICULATION POSSIBILITIES / *ARTIKULASIEMOONTLIKHEDE*

On successful completion of most of the MSc curricula the student may be admitted to further learning for the doctorate at NQF level 10 in the core subject in which the qualification has been obtained. / *Met die suksesvolle voltooiing van die meeste MSc-kurrikulums kan die student toegelaat word tot verdere leer vir die doktorsgraad, op NKR-vlak 10, in die kernvak waarin die kwalifikasie verwerf is.*

Credits will be awarded for modules of other faculties and institutions on condition that the outcomes and total credit requirements of this qualification are totally complied with. / *Krediet sal verleen word vir modules van ander fakulteite en inrigtings, op voorwaarde dat die uitkoms- en totale kredietvereistes vir hierdie kwalifikasie as geheel nagekom word*.

With the basic applied and expert skills, as well as the research skills that the student has acquired by this qualification in one of the mathematical, computer and natural science disciplines, he/she will be equipped to continue with further learning and research in related specialist areas at other institutions. / *Met die basiese, toepasbare en spesialis-vaardighede, sowel as navorsingsvaardighede, wat die student met hierdie kwalifikasie in een van die wiskundige, rekenaarkundige en natuurwetenskaplike dissiplines opgedoen het, sal die student toegerus wees om met verdere leer en navorsing in verwante spesialisasiegebiede, aan ander inrigtings voort te gaan*

Programme-specialised articulation possibilities will be indicated, where applicable, in the programme descriptions. / *Programspesifieke artikulasiemoontlikhede sal, waar van toepassing, by die programbeskrywings aangedui word.*

CHANGING FROM MASTER'S STUDIES TO DOCTORATE STUDIES / *VERANDERING VAN MAGISTERSTUDIE NA DOKTORSTUDIE*

The General Rules 4.13 makes provision for a student who has registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors involved, outcomes of a quality and scope acceptable for a doctoral degree, to apply to the Faculty Board to change his/her registration for master's studies to registration for doctorate studies. / *Die Algemene Reël 4.13 maak voorsiening daarvoor dat 'n student wat vir 'n magistergraad geregistreer is en wat, na die eenparige oordeel van die studieleier en die betrokke navorsings- en skooldirekteure, uitkomste bereik het van 'n gehalte en omvang wat vir 'n doktorsgraad aanvaarbaar is, by die fakulteitsraad aansoek kan doen om die registrasie vir die magistergraadstudie na doktorsgraadstudie te verander.*

EXIT LEVEL OUTCOMES / *UITTREEVLAKUITKOMSTE*

The outcomes as described for the Honours Bachelor of Science are further refined and rounded off by this Magister Scientiae. Furthermore the qualifiers in these curricula will be familiar with the general scientific methods of research, with emphasis on the special research methodologies of one of the natural science core disciplines. These include: / *Die uitkomste soos beskryf by die Honneurs Baccalaureus Scientiae word by hierdie Magister Scientiae verder verfyn en afgerond. Verder sal die kwalifiseerders in hierdie kurrikulums vertroud wees met die algemene wetenskaplike metode van navorsing, met toespitsing op die besondere navorsingsmetodologie van een die natuurwetenskaplike kerndissiplines. Dit sluit in:*

a) identification and formulation of a problem statement; / *die identifisering en wetenskaplike formulering van 'n probleemstelling;*

b) thorough investigation of existing knowledge as reflected in appropriate scientific literature */ 'n deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike wetenskaplike literatuur;*

c) appropriate research to solve the problem / *die uitvoer van toepaslike navorsing ter oplossing van die probleem;*

d) scientific evaluation of the results in the context of the problem statement */ die wetenskaplike evaluering van die resultate in die konteks van die probleemstelling;*

e) scientific communication of the *results in the form of a mini dissertation, research report or dissertation / die wetenskaplike kommunikering van die resultate in die vorm van 'n skripsie, navorsingsverslag of verhandeling.*

NATURAL SCIENCE (INCLUDING MATHEMATICAL AND COMPUTER) AND TECHNOLOGICAL PROBLEM SOLVING / *NATUURWETENSKAPLIKE (INSLUITEND WISKUNDIGE EN REKENAARKUNDIGE) EN TEGNOLOGIESE PROBLEEMOPLOSSING*

At the end of the studies the student will be able to identify, evaluate and creatively and innovatively solve certain convergent and divergent problems in the relevant discipline from the natural science, health and technology fields. / *Aan die einde van die studie is die student in staat om sekere konvergente en divergente probleme in die betrokke dissipline uit die natuurwetenskaplike, gesondheidswetenskaplike en tegnologiese veld te identifiseer, te evalueer, en kreatief en innoverend op te los.*

APPLYING FUNDAMENTAL AND EXPERT KNOWLEDGE / *TOEPASSING VAN FUNDAMENTELE EN SPESIALIS KENNIS*

At the end of the studies the student will be able to integrate a basic knowledge and techniques from natural science and information technology in order to investigate human and natural phenomena and to solve accompanying problems. These abilities include the following:/ *Aan die einde van die studie is die student in staat om basiese kennis en tegnieke van die natuurwetenskap en die inligtingstegnologie te integreer om menslike verskynsels en verskynsels in die natuur te kan ondersoek en gepaardgaande probleme te kan oplos. Dit sluit die volgende in:*

a) Application of natural science knowledge and methods (with emphasis on those of the specific discipline) to problems by means of the appropriate use of / *Pas natuurwetenskaplike kennis en metodes (met toespitsing op dié van die besondere dissipline) toe op probleme deur toepaslike aanwending van:*

- formal analysis and modelling of human activities and natural phenomena, systems and problems / *formele analise en modellering van menslike aktiwiteite en natuurverskynsels, -stelsels en -probleme;*

- communication of theories, concepts and ideas / *kommunikering van teorieë, konsepte en idees;*

- discussions and conceptualisation of human activities and natural phenomena, systems and problems / *beredenering en konseptualisering van menslike aktiwiteite en natuurverskynsels, -stelsels en -probleme;*

- management of uncertainties and risks by utilising statistical principles and methods / *hantering van onsekerhede en risiko's deur gebruik van statistiese beginsels en metodes;*

- computer skills and information technology / •*rekenaarvaardighede en inligtingstegnologie*

b) Use of principles, laws and techniques of Natural and Agricultural Sciences and Health sciences (with emphasis on those of the specific discipline) at the fundamental level to / *Gebruik die beginsels, wette en tegnieke van die Natuurwetenskap en Gesondheidswetenskappe (met toespitsing op dié van die besondere dissipline) op fundamentele vlak om:*

• identify and solve open business and community problems / *oop bedryfs- en samelewingsprobleme te identifiseer en op te los;*

• identify and utilise applications / *toepassings te identifiseer en aan te wend*

• work with common fundamental expertise across the boundaries of disciplines / *oor dissiplinegrense heen met gemeenskaplike fundamentele kundigheid te werk*

Investigations, experiments and data-analysis / Ondersoeke, eksperimentering en data-analise

At the end of the studies the student will be able to */ Aan die einde van die studie is die student in staat om*

a) plan and perform investigations and experiments by utilising scientific modelling techniques / *ondersoeke en eksperimente te beplan en uit te voer deur gebruikmaking van wetenskaplike modelleringstegnieke;*

b) analyse, interpret and derive information from data*. / inligting vanuit data te analiseer, te interpreteer en af te lei.*

The student will have a limited knowledge of the fundamental research methodology of the specific discipline. / *Die student sal beskik oor deeglike kennis van die fundamentele navorsingsmetodologie van die besondere dissipline*

Scientific methods, skills and information technology/ *Wetenskaplike metodes, vaardighede en inligtingstegnologie*

At the end of the studies the student will be able to / *Aan die einde van die studie is die student in staat om*

a) apply appropriate scientific methods and to evaluate the results delivered */ toepaslike wetenskaplike metodes aan te wend en die resultate wat dit lewer, te evalueer;*

b) use computer software for calculations, modelling, simulation and handling of information, including */ rekenaarpakkette vir berekenings, modellering, simulasie en hantering van inligting te gebruik, wat insluit*

• evaluation of the appropriateness and limitations of software / *evaluering van die toepaslikheid en beperkings van die pakket;*

• correct application and functioning of software / *korrekte toepassing en werking van die pakket;*

• critical evaluation of the end product delivered by software / *kritiese evaluering van die eindproduk deur die pakket gelewer;*

• manage computers, networks and information infrastructures in evaluating, processing, managing and storing information to improve personal productivity and team work / *rekenaars, netwerke en inligtingsinfrastrukture te gebruik vir evaluering, prosessering, bestuur en berging van inligting om persoonlike produktiwiteit en spanwerk te verbeter;*

• implement basic techniques and knowledge of business management and health, safety and environmental conservation in business practice / *basiese tegnieke en kennis van besigheidsbestuur en gesondheids- en veiligheids- en omgewingsbewaring aan te wend op bedryfspraktyk.*

PROFESSIONAL AND GENERAL COMMUNICATION / *PROFESSIONELE EN ALGEMENE KOMMUNIKASIE*

At the end of the studies the student will be able to / *Aan die einde van die studie is die student in staat om:*

a) communicate effectively both orally and in writing with scientists (with emphasis on the specific discipline) and the community by using the appropriate structure, style and graphic and electronic support / *sowel mondeling as skriftelik, effektief met wetenskaplikes (met toespitsing op dié van die besondere dissipline) en die gemeenskap te kommunikeer, deur gebruikmaking van die gepaste struktuur, styl en grafiese en elektroniese ondersteuning;*

b) apply methods of information communication for use by others, especially in the world of Natural and Agricultural Sciences and health sciences (with emphasis on those of the specific discipline) / *metodes van inligtingverskaffing vir gebruik deur ander in veral die wêreld van die natuurwetenskap en gesondheidswetenskap (met toespitsing op dié van die besondere dissipline) toe te pas.*

IMPACT OF NATURAL SCIENCE ACTIVITIES ON THE COMMUNITY AND ENVIRONMENT / *IMPAK VAN NATUURWETENSKAPLIKE EN GESONDHEIDSWETENSKAPLIKE AKTIWITEIT OP DIE GEMEENSKAP EN DIE OMGEWING*

The student is critically aware of / *Die student is krities bewus van:*

a) the impact of natural science and health science activities (especially those of the specificdiscipline) on the community and the environment / *die impak van natuurwetenskaplike en gesondheidswetenskaplike aktiwiteit (veral dié van die besondere dissipline) op die gemeenskap en die omgewing*

b) the necessity to take into account in natural and health science activities / *die noodsaaklikheid om by natuurwetenskaplike en gesondheidsweten- skaplike aktiwiteite*

• the impact of technology on the community and / *die impak van tegnologie op die gemeenskap, en*

• the personal, social and cultural values and expectancies of those people influenced by the scientific activities / *die persoonlike, sosiale, en kulturele waardes en verwagtinge van diegene wat deur wetenskaplike aktiwiteite geraak word, in ag te neem.*

TEAM AND MULTIDISCIPLINARY WORK / *SPAN- EN MULTIDISSIPLINÊRE WERK*

At the end of the studies the student will be able to work effectively as an individual, in teams and in multidisciplinary environments and to exercise leadership and other critical functions / *Aan die einde van die studie is die student in staat om effektief as*

individu, in spanne en in multidissiplinêre omgewings te werk en leiers- en ander kritiese funksies te verrig.

LIFELONG LEARNING / *LEWENSLANGE LEER*

The student will understand the necessity to ensure continuing competency and to remain at the forefront of the latest technology and techniques and he/she will have the ability to stay involved in lifelong learning by means of well-developed learning skills / *Die student verstaan die noodsaaklikheid om voortgesette bekwaamheid te verseker en om aan die voorpunt van die jongste tegnologie en tegnieke te bly, en is in staat om in lewenslange leer deur goed-ontwikkelde leervaardighede betrokke te bly*.

PROFESSIONAL ETHICS AND PRACTICE / *PROFESSIONELE ETIEK EN PRAKTYK*

The student is critically aware of the necessity to act in a professional and ethical way and to assume responsibility within his/her own limitations and skills, while he/she is able to make judgements according to knowledge and experience / *Die student is krities bewus van die noodsaaklikheid om professioneel en eties op te tree en om verantwoordelikheid binne eie beperkings en vaardighede te aanvaar, en is in staat om oordele te vel in verhouding tot kennis en ervaring.*

EXTENSION OF THE STUDY PERIOD / VERLENGING VAN STUDIETYDPERK

See A Rules 4.14. / Sien A Reëls 4.14

NAS.8.2 EXAMINATION

Exams/Eksamens

The examination opportunities and relevant related rules apply in congruence with General Rule 4.11./ *Die eksamengeleenthede en verbandhoudende reëls geskied in ooreenstemming met Algemene Reël 4.11.*

Composition of the participation mark/ Samestelling van die deelnamepunt

A participation mark for a module can be compiled from tests, worksheets and other forms of evaluation./ *'n Deelnamepunt vir 'n module kan saamgestel word uit toetse, werkstukke en ander vorms van evaluering*.

Admission to the examination for modules wherein exam will be written/ *Toelating tot die eksamen vir modules waarin eksamen geskryf word*

Admission to the exam in any module takes place after achieving a participation proof./ *Toelating tot die eksamen in enige module geskied deur die verwerwing van 'n deelnamebewys*.

A participation proof, where admission to the exam is permitted, will only be issued after the student meets the approval of the school director, and met the requirements thereof stipulated in the study guide for the appropriate module./ *'n Deelnamebewys, wat toelating tot die eksamen verleen, sal slegs uitgereik word nadat 'n student tot die bevrediging van die skooldirekteur, voldoen het aan die vereistes daarvoor wat in die studiegids vir die betrokke module uiteengesit i*s.

Pass requirements/*Slaagvereistes*

The stipulations of General Rule 4.11 Applies./ *Die bepalings van Algemene Reël 4.11 is van toepassing.*

The subminimum of the exam, for all modules on NQR-level 9 wherein exam is written, is 50%./ *Die subminimum in die eksamen, vir alle modules op NKR-vlak 9 waarin eksamen geskryf is, is 50%.*

The pass requirements for a module wherein exam is written, is 50%./ *Die slaagvereiste vir 'n module waarin eksamen geskryf is, is 'n modulepunt van 50%.*

A programme is passed by passing all the modules that the programme consists of respectively./ *'n Program word geslaag deur al die modules waaruit die program saamgestel is, afsonderlik te slaag*.

If the examiners are not unanimous that the student passed the module, then the final decision rests with the dean, after the dean has sought advice as the dean deems necessary./ *Indien die eksaminatore nie eenparig daaroor is dat die student in 'n module geslaag het nie, berus die finale besluit by die dekaan, nadat advies ingewin is soos die dekaan nodig ag.*

A module is passed with distinction if a pass mark of at least 75% is acquired. The degree is passed with distinction if the average module mark, weighed against credit marks of every module in the curriculum, is at least 75%./*'n Module word met onderskeiding geslaag indien 'n modulepunt van minstens 75% behaal is. Die graad word met onderskeiding geslaag indien die gemiddelde punt, geweeg volgens die kredietpunte van elke module in die kurrikulum, minstens 75 % is.*

Repeating of modules/*Herhaling van modules*

A once off repeating of modules that are not passed only occurs according to the stipulations of the General Rule A.4.11.3./ *Eenmalige herhaling van modules wat nie geslaag is nie, geskied volgens die bepalings van Algemene Reël 4.11.3.*

NAS.8.3 MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS/ *MAGISTER SCIENTIAE IN LANDBOU EKONOMIE /*

NAS.8.3.1 RULES FOR THE DEGREE MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS */ REëLS VIR DIE GRAAD MAGISTER SCIENTIAE IN LANDBOU EKONOMIE*

Prospective students must, before the date set by the relevant research director in consultation with the relevant school director involved, apply to the relevant research director for selection and formal admission to the intended programme in the following year (see General Rules). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to a programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group./ *Voornemende studente moet voor die keerdatum soos deur die navorsingsdirekteur in oorleg met die skooldirekteur bepaal, by die navorsings¬direkteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk die Algemene Reël). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke program beskikbaar is*

INTRODUCTION / *INLEIDING*

Research in the Faculty of Natural and Agricultural Sciences is managed in research entities. The research entities areas are furthermore responsible for the master's (MSc) and doctorate (PhD) training curricula, i.e. curricula that contain a considerable research component./ *Navorsing word in die Fakulteit Natuur- en Landbouwetenskappe bestuur in navorsingsentiteite. Die navorsingsentiteite is verder verantwoordelik vir die magister- en PhD-opleidingskurrikulums, dit wil sê kurrikulums wat 'n beduidende navorsingskomponent bevat*.

Apart from very rare exceptions that must be approved by the Dean the research required for this master's degree must be conducted in the Research Unit for Environmental Sciences and Management./ *Behoudens hoë uitsonderings wat deur die dekaan goedgekeur moet word, moet die navorsing wat vir hierdie M-graad vereis word in die Navorsingseenheid Omgewingswetenskappe en -Bestuur verrig word.*

DURATION OF STUDIES / *DUUR VAN STUDIES*

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is two years full-time and three years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rules, a student may apply for an extension of

the study period./ *Die minimum duur van die studie is een jaar voltyds en twee jaar deeltyds en die maksimum duur is twee jaar voltyds en drie jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël, aansoek gedoen word om 'n verlenging van die studietermyn.*

ASSUMED PRIOR LEARNING / *AANNAMES OOR VORIGE LEER*

To be admitted to this qualification the candidate should be in possession of the BSc Agric Honours degree (including subjects relevant to agricultural economics, animal health, animal science, crop science and agricultural extension) or an equivalent qualification as approved by Senate. Admission to the study is also subject to the approval of the School Director (MC) or Research Unit Director (PC) and a post graduate selection committee, which will be based on a satisfactory study record and appropriate qualification already obtained. The School Director (MC) or Research Unit Director (PC) may require additional subjects/modules to be completed before the admission to the MSc (Agric)./ *Die student beskik oor 'n toepaslike baccalaureusgraad en/of 'n toepaslike honneurs baccalaureusgraad. Indien die student nie aan die bepaling voldoen nie bepaal die skooldirekteur in oorleg met die navorsingsdirekteur, en indien nodig na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die M Art et Scien-studie toegelaat kan word. 'n Student moet Afrikaans of Engels magtig wees. Programspesifieke aannames word, waar van toepassing, by elk van die programbeskrywings aangedui.*

ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rules. The relevant research director in consultation with the school director, may refuse admission to a programme if the standard of competence previously attained by the prospective student in the subject(s) in which he/she wishes to continue his/her studies does not conform to the relevant programme requirements. If the applications received for a programme are more than the relevant research entity can handle in that programme, the group of students who, in the opinion of the research director in consultation with the school director, has the greatest chance of success will be selected for the relevant programme. The background and potential of students will also be taken into account in this selection process./ *Om toegelaat te word tot hierdie kwalifikasie moet die kandidaat in besit wees van die BSc Agric Hons-graad (insluitend vakke wat betrekking het op landbou-ekonomie, dieregesondheid, veekunde, gewaswetenskap en landbouvoorligting) of 'n gelykwaardige kwalifikasie soos goedgekeur deur die Senaat. Toelating tot die studie is ook onderhewig aan die goedkeuring van die Skooldirekteur (MK) of Direkteur van die Navorsingseenheid (PK) en 'n nagraadse keurkomitee, en sodanige besluit sal gegrond wees op 'n bevredigende studierekord en toepaslike kwalifikasie alreeds verwerf. Die Skooldirekteur (MK) of Direkteur van die Navorsingseenheid (PK) mag vereis dat bykomende vakke/modules eers voltooi word voor toelating tot die MScAgric.*

APPROVAL OF THE STUDY PROGRAMME / *GOEDKEURING VAN DIE STUDIEPROGRAM*

Approval of the study programme takes place in terms of the provisions of the General Rules and the relevant provisions in the *Manual for Postgraduate Studies*. *Prospective students must consult this manual carefully./ Goedkeuring van die studieprogram geskied na aanleiding van die bepalings in die Algemene Reël en die tersaaklike bepalings in die Handleiding vir Nagraadse Studie. Voornemende studente moet hierdie handleiding baie deeglik raadpleeg*.

ARTICULATION POSSIBILITIES / *ARTIKULASIEMOONTLIKHEDE*

A student having completed this degree may be admitted to the PhD studies in a core subject in which adequate credits have been obtained./ *Na verwerwing van hierdie graad kan die student toegelaat word tot verdere leer vir die PhD-graad in Landbou-ekonomie.*

CHANGING FROM MASTER'S TO DOCTOR'S STUDIES / *VERANDERING VAN MAGISTERSTUDIE NA DOKTORSTUDIE*

The General Rules 4.13 make provision for a student who is registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors concerned, outcomes of a quality and scope acceptable for a doctorate, to apply to the Faculty Board to change his/her registration for master's studies to that for a doctorate./ *Die Algemene Reël 4.13 maak voorsiening daarvoor dat 'n student wat vir 'n magistergraad geregistreer is en wat, na die eenparige oordeel van die studieleier en die betrokke navorsings- en skooldirekteure, uitkomste bereik het van 'n gehalte en omvang wat vir 'n doktorsgraad aanvaarbaar is, by die fakulteitsraad aansoek kan doen om die registrasie vir die magistergraadstudie na doktorsgraadstudie te verander*

EXIT LEVEL OUTCOMES / *UITTREEVLAKUITKOMSTE*

By completion of this qualification, the student should be able to: / *Na voltooiing van hierdie kwalifikasie behoort die student in staat te wees om:*

Demonstrate a comprehensive and systematic knowledge base in the specific field of animal health / animal sciences / agronomy and crop science / agriculture economics./ *'n Omvattende en sistematiese kennisbasis te demonstreer in die spesifieke gebied van Dieregesondheid / Veekunde / Agronomie en Gewaswetenskap / Landbou-ekonomie.*

Demonstrate a critical understanding of the theory, research methodologies and techniques relevant to agriculture and be able to collect and critical evaluate current research and take part in scholarly debates in this particular field of specialization./ *'n Kritiese begrip te demonstreer van die teorie, navorsingsmetodologie en tegnieke wat betrekking het op die landbou en in staat wees om vir huidige navorsing inligting in te samel en krities te evalueer, en deel te neem aan akademiese debatte op hierdie bepaalde spesialisasiegebied.*

Identify, analyse and deal with complex real world problems and issues regarding agriculture, to apply relevant research methods, techniques and technologies,

collect, interpret and evaluate data under supervision and communicate results of the research to specialist and non-specialist audiences in a dissertation which meets the standards of the faculties and NWU./ *Komplekse werklikheidsprobleme en kwessies rakende die landbou te identifiseer, te ontleed en daarmee te handel; om tersaaklike navorsingsmetodes, -tegnieke en tegnologie toe te pas, data te versamel, te interpreteer en onder toesig te evalueer, en die resultate van die navorsing in 'n verhandeling wat voldoen aan die standaarde van die fakulteite en die NWU aan spesialis- en nie-spesialisgehore te kommunikeer.*

OBJECTIVE / *DOEL*

The purpose of this programme is to provide students of specialist knowledge and advanced skills in research methodology, which should enable the student to continue as a specialist in the field of Agricultural Sciences on NKR-level 9. The qualifier should belong to a prestigious group of masters in the field of Agricultural Sciences in the country. Students will have access to further studies in Agricultural Sciences nationally, as well as internationally. / *Die doel met hierdie program is om studente te voorsien van spesialiskennis en gevorderde vaardighede in navorsingsmetodologie wat elke student in staat behoort te stel om sy of haar werk voort te sit as 'n kundige op die gebied van die Landbouwetenskap op NKR-vlak 9. Die persoon wat kwalifiseer, moet deel kan uitmaak van 'n uitgelese groep meesters op die gebied van die landbouwetenskappe in die land. Studente sal nasionaal sowel as internasionaal toegang hê tot verdere studie in die landbouwetenskappe.*

NAS.8.4 MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS / *MAGISTER SCIENTIAE IN LANDBOU-EKONOMIE*

CODE/*KODE*: 2CG N01 N801P/M

CAMPUS/*KAMPUS*: Mafikeng/Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Agricultural Economics /*Magister Scientiae in Landbou-Ekonomie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AECM871	Dissertation/Verhandeling	180

NAS.8.5 MASTER OF SCIENCE IN AGRICULTURAL EXTENSION / *MAGISTER SCIENETIAE IN LANDBOU UITBREIDING*

CODE: **2CJ N01 N801M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Science in Agricultural Extension/

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AEXM871	Dissertation/Verhandeling	180

NAS.8.6 MASTER OF SCIENCE IN ANIMAL HEALTH / *MAGISTER SCIENTIAE IN DIEREGESONDHEID*

CODE: **2CE N01 N801M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Science in Animal Health / *Magister Scientiae in Dieregesondheid*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AHMM871	Dissertation/Verhandeling	180

NAS.8.7 MASTER OF SCIENCE IN ANIMAL SCIENCE / *MAGISTER SCIENTIAE IN DIEREWETENSKAPPE*

CODE: **2CK N01 N801M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme Master of Science in Animal Science / *Magister Scientiae in Dierewetenskappe*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ASDM871	Dissertation/Verhandeling	180

NAS.8.8 MASTER OF SCIENCE IN AGRONOMY / *MAGISTER SCIENTIAE IN AGRONOMIE*

CODE: **2CF N01 N801M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Science in Agronomy / *Magister Scientiae in Agronomie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AGRM871	Dissertation/Verhandeling	180

NAS.8.9 MASTER OF SCIENCE IN THE UNIT FOR BUSINESS MATHEMATICS AND INFORMATICS / *MAGISTER SCIENTIAE IN DIE EENHEID VIR BEDRYFSWISKUNDE EN INFORMATIKA*

NAS.8.9.1 RULES FOR THE DEGREE MASTER OF SCIENCE IN THE UNIT FOR BUSINESS MATHEMATICS AND INFORMATICS / *REëLS VIR DIE GRAAD MAGISTER SCIENTIAE IN DIE EENHEID VIR BEDRYFSWISKUNDE EN INFORMATIKA*

SPECIFIC ASSUMED PRIOR LEARNING

The student has already obtained an appropriate honours baccalaureus degree. If not, the school director and/or centre director determines in consultation with the research director, and if necessary after consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to the MSc studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning / *Die student beskik oor 'n honneurs baccalaureusgraad. Indien nie, bepaal die skooldirekteur en/of die sentrumdirekteur in oorleg met die navorsingsdirekteur, en indien nodig na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die MSc-studie toegelaat kan word.*

For an MSc in a specific subject (Computer Science, Statistics, Applied Mathematics or Mathematics) the honours baccalaureus degree in the same subject is normally required, with the following additions / *Normaalweg word vir 'n MSc-graad in 'n spesifieke vakrigting (Rekenaarwetenskap, Statistiek, Toegepaste Wiskunde of Wiskunde), die honneurs baccalaureusgraad in dieselfde vak vereis met die volgende toevoegings:*

- An honours baccalaureus degree in Mathematics in which Statistics has been taken at level 7 grants admission to Statistics / *'n Honneurs baccalaureusgraad in Wiskunde met 'n baccalaureusgraad waarin Statistiek tot op vlak 7 verwerf is, verleen toegang tot Statistiek.*

- A four-year Baccalaureus degree in Engineering with Applied Mathematics at level 7 grants admission to Applied Mathematics / *'n Vierjarige baccalaureusgraad in Ingenieurswese met Toegepaste Wiskunde tot op vlak 7, verleen toegang tot Toegepaste Wiskunde.*

For admission to the programs N809P, N810P and N811P in Business Mathematics and Informatics (BMI) above and beyond the assumed prior learning as stated in the general programme description of the MSc programme a student is also required to have taken the Hons BSc qualification in Business Mathe-matics and Informatics, subject to the following specific prerequisites / *Vir toelating tot die kurrikulums N809P, N810P en N811P in Bedryfswiskunde en Informatika (BWI), word bo-en behalwe vir die aannames oor vorige leer soos in die algemene MSc-programbeskrywing vermeld, ook nog vereis dat 'n student die Hons BSc-kwalifikasie in Bedryfswiskunde en Informatika verwerf het, en wel onderhewig aan die volgende spesifieke voorvereistes:*

Masters' programme Magister program	Honours program Honneurs program
N809P	202 126 (N609P) 2DP L01 N601P (N610P)
N810P	2DQ L01 N601P
N811P	202 129 N612P N612P or equivalent 4-year degree /

Switching between the curricula may take place in consultation with Director of the Centre for BMI / *Oorskakeling tussen kurrikulums, kan in oorleg met die sentrumdirekteur geskied.*

Apart from the prerequisites specified for admission in N.4.3 students may be refused to be admitted to the postgraduate BMI qualifications N809P, N810P and N811P if the Centre should have insufficient capacity to handle the accompanying projects (BWIR826). This limitation will naturally be applied very cautiously and will vary from year to year. The selection process of the master's degree in BMI takes place during September of the previous year and only the best candidates will be selected / *Benewens die voorvereistes vir toelating in N.4.3 gespesifiseer, kan studente toegang tot die nagraadse BWI-kurrikulums N809P, N810P en N811P geweier word, mits die Sentrum onvoldoende kapasiteit het om die gepaardgaande projekte (BWIR826) te hanteer. Hierdie beperking sal uiteraard met omsigtigheid toegepas word en kan wissel van jaar tot jaar. Die keuringsproses vir die M-graad in BWI vind in September van die vorige jaar plaas, en net die beste kandidate word hiervoor gekies*

For the MSc in Risk Analytics 2ED P01(N865P) the candidate must already have obtained an honours degree in mathematical sciences with theoretical or practical experience in risk analysis / *Vir die MSc in Risiko-analise 2ED P01(N865P), moet die kandidaat beskik oor 'n Honneursgraad in die Wiskundige Wetenskappe met teoretiese of praktiese ervaring in Risiko-analise.*

PROGRAMME-SPECIFIC ARTICULATION POSSIBILITIES /
PROGRAMSPESIFIEKE ARTIKULASIEMOONTLIKHEDE :

MSc programs in Computer Science N861P, Statistics 2CY P01 N801P, Applied Mathematics 2FK P01 N801P and Mathematics 2GA P01N801P / ***MScprogram in Rekenaarwetenskap N861P, Statistiek 2CY P01 N801P, Toegepastewiskunde 2FK P01 N801P en Wiskunde 2GA P01N801P***

On successful completion of the MSc programme the student will have direct access to further learning for the doctoral degree at NQF level 10 / *Met die suksesvolle voltooiing van die MSc-program sal die student direk toegang hê tot verdere leer vir die doktorsgraad op NKR-vlak 10:*

- Credits will be awarded for modules of other faculties and institutions on condition that the outcomes and total credit requirements of this qualification are

totally complied with / *Krediet sal verleen word vir modules van ander fakulteite en inrigtings, op voorwaarde dat die uitkoms- en totale kredietvereistes vir hierdie kurrikulum as geheel nagekom word.*

- With the basic applicable and expert skills, as well as the research skills that the student has acquired by this qualification in one of the mathematical, computer and natural science disciplines or health science disciplines, he/she will be equipped to continue with further learning and research in related specialist areas at other institutions / *Met die basiese, toepasbare en spesialis-vaardighede, sowel as navorsingsvaardighede, wat die student met hierdie kwalifikasie in een van die wiskundige, rekenaarkundige en natuurwetenskaplike of gesondheidswetenskaplike dissiplines opgedoen het, sal die student toegerus wees om met verdere leer en navorsing voort te gaan in verwante spesialisasiegebiede aan ander inrigtings.*

MSc program N809P, N810P and -N811P in Business Mathematics and* 2ED P01 N801P*in Risk Analysis / MSc-kurrikulums N809P, N810P en N811P in Bedryfswiskunde en Informatika en* 2ED P01N801P*in Risiko-analise

The above-mentioned MSc programs grant admission to a PhD in Risk Analytics and a PhD in Business Mathematics and Informatics. Please note that due to the nature of the BMI industry directed research projects, all projects have to be completed before the end of the academic year. Failure to do so will result in failing the degree / *Bogenoemde MSc programme gee toelating tot 'n PhD-studie in Risiko-analise. Neem kennis dat alle projekte in die BWI Industrie-gerigte navorsings-projekte, voltooi moet wees voor die einde van die akademiese jaar. Studente wat nie hieraan voldoen nie, druip hul graad.*

NAS.8.10 MASTER OF SCIENCE IN COMPUTER SCIENCE / *MAGISTER SCIENTIAE IN REKENAARWETENSKAP*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N808M

CODE: **203-180**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Science in Computer Science / *Magister Scientiae in Rekenaarwetenskap*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
CISM871	Dissertation/Verhandeling	240

CURRICULUM: N802V

CODE: **203-180**

CAMPUS: Vaal-Triangle **(**English)

DELIVERY MODE: Full time and part-time

Compilation of old Programme: Master of Science in Computer Science / *Magister Scientiae in Rekenaarwetenskap*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ITRV871	Dissertation/Verhandeling	180

NAS.8.11 MASTER OF SCIENCE IN COMPUTER SCIENCE / *MAGISTER SCIENTIAE IN REKENAARWETENSKAP*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: 2DB N01 N801M/V

CAMPUS: Mafikeng / Vaal-Triangle(English)

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Science in Computer Science / *Magister Scientiae in Rekenaarwetenskap*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ITWV871	Dissertation/Verhandeling	180

NAS.8.12 MASTER OF SCIENCE IN COMPUTER SCIENCE/ *MAGISTER SCIENTIAE IN REKENAARWETENSKAP*

CURRICULUM/*KURRIKULUM*: N861P

CODE/*KODE:* 203-155

CAMPUS/*KAMPUS:* Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time

Compilation of old Programme: Master of Science in Computer Science/ *Magister Scientiae in Rekenaarwetenskap*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
ITRN872	Dissertation / *Verhandeling*	100
RSWW811	Research Methodology / Navorsingsmetodologie	8
Total compulsory modules 1 semester / *Verpligte modules 1 semester*		**108**
Elective modules / *keuse modules:*		
Selects in consultation with the research director and the school director TWO other modules from the following list / *Kies in oorleg met die navorsingsdirekteur en skooldirekteur TWEE modules uit die volgende lys:*		
ITRW876	Databases / *Databasisse*	32
ITRW877	Decision Support Systems / *Besluitsteunstelsels*	32
ITRW878	Artificial Intelligence / *Kunsmatige Intelligensie*	32
ITRW883	Image Processing / *Beeldverwerking*	32
ITRW884	Information Systems Engineering / *Inligtingstelselingenieurswese*	32
ITRW885	Computer Security / *Rekenaarsekuriteit*	32
ITRW886	Data Warehouses / *Datapakhuise*	32
Total elective modules/ *Totaal keuse modules*		**64**
2 Semester		
ITRN872	Dissertation / *Verhandeling*	
RSWW821	Research Communication / *Navorsingskommunikasie*	8
Total number of credits / Totale krediete		**180**

NAS.8.13 MASTER OF SCIENCE IN BUSINESS STATISTICS / *MAGISTER SCIENTIAE IN BEDRYFS-STATISTIEK*

CURRICULUM: N801V

CODE: **203-180**

CAMPUS: Vaal-Triangle **(**English)

DELIVERY MODE: Full time and part-time

Compilation of Old Programme: Master of Science in Business Statistics / *Magister Scientiae in Bedryfs-Statistiek*

Module code	Descriptive name	Credits
ITWV874	Data Miningl	32
ITWV875	Data Mining II	32
ONAV872	Dissertation	64
Credit total for the curriculum		**128**

NAS.8.14 MASTER OF SCIENCE IN MATHEMATICAL STATISTICS / *MAGISTER SCIENTIAE IN WISKUNDIGE STATISTIEK*

CODE/*KODE*: 2CY P01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Mathematical Statistics / *Magister Scientiae in Wiskundige Statistiek*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
STTN872	Dissertation / *Verhandeling*	100
RSWW811	Research Methodology / *Navorsingsmetodologie*	8
Select in consultation with the research director and the school director TWO other modules from the following list / *Kies in oorleg met die navorsingsdirekteur en skooldirekteur TWEE modules uit die volgende lys:*		
STTK874	Advanced Resampling Methods / *Gevorderde hersteekproef-nemingsmetodes*	32
STTK875	Advanced Statistical Models / *Gevorderde statistiese modelle*	32
STTK876	Advanced Multivariate Statistics / *Gevorderde meerveranderlike Statistiek*	32
STTK877	Advanced Probability Theory / *Gevorderde waarskynlikheidsleer*	32
STTK878	Advanced Time Series Models / *Gevorderde Tydsreeksmodelle*	32
STTK879	Advanced Stochastic Processes / *Gevorderde Stogastiese prosesse*	32
STTN874	Advanced Survival Models / *Gevorderde Oorlewingsteorie*	32
Second Semester		
STTN872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research Communication / *Navorsingskommunikasie*	8
Total number of credits / *Totale aantal kredietpunte*		**180**

NAS.8.15 MASTER OF SCIENCE IN APPLIED MATHEMATICS BY RESEARCH / *MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE DEUR NAVORSING*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N804M

CODE: **203-121**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Science in Applied Mathematics by Research / *Magister Scientiae in Toegepaste Wiskunde deur Navorsing*

Module code	Descriptive name	Credits
APMM871	Dissertation/Verhandeling	240

NAS.8.16 MASTER OF SCIENCE IN APPLIED MATHEMATICS BY RESEARCH / *MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE DEUR NAVORSING*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE: **2FL N01 N801M**

CAMPUS: Mafikeng (English)

DELIVERY MODE*:* : Full time

Compilation of new Programme: Master of Science in Applied Mathematics by Research / *Magister Scientiae in Toegepaste Wiskunde deur Navorsing*

Module code	Descriptive name	Credits
APPM871	Dissertation/Verhandeling	180

NAS.8.17 MASTER OF SCIENCE IN APPLIED MATHEMATICS COURSEWORK */ MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE KURSESWERK*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N863P

CODE/*KODE:* **203-157**

CAMPUS/*KAMPUS:* Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time/*Voltyds*

Compilation of old Programme: Master of Science in Applied Mathematics by Coursework / *Magister Scientiae in Toegepaste Wiskunde met Kursuswerk*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
TGWN872	Dissertation / *Verhandeling*	100
RSWW811	Research Methodology / *Navorsingsmetodologie*	8
Select in consultation with the research director and the school director TWO modules from the following list / *Kies in oorleg met die navorsings-direkteur en die skooldirekteur TWEE van die volgende modules:*		
TGWN881	Applicable Analysis I / *Toepasbare Analise 1*	32
TGWN882	Applicable Analysis II / *Toepasbare Analise 2*	32
TGWN883	Modelling I / *Modellering 1*	32
TGWN884	Modelling 2 / *Modellering 2*	32
TGWN887	Principles and Paradigms:Applied Mathematics / *Beginsels en Paradigmas: Toegepaste Wiskunde*	32
WISN885	Discrete Structures I / *Diskrete Strukture 1*	32
WISN886	Discrete Structures 2 / *Diskrete Strukture 2*	32
2 Semester		
TGWN872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research Communication / *Navorsingskommunikasie*	8
Total number of credits/ *Totale aantal krediete*		**180**

NAS.8.18 MASTER OF SCIENCE IN APPLIED MATHEMATICS COURSEWORK */ MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE KURSESWERK*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE/*KODE*: 2FK P01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of new Programme: Master of Science in Applied Mathematics by Coursework / *Samstelling van die Program Magister Scientiae in Toegepaste Wiskunde met Kursuswerk*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
APPM872	Dissertation / *Verhandeling*	100
RSWW811	Research Methodology / *Navorsingsmetodologie*	8
Select in consultation with the research director and the school director TWO modules from the following list / Kies in oorleg met die navorsingsdirekteur en die skooldirekteur TWEE van die volgende modules:		
APPM881	Applicable Analysis I/*Abstrakte Analise 1*	32
APPM882	Applicable Analysis II / *Abstrakte Analise 2*	32
APPM883	Modelling I / *Algebra I*	32
APPM884	Modelling 2 / *Algebra II*	32
APPM887	Principles and Paradigms:Applied Mathematics / *Beginsels en Paradigmas: Suiwer Wiskunde*	32
MTHS885	Discrete Structures I/*Diskrete Strukture*	32
MTHS886	Discrete Structures 2 / *Diskrete Strukture 2*	32
2 Semester		
APPM872	Dissertation / *Verhandeling*	
RSWW821	Research Communication/ *Navorsingskommunikasie*	8
Total number of credits / *Totale aantal krediete*		**180**

NAS.8.19 MASTER OF SCIENCE IN MATHEMATICS BY RESEARCH / *MAGISTER SCIENTIAE IN WISKUNDE DEUR NAVORSING*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N830M

CODE: **203 – 135**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of Programme: Master of Science in Mathematics by Research / *Magister Scientiae in Wiskunde deur Navorsing*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
MMAY871	Dissertation/Verhandeling	240

NAS.8.1 MASTER OF SCIENCE IN MATHEMATICS BY RESEARCH / *MAGISTER SCIENTIAE IN WISKUNDE DEUR NAVORSING*

NEW PROGRAMME (2018 1st Registration)

CODE/*KODE*: **2CV N01 N801M**

CAMPUS/*KAMPUS*: Mafikeng

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of new Programme: Master of Science in Mathematics by Research / *Magister Scientiae in Wiskunde deur Navorsing*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
MTHS871	Dissertation/Verhandeling	180

NAS.8.2 MASTER OF SCIENCE IN MATHEMATICS COURSEWORK/ *MAGISTER SCIENTIAE IN WISKUNDE KURSUSWERK*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N806M

CODE: **203-135**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Science in Mathematics by Coursework / *Magister Scientiae in Wiskundemet Kursuswerk*

Module code		Credits
1 Semester		
MAYM 811		30
MAYM 812		30
Total 1 Semester		60
2 Semester		
MAYM 821		30
MAYM 822		30
Total 2 Semester		60
Total number of credits		120

CURRICULUM/*KURRIKULUM*: N864P

CODE/*KODE:* **203-158**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time/Voltyds

Compilation of old Programme: Master of Science in Mathematics by Coursework / *Magister Scientiae in Wiskunde met Kursuswerk*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
WISK872	Dissertation / *Verhandeling*	100
RSWW811	Research methodology / *Navorsingsmetodologie*	8
Select in consultation with the research director and the school director TWO modules from the following list / *Kies in oorleg met die navorsingsdirekteur en die skooldirekteur TWEE van die volgende modules:*		

WISN881	Abstract Analysis I / *Abstrakte Analise 1*	32
WISN882	Abstract Analysis II / *Abstrakte Analise 2*	32
WISN883	Algebra I / *Algebra I*	32
WISN884	Algebra II / *Algebra II*	32
WISN885	Discrete Structures 1 / *Diskrete Strukture 1*	32
WISN886	Discrete Structures 2 / *Diskrete Strukture 2*	32
WISN887	Principles and Paradigms: Pure Mathematics / *Beginsels en Paradigmas: Suiwer Wiskunde*	32
2 Semester		
WISK872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research communication / *Navorsingskommunikasie*	8
Total number of credits / *Totale aantal krediete*		**180**

NAS.8.3 MASTER OF SCIENCE IN MATHEMATICS COURSEWORK/ *MAGISTER SCIENTIAE IN WISKUNDE KURSUSWERK*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE/*KODE*: 2GA P01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of new Programme: Master of Science in Mathematics by Coursework / *Magister Scientiae in Wiskunde met Kursuswerk*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
Compulsory 1 Semester		
MTHS872	Dissertation / *Verhandeling*	100
RSWW811	Research methodology / *Navorsingsmetodologie*	8
Elective modules / *keuse modules :*		
Select in consultation with the research director and the school director TWO other modules from the following list / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI TWEE van die volgende modules:*		
MTHS881	Abstract Analysis I / *Abstrakte Analise 1*	32
MTHS882	Abstract Analysis II / *Abstrakte Analise 2*	32
MTHS883	Algebra I / *Algebra I*	32
MTHS884	Algebra II / *Algebra II*	32
MTHS885	Discrete Structures 1 / *Diskrete Strukture 1*	32
MTHS886	Discrete Structures 2 / *Diskrete Strukture 2*	32
MTHS887	Principles and Paradigms: Pure Mathematics / *Beginsels en Paradigmas: Suiwer Wiskunde*	32
2 Semester		
MTHS872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research communication / *Navorsings-kommunikasie*	8
Total number of credits / Totale krediete		**180**

NAS.8.4 MASTER OF SCIENCE IN NATURAL SCIENCE TEACHING / *MAGISTER SCIENTIAE IN NATUURWETENSKAP ONDERWYS*

Admission requirements for the programme/*Toelatingsvereistes vir die program:*

Prospective students must hold an applicable honours degree and a Post-Graduate Certificate in Education (PGCE). / *Voornemende studente moet oor 'n toepaslike honneursgraad en die Nagraadse Onderwyssertifikaat (NGOS) beskik.*

CODE/*KODE*: 2CU N01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Natural Science Teaching / *Magister Scientiae in Natuurwetenskap Onderwys*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
NWON871	Dissertation / *Verhanderling*	180

NAS.8.5 MASTER OF SCIENCE IN RISK ANALYSIS / *MAGISTER SCIENTIAE IN RISIKO-ANALISE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM/*KURRIKULUM*: N865P

CODE/*KODE:* **203-127**

CAMPUS/*KAMPUS*: Potchefstroom (English)

DELIVERY MODE/*AFLEWERINGSMETODE*: F**ull time**

Compilation of old Programme: Master of Science in Risk Analysis / *Magister Scientiae in Risiko-Analise*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Semester**	**Credits** *Krediete*
1 Semester			
BWIN872	Dissertation / *Verhaneling*		132
RSWW811	Research Methodology / *Navorsingsmetodologie*		8
Elective modules / *keuse module*s:			
Select in consultation with the research director and director of the Centre for BMI ONE of the following modules / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI EEN van die volgende modules :*			
BWIN611	Quantitative Risk Analysis I / *Kwantitatiewe Risiko-analise I*		16
BWIN613	Financial Engineering I / *Finansiële Ingenieurswese I*		16
BWIN615	Financial Modelling I / *Finansiële Modellering I*		16
BWIN811	Practical Risk Management SAS RD / Praktiese Risiko-analise SAS		16
BWIN812	Pricing of Derivatives B / Prysing van Afgeleides B		24
BWIN813	Practical Data Mining / *Praktiese Data-ontginning*		16
BWIN816	Modern Portfolio Theory / *Moderne Portefeuljeteorie*		16
BWIN817	Retail Credit Risk / *Kleinhandel kredietrisiko*		16
BWIN818	Topical Research issues in Risk Analysis / *Voorpunt Risikovraagstukke*		16
BWIA811	Enterprise-wide Risk Management /		16

	Ondernemingswye Risikobestuur I	
2 Semester		
BWIN872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research Communication / *Navorsings-kommunikasie*	8
Select in consultation with the research director and director of the Centre for BMI ONE of the following modules / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI EEN van die volgende modules:*		
BWIN621	Quantitative Risk Analysis II / *Kwantitatiewe Risiko-analise II*	16
BWIN622	Pricing of Derivatives A / *Prysing van Afgeleides A*	16
BWIN623	Financial Engineering II / *Finansiële Ingenieurswese II*	16
BWIN625	Financial Modelling II / *Finansiële Modulering II*	16
BWIA821	Enterprise wide Risk Management II / *Ondernemingswye Risikobestuur II*	12
Total number of credits / Totale krediete		**180**

NAS.8.6 MASTER OF SCIENCE IN RISK ANALYSIS / *MAGISTER SCIENTIAE IN RISIKO ANALISE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Admission requirements for the programme/*Toelatingsvereistes*:

The curriculum consists of a dissertation and an examination paper on topics that are supportive of the research done for the dissertation. The study leader decides together with the research director and the school/centre director on appropriate topics / *Die kurrikulum bestaan uit 'n verhandeling en 'n vraestel oor onderwerpe wat ondersteunend is vir die navorsing wat gedoen word vir die verhandeling. Die studieleier saam met die navorsingsdirekteur en skooldirekteur/sentrumdirekteur, besluit op die gepaste onderwerpe:*

CODE/*KODE*: 2ED P01 N801P

CAMPUS/*KAMPUS*: Potchefstroom (English)

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of new Programme: Master of Science in Risk Analysis / *Magister Scientiae in Risiko Analise*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
1 Semester		
BWIN872	Dissertation / V*erhaneling*	132
RSWW811	Research Methodology / *Navorsingsmetodologie*	8
Elective modules / *keuse modules*:		
Select in consultation with the research director and director of the Centre for BMI ONE of the following modules / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI EEN van die volgende modules :*		
BWIN611	Quantitative Risk Analysis I / *Kwantitatiewe Risiko-analise I*	16
BWIN613	Financial Engineering I / *Finansiële Ingenieurswese I*	16
BWIN615	Financial Modelling I / *Finansiële Modellering I*	16
BWIN811	Practical Risk Management SAS RD / Praktiese Risiko-analise SAS	16
BWIN816	Pricing of Derivatives B / Prysing van Afgeleides B	16
BWIN817	Practical Data Mining / *Praktiese Data-ontginning*	16
BWIN818	Modern Portfolio Theory / *Moderne*	16

	Portefeuljeteorie	
BWIA811	Retail Credit Risk / *Kleinhandel kredietrisiko*	16
2 Semester		
BWIN872	Dissertation (continue) / *Verhandeling (vervolg)*	
RSWW821	Research Communication / *Navorsings-kommunikasie*	8
Select in consultation with the research director and director of the Centre for BMI ONE of the following modules / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI EEN van die volgende modules:*		
BWIN621	Quantitative Risk Analysis II / *Kwantitatiewe Risiko-analise II*	16
BWIN622	Pricing of Derivatives A / *Prysing van Afgeleides A*	16
BWIN625	Financial Modelling Optimisation / *Finansiele Modellering Optimalisering*	16
Total number of credits / Totale krediete		**180**

NAS.8.7 MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORMATICS (QUANTITATIVE RISK MANAGEMENT) */ MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA (KWANTITATIEWE RISIKOBESTUUR)*

PROGRAMME ALIGNMENT AND CODING ON HOLD

CODE/*KODE:* **203-181 N809P**

CAMPUS/*KAMPUS*: Potchefstroom (English)
DELIVERY MODE/*AFLEWERINGSMETODE*: Full time
Compilation of old Programme: Master of Science in Business Mathematics and Informatics (Quantitative Risk Management) */ Magister Scientiae in Bedryfswiskunde en Informatika (Kwantitatiewe Risikobestuur)*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Semester**	**Credits** ***Krediete***
1 Semester			
BWIA812	Enterprise-Wide Risk Management I / *Ondernemingswye Risikobestuur I*		24
BWIN815	Industry Integration Project / *Bedryfsintegrasieprojek*		32
	Elective Module# / *Keusemodule#*		16
	Elective Module# / Keusemodule#		16
Elective modules / *keuse modules:*			
Select in consultation with the research director and director of the Centre for BMI TWO of the following modules / *Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI TWEE van die volgende modules:*			
BWIN811	Practical Risk Management SAS RD / *Praktiese Risiko-analise SAS RD*		16
BWIN816	Modern Portfolio Theory / *Moderne Portefeuljeteorie*		16
BWIN817	Retail Credit Risk / *Kleinhandel Kredietrisiko*		16
2 Semester			
BWIR826	*Industry Directed Research Project / Industrie-gerigte Navorsingsprojek*		80
Select in consultation with the research director and director of the Centre for BMI ONE of the following modules / Kies in oorleg met die navorsingsdirekteur en direkteur van die Sentrum vir BWI EEN van die volgende modules:			
BWIA821	Enterprise-wide Risk Management II / *Ondernemingswye Risikobestuur II*		12
BWIB821	Data Mining Techniques / *Data-ontginningstegnieke*		12
Total number of credits / *Totale krediete*			**180**

NAS.8.8 MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORAMTICS (FINANCIAL MATHEMATICS) / *MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA (FINANSIËLE WISKUNDE)*

PROGRAMME ALIGNMENT AND CODING ON HOLD

CODE/*KODE:* **203-182 N810 P**

CAMPUS/*KAMPUS*: Potchefstroom (English)
DELIVERY MODE/*AFLEWERINGSMETODE*: Full time
Compilation of old Programme: Master of Science in Business Mathematics and Inforamtics (Financial Mathematics) / *Magister Scientiae in Bedryfswiskunde en Informatika (Finansiële Wiskunde)*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
BWIN812	Pricing of Derivatives B / *Prysing van Afgeleides B*	24
BWIN815	Industry Integration Project / *Bedryfsintegrasieprojek*	32
	Elective Module[#] / *Keusemodule#*	16
	Elective Module[#] / *Keusemodule#*	16
2 Semester		
BWIB821	Data Mining Techniques / *Data-ontginningstegnieke*	12
BWIR826	Industry Directed Research Project / *Industrie-gerigte Navorsingsprojek*	80
Total number of credits / *Totale aantal krediete*		**180**

[#]The elective module in the first semester is chosen from the modules in the following table / # *Die keusemodule in die eerste semester mag uit die modules in tabel hieronder gekies word:*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
BWIN811	Practical Risk Management SAS RD / *Praktiese Risiko-analise SAS RD*	16
BWIN816	Modern Portfolio Theory / *Moderne Portefeuljeteorie*	16
BWIN817	Retail Credit Risk / *Kleinhandel Kredietrisiko*	16

The integrated assessment of this curriculum takes place during the assessment of the module BWIR826. / *Die geïntegreerde assessering vir hierdie kurrikulum vind plaas tydens die assessering van die module BWIR826.*
Please note that due to the nature of the BMI industry directed research projects (BWIR826) all projects have to be completed before the end of the academic year. A student who fails to do so will fail the degree./ *Neem kennis dat alle projekte in die BWI Industrie-gerigte navorsingsprojekte (BWIR826), voltooi moet wees voor die einde van die akademiese jaar. Studente wat nie hieraan voldoen nie, druip hul graad.*

NAS.8.9 MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORMATICS (BUSINESS ANALYTICS)/ *MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA (BEDRYFSANALISE)*

PROGRAMME ALIGNMENT AND CODING ON HOLD

CODE/*KODE:* **203-183 N811P**

CAMPUS/*KAMPUS*: Potchefstroom (English)

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time

Compilation of old Programme: Master of Science in Business Mathematics and Informatics (Business Analytics)/ *Magister Scientiae in Bedryfswiskunde en Informatika (Bedryfsanalise)*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
BWIB818	Business Intelligence / *Bedryfsintelligensie*	16
BWIN817	Retail Credit Risk / *Kleinhandel Kredietrisiko*	16
BWIN815	Industry Integration Project / *Bedryfsinte-grasieprojek*	32
2 Semester		
BWIB821	Data Mining Techniques / *Data-ontginningstegnieke*	12
BWIB822	Contemporary Issues in Business Analytics / *Aktuele Vraagstukke in Bedryfsanalise*	12
BWIB823	Multiple Criteria Decision Making / *Multi-kriteria Besluitneming*	12
BWIR826	Industry Directed Research Project / *Industrie-gerigte Navorsingsprojek*	80
Total number of credits / *Totale krediete*		**180**

NAS.8.10 MASTER OF SCIENCE IN PHYSICS / *MAGISTER SCIENTIAE IN FISIKA*

CODE/*KODE*: **2CW N01 N801M**

CAMPUS/*KAMPUS*: Mafikeng

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time

Compilation of Programme: Master of Science in Physics / *Magister Scientiae in Fisika*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MPHY871	Dissertation/Verhandeling	180

NAS.8.11 MASTER OF SCIENCE IN ASTROPHYSICAL SCIENCES / *MAGISTER SCIENTIAE IN ASTROFISIESE WETEN-SKAPPE*

Faculty-specific rules for the programme/ *Fakulteit spesifieke reëls vir die program:*

All of the modules described in the curricula below are not necessarily presented every year. The Research director decides in consultation with the lecturer which modules may be taken in each semester./ *Al die modules in die program wat hieronder beskryf word, word nie noodwendig elke jaar aangebied nie. Die Navorsingsdirekteur, in oorleg met die dosente, bepaal jaarliks watter van die modules in elke semester van die M-studie geneem kan word*

Admission requirements for the programme / *Toelatingsvereistes vir die program:*

The General Physics module may replace one of the other modules and the contents to be chosen in consultation with the research director.

CODE/*KODE*: 2CQ P0 N801P

CAMPUS/*KAMPUS*: Potchefstroom (English)

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*
Compilation of Programme: Master of Science in Astrophysical Sciences / *Magister Scientiae in Astrofisiese Wetenskappe*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
1 Semester		
FSKS872	Dissertation/ *Verhandeling*	132
A student choose TWO of the following in consultation with the research director / *Student kies in oorleg met die navorsingsdirekteur TWEE van die volgende modules:*		
FSKM811	Astrophysics I*Astrofisika I*	16
FSKM812	Transport Theory*Transportteorie*	16
FSKM813	Astrophysics II*Astrofisika II*	16
FSKM814	Heliospheric Physics*Heliosferiese Fisika*	16
FSKM815	General Physics **Algemene Fisika**	16
2 Semester		
FSKS872	Dissertation (continue)*Verhandeling (vervolg)*	
FSKM821	General Relativity/*Algemene Relatiwiteit*	16
Total number of credits/ *Totale aantal kredietpunte*		**180**

*Select in consultation with the Research Director a topic in General Physics/
**Kies in oorleg met die skooldirekteur Navorsingsdirekteur 'n onderwerp in Algemene Fisika*

NAS.8.12 MASTER OF SCIENCE IN ASTROPHYSICS AND SPACE SCIENCE / *MAGISTER SCIENTIAE IN ASTROFISIKA EN RUIMTEWETENSKAP*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

This curriculum is taken by students in the National Astrophysics and Space Science Programme (NASSP). It is compiled from FSKS872 and lectured modules. The lectured modules, which represent 60 credits, are presented and examined at the University of Cape Town by the NASSP consortium and are selected from modules in the list following below. **Students are permitted to start on the dissertation only after they have passed all of the lectured modules**./*Hierdie program word gevolg deur studente in die National Astrophysics and Space Science Programme (NASSP). Dit is saamgestel uit FSKS872 en gedoseerde modules. Die gedoseerde modules wat 60 kredietpunte verteenwoordig, word deur die NASSP-konsortium aangebied en geëksamineer by die Universiteit van Kaapstad en word gekies uit die lys hieronder.* ***Studente word slegs toegelaat om met die verhandeling te begin nadat die gedoseerde modules geslaag is.***

CODE/*KODE*: 2CR P01 N801P

CAMPUS/*KAMPUS*: Potchefstroom (English)

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Astrophysics and Space Science / *Magister Scientiae in Astrofisika en Ruimtewetenskap*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
A student choose 60 credits of the following in consultation with the research director / *Student kies in oorleg met die navorsingsdirekteur 60 krediete van die volgende modules:*		
FSKB874	Plasma Physics/*Plasmafisika*	12
FSKB875	Magnetohydrodynamics/ *Magnetohidrodinamika*	12
FSKB891	Theoretical Cosmology/ *Teoretiese Kosmologie*	12
FSKB877	Cataclysmic Variables/ *Kataklismiese Veranderlikes*	12
FSKB878	Extragalactic Astronomy / *Ekstragalaktiese Astronomie*	12
FSKB879	Advanced General Relativity/ *Gevorderde Algemene Relatiwiteit*	12
FSKB880	High Energy Astrophysics and	12

	Pulsars/ *Hoë-energie Astrofisika en Pulsare*	
FSKB882	Stellar Structure and –Evolution/ *Sterstruktuur en -Evolusie*	12
FSKB885	Geomagnetism and Aeronomy/ *Geomagnetisme en Aeronomie*	12
FSKB886	Computational Astrophysics/ *Berekeningsastrofisika*	12
FSKB887	Radio Interferometry/*Radio Interferometrie*	12
FSKB888	Time Series and Data Analysis/ *Tydsreekse en Data Analise*	12
FSKB889	Space Weather/ *Ruimteweer*	12
FSKB890	Observational Cosmology/ *Waarnemingskosmologie*	12
Elective modules / *Keuse modules*		**60**
Compulsory module / *Verpligte modules*		
FSKS872	Dissertation/ V*erhandeling*	132
Total number of credits / *Totale krediete*		**192**

NAS.8.13 MASTER OF SCIENCE IN CHEMISTRY / *MAGISTER SCIENTIAE IN CHEMIE*

CODE: **2CM N01 N801M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of Programme: Master of Science in Chemistry / *Magister Scientiae in Chemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
CHEN871	Dissertation/Verhandeling	180

CODE: **2CN P01 N801P**

CAMPUS: Potchefstroom (English)

DELIVERY MODE: Full time
Compilation of Programme: Master of Science in Chemistry / *Magister Scientiae in Chemie*

There are five research areas in this research entity and a research topic for a MSc dissertation must therefore be selected from one of these research areas. The research areas are / *Daar is vyf navorsingsrigtings in hierdie navorsingsentiteit en 'n navorsingsonderwerp vir 'n MSc-verhandeling moet dus uit een van hierdie navorsingsrigtings gekies word. Die navorsingsrigtings is*:

a) Chromium Technology / *Chroomtegnologie*
b) Catalysis and Synthesis / *Katalise en Sintese*
c) Membrane Technology / *Membraantegnologie*
d) Electrochemistry for Energy and Environment / *Elektrochemie vir Energie en Omgewing*
e) Coal Chemistry / *Steenkoolchemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
CHEN872	Dissertation / *Verhandeling*	132
CHEN874*	Advanced Chemistry* / *Gevorderde Chemie*	48
Total of credits /*Totale krediete*		**180**

*Select in consultation with the research director a topic at the M-level from the subject Chemistry.

NAS.8.14 MASTER OF SCIENCE IN APPLIED RADIATION, SCIENCE AND TECHNOLOGY / *MAGISTER SCIENTIAE IN TOEGEPASTE STRALINGSWETENSKAP EN TEGNOLOGIE*

PROGRAMME ALIGNMENT AND CODING ON HOLD

CODE: **285-100 N881M**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Science in Applied Radiation, Science and Technology / *Magister Scientiae in Toegepaste Stralingswetenskap en Tegnologie*

Module code		**Credits**
1 Semester		
MARS 811	Radioanalytical Applications	12
MARS 812	Environmental Applications	12
MARS 813	Radioactive Waste Minimisation and Management	12
MARS 814	Industrial Applications	12
MARS 815	Science And Technology Management	12
Total 1st semester		60
RESEARCH MODULE (One to one and half years)		
MARS 873	Research Dissertation	120
Total number of credits		**180**

NAS.8.15 MASTER OF SCIENCE IN BIOCHEMISTRY / *MAGISTER SCIENTIAE IN BIOCHEMIE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N869P

CODE: **203-132 N859M**

CAMPUS: Potchefstroom**(**English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Science in Biochemistry / *Magister Scientiae in Biochemie*

Module code	Descriptive name	Credits
BCHN872	Dissertation / *Verhandeling*	135
BCHN877*	Advanced Biochemistry* / *Gevorderde Biochemie*	45
Total of credits / *Totale krediete*		**180**

* Presentation and oral examination of the dissertation and relevant field of HDMG871 / *Voordrag en mondelinge eksaminering van die verhandeling en toepaslike studieveld*

NAS.8.16 MASTER OF SCIENCE IN BIOCHEMISTRY / *MAGISTER SCIENTIAE IN BIOCHEMIE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

Admission requirements for the programme /*Toelatingsvereistes:*

Presentation and oral examination of the dissertation and relevant field of HDMG871./ *Voordrag en mondelinge eksaminering van die verhandeling en toepaslike studieveld.*

CODE/*KODE*: 2EF P01 N801P/M

CAMPUS/*KAMPUS*: Mafikeng / Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of new Programme: Master of Science in Biochemistry / *Magister Scientiae in Biochemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
BCHN872	Dissertation / *Verhandeling*	135
BCHN877*	Advanced Biochemistry* / *Gevorderde Biochemie*	45
Total number of credits / Totale krediete		**180**

NAS.8.17 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*

CODE: **2CT N01 N801M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Environmental Science and Management / *Magister Scientiae in Omgewingswetenskappe*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MENV871	Thesis	180

NAS.8.18 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

This programme can only be followed if a student already has an appropriate honours degree./ *Hierdie program kan slegs gevolg word indien die student reeds oor 'n toepaslike honneursgraad beskik*

The topic of a MSc dissertation must be selected in conjunction with the directors of the School and Research Unit, from one of the followed research fields/ : *Die onderwerp vir 'n MSc verhandeling moet in oorleg met die direkteure van die Skool en Navorsingseenheid, uit een van die volgende navorsingsrigtings gekies word:*

a) Climate change, Air Quality and Impacts/ *Klimaatsverandering, luggehalte en invloede*
b) Aquatic Ecosystem Health/ *Akwatiese ekosisteemwelstand*
c) Biodiversity and Conservation Ecology/ *Biodiversiteit en bewaringsekologie*
d) Ecological Interactions and Ecosystem Resilience *Ekologiese interaksies en ekostelsel veerkragtigheid*
e) Spatial Planning, Development and Implementation/ *Ruimtelike beplanning, ontwikkeling en implementering*
f) Environmental Geology and Soil Sciences/ *Omgewings geologie en grondkunde*

CODE/*KODE*: 2CT N02 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time*/Voltyds*

Compilation of Programme: Master of Science in Environmental Sciences / *Magister Scientiae in Omgewingswetenskappe*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
OMWN871	Dissertation/Verhandeling	180

NAS.8.19 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH ATMOSPHERIC CHEMISTRY / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET ATMOSFERIESE CHEMIE*

Admission requirements for the programme / *Toelatingsvereistes*:

This programme can only be followed if a student already has an appropriate honours degree./ *Hierdie program kan slegs gevolg word indien die student reeds oor 'n toepaslike honneursgraad beskik*

The topic of a MSc dissertation must be selected in conjunction with the directors of the School and Research Unit, from one of the followed research fields/ : *Die onderwerp vir 'n MSc verhandeling moet in oorleg met die direkteure van die Skool en Navorsingseenheid, uit een van die volgende navorsingsrigtings gekies word:*

a) Climate change, Air Quality and Impacts/ *Klimaatsverandering, luggehalte en invloede*
b) Aquatic Ecosystem Health/ *Akwatiese ekosisteemwelstand*
c) Biodiversity and Conservation Ecology/ *Biodiversiteit en bewaringsekologie*
d) Ecological Interactions and Ecosystem Resilience *Ekologiese interaksies en ekostelse I veerkragtigheid*
e) Spatial Planning, Development and Implementation/ *Ruimtelike beplanning, ontwikkeling en implementering*
f) Environmental Geology and Soil Sciences/ *Omgewingsgeologie en grondkunde*

CODE/*KODE*: 2CT N03 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time and Part-time*/Voltyds en Deeltyds*

Compilation of Programme: Master of Science in Environmental Sciences with Atmospheric Chemistry / *Magister Scientiae in Omgewingswetenskappe met Atmosferiese Chemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
CHEM871	Dissertation/Verhandeling	180

NAS.8.20 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH DISASTER RISK SCIENCE */ MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET RAMP RISIKOWETENSKAPPE*

Admission requirements for the programme/*Toelatingsvereistes*:

This programme can only be followed if a student already has an appropriate honours degree./ *Hierdie program kan slegs gevolg word indien die student reeds oor 'n toepaslike honneursgraad beskik*

The topic of a MSc dissertation must be selected in conjunction with the directors of the School and Research Unit, from one of the followed research fields/ : *Die onderwerp vir 'n MSc verhandeling moet in oorleg met die direkteure van die Skool en Navorsingseenheid, uit een van die volgende navorsingsrigtings gekies word:*

a) Climate change, Air Quality and Impacts/ *Klimaatsverandering, luggehalte en invloede*
b) Aquatic Ecosystem Health/ *Akwatiese ekosisteemwelstand*
c) Biodiversity and Conservation Ecology/ *Biodiversiteit en bewaringsekologie*
d) Ecological Interactions and Ecosystem Resilience *Ekologiese interaksies en ekostelsel veerkragtigheid*
e) Spatial Planning, Development and Implementation/ *Ruimtelike beplanning, ontwikkeling en implementering*
f) Environmental Geology and Soil Sciences/ *Omgewings geologie en grondkunde*

CODE/*KODE*: 2CT N07 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time and Part-time*/Voltyds en Deeltyds*

Compilation of Programme: Master of Science in Environmental Sciences with Disaster Risk Science / *Magister Scientiae in Omgewingswetenskappe met Ramp Risikowetenskappe*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
DRRS871	Dissertation/Verhandeling	180

NAS.8.21 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH INTEGRATED PEST MANAGEMENT / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET GEÏNTEGREERDE PLAAGBESTUUR*

Admission requirements for the programme/*Toelatingsvereistes vir die programme*:

This programme can only be followed if a student already has an appropriate honours degree./ *Hierdie program kan slegs gevolg word indien die student reeds oor 'n toepaslike honneursgraad beskik*

The topic of a MSc dissertation must be selected in conjunction with the directors of the School and Research Unit, from one of the followed research fields/ : *Die onderwerp vir 'n MSc verhandeling moet in oorleg met die direkteure van die Skool en Navorsingseenheid, uit een van die volgende navorsingsrigtings gekies word:*

a) Climate change, Air Quality and Impacts/ *Klimaatsverandering, luggehalte en invloede*
b) Aquatic Ecosystem Health/ *Akwatiese ekosisteemwelstand*
c) Biodiversity and Conservation Ecology/ *Biodiversiteit en bewaringsekologie*
d) Ecological Interactions and Ecosystem Resilience *Ekologiese interaksies en ekostelsel veerkragtigheid*
e) Spatial Planning, Development and Implementation/ *Ruimtelike beplanning, ontwikkeling en implementering*
f) Environmental Geology and Soil Sciences/ *Omgewings Geologie en grondkunde*

CODE/*KODE*: 2CT N05 N801P

CAMPUS/*KAMPUS*: Potchefstroom
DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time and Part-time*/Voltyds en Deeltyds*
Compilation of Programme: Master of Science in Environmental Sciences Environmental Sciences with Integrated Pest Management / *Magister Scientiae in Omgewingswetenskappe met Geïntegreerde Plaagbestuur*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
IPMM871	Dissertation/Verhandeling	180

NAS.8.22 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH MINING HYDROLOGY / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET MYNHIDROLOGIE*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

In this programme research can be conducted on any area in Mining Hydrolgy, although the Unit retains the right not to accept a candidate in instances where there does not exist sufficient capacity./ *Daar kan in hierdie program navorsing gedoen word oor enige aspek van Mynbou Hidrologie, alhoewel die Sentrum die reg voorbehou om 'n student nie te aanvaar, as daar nie genoegsame spesifieke kundigheid onder personeel oor die spesifieke navorsingstema is nie*

CODE/*KODE*: 2CT N06 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time*/Voltyds*

Compilation of Programme: Master of Science in Environmental Sciences with Mining Hydrology / *Magister Scientiae in Omgewingswetenskappe met Mynhidrologie*

Module code	Descriptive name	Credits
HDMG871	Dissertation/*Verhandeling*	180

NAS.8.23 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH HYDROLOGY AND GEOHYDROLOGY / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET HIDROLOGIE EN GEOHIDROLOGIE*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

In this programme research can be conducted on any area in Hydrology and Geohydrology, although the Unit retains the right not to accept a candidate in instances where there does not exist sufficient capacity./ *Daar kan in hierdie program navorsing gedoen word oor enige aspek van Hidrologie of Geohidrologie, alhoewel die Sentrum die reg voorbehou om 'n student nie te aanvaar, as daar nie genoegsame spesifieke kundigheid onder personeel oor die spesifieke navorsingstema is nie*

CODE/*KODE*: 2CT N04 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Environmental Sciences with Hydrology and Geohydrology / *Magister Scientiae in Omgewings-Wetenskappe met Hidrologie en Geohidrologie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
HDGH871	Dissertation/Verhandeling	180

NAS.8.24 MASTER OF SCIENCE IN ZOOLOGY / *MAGISTER SCIENTIAE IN DIERKUNDE*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

In this programme research can be conducted on any area in Zoology, although the Unit retains the right not to accept a candidate in instances where there does not exist sufficient capacity./ *In hierdie program kan navorsing gedoen word oor enige onderwerp uit die Dierkunde, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

CODE/*KODE*: **2DD N01 N601P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Zoology / *Magister Scientiae in Dierkunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
DRKN871	Dissertation/Verhandeling	180

NAS.8.25 MASTER OF SCIENCE IN GEOGRAPHY / *MAGISTER SCIENTIAE IN GEOGRAFIE*

CODE: **2CP N01 N801M**

CAMPUSS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Master of Science in Geography / *Magister Scientiae in Geografie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
MGEO871	Dissertation/Verhandeling	180

NAS.8.26 MASTER OF SCIENCE IN GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT / *MAGISTER SCIENTIAE IN GEOGRAFIE EN OMGEWINGSBESTUUR*

Faculty-specific rules for the programme / *Fakulteit spesifieke reëls vir die program:*

In this programme research can be conducted on any aspect of Geography and environmental management, although the Unit retains the right not to accept a student if there is not sufficient particular expertise among staff on the specific research topic. Specialisation fields include (but are not limited to):

a. Spatial studies
b. Environmental impact analysis and all aspects thereof
c. Environmental management and all aspects thereof
d. Physical and human Geography

CODE/*KODE*: 2DG N01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Geography and Environmental Management / *Magister Scientiae in Geografie en Omgewingsbestuur*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
GGFN871	Dissertation/Verhandeling	180

NAS.8.27 MASTER OF SCIENCE IN MICROBIOLOGY / *MAGISTER SCIENTIAE IN MIKROBIOLOGIE*

Faculty-specific rules for the programme / *Fakulteit spesifieke reëls vir die program:*

In this programme research can be conducted on any subject in Microbiology, although the Unit retains the right not to accept a candidate in instances where there is not sufficient capacity./ *In hierdie program kan navorsing gedoen word oor enige onderwerp uit Mikrobiologie, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

CODE/*KODE*: 2DE N01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Microbiology / *Magister Scientiae in Mikrobiologie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MKBN871	Dissertation/Verhandeling	180

NAS.8.28 MASTER OF SCIENCE IN BIOLOGY / *MAGISTER SCIENTIAE IN BIOLOGIE*

CODE: **2CL N01 N804M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme Master of Science in Biology / *Magister Scientiae in Biologie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
BIOM871	Dissertation	180

NAS.8.29 MASTER OF SCIENCE IN BOTANY / *MAGISTER SCIENTIAE IN PLANTKUNDE*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

In this programme research can be conducted on any subject in the field of Botany, although the Unit retains the right not to accept a candidate in cases where there is not sufficient capacity./ *In hierdie program kan navorsing gedoen word oor enige onderwerp uit die Plantkunde, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie*

CODE/*KODE*: **2DF N01: N801P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Master of Science in Botany / *Magister Scientiae in Plantkunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
PLKN871	Dissertation/Verhandeling	180

NAS.9 MASTER OF ENVIRONMENTAL MANAGEMENT /*MAGISTER IN OMGEWINGSBESTUUR*

NAS.9.1 RULES FOR THE DEGREE MASTER OF ENVIRONMENTAL MANAGEMENT / *REËLS VIR DIE GRAAD MAGISTER IN OMGEWINGSBESTUUR*

Prospective students must, before the date set by the relevant research director in consultation with the relevant school director involved, apply to the relevant research director for selection and formal admission to the intended programme in the following year (see General Rules 4.3). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to a programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group./ *Voornemende studente moet voor die keerdatum soos deur die navorsingsdirekteur in oorleg met die skooldirekteur bepaal, by die navorsingsdirekteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reël 4.3). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke program beskikbaar is.*

NB: Lectures for the taught modules for this degree in the Faculty of Natural and Agricultural Sciences are presented mainly on a part time basis in English only / *Lesings vir die gedoseerde modules van hierdie graad word slegs na-uurs en in Engels aangebied.*

INTRODUCTION/*INLEIDING*

Research in the Faculty of Natural and Agricultural Sciences is managed in research entities. The research entities are furthermore responsible for the master's (MSc) and doctorate (PhD) training curricula, i.e. curricula that contain a considerable research component./ *Navorsing word in die Fakulteit Natuur- en Landbouwetenskappe bestuur in navorsingsentiteite. Die navorsingsentiteite is verder verantwoordelik vir die magister- en PhD-opleidingskurrikulums, dit wil sê kurrikulums wat 'n beduidende navorsingskomponent bevat.*

Apart from very rare exceptions that must be approved by the Dean, the research required for this master's degree must be conducted in the RESEARCH UNIT of Environmental Sciences and Management./ *Behoudens hoë uitsonderings wat deur die dekaan goedgekeur moet word, moet die navorsing wat vir hierdie M-graad vereis word in die Navorsingseenheid vir Omgewingswetenskappe en –Bestuur, verrig word.*

DURATION OF THE STUDIES/*DUUR VAN STUDIE*

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is two years full-time and three years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rules 1.14, a student may apply for an extension of the study period./ *Die minimum duur van die studie is een jaar voltyds en twee jaar deeltyds en die maksimum duur is twee jaar voltyds en drie jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 1.14, aansoek gedoen word om 'n verlenging van die studietermyn*.

ASSUMED PRIOR LEARNING/*AANAMES OOR VORIGE LEER*

The student has already obtained an honours baccalaureus degree in Geography and Environmental Management or Studies. / *Die student beskik oor ’n honneurs baccalaureusgraad in Geografie en Omgewingsbestuur/-studie.*

If the student does not conform to the provision of NAS 8.2.2 the school director determines in consultation with the research director and, if necessary, after consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to studies for the master’s degree in environmental management (Master of Environmental Management) on the strength of knowledge and skills acquired by prior learning and work experience./ *Indien die student nie aan die bepaling van NAS.8.2.2 voldoen nie, bepaal die skooldirekteur in oorleg met die navorsingsdirekteur, en indien nodig na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die Magister in Omgewingsbestuur toegelaat kan word.*

On the ground of the assessment of individual merits by the school director, in consultation with the research director, a prospective student may be required to pass certain fundamental and core modules before he/she will be admitted to the Master of Environmental Management studies./ *Op grond van individuele meriete-beoordeling deur die Skooldirekteur in oorleg met die navorsingsdirekteur, kan van ’n voornemende student verwag word om eers bepaalde kernmodules te slaag, voordat hy tot die Magister in Omgewingsbestuur toegelaat word.*

Programme specific assumptions are, where applicable, indicated in the programme descriptions./ *Programspesifieke aannames word, waar van toepassing, by elk van die programbeskrywings aangedui.*

ADMISSION AND REGISTRATION/ *TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rules./ *Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reëls*.

The relevant research director in consultation with the school director, may refuse admission to a programme if the standard of competence previously attained by the prospective student in the subject(s) in which he/she wishes to continue his/her studies does not conform to the relevant programme requirements./ *Die navorsingsdirekteur, in oorleg met die skooldirekteur, kan toelating tot 'n program weier indien die standaard van bekwaamheid wat die voornemende student tevore*

in die betrokke vak(ke) waarin die student verder wil studeer, bereik het, nie aan die betrokke programvereistes voldoen nie.

If the applications received for a programme are more than the relevant research entity can handle in that programme, the group of students who, in the opinion of the research director in consultation with the school director, has the greatest chance of success will be selected for the relevant programme. The background and potential of students will also be taken into account in this selection process./ *Indien meer aansoeke vir 'n program ontvang word as wat die navorsingsentiteit in daardie program kan hanteer, word die groep studente wat volgens die oordeel van die navorsingsdirekteur, in oorleg met die skooldirekteur, die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.*

APPROVAL OF THE STUDY PROGRAMME/ ***GOEDKEURING VAN DIE STUDIEPROGRAM***

Approval of the study programme takes place in terms of the provisions in the General Rules and the relevant provisions in the *Manual for Postgraduate Studies*. **Prospective students must consult this manual carefully.** Full information on the programme in which research for this degree may be undertaken is available from the director of the research area./ *Goedkeuring van die studieprogram geskied na aanleiding van die bepalings in die Algemene Reël en die tersaaklike bepalings in die Handleiding vir Nagraadse Studie. Voornemende studente moet hierdie handleiding baie deeglik raadpleeg. Volledige inligting oor die programme waarin daar vir hierdie graad navorsing gedoen kan word, is van die direkteur van die navorsingsentiteit verkrygbaar*

ARTICULATION POSSIBILITIES/*ARTIKULASIE MOONTLIKHEDE*

A student having completed this degree may be admitted to the PhD studies in a core subject in which adequate credits have been obtained./ *'n Student wat hierdie graad voltooi het, kan toegelaat word tot PhD studie in 'n kernvak waarin daar voldoende kredietpunte verwerf is.*

EXIT LEVEL OUTCOMES/*UITTREEVLAKUITKOMSTE*

General Exit Level Outcomes/*Algemene Uittreevlakuitkomste*

On successful completion of this qualification the student ought to be able to provide proof that he has command of the following skills and competencies:/ *By die suksesvolle voltooiing van hierdie kwalifikasie behoort die student in staat te wees om bewys te lewer dat hy oor die volgende vaardighede en bevoegdhede beskik*:

- The ability to apply corporate environmental management and demonstrate a good understanding and a knowledge of concepts such as sustainability, environmental legislation and the role of local authorities in environmental management;/ *Korporatiewe omgewingsbestuur te kan toepas en 'n goeie begrip en kennis te besit van konsepte soos volhoubaarheid, omgewingsreg en die rol van plaaslike owerhede in omgewingsbestuur*
- The ability to implement environmental management systems and apply environmental standards;/ *Die vermoë om omgewingsbestuurstelsels te implementeer en omgewings standaarde toe te pas.*

- The ability to demonstrate expertise in carrying out and applying environmental auditing, environmental impact assessments, landscape assessment and all relevant environmental assessments and analyses;/ *Om kundigheid t.o.v. omgewingsoudit, omgewingsinvloedbepalings, landskapevaluering en alle relevante omgewingsevaluering en analises te kan uitvoer en toepas.*
- The ability to independently plan research, collect, process, analyse and make a résumé of data in a mini dissertation;/ *Die vermoë om selfstandig navorsing te beplan, data te versamel, te verwerk, te analiseer en in 'n skripsie saam te vat.*
- The ability to retrieve current knowledge and remain at the forefront of the latest technology and experimental methods in environmental sciences;/ *Die vermoë om nuwe kennis te ontsluit om op die voorpunt te bly van die nuutste tegnologie en eksperimentele metodes in omgewingswetenskappe*
- The ability to apply knowledge and skills acquired in these studies meaningfully as an entrepreneur or for the benefit of the national economy and the people in a specific work situation;/ *Die vermoë om die kennis en vaardighede opgedoen in hierdie studie sinvol toe te pas as entrepreneur of in 'n bepaalde werksituasie tot voordeel van die landsekonomie en die mense aan te wend.*
- The ability to act as a leader in the local or general community;/*Om as leier te kan optree in die plaaslike of breër gemeenskap*
- The ability to communicate professionally or in general with scientists and the community, whether orally or in writing, while making use of the appropriate structure, style and graphic and electronic support./*Oor die vermoë beskik om professioneel of algemeen te kommunikeer met die wetenskaplikes en die gemeenskap, hetsy mondeling of skriftelik met die gebruikmaking van die gepaste struktuur, styl en grafiese en elektroniese ondersteuning*

SPECIFIC EXIT LEVEL OUTCOMES/SPESIFIEKE UITTREEVLAKUITKOMSTE

Knowledge/*Kennis*

On completion of the qualification the student will have a knowledge and skills to*:/ By voltooiing van die kwalifikasie sal die student oor kennis en vaardighede beskik om:*

- Understand the concept of environmental reporting and be able to initiate the "State of the environmental" report project/*Die konsep van omgewingsverslaggewing te verstaan en in staat wees om 'n "Toestand van die omgewing "-verslag projek te inisieer.*
- Understand and critically evaluate "command and control" and "joint management" strategies in legislation;/ *Die "bevel-en-beheer" en "medebestuur" strategieë in die wetgewing te verstaan en krities te valueer.*
- Understand the different environmental management systems, be familiar with the requirements of ISO 14001 and be able to implement a environmental management system based on ISO 14001;/*Die verskillende omgewingsbestuur stelsels te verstaan en die vereistes van*

ISO 14001 ken en in staat wees om 'n omgewingbestuurstelsel gebaseer op ISO 14001 te implementeer

- Understand the requirements of an integrated management system based on ISO 14001, ISO 9000:2000 and OHSAS 18001;/ *Die vereistes van 'n geïntegreerde bestuurstelsel gebaseer op ISO 14001, ISO 9000:2000 en OHSAS 18001 te verstaan*
- Understand and plan environmental monitoring and performance evaluation;/*Omgewingsmonitering en prestasie-evaluasie te verstaan en te kan beplan.*
- Know the requirements of ISO 19011 and be able to take part in an environmental audit and to manage the auditing process;/ *Die vereistes van ISO 19011 te ken en in staat wees om aan 'n omgewingsoudit deel te neem en die oudit proses te bestuur.*
- Understand the concept of sustainable development and be able to apply the principles of Agenda 21;/*Die begrip volhoubare ontwikkeling te verstaan en in staat wees om die beginsels van Agenda 21 toe te pas*
- Understand in what way government structures are functioning at a local, provincial and national level;/*Te verstaan hoe die regeringstrukture op die plaaslike, provinsiale en nasionale vlak opereer.*
- Understand the legal requirements of an environmental impact study;/*Die wetlike vereistes van 'n omgewingsimpakstudie te verstaan*
- Be able to carry out a base line study and to carry out a screening process successfully;/*In staat wees om 'n basislyn studie te doen en om die siftingsproses suksesvol te bedryf*
- Be able to understand the process to determine significant impacts and to identify and debate different possible processes;/ *In staat wees om die proses vir die bepaling van beduidende impakte te verstaan en die verskillende moontlike prosesse te identifiseer en te beredeneer.*
- Manage the public participation process successfully;/ *Die publieke deelnameproses suksesvol te bedryf*
- Compile a full environmental impact report and evaluate such a report;/ *'n Volledige omgewingsimpakverslag op te stel en sodanige verslag te evalueer*
- Understand and manage the process of reporting on social impact;/*Die sosiale impakverslag proses te verstaan en te kan bestuur.*
- Understand and be able to manage the process of reporting on strategic and life cycles impact;/ *Die strategiese en lewensiklusimpakverslag prosesse te verstaan en te kan bestuur.*
- Understand and manage the process of environmental risk analysis./*Die omgewingsrisiko-analise proses te verstaan en kan bestuur*

Skills/*Vaardighede*

On successful completion this course the student will be able to use the relevant implements (instruments) to effectively implement the full P-D-C-A-R environmental management loop. (The P-D-C-A-R environmental management loop refers to the Denning management model as applied to environmental management and the meaning of the symbols is the following: "Plan-Do-Check-Act-Report".)/ *Na die suksesvolle voltooiing van hierdie kursus sal studente in staat wees om die relevante gereedskap (instrumente) te gebruik om die volle P-D-C-A-R omgewingsbestuurslus effektief te bedryf. (Die P-D-C-A-R omgewingsbestuurslus*

verwys na die Denningsbestuursmodel soos van toepassing in omgewingsbestuur en die simbole se betekenis is soos volg: "Plan-Do-Check-Act-Report").

The student will further be able to:/ *Die student sal verder in staat wees om:*

Independently plan, collect, analyse and interpret data and report the findings in a mini dissertation that conforms to scientific standards;/ *Die beplanning, insameling van data, analise, interpretering van data en verslagdoening daaroor vir 'n skripsie, wat aan wetenskaplike standaarde voldoen, selfstandig te kan uitvoer*

Communicate in every mode, whether orally, in writing or visually;/*Op alle wyses, hetsy mondeling, skriftelik of visueel te kan kommunikeer.*

Function in multidisciplinary groups and apply responsible and effective self-management;/ *In multidissiplinêre groepe te kan funksioneer en verantwoordelike en effektiewe selfbestuur te kan toepas*

Develop an own frame of thought in writing reports./ *'n Eie denkraamwerk te kan verwoord in die skryf van verslae*

Values/*Waardes*

On completion of the degree the student will be able to provide proof that he/she is familiar with the following values:/ *By die voltooiing van die graad sal die student bewys kan lewer dat hy/sy vertroud is met die volgende waardes:*

Environmental, research and conservation ethics from a grounded perspective;/ *'n Omgewings-, navorsings- en bewaringsetiek vanuit 'n gefundeerde perspektief.*

A holistic view of the nature, structure and functioning of the environment;/'n *Holistiese siening oor die aard, samestelling en funksionering van die omgewing.*

An appreciation of the nationally and internationally shared responsibility and stewardship with regard to the management and conservation of the environment and biodiversity./ *'n Waardering vir die nasionaal- en internasionaal-gedeelde verantwoordelikheid en rentmeesterskap met betrekking tot die bestuur en bewaring van die omgewing en biodiversiteit*.

NAS.9.2 MASTER OF ENVIRONMENTAL MANAGEMENT / *MAGISTER IN OMGEWINGSBESTUUR*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

a) This programme is presented part-time and in **English** only and extends over two years./ *Hierdie program word slegs deeltyds en in Engels aangebied en strek oor 'n minimum van twee jaar.*

b) Students who have an appropriate honours degree (or equivalent) may after they have been selected be admitted to this curriculum in consultation with the school and/or research director./ *Studente wat oor 'n toepaslike Honneursgraad (of ekwivalent) beskik kan na keuring in oorleg met die skool- en/of navorsingsdirekteur tot hierdie kurrikulum toegelaat word.*

c) The closing date for applications to be admitted to this programme is the last day of October of the previous year./ *Die sluitingsdatum vir aansoeke om tot hierdie program toegelaat te word, is die laaste dag van Oktober van die vorige jaar.*

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

CODE/KODE: 2CD P01 N801P - for OMBO878 and OMBO879

Compilation of Programme: Master of Environmental Management / *Magister in Omgewingsbestuur*

Module code ***Modulekode***	**Descriptive name/** ***Beskrywende naam***	**Credits/** Krediete
OMBO878	Environmental Management 2/ *Omgewingsbestuur 2*	40
OMBO879	Environmental Assessment 2 / *Omgewingsevaluering 2*	40
Mini dissertation/ *Skripsie*		
OMBO873	Mini dissertation/*Skripsie*	100
	Total of credits of this programme ***Totale krediete vir die program***	**180**

NAS.9.3 MASTER OF ENVIRONMENTAL MANAGEMENT WITH ENVIRONMENTAL WATER REQUIREMENTS / *MAGISTER IN OMGEWINGSBESTUUR MET WATERVEREISTES*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

a) This programme is presented part-time and in **English** only and extends over two years./ *Hierdie program word slegs deeltyds en in Engels aangebied en strek oor 'n minimum van twee jaar.*

b) Students who have an appropriate honours degree (or equivalent) may after they have been selected be admitted to this curriculum in consultation with the school and/or research director./ *Studente wat oor 'n toepaslike Honneursgraad (of ekwivalent) beskik kan na keuring in oorleg met die skool- en/of navorsingsdirekteur tot hierdie kurrikulum toegelaat word.*

c) The closing date for applications to be admitted to this programme is the last day of October of the previous year./ *Die sluitingsdatum vir aansoeke om tot hierdie program toegelaat te word, is die laaste dag van Oktober van die vorige jaar.*

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

CODE/*KODE*: B: 2CD P02 N801P - for OMBO880 and OMBO881

Compilation of Programme: Master of Environmental Management with Environmental Water Requirements / *Magister in Omgewingsbestuur met Watervereistes*

Module code ***Modulekode***	**Descriptive name/** ***Beskrywende naam***	**Credits/** Krediete
*OMBO880	Management of Ecological Drivers in Aquatic Systems/ *Bestuur van ekologiese drywers in akwatiese sisteme*	40
OMBO881	Management of Ecological Responders in Aquatic Systems/ *Bestuur van ekologiese komponente in akwatiese sisteme*	40
Mini dissertation/ *Skripsie*		
OMBO873	Mini dissertation/ *Skripsie*	100
	Total of credits of this programme ***Totale krediete vir die program***	**180**
*****Completion of OMBO880 is a prerequisite for admission to OMBO881/ ** Voltooiing van OMBO880 is 'n voorvereiste vir toelating tot OMBO881*		

NAS.9.4 MASTER OF ENVIRONMENTAL MANAGEMENT WITH WASTE MANAGEMENT / *MAGISTER IN OMGEWINGSBESTUUR MET AFVALBESTUUR*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

a) This programme is presented part-time and in **English** only and extends over two years./ *Hierdie program word slegs deeltyds en in Engels aangebied en strek oor 'n minimum van twee jaar.*

b) Students who have an appropriate honours degree (or equivalent) may after they have been selected be admitted to this curriculum in consultation with the school and/or research director./ *Studente wat oor 'n toepaslike Honneursgraad (of ekwivalent) beskik kan na keuring in oorleg met die skool- en/of navorsingsdirekteur tot hierdie kurrikulum toegelaat word.*

c) The closing date for applications to be admitted to this programme is the last day of October of the previous year./ *Die sluitingsdatum vir aansoeke om tot hierdie program toegelaat te word, is die laaste dag van Oktober van die vorige jaar.*

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

CODE/*KODE*: C: 2CD P03 N801P- for OMBO882 and OMBO883

Compilation of Programme: Master of Environmental Management with Waste Management / *Magister in Omgewingsbestuur met Afvalbestuur*

Module code ***Modulekode***	**Descriptive name/** ***Beskrywende naam***	**Credits/** Krediete
OMBO882	Integrated Waste Management/ *Geïntegreerde Afvalbestuur*	40
OMBO883	Waste Management Law And Governance/*Afvalbestuur: Wetgewing En Owerheidsbestuur*	40
Mini dissertation/ *Skripsie*		
OMBO873	Mini dissertation/*Skripsie*	100
Total of credits / *Totale krediete*		**180**

NAS.9.5 MASTER OF INDIGENOUS KNOWLEDGE SYSTEMS / *MAGISTER SCIENTIAE IN INHEEMSE KENNISSTELSELS*

CODE: **2AA N01 N801P**

CAMPUS: Mafikeng (English)

DELIVERY MODE*:* : Full time/*Voltyds*

Compilation of Programme: Master of Indigenous Knowledge / *Magister Scientiae in Inheemse Kennisstelsels*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MIKS871	Thesis	180

NAS.10 MASTER OF COMMERCE IN COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES / *MAGISTER COMMERCII IN REKENAAR, STATISTIESE EN WISKUNDIGE WETENSKAPPPE*

NAS.10.1 RULES FOR THE DEGREE MASTER OF COMMERCE IN COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES / *REËLS VIR DIE GRAAD MAGISTER COMMERCII IN REKENAAR, STATISTIESE EN WISKUNDIGE WETENSKAPPPE*

Prospective students must, before the date set by the relevant research director in consultation with the relevant school director involved, apply to the relevant research director for selection and formal admission to the intended programme in the following year (see General Rules 4). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to a programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group.

NB: Lectures for the lectured modules for this degree in the Faculty of Natural and Agricultural Sciences are with a single exception presented full-time only. /

Voornemende studente moet voor die keerdatum soos deur die navorsingsdirekteur in oorleg met die skool¬direk¬teur bepaal, by die navorsingsdirekteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reël 4). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke program beskikbaar is.

NB: Lesings vir gedoseerde magistermodules word in die Fakulteit Natuur- en Landbouwetenskappe slegs voltyds aangebied.

INTRODUCTION/*INLEIDING*

The MCom degree is a qualification in the Faculty of Natural and Agricultural Sciences following on a BCom, Hons BCom degree or an appropriate BSc or Hons BSc degree.

The research component of the curricula for this degree is conducted in the Research Unit for Business Mathematics and Informatics.

The studies may be undertaken full-time or part-time./

Die MCom-graad is 'n graad wat in die Fakulteit Natuur- en Landbouwetenskappe volg op 'n BCom-, Hons BCom-graad, of op 'n toepaslike BSc- of Hons BSc-graad.

Die navorsingskomponent van die kurrikulums vir hierdie graad, word binne die Navorsingseenheid vir Bedryfswiskunde en Informatika gedoen.

Die studie kan voltyds of deeltyds geskied.

DURATION OF THE STUDIES/*DUUR VAN DIE STUDIE*

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is two years full-time and three years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rules 1.14, a student may apply for an extension of the study period.

Die minimum duur van die studie is een jaar voltyds en twee jaar deeltyds en die maksimum duur is twee jaar voltyds en drie jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 1.14, aansoek gedoen word om 'n verlenging van die studietermyn.

ASSUMED PRIOR LEARNING/*AANNAMES OOR VORIGE LEER*

The student has already obtained an appropriate baccalaureus degree and/or appropriate honours baccalaureus degree. For an MCom degree in a specific subject the honours baccalaureus degree in the same subject is required with the following additional requirement: an honours baccalaureus degree in Mathematics in which Statistics up to level 6 has been taken grants admission to master's studies in Statistics.

If a student does not conform to the provision that the school director determines, in consultation with the research director and if necessary **after** consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to the MCom studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions./

Die student beskik oor 'n toepaslike baccalaureusgraad en/of 'n toepaslike honneurs baccalaureusgraad. Normaalweg word vir 'n MCom-graad in 'n spesifieke vakrigting (Rekenaarwetenskap, Statistiek of Wiskunde), die honneurs baccalaureusgraad in dieselfde vak vereis met die volgende toevoeging: 'n honneurs baccalaureusgraad in Wiskunde met 'n baccalaureusgraad waarin Statistiek tot op vlak 7 verwerf is, verleen toegang tot M-studie in Statistiek.

Indien die student nie aan die bepaling van bepaal deur die skooldirekteur in oorleg met die navorsingsdirekteur, en indien nodig na oorlegpleging met die dekaan, en met kennisgewing aan die fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die MCom-studie toegelaat kan word.

Programspesifieke aannames word, waar van toepassing, by elk van die programbeskrywings aangedui.

ADMISSION AND REGISTRATION/*TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rules.

The relevant research director in consultation with the school director, may refuse admission to a programme if the standard of competence previously attained by the prospective student in the subject(s) in which he/she wishes to continue his/her studies does not conform to the relevant programme requirements.

If the applications received for a programme are more than the relevant research entity can handle in that programme, the group of students who, in the opinion of the research director in consultation with the school director, has the greatest chance of success will be selected for the relevant programme. The background and potential of students will also be taken into account in this selection process.

Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reël.

Die navorsingsdirekteur, in oorleg met die skooldirek-teur, kan toelating tot 'n program weier indien die standaard van bekwaamheid wat die voornemende student tevore in die betrokke vak(ke) waarin die student verder wil studeer, bereik het, nie aan die betrokke programvereistes voldoen nie.

Indien meer aansoeke vir 'n program ontvang word as wat die navorsingseenheid in daardie program kan hanteer, word die groep studente wat volgens die oordeel van die navorsingsdirekteur, in oorleg met die skooldirekteur, die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.

APPROVAL OF THE STUDY PROGRAMME/*GOEDKEURING VAN DIE STUDIEPROGRAM*

Approval of the study programme takes place on the basis of the provisions in the General Rules and the relevant provisions in the *Manual for Postgraduate Studies*. **Prospective students must consult this manual carefully./**

Goedkeuring van die studieprogram geskied na aanleiding van die bepalings in die Algemene Reël en die tersaaklike bepalings in die Handleiding vir Nagraadse Studie. ***Voornemende studente moet hierdie handleiding baie deeglik raadpleeg*.**

ARTICULATION POSSIBILITIES/*ARTIKULASIE MOONTLIKHEDE*

On successful completion of one of these MCom curricula the student may be admitted to further learning for the doctorate at NQF level 8 in the core subject in which the qualification has been taken.

Credits will be awarded for modules of other faculties and institutions on condition that the outcomes and total credit requirements of this qualification are totally complied with.

With the basic, applied and expert skills, as well as the research skills that the student has acquired with this qualification in one of the mathematical, computer and natural science disciplines, he/she will be equipped to continue in related specialist areas at other institutions.

Programme specific articulation possibilities are, where applicable, indicated in the programme descriptions./

Met die suksesvolle voltooiing van een van hierdie MCom.-kurrikulums kan die student toegelaat word tot verdere leer vir die doktorsgraad, op NKR-vlak 10, in die kernvak waarin die kwalifikasie verwerf is.

Krediet sal verleen word vir modules van ander fakulteite en inrigtings, op voorwaarde dat die uitkoms- en totale kredietvereistes vir hierdie kwalifikasie as geheel nagekom word.

Met die basiese, toepasbare en spesialis-vaardighede, sowel as navorsingsvaardighede, wat die student met hierdie kwalifikasie in een van die wiskundige, rekenaarkundige en natuurwetenskaplike dissiplines opgedoen het, sal die student toegerus wees om met verdere leer en navorsing voort te gaan in verwante spesialisasiegebiede aan ander inrigtings.

Programspesifieke artikulasiemoontlikhede sal, waar van toepassing, by die programbeskrywings aangedui word.

CHANGING FROM MASTER'S STUDIES TO DOCTOR'S STUDIES/*VERANDERING VAN MAGISTERSTUDIE NA DOKTORSTUDIE*

The General Rules 4.13 make provision for a student who is registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors concerned, outcomes of a quality and scope acceptable for a doctorate, to apply to the Faculty Board to change his/her registration for master's studies to that for a doctorate./

Die Algemene Reël 4.13 maak voorsiening daarvoor dat 'n student wat vir 'n magistergraad geregistreer is en wat, na die eenparige oordeel van die studieleier en die betrokke navorsings- en skooldirekteure, uitkomste bereik het van 'n gehalte en omvang wat vir 'n doktorsgraad aanvaarbaar is, by die fakulteitsraad aansoek kan doen om die registrasie vir die magistergraadstudie na doktorsgraadstudie te verander.

EXIT LEVEL OUTCOMES/*UITTREEVLAKUITKOMSTE*

Above and beyond the exit level outcomes and the critical outcomes as described in the general MSc programme description (see N.9.2) the student will also have mastered the following specific knowledge and skills:/

Bo en behalwe die uittreevlakuitkomste en kritieke uitkomste soos in die algemene MSc-programbeskrywing beskryf (kyk N.9.2), sal die student ook oor die volgende spesifieke kennis en vaardighede beskik:

Knowledge/*Kennis*

Knowledge of the research methodology and techniques in one of the subjects that will be demonstrated by writing a mini dissertation or dissertation on an advanced topic./ *Kennis van die navorsingsmetodologie en -tegniek in een van die vakke wat gedemonstreer word deur die skryf van 'n navorsingsverslag of 'n verhandeling oor 'n gevorderde onderwerp*

Knowledge of two or more advanced topics from one or more of the subjects as indicated below:/*Kennis van twee of meer gevorderde onderwerpe uit een of meer van die vakke:*

- *Computer Science:* linear programming, databases, data warehouses, pseudo-intelligence, decision support systems, information systems engineering and computer security;/ Rekenaarwetenskap: Lineêre Programmering, databasisse, datapakhuise, pseudo-intelligensie, besluitnemingsondersteuningstelsels, inligtingstelselingenieurs-wese, rekenaarsekuriteit;
- *Statistics:* advanced resampling methods, statistical models, multivariate statistics, probability theory, stochastic processes and survival theory;/ *Statistiek: Gevorderde hersteekproefnemingsmetodes, statistiese modelle, meerveranderlike statistiek, waarskynlikheidsleer, stogas¬tiese prosesse, oorlewingsteorie;*
- *Mathematics:* functional analysis, operator theory, algebra, Riesz spaces and Banach latices./ *Wiskunde: Funksionaalanalise, operatorteorie, algebra, Riesz-ruimtes en Banach-roosters*

Skills / *Vaardighede*

On successful completion of the programme the student will be able to demonstrate that he/she has the following skills:/ *Na suksesvolle voltooiing van die program sal die student kan demonstreer dat hy/sy oor die volgende vaardighede, dit wil sê vermoëns, beskik:*

- The ability to identify problems from reality with computer/mathematical/ stochastic content, formulate these in forms lending themselves to computer/mathematical/statistical handling, handle them with the most appropriate methods and communicate the solutions./ *Die vermoë om probleme met rekenaar-/wiskundige/stogastiese inhoud uit die werklikheid te identifiseer, dit te formuleer in 'n vorm wat hom leen tot rekenaar-/wiskundige/statistiese hantering, dit aan te pak met die mees geskikte metode en die oplossing te kommunikeer.*
- The ability to learn new techniques and theories necessary in solving a problem stated and to consult and use literature by so doing./ *Die vermoë om nuwe tegnieke en teorieë aan te leer wat nodig is om 'n gestelde probleem op te los en om die wetenskaplike literatuur daarvoor te raadpleeg en te gebruik.*
- The ability to see problems of a computer/mathematical/stochastic nature in a broad context and to work on them in a team./*Die vermoë om probleme van rekenaar-/wiskundige/stogastiese aard in 'n breë konteks te sien en in spanverband daaraan te werk.*

The ability to understand, utilise and generalise abstract theories./ *Die vermoë om abstrakte teorieë te begryp, aan te wend en te veralgemeen*

The ability to structure arguments logically and use them coherently in effective subject communication for the benefit of the broad community when teaching computer science and information systems, statistics or mathematics up to a tertiary level./ *Die vermoë om argumentasie logies te struktureer en samehangend te gebruik vir effektiewe vakkommunikasie tot voordeel van die breë samelewing in*

onderrig in Rekenaarwetenskap en Inligtingstelsels, Statistiek of Wiskunde tot op tersiêre vlak.

The ability to act as an independent practitioner in anyone of the topics and to take the lead in standard research projects in the work context./ *Die vermoë om as selfstandige praktisyn in enigeen van die vakke op te tree en leiding te neem met standaard navorsingsprojekte binne sy/haar werkverband.*

The ability to communicate with non-subject specialists in view of applying results of abstract theories in the community./ *Die vermoë om met nie-vakspesialiste te kommunikeer om sodoende die resultate van abstrakte teorieë toe te pas in die gemeenskap*

The ability to use appropriate computer technology and software./ *Vaardigheid in die gebruik van toepaslike rekenaartegnologie en rekenaarpakette*

The ability to communicate internationally with collegial peers./*Die vermoë om internasionaal met vakgenote op dieselfde vlak te kommunikeer.*

NAS.10.2 MASTER OF COMMERCE IN COMPUTER SCIENCE AND INFORMATION SYSTEMS / *MAGISTER COMMERCII IN REKENAARWETENSKAP EN INLIGTINGSTELSELS*

CURRICULUM: N870P

CODE: **505-138**

CAMPUS: Potchefstroom **(**English)

DELIVERY MODE: Full time

Compilation of old Programme: Master of Commerce in Computer, Science and Information Systems / *Magister Commercii in Rekenaarwetenskap en Inligtingstelsel*s

Module code/ *Modulekode*	**Descriptive name / *Beskrywende naam***	**Credits *Krediete***
1 Semester		
ITRN872	Dissertation / *Verhandeling*	100
RSWW811	Research Methodology / *Navorsingsmetodologie*	8
Select in consultation with the research and school directors TWO of the following modules / *Student kies in oorleg met die navorsingsdirekteur TWEE van die volgende modules:*		
ITRW876	Databases / *Databasisse*	32
ITRW877	Decision Support Systems / *Besluitsteunstelsels*	32
ITRW878	Artificial Intelligence / *Kunsmatige Intelligensie*	32
ITRW886	Data Warehouses / *Datapakhuise*	32
ITRW884	Information Systems Engineering / I*nligtingstelselingenieurswese*	32
ITRW885	Computer Security / *Rekenaarsekuriteit*	32
ITRW883	Image Processing / *Beeldverwerking*	32
2 Semester		
ITRN872	Dissertation (continue)/ *Verhandeling (vervolg)*	
RSWW821	Research Communication / *Navorsingskommunikasie*	8
Total credits / *Totale krediete*		**180**

NAS.11 MASTER OF SCIENCE IN URBAN AND REGIONAL PLANNING/ *MAGISTER SCIENTIAE IN STADS- EN STREEK BEPLANNING*

NAS.11.1 RULES FOR THE DEGREE MASTER SCIENCE IN URBAN AND REGIONAL PLANNING/ *REËLS VIR DIE GRAAD MAGISTER SCIENTIAE IN STADS EN STREEK BEPLANNING*

PROGRAMME OUTCOMES/*PROGRAMUITKOMSTE:*

On completion of this qualification the student ought to be able to:

a. Illustrate the ability to independently conduct research under guidance, and collect, process, analyse, evaluate and interpret data and to document these findings meaningfully in a dissertation.
b. Illustrate the ability to apply advanced subject-specific and integrated planning knowledge and skills in addressing planning issues and in identifying, analysing and solving complex and abstract problems.
c. Illustrate sufficient knowledge of related literature, mastery of appropriate techniques and analytical methods, and the ability to remain at the forefront of the latest policy and practices in planning;
d. Illustrate the ability to apply the knowledge and skills acquired in these studies meaningfully in order to reflect significant insight.
e. Demonstrate advanced and specialised skills, appropriate to the Urban and Regional Planning discipline, to communicate research findings to a range of audiences with different levels of knowledge or expertise./

By die voltooiing van hierdie kwalifikasie behoort die student in staat te wees om die volgende uitkomste te bereik:

a. Illustreer die vermoë om selfstandig navorsing uit te voer onder toesig, data te versamel, te verwerk, te analiseer, te evalueer en te interpreteer en dit sinvol in 'n verhandeling op te skryf.
b. Illustreer die vermoë om gevorderde vakspesifieke en geïntegreerde beplanningskennis en -vaardighede toe te pas om beplanningsvraagstukke aan te pak en probleme te identifiseer, analiseer en op te los.
c. Illustreer voldoende bekendheid met verbandhoudende literatuur, bemeestering van toepaslike en analitiese metodes en die vermoë om op die voorpunt te bly van die nuutste wetgewing en praktyke in beplanning.
d. Illustreer die vermoë om die kennis en vaardighede opgedoen in hierdie studie sin-vol toe te pas ten einde betekenisvolle insig te reflekteer.
e. Demonstreer gevorderde en gespesialiseerde vaardighede toepaslik vir Stads- en Streeksbeplanning dissipline, ten einde navorsingsbevindings te kommunikeer met verskillende gehore uit verskillende vlakke van kennis en kundigheid.

PROGRAMME OBJECTIVE / *DOEL VAN DIE PROGRAM:*

The objective of this programme is to provide students with specialist and advanced skills in research methodology in order to afford such student the opportunity to continue with further research in the field of Urban and Regional Planning. A complete dissertation based on research related to the core focuses within Urban and Regional Planning will have to be undertaken. Study supervision will be internally be provided by a Professional Urban and Regional Planner registered with SACPLAN. An article option will only be considered on merit and in extraordinary circumstances. /

Die doel van hierdie program is om studente van spesialis kennis en gevorderde vaardighede te voorsien in navorsingsmetodologie, sodat die student as 'n spesialis kan voorgaan in die veld van Stads- en Streekbeplanning. 'n Volledige verhandeling op grond van navorsing in een van die kernfokusse binne Stads- en Streekbeplanning sal onderneem moet word. Studieleiding sal intern verskaf word deur 'n Professionele Stads- en Streekbeplanner wat by SACPLAN geregistreer is. 'n Artikelopsie sal op meriete oorweeg word en slegs in uitsonderlike gevalle ondersteun word.

ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE:*

The admission requirements and the prescribed dates for registration are set out in the General Rules.The relevant Research Director in consultation with the Sub-programme 7 (Programme for Spatial Planning, Development and Implementation) consider admission to the programme based on specific criteria in line with relevant programme requirements.

Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reëls.Die Navorsingsdirekteur, in oorleg met die Subprogram 7 (Program vir Ruimtelike Beplanning, Ontwikkeling en Implementering) oorweeg toelating tot die program gebasseer op spesifieke kriteria in lyn met die programvereistes.

DURATION OF THE STUDIES / *TYDPERK VAN STUDIE:*

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is two years full-time and three years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rules 1.14, a student may apply for an extension of the study period. /

Die minimum duur van die studie is een jaar voltyds en twee jaar deeltyds en die maksimum duur is twee jaar voltyds en drie jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 1.14, aansoek gedoen word om 'n verlenging van die studietermyn

ASSUMED PRIOR LEARNING / *AANNAMES OOR VORIGE LEER:*

The student has a four year baccalaureus degree in Urban and Regional Planning. If the student does not conform to the provision of N.6.3 the Research Director, after consulting Subprogramme 7 (Programme for Spatial Planning, Development and Implementation), as well as the Dean and with notice to the Faculty Board, decides whether the candidate may be admitted to the MSc Urban and Regional Planning

programme on the strength of knowledge and skills acquired by prior learning and work experience. A student must have command of Afrikaans or English. /

Die student beskik oor 'n vierjarige baccalaureusgraad in Stads- en Streekbeplanning. Indien die student nie aan die bepaling van N.6.3 voldoen nie bepaal die Navorsingsdirekteur, na oorlegpleging met Subprogram 7 (Program vir Ruimtelike Beplanning, Ontwikkeling en Implementering), asook die Dekaan, en met kennisgewing aan die Fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die MSc Stads- en Streekbeplanning program toegelaat kan word. 'n Student moet Afrikaans of Engels magtig wees.

ARTICULATION POSSIBILITIES / *ARTIKULASIEMOONTLIKHEDE:*

On completing this degree the student may be admitted to further learning for the PhD degree in Urban and Regional Planning. /

Na verwerwing van hierdie graad kan die student toegelaat word tot verdere leer vir die PhD-graad in Stads- en Streekbeplanning.

CHANGING FROM MASTER'S TO DOCTOR'S STUDIES / *VERANDERING VAN MAGISTERSTUDIE NA DOKTORSTUDIE:*

The General Rules make provision for a student who is registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors concerned, outcomes of a quality and scope acceptable for a doctorate, to apply to the Faculty Board to change his/her registration for master's studies to that for a doctorate. /

Die Algemene Reël 4.4.9 maak voorsiening daarvoor dat 'n student wat vir 'n magistergraad geregistreer is en wat, na die eenparige oordeel van die studieleier en die betrokke navorsings- en skooldirekteure, uitkomste bereik het van 'n gehalte en omvang wat vir 'n doktorsgraad aanvaarbaar is, by die fakulteitsraad aansoek kan doen om die registrasie vir die magistergraadstudie na doktorsgraadstudie te verander.

ASSESSMENT /*ASSESSERING:*

Assessment is based on integrated assessment through a research dissertation or articles (refer to Faculty guidelines), which aim at assessing students' ability to plan, structure, conceptualise and execute innovative scientific research that makes a contribution to the Urban and Regional Planning discipline and report the findings thereof. Assessment is initiated when the research proposal is considered by the Ethical Committee and Faculty Management Committee for Advanced Degrees. Approval by these committees is a requirement for the study. The supervisor also assesses continuously while the dissertation is being written. Final examination of the dissertation is done by at least two examiners of which one is external and one who is registered at SACPLAN. All examiners are experts in the field of Urban and Regional Planning and associated sciences. The assessment mark received after examination and moderation of the dissertation counts towards 100% of final module mark.

Assessering is gebaseer op geïntegreerde assessering deur middel van 'n navorsingsverhandeling of artikels (verwys na Fakulteitsriglyne) wat daarop gemik is

om studente se vermoë te evalueer om innoverende wetenskaplike navorsing te beplan, te struktureer, te konseptualiseer en uit te voer ten einde 'n bydrae te lewer tot die Stads- en Streekbeplanning-dissipline en om verslag oor die bevindings daarvan te lewer. Assessering word geïnisieer wanneer die navorsingsvoorstel deur die Etiese Komitee en Fakulteitsbestuurskomitee vir Gevorderde grade oorweeg word. Goedkeuring deur hierdie komitees is 'n vereiste vir die studie. Die studieleier assesseer ook voortdurend terwyl die verhandeling geskryf word. Finale eksaminering van die verhandeling word deur ten minste twee eksaminatore gedoen, waarvan een ekstern is en een by SACPLAN geregistreer is. Alle eksaminatore is kundiges op die gebied van Stads- en Streekbeplanning en verwante wetenskappe. Die assesseringspunt wat na die eksamen en moderering van die verhandeling ontvang word, tel 100% van die finale modulepunt.

CODE/*KODE*: 2DH N01 N801P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or part-time/*Voltyds of deeltyds*

Compilation of Programme: Master of Science in Urban and Regional Planning / *Magister Scientiae in Stads- en Streek Beplanning*

Module code / *Module kode*	**Descriptive name / *Beskrywende naam***	**Credits *Krediete***
SBEL871	Dissertation / *Verhandeling*	180

NAS.12 DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*

NAS.12.1 RULES FOR THE DEGREE DOCTOR OF PHILOSOPHY/ *REËLS VIR DIE GRAAD DOCTOR PHILOSOPHIAE*

The PhD degree is a qualification that may follow on a Masters degree approved by the Dean. / *Die PhD-graad is 'n graad wat kan volg op 'n Meeestersgraad wat deur die dekaan goedgekeur is.*

Studies may be taken full-time or part-time. / *Die studie kan voltyds of deeltyds geskied.*

Prospective students must, before the date as set by the relevant academic director , apply to the relevant academic director for selection and formal admission to the intended programme in the following year (see General Rules 5). Only students who, on the basis of their academic record and other proven prior learning, are judged to have a realistic chance of success would be admitted to the programme. The background and potential of students are also taken into account in this selection process. Late applications will only be considered if an additional student can be accommodated in the relevant subject group. / *Voornemende studente moet voor die keerdatum, soos deur die toepaslike akademiese direkteur bepaal, by die relevante akademiese direkteur aansoek doen om keuring en formele toelating tot die beoogde program in die daaropvolgende jaar (Kyk Algemene Reëls 5). Slegs studente wat, geoordeel aan hulle akademiese rekord en ander bewese tersaaklike vooraf leer, 'n realistiese kans op sukses het, sal tot 'n program toegelaat word. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem. Laat aansoeke sal slegs oorweeg kan word indien daar nog ruimte vir 'n bykomende student in die betrokke program beskikbaar is.*

INTRODUCTION / *INLEIDING*

Research and postgraduate education in the Faculty of Natural and Agricultural Sciences is mostly managed in research entities. The research entities deal with the master's and PhD training curricula, i.e. curricula that contain a considerable research component. In some cases this is done in schools or centres/ *Navorsing en nagraadse studie word in die Fakulteit Natuur- en Landbouwetenskappe meestal in navorsingsentiteite bestuur. Die navorsingsentiteite hanteer die magister- en PhD-opleidingskurrikulums, dit wil sê kurrikulums wat 'n beduidende navorsingskomponent bevat*. In sommige gevalle geskied dit in skole of sentrums.

At the moment, there is one centre of excellence in Space Research, two research units, viz. Business Mathematics and Informatics, Environmental Sciences and Management, the three research focus areas, viz. Chemical Resource Beneficiation, Human Metabolomics and Material Science Innovation and Modelling, two niche areas, viz. Food Safety and Security and Technology Enhanced Learning and Innovation Education and Training in South Africa as well as five centres, viz. 1) Applied Radiation Science and Technology, 2) Human Metabolomics, 3) Business Mathematics and Informatics, 4) Indigenous Knowledge Systems and 5) Water Science and Management. / *Tans is daar een sentrum van uitnemendheid, naamlik die Sentrum van Uitnemendheid in Ruimtenavorsing, twee navorsingseenhede, naamlik Bedryfswiskunde en Informatika;*

Omgewingswetenskappe en -Bestuur; drie navorsingsfokusareas naamlik Chemiese Hulpbronveredeling, Materiaalwetenskap Innovasie en Modellering en Menslike Metabolomika, twee nisareas naamlik Tegnologieverbeterde Leer en Innoverende Onderwys en Opleiding en Voedselveiligheid en – sekuriteit, asook die volgende vyf Sentrums: Bedryfswiskunde en Informatika. Inheemse Kennissisteme, *Menslike Metabolomika; Toegepaste Stralingswetenskap en –tegnologie en Waterwetenskappe en –bestuur.*

DURATION OF THE STUDIES / *DUUR VAN STUDIES*

The minimum duration of the studies is two years and the maximum duration four years (Genera Rule 1.14.1.6), taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rule 5.17, a student may apply for an extension of the study period. / *Die minimum duur van die studie is twee jaar en die maksimum duur is vier jaar (Algemene Reël 1.14.1.6), bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 5.17, aansoek gedoen word om 'n verlenging van die studietermyn.*

ASSUMED PRIOR LEARNING / *AANNAMES OOR VORIGE LEER*

The student has already obtained an appropriate master's degree./ *Die student beskik oor 'n toepaslike meestersgraad.*

If the student does not conform to this the Dean determines in consultation with the Faculty Management Committee and with notice to the Faculty Board and Senate whether the candidate may be admitted to the PhD studies on the strength of prior learning and work experience that led to learning. / *Indien die student nie hieraan voldoen nie, bepaal die dekaan, in oorleg met die fakulteitsbestuur en met kennisgewing aan die fakulteitsraad en senaat, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die PhD-studie toegelaat kan word.*

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions. / *Programspesifieke aannames word, waar van toepassing, by elk van die programbeskrywings aangedui.*

ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rules 5.5. / *Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reël 5.5.*

The relevant research director in consultation with the school director, may refuse admission to a programme if the standard of competence previously attained by the prospective student in the subject(s) in which he/she wishes to continue his/her studies does not conform to the relevant programme requirements. / *Die navorsingsdirekteur, in oorleg met die skool¬direk-teur, kan toelating tot 'n program weier indien die standaard van bekwaamheid wat die voornemende student tevore in die betrokke vak(ke) waarin die student verder wil studeer, bereik het, nie aan die betrokke programvereistes voldoen nie.*

If the applications received for a programme are more than the relevant research entity can handle in that programme, the group of students who, in the opinion of the research director in consultation with the school director, has the greatest chance of

success will be selected for the relevant programme. The background and potential of students will also be taken into account in this selection process. / *Indien meer aansoeke vir 'n program ontvang word as wat die navorsingsentiteit in daardie program kan hanteer, word die groep studente wat volgens die oordeel van die navorsingsdirekteur, in oorleg met die skooldirekteur, die grootste kans op sukses het, vir die betrokke program gekeur. Studente se agtergrond en potensiaal word in hierdie keuringsproses ook in aanmerking geneem.*

APPROVAL OF THE STUDY PROGRAMME / *GOEDKEURING VAN DIE STUDIEPROGRAM*

Approval of the study programme takes place in terms of the provisions in the General Rules and the relevant provisions in the ***Manual for Postgraduate Studies*. Prospective students must consult this manual carefully. /** *Goedkeuring van die studieprogram geskied na aanleiding van die bepalings in Algemene Reël en die tersaaklike bepalings in die* ***Handleiding vir Nagraadse Studie. Voornemende studente moet hierdie handleiding deeglik raadpleeg.***

ARTICULATION POSSIBILITIES / *ARTIKULASIEMOONTLIKHEDE*

- Credits will be awarded in view of learning at other faculties and institutions, on condition that the outcomes and total credit requirements for the curriculum of this qualification is totally complied with. / *Krediet sal verleen word vir leer aan ander fakulteite en inrigtings, op voorwaarde dat die uitkoms- en totale kredietvereistes vir die kurrikulum vir hierdie kwalifikasie in sy geheel nagekom word.*

With the basic applied and expert skills, as well as the research skills that the student has acquired by this qualification in one of the mathematical, computer and natural science disciplines, he/she will be equipped to continue with further learning and research in related specialist areas at other national or international institutions. / *Met die basiese, toepasbare en spesialis-vaardighede, sowel as navorsingsvaardighede, wat die student met hierdie kwalifikasie in een van die wiskundige, rekenaarkundige en natuurwetenskaplike dissiplines opgedoen het, sal die student toegerus wees om met verdere leer en navorsing voort te gaan in verwante spesialisasiegebiede aan ander inrigtings, nasionaal en internasionaal*

EXIT LEVEL OUTCOMES / *UITTREEVLAKUITKOMSTE*

The student in this programme will attain the following specific outcomes: / *Die student in hierdie program sal die volgende spesifieke uitkomste be*reik:

He will write *a thesis of high technical quality* (with reference to language usage, illustrations, tables, graphic representations, etc.) that will demonstrate: his command of an applied competency in an applicable quantitative and qualitative research methodology and in scientific penmanship; his ability to identify a relevant research problem in a natural science or health science discipline by integrating the above-mentioned skills and by thoroughly investigating existent knowledge as reflected in appropriate scientific literature; / *Die student sal 'n proefskrif van hoë tegniese gehalte (met verwysing na taalgebruik, illustrasies, tabelle, grafiese voorstellings, ens,) skryf, wat sal demonstreer dat die student oor toegepaste bevoegdheid in toepasbare kwantitatiewe en kwalitatiewe navorsingsmetodologie en wetenskaplike skryfkuns beskik, en in staat is om deur die integrering van bogenoemde vaardighede en op grond van deeglike ondersoek van bestaande*

kennis, soos gereflekteer deur toepaslike wetenskaplike literatuur 'n relevante navorsingsprobleem te identifiseer in 'n natuurwetenskaplike of gesondheidswetenskaplike dissipline;

- his ability to carry out the desired research in view of solving the problem; / *die verlangde navorsing ter oplossing van die probleem uit te voer;*
- his ability to evaluate the results scientifically in the context of the problem statement; / *die resultate wetenskaplik te evalueer in die konteks van die probleemstelling;*
- his ability to communicate the results scientifically. / *die resultate wetenskaplik te kommunikeer.*

The student will demonstrate by means of a *literature investigation* that he has a thorough and in-depth knowledge of related scientific literature; has the ability to interpret and debate different viewpoints and theories on a scientific basis; has looked up a large enough quantity of recent *and* appropriate historic primary and secondary sources in the speciality area. / *Die student sal deur 'n literatuurondersoek demonstreer dat hy 'n deeglike en in-diepte kennis van verwante wetenskaplike literatuur het; die vermoë het om verskillende gesigspunte en teorieë op 'n wetenskaplike basis te interpreteer en te beredeneer; genoegsame resente en gepaste historiese primêre en sekondêre bronne in die spesialiteitsarea nageslaan het.*

The student will provide proof by means of *problem identification* that he has a sound insight into the nature and aim of the research; has the ability to circumscribe the research topic properly at the level of a doctorate. / *Die student sal deur probleemidentifisering bewys lewer dat hy 'n deeglike insig in die aard en doel van die navorsing het; die navorsingsonderwerp gepas op doktorale vlak kan omskryf.*

Apart from the literature investigation the student will demonstrate that the research method is appropriate to the speciality area in view of handling the problem identified and that the research method has been selected in a reflexive and responsible manner. / *Behalwe die literatuurondersoek, sal die student demonstreer dat die navorsingsmetode gepas is in die spesialiteitsgebied om die geïdentifiseerde probleem te hanteer, en dat die navorsingsmetode op 'n refleksiewe en verantwoordelike wyse gekies is.*

By scientific *evaluation and communication of the results* the student will demonstrate the following: / *Deur die wetenskaplike evaluering van die resultate en die kommunikasie daarvan, sal die student die volgende demonstreer:*

- scientific processing of the thesis, with reference to the handling of appropriate quantitative or qualitative research methods and/or techniques, such as modelling, mathematical techniques of proof, experiments, observations, systematisation, founding of scientific statements, etc., as may be relevant to the problem investigated; / *wetenskaplike verwerking van die inhoud van die proefskrif, met verwysing na die hantering van gepaste kwantitatiewe of kwalitatiewe navorsings¬metodes en/of tegnieke soos modellering, wiskundige bewystegnieke, eksperimentering, waarneming, sistematisering, interpretering, begronding van wetenskaplike uitsprake, ens., soos dit betrekking het op die probleem wat ondersoek word;*

- the ability to formulate clearly; the ability to present a logical structure; a critical attitude and personal insight; / *die vermoë om duidelik te formuleer; die vermoë om 'n logiese struktuur aan te bied; 'n kritiese benadering en eie insig;*
- the ability to formulate scientifically justified recommendations. / *die formulering van wetenskaplik geregverdigde aanbevelings.*

SUMMARISED / *SAAMGEVAT:*

Students will have to demonstrate their ability to make a specific contribution to the development of new knowledge and skills in the field of specialisation by providing proof they have mastered knowledge of the theory and principles in the field; they are capable of integrating theory and practice in the field; of critical analysis of existing methodologies in the field; of analysis and interpretation of research data and results; of reporting research results in a scientifically acceptable format. / *Studente sal hul vermoë moet demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in die veld van spesialisasie deur bewys te lewer van beheersde kennis van die teorie en beginsels van die veld; die integrering van teorie en praktyk in die veld; kritiese analise van bestaande kennis in die veld; die uitvoering van navorsing volgens die aanvaarde metodologie in die veld; die ontleding en interpretasie van navorsingsdata en resultate; die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.*

The outcomes as described for the master's degrees are further refined and finally rounded off in this programme. / *Die uitkomste soos beskryf by die meestersgrade word in hierdie program verder verfyn en finaal afgerond.*

NAS.12.2 EXAMINATIONS/EKSAMINERING

Exams / Eksamens

Examinations for the doctorate are taken in terms of the provisions of the General Rule 5.14. Submitting the thesis takes place in terms of the General Rule 5.13 / *Die eksamen vir die doktorsgraad geskied volgens die voorskrifte van die Algemene Reël 5.14.*

The number of times that a student may present him-/herself for examinations and the repetition of modules are determined by the provisions of the General Rule 5.4.6. / *Die aantal kere wat 'n student vir 'n eksamen kan aanmeld en die herhaling van modules geskied volgens die bepalings van die Algemene Reël 5.4.6.*

Pass Requirements / Slaagvereistes

Passing modules and a curriculum takes place in accordance with General Rule 5.11. / *Die slaag van modules en 'n kurrikulum geskied in ooreenstemming met die Algemene Reël 5.11.*

NAS.12.3 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRICULTURAL ECONOMICS / *DOCTOR PHILOSOPHIAE IN LANDBOU MET LANDBOU-EKONOMIE*

Admission requirements / *Toelatingsvereistes:*

A student in order to qualify for admission to PhD studies, must have a MAgric or Msc Agric or MSA degree.

At the PC candidates must apply at the Research Unit Director on the prescribed form for admission to PhD studies at the PC and convince the Research Unit Director concerned beforehand that he/she has sufficient knowledge of the subject to warrant admission /

Om vir toelating tot PhD-studie te kwalifiseer moet 'n student 'n MAgric of MSc Agric of MA-graad hê.

By die Potchefstroomkampus moet kandidate op die voorgeskrewe vorm by die Direkteur van die Navorsingseenheid aansoek doen om toelating tot PhD-studie.

CODE/KODE: **2EA R03 N901P/M**

CAMPUS/*KAMPUS*: Mafikeng / Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Agriculture with Agricultural Economics / *Doctor Philosophiae in Landbou met Landbou-Ekonomie*

Module code	Descriptive name	Credits
AECM971	Dissertation / *Verhandeling*	360

NAS.12.4 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRICULTURAL EXTENSION / *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET LANDBOUVOORLIGTING*

CODE: **2EA R04 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Doctor of Philosophy in Agriculture with Agricultural Extension / *Doctor Philosophiae in Landboukunde met Landbouvoorligting*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AEXM971	Thesis	360

NAS.12.5 DOCTOR OF PHILOSOHPY IN AGRICULTURE WITH ANIMAL SCIENCE / *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET DIEREWETENSKAP*

CODE: **2EA R01 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Doctor of Philosohpy in Agriculture with Animal Science / *Doctor Philosophiae in Landboukunde met Dierewetenskap*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ASCM971	Thesis	360

NAS.12.6 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRONOMY / *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET AGRONOMIE*

CODE: **2EA R02 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Doctor of Philosophy in Agriculture with Agronomy / *Doctor Philosophiae in Landboukunde met Agronomie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AGRM971	Thesis	360

NAS.12.7 DOCTOR OF PHILOSOPHY IN ANIMAL HEALTH / *DOCTOR PHILOSOPHIAE IN DIEREGESONDHEID*

CODE: **2CA R01 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Doctor of Philosophy in Animal Health / *Doctor Philosophiae in Dieregesondheid*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
AHAM971	Thesis	360

NAS.12.8 **DOCTOR OF PHILOSOPHY IN COMPUTER AND INFORMATION SCIENCES /** ***DOCTOR PHILOSOPHIAE IN REKENAAR- EN INLIGTINGSWETENSKAPPE***

CODE: **2CB R02 N901P/M**

CAMPUS: Potchefstroom and Mafikeng

DELIVERY MODE*:* : Full time

Compilation of Programme: Doctor of Philosophy in Computer and Information Sciences / ***Doctor Philosophiae in Rekenaar- en Inligtingswetenskappe***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ITRW971	Thesis	360

NAS.12.9 DOCTOR OF PHILOSOPHY IN COMPUTER AND INFORMATION SCIENCES WITH INFORMATION TECHNOLOGY / *DOCTOR PHILOSOPHIAE IN REKENAAR EN INLIGTINGSWETENSKAP MET INLIGTINGTEGNOLOGIE*

CODE: 2CB R01 N901V

CAMPUS: Vaal-Triangle (English)

DELIVERY MODE*:* : Full time and part-time

Compilation of Programme: Doctor of Philosophy in Computer and Information Sciences with Information Technology / *Doctor Philosophiae in Rekenaar en Inligtingswetenskap met Inligtingtegnologie*

Module code	Descriptive name	Credits
ITWV971	Thesis	360

NAS.12.10 DOCTOR OF PHILOSOPHY IN SCIENCE WITH STATISTICS / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STATISTIEK*

CODE/*KODE*: 2CC R20 N901P/M

CAMPUS/*KAMPUS*: Potchefstroom and Mafikeng

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Doctor of Philosophy in Science with Statistics / *Doctor Philosophiae in Wetenskap met Statistiek*

Module code	Descriptive name	Credits
STTK971	Thesis	360

NAS.12.11 DOCTOR OF PHILOSOPHY IN APPLIED MATHEMATICS / *PHILOSOPHIAE DOCTOR IN TOEGEPASTE WISKUNDE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N934M

CODE: **204-123**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of Old Programme: Doctor of Philosophy in Applied Mathematics / *Philosophiae Doctor in Toegepaste Wiskunde*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
APMM 971	Thesis	360

CURRICULUM: N902P

CODE: **204-139**

CAMPUS: Potchefstroom

DELIVERY MODE: Full time

Compilation of Old Programme: Doctor of Philosophy in Applied Mathematics / *Philosophiae Doctor in Toegepaste Wiskunde*

Module code	**Descriptive name**	**Credits**
TGWS971	Thesis	360

NAS.12.12 DOCTOR OF PHILOSOPHY IN SCIENCE WITH APPLIED MATHEMATICS */ DOCTOR PHILOSOPHIAE IN WETENSKAP MET TOEGEPASTE WISKUNDE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE/*KODE*: 2CC R25 N901P/M

CAMPUS/*KAMPUS*: Mafikeng and Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Doctor of Philosophy in Science with Applied Mathematics / *Doctor Philosophiae in Wetenskap met Toegepaste Wiskunde*

Module code	Descriptive name	Credits
APPM971	Thesis	360

NAS.12.13 DOCTOR OF PHILOSOPHY WITH MATHEMATICS / *DOCTOR PHILOSOPHIAE MET WISKUNDE*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N933M

CODE: **204-122**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Doctor of Philosophy with Mathematics / *Doctor Philosophiae in Wetenskap met Wiskunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MAYM 971	Thesis	360

CURRICULUM/*KURRIKULUM*: N904P

CODE/*KODE*: **204-140**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:*: Full time or Part-time / *Voltyds of Deeltyds*

Compilation of old Programme: Doctor of Philosophy with Mathematics / *Doctor Philosophiae in Wetenskap met Wiskunde*

Module code	**Descriptive name**	**Credits**
WISK971	Thesis	360

NAS.12.14 DOCTOR OF PHILOSOPHY IN SCIENCE WITH MATHEMATICS / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET WISKUNDE*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE/*KODE*: 2CC R24 N901 P/M

CAMPUS/*KAMPUS:* Mafikeng and Potchefstroom

DELIVERY MODE / *AFLEWERINGSMETODE:* : Full time / *Voltyds*

Compilation of old Programme: Doctor of Philosophy in Science with Mathematics / *Doctor Philosophiae in Wetenskap met Wiskunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MTHS 971	Thesis	360

NAS.12.15 DOCTOR OF PHILOSOPHY IN SCIENCE WITH NATURAL SCIENCES EDUCATION / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET NATUURWETENSKAP- ONDERWYS*

Faculty-specific rules for the programme/Fakulteit spesifieke reëls vir die program:

Prospective students must hold an applicable masters degree and a Post-Graduate Certificate in Education (PGCE). / *Voornemende studente moet oor 'n toepaslike meestersgraad en die Nagraadse Onderwyssertifikaat (NGOS) beskik.*

CODE/*KODE*: 2CC R09 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Doctor of Philosophy in Science with Natural Sciences Education / *Doctor Philosophiae in Wetenskap met Natuurwetenskaponderwys*

Module code *Module kode*	Descriptive name *Beskrywende naam*	Credits *Krediete*
NWON971	Thesis	360

NAS.12.16 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BUSSINESS MATHEMATICS / *DOCTOR PHILOSOPHIAE IN WETENSKAPPE MET BEDRYFSWISKUNDE*

CODE/*KODE*: 2CC R01 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of Programme: Doctor of Philosophy in Science with Bussiness Mathematics / *Doctor Philosophiae in Wetenskappe in Bedryfswiskunde*

Module code *Module kode*	Descriptive name *Beskrywende naam*	Credits *Krediete*
BWIN971	Thesis	360

NAS.12.17 DOCTOR OF PHILOSOPHY IN SCIENCE WITH RISK ANALYSIS / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET RISIKO-ANALISE*

CODE/*KODE*: 2CC R15 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time/*Voltyds*

Compilation of old Programme: Doctor of Philosophy in Science with Science in Risk Analysis / *Doctor Philosophiae in Wetenskap met Risiko-Analise*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
BWIR971	Thesis	360

NAS.12.18 DOCTOR OF PHILOSOPHY IN SPACE PHYSICS / P*HILOSOPHIAE DOCTOR IN RUIMTEFISIKA*

OLD PROGRAMME (PHASING OUT / FASSEER UIT)

CURRICULUM: N906P

CODE: **204-112**

CAMPUS: Potchefstroom

DELIVERY MODE: Full time

Compilation of old Programme: Doctor of Philosophy in Space Physics / P*hilosophiae Doctor in Ruimtefisika*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
FSKN971	Thesis	360

NAS.12.19 DOCTOR OF PHILOSOPHY IN PHYSICS / *PHILOSOPHIAE DOCTOR IN FISIKA*

OLD PROGRAMME (PHASING OUT)

CURRICULUM: N935M

CODE: **204-124**

CAMPUS: Mafikeng (English)

DELIVERY MODE: Full time

Compilation of old Programme: Doctor of Philosophy in Physics / *Doctor Philosophiae in Fisika*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
PHYM 971	Thesis	360

NAS.12.1 DOCTOR OF PHILOSOPHY IN PHYSICS / *DOCTOR PHILOSOPHIAE IN FISIKA*

NEW PROGRAMME (2018 1st Registration) / NUWE PROGRAM (2018 1st registrasie)

CODE 2CC R23 N901 P/M

CAMPUS: Mafikeng / Potchefstroom

DELIVERY MODE*:* : Full time

Compilation of new Programme: Doctor of Philosophy in Physics / *Doctor Philosophiae in Fisika*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
FSKN 971	Thesis	360

NAS.12.2 DOCTOR OF PHILOSOPHY IN SCIENCE WITH CHEMISTRY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET CHEMIE*

CODE/*KODE*: **2CC R11 N901P/M**

CAMPUS/*KAMPUS*: Mafikeng / Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE*: Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Chemistry / *Doctor Philosophiae in Wetenskap met Chemie*

There are five research areas in this research entity and a research topic for a PhD thesis must therefore be selected from one of these research areas. The research areas are: / *Daar is vyf navorsingsrigtings in hierdie navorsingsentiteit en 'n navorsingsonderwerp vir 'n PhD-proefskrif moet dus uit een van hierdie navorsingsrigtings gekies word. Die navorsingsrigtings is:*

a) Chromium Technology / Chroomtegnologie
b) Catalysis and Synthesis / Katalise en Sintese
c) Membrane Technology / Membraantegnologie
d) Electrochemistry for Energy and Environment / Elektrochemie vir Energie en Omgewing
e) Coal Chemistry / Steenkoolchemie

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
CHEN971	Thesis	360

NAS.12.3 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ATMOSPHERIC CHEMISTRY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET ATMOSFERIESE CHEMIE*

CODE/*KODE*: **2CC R05 N901P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Atmospheric Chemistry / *Doctor Philosophiae in Wetenskap met Atmosferiese Chemie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
CHEM971	Thesis	360

NAS.12.4 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIROMENTAL SCIENCES / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OMGEWINGSWETENSKAPPE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

The topic for a PhD thesis must be selected from one of the following research fields in consultation with the directors of the School and Research Unit/ *Die onderwerp vir 'n Phd tesis moet, in oorleg met die direkteure van die Skool en Navorsingseenheid, uit die volgende onderwerpe gekies word*:

a) Climate change, Air Quality and Impacts
b) Aquatic Ecosystem Health
c) Biodiversity and Conservation Ecology
d) Ecological Interactions and Ecosystem Resilience
e) Spatial Planning, Development and Implementation
f) Environmental Geology and Soil Sciences
a) Klimaatsverandering, luggehalte en invloede
b) Akwatiese ekosisteemwelstand
c) Biodiversiteit en bewaringsekologie
d) Ekologiese interaksies en ekostelsel veerkragtigheid
e) Ruimtelike beplanning, ontwikkeling en implementering
f) Omgewings geologie en grondkunde

CODE/*KODE*: 2CC R04 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Enviromental Sciences / *Doctor Philosophiae in Wetenskap met Omgewingswetenskappe*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
OMWN971	Thesis	360

NAS.12.1 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIRONMENTAL SCIENCES AND MANAGEMENT / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OMGEWINGSWETENSKAPPE EN BESTUUR*

CODE: **2CC R03 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time or Part-time/

Compilation of Programme: Doctor of Philosophy in Science with Environmental Sciences and Management / *Doctor Philosophiae in Wetenskap met Omgewingswetenskappe en Bestuur*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
ENVM 971	Thesis	360

NAS.12.2 DOCTOR OF PHILOSOPHY IN SCIENCE WITH DISASTER RISK SCIENCE */ DOCTOR PHILOSOPHIAE IN WETENSKAP MET RAMP-RISIKOWETENSKAPPE*

CODE/*KODE*: 2CC R14 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time*/Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Disaster Risk Science */ Doctor Philosophiae in Wetenskap met Ramp-Risikowetenskappe*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
DRRS971	Thesis	360

NAS.12.3 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ZOOLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET DIERKUNDE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

In this programme research can be conducted on any subject in Zoology, although the Unit retains the right not to accept a candidate in instances where there is not sufficient capacity. / *In hierdie program kan navorsing gedoen word oor enige onderwerp uit die Dierkunde, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie*

CODE/*KODE*: **2CC R18 N901P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Zoology / *Doctor Philosophiae in Wetenskap met Dierkunde*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
DRKN971	Thesis	360

NAS.12.1 **DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIRONMENTAL SCIENCES AND MANAGEMENT/** ***DOCTOR PHILIOSOPHAIE IN WETENSKAP MET OMGEWINGSWETENSKAPPE EN BESTUUR***

CODE/*KODE*: 2CC R26 N901M

CAMPUS/*KAMPUS*: Mafikeng

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Environmental Sciences and Management/ *Doctor Philiosophaie in Wetenskap met Omgewingswetenskappe en Bestuur*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
ENVM971	Thesis	360

NAS.12.2 DOCTOR PHILOSOPHY IN SCIENCE WITH GEOGRAPHY /*DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE*

CODE: **2CC R12 N901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* Full time or Part-time

Compilation of Programme: Doctor Philosophy in Science with Geography / ***Doctor Philosophiae in Wetenskap met Geografie***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
GEOM 971	Thesis	360

NAS.12.3 DOCTOR OF PHILOSOPHY IN SCIENCE WITH GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE EN OMGEWINGSBESTUUR*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

This programme can only be followed of the student already has an appropriate MSc degree. In this programme research can be conducted on any subject in Geography, although the Unit retains the right not to accept a candidate in instances where there is not sufficient particular expertise among staff on the specific research topic. Specialist fields include (but are not limited to):

a) Spatial studies
b) Environmental impact analysis and all aspects thereof
c) Environmental management and all aspects thereof
d) Physical and human Geography

Daar kan in hierdie program navorsing gedoen word oor enige aspek van Geografie en die bestuur van die omgewing, alhoewel die Eenheid die reg voorbehou om 'n student nie te aanvaar, as daar nie genoegsame spesifieke kundigheid onder personeel oor die spesifieke navorsingstema is nie. Spesialisvelde sluit in (maar is nie eksklusief nie):

a) Ruimtelike studies
b) Omgewingsinvloedanalise en alle aspekte daarvan
c) Omgewingsbestuur en alle aspekte daarvan
d) Fisiese en menslike Geografie

CODE/*KODE*: 2CC R19 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Geography and Environmental Management / *Doctor Philosophiae in Wetenskap met Geografie en Omgewingsbestuur:*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
GGFN971	Thesis	360

NAS.12.4 DOCTOR OF PHILOSOPHY IN SCIENCE WITH MICROBIOLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET MIKROBIOLOGIE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

This programme can only be followed of the student already has an appropriate MSc degree. In this programme research can be conducted on any subject in Microbiology, although the Unit retains the right not to accept a candidate in instances where there is not sufficient capacity./ *In hierdie program kan navorsing gedoen word oor enige onderwerp uit Mikrobiologie, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

CODE/*KODE*: 2CC R17 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Microbiology / *Doctor Philosophiae in Wetenskap met Mikrobiologie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
MKBN971	Thesis	360

NAS.12.5 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BOTANY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET PLANTKUNDE*

Faculty-specific rules for the programme/*Fakulteit spesifieke reëls vir die program:*

This programme can only be followed of the student already has an appropriate MSc degree. In this programme research can be conducted on any subject in Microbiology, although the Unit retains the right not to accept a candidate in instances where there is not sufficient capacity./ *In hierdie program kan navorsing gedoen word oor enige onderwerp uit Mikrobiologie, alhoewel die Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

CODE/*KODE*: 2CC R16 N901P

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Botany / *Doctor Philosophiae in Wetenskap met Plantkunde*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
PLKN971	Thesis	360

NAS.12.6 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOCHEMISTRY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOCHEMIE*

CODE/*KODE*: 2CC R08 N901P/M

CAMPUS/*KAMPUS*: Mafikeng / Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Biochemistry / *Doctor Philosophiae in Wetenskap met Biochemie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
BCHN971	Thesis	360

NAS.12.7 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOLOGIE*

CODE/*KODE*: 2CC R10 N901M

CAMPUS/*KAMPUS*: Mafikeng

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/

Compilation of Programme: Doctor of Philosophy in Science with Biology / *Doctor Philosophiae in Wetenskap met Biologie*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
BIYM 971	Thesis	360

NAS.12.8 DOCTOR OF PHILOSOPHY IN SCIENCE WITH HYDROLOGY AND GEOHYDROLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET HIDROLOGIE EN GEOHIDROLOGIE*

CODE/*KODE*: **2CC R06 N901P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Hydrology and Geohydrology / *Doctor Philosophiae in Wetenskap met Hidrologie en Geohidrologie*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
HDGH971	Thesis	360

NAS.12.9 DOCTOR OF PHILOSOPHY IN SCIENCE WITH OPERATIONAL RESEARCH / *DOCTOR PHILOSOPHIAE IN WETENSKAP OPERASIONELE NAVORSING*

CODE: **2CC R21 N901V**

CAMPUS: **Vaal-Triangle**

DELIVERY MODE*:* : Full time/ Part-time

Compilation of Programme: Doctor of Philosophy in Science with Operational Research / *Doctor Philosophiae in Wetenskap Operasionele Navorsing*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
ONAV 972	Thesis	360

NAS.12.10 DOCTOR OF PHILOSOPHY IN SCIENCE WITH RADIATION SCIENCE / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STRALINGSWETENSKAP*

CODE: **2CC R22 N901M**

CAMPUS: **Mafikeng**

DELIVERY MODE*:* : Full time/ Part-time

NAS.12.1 Compilation of Programme: Doctor of Philosophy in Science with Radiation Science / *Doctor Philosophiae in Wetenskap met Stralingswetenskap*

Module code *Module kode*	**Descriptive name** *Beskrywende naam*	**Credits** *Krediete*
ARST 971	Thesis	360

NAS.12.2 **DOCTOR OF PHILOSOPHY IN SOCIAL SCIENCE WITH INDIGENOUS KNOWLEDGE SYSTEMS /** ***DOCTOR PHILOSOPHIAE IN SOSIALEWETENSKAP MET INHEEMSE KENNISSTELSELS***

CODE: **1CC R13 L901M**

CAMPUS: Mafikeng

DELIVERY MODE*:* : Full time

NAS.12.1 **Compilation of Programme: Doctor of Philosophy in Social Science with Indigenous Knowledge Systems /** ***Doctor Philosophiae in Sosialewetenskap met Inheemse Kennisstelsels***

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
HIKS 971	Thesis	360

NAS.12.2 DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*

NAS.12.2.1 RULES FOR THE DEGREE DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING / *REëLS VIR DIE PROGRAM DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*

PROGRAMME OUTCOMES/PROGRAMUITKOMSTE:

On completion of this qualification the student ought to be able to:

a. Illustrate an original contribution to knowledge creation within the field of Urban and Regional Planning, by applying advanced subject-specific and integrated planning knowledge and skills in addressing planning issues and in identifying, analysing and solving relevant problems.
b. Illustrate expertise and insight into the nature and objectives of the study, as well as the theoretical and scientific principles that form the basis of the study, in order to conceptualise new research initiatives, and create new knowledge.
c. Illustrate the ability to contribute to scholarly debates around theories and knowledge production within the field of Urban and Regional Planning
d. Illustrate the ability to develop new techniques and analytical methods appropriate to complex planning problems, and the ability to retrieve new knowledge appropriate to specialised and complex Urban and Regional Planning contexts.
e. Illustrate thorough, logical and coherent assessment of the significance of the research findings, including the ability to produce significant insights, apply specialist knowledge and skills acquired in these studies, meaningfully.
f. Illustrate critical and independent thought, demonstrating insight into the challenges and multi-dimensional considerations within the field of Urban and Regional Planning, which makes a significant, publishable contribution to the Urban and Regional Planning discipline./

By die voltooiing van hierdie kwalifikasie behoort die student in staat te wees om die volgende uitkomste te bereik:

a. Illustreer 'n oorspronklike bydrae tot kennis ontwikkeling in die vakgebied Stads- en Streekbeplanning, deur gevorderde vakspesifieke en geïntegreerde beplanningskennis en -vaardighede toe te pas om beplanningsvraagstukke aan te pak en relevante probleme te identifiseer, analiseer en op te los.
b. Illustreer kundigheid en insig met betrekking tot die aard en doelstellings van die studie, asook die teoretiese en wetenskaplike beginsels wat die studie onderbou, ten einde nuwe navorsingsinisiatiewe te konseptualiseer en nuwe kennis te genereer of praktyke te vestig

c. *Illustreer die vermoë om 'n bydrae te lewer tot vakkundige debat rakende teorieë en prosesse waardeur kennis gegenereer word binne Stads- en Streekbeplanning*
d. *Illustreer die vermoë om nuwe tegnieke en analitiese metodes te ontwikkel wat toepaslik is vir komplekse beplanningsprobleme, en die vermoë om nuwe kennis te ontsluit toepaslik vir gespesialiseerde en komplekse Stads- en Streekbeplanningkontekste*
e. *Illustreer deeglike, logiese en samehangende beoordeling van die betekenisvolheid van die navorsingsbevindings, insluitend die vermoë om gespesialiseerde kennis en vaardighede opgedoen in hierdie studie sinvol toe te pas en betekenisvolle insigte te genereer.*
f. *Illustreer kritiese en onafhanklike denke wat van insig getuig in die uitdagings en unieke, multidimensionele oorwegings binne die veld van Stads- en Streekbeplanning, wat publiseerbaar is en 'n betekenisvolle bydrae lewer tot die Stads- en Streekbeplanning dissipline.*

PROGRAMME OBJECTIVE / *DOEL VAN DIE PROGRAM:*

The objective of the programme is to enable a student who has completed a recognised Magister degree in Urban and Regional Planning the opportunity to prove through a doctoral thesis that he/she made a contribution to the development of new knowledge and/or applicable skills directly related to the subject field. A further objective of the programme is to provide South Africa with scientific researchers that have a broad theoretical knowledge and practical skills in planning in order to contribute to the leadership basis for innovative and knowledge based environmental scientists for the country. The option of writing the thesis in article format, will be considered on merit, in which case the rules of the Faculty of Natural Sciences will apply. A complete thesis based on original research related to the core focuses within Urban and Regional Planning will have to be undertaken. Unlocking of specific new knowledge within the subject area of Urban and Regional Planning forms a basic requirement. Study leadership will internally be provided by a Professional Urban and Regional Planner registered with SACPLAN. /

*Die doel van die program is om aan 'n student wat reeds oor 'n erkende magistergraad in Stads- en Streekbeplanning beskik, in staat te stel om by wyse van 'n doktorale proefskrif bewys te lewer dat hy/sy 'n definitiewe wetenskaplike bydrae gelewer het tot die ontwikkeling van nuwe kennis en/of toepasbare vaardighede binne die vakgebied. 'n Verdere doel van die program is om Suid-Afrika te voorsien van wetenskaplike navorsers wat oor breë teoretiese kundigheid en praktiese vaardighede in Beplanning beskik, om bydrae te lewer tot die verbreding van die leierskapsbasis vir innoverende en kennisgebaseerde omgewingswetenskaplikes in die land. 'n Artikelopsie sal slegs op meriete oorweeg word, in welke geval die regulasies van die Fakulteit Natuurwetenskappe sal geld. 'n Volledige proefskrif op grond van oorspronklike navorsing in een van die kernfokusse binne Stads- en Streekbeplanning sal onderneem moet word, met 'n spesifieke bydrae tot die ontsluiting van nuwe vakkennis binne die vakgebied van Stads- en Streekbeplanning. Studieleiding sal intern verskaf word deur 'n Professionele Stads- en Streekbeplanner, wat by SACPLA*N *geregistreer is.*

DURATION OF THE STUDIES / TYDPERK VAN STUDIE

The minimum duration of the studies is three years full-time and four years part-time and the maximum duration is four years full-time and five years part-time, taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rules 4.4.10, a student may apply for an extension of the study period. /

Die minimum duur van die studie is drie jaar voltyds en vier jaar deeltyds en die maksimum duur is vier jaar voltyds en vyf jaar deeltyds, bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 4.4.10, aansoek gedoen word om 'n verlenging van die studietermyn.

ASSUMED PRIOR LEARNING / ***AANNAMES OOR VORIGE LEER***

The student has MSc degree in Urban and Regional Planning. If the student does not conform to the provision of N.6.3 the Research Director, after consulting Sub-programme 7 (Programme for Spatial Planning, Development and Implementation), as well as the Dean and with notice to the Faculty Board, decides whether the candidate may be admitted to the MSc Urban and Regional Planning programme on the strength of knowledge and skills acquired by prior learning and work experience. A student must have command of Afrikaans or English. /

Die student beskik oor 'n MSc graad in Stads- en Streekbeplanning. Indien die student nie aan die bepaling van N.6.3 voldoen nie bepaal die Navorsingsdirekteur, na oorlegpleging met Subprogram 7 (Program vir Ruimtelike Beplanning, Ontwikkeling en Implementering), asook die Dekaan, en met kennisgewing aan die Fakulteitsraad, of die kandidaat op grond van kennis en vaardighede opgedoen deur vorige leer en werkservaring wat tot leer gelei het, tot die MSc Stads- en Streekbeplanning program toegelaat kan word. 'n Student moet Afrikaans of Engels magtig wees.

ASSESSMENT /*ASSESSERING:*

Integrated assessment continuously takes place with the aim to assess the student's ability to plan, structure, conceptualise and execute innovative scientific research that makes an original contribution to the Urban and Regional Planning discipline, and the students ability to report the findings thereof. Assessment is initiated when the research proposal is considered by the Ethical Committee and the Faculty Management Board for Advanced Degrees. Approval by these committees is a requirement for the study. The supervisor also assesses continuously while the thesis are being written. Final examination of the documentation is done by at least three examiners, of which a minimum of two are externally appointed. The examiners will be experts in the field of Urban and Regional Planning and associated disciplines, with at least one examiner being professionally registered at SACPLAN. The assessment mark received after examination and moderation of the thesis counts towards 100% of final module mark.

Geïntegreerde assessering vind deurlopend plaas met die doel om die student se vermoë te evalueer om innoverende wetenskaplike navorsing te beplan, te struktureer, te konseptualiseer en uit te voer ten einde 'n oorspronklike bydrae te lewer tot die Stads- en Streekbeplanning-dissipline en om die bevindings daarvan te rapporteer. Assessering word geïnisieer wanneer die navorsingsvoorstel deur die

Etiese Komitee en Fakulteitsbestuurskomitee vir Gevorderde grade oorweeg word. Goedkeuring deur hierdie komitees is 'n vereiste vir die studie. Die studieleier assesseer ook voortdurend terwyl die tesis geskryf word. Finale eksaminering van die verhandeling word deur ten minste drie eksaminatore gedoen, waarvan minstens twee ekstern aangestel word. Alle eksaminatore sal kundiges op die gebied van Stads- en Streekbeplanning en verwante wetenskappe wees, met minstens een eksaminator wat professioneel by SACPLAN geregistreer is. Die assesseringspunt wat na die eksamen en moderering van die proefskrif ontvang word, tel 100% van die finale modulepunt.

NAS.12.3 DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*

NAS.12.4

CODE/*KODE*: **2CC R07 N901P**

CAMPUS/*KAMPUS*: Potchefstroom

DELIVERY MODE/*AFLEWERINGSMETODE:* : Full time or Part-time/*Voltyds of Deeltyds*

Compilation of Programme: Doctor of Philosophy in Science with Urban and Regional Planning / *Doctor Philosophiae in Wetenskap met Stads- en Streekbeplanning*

Module code ***Module kode***	**Descriptive name** ***Beskrywende naam***	**Credits** ***Krediete***
SBEL971	Thesis	360

NAS.13 MODULE OUTCOMES / *MODULE UITKOMSTE*

NAS.13.1 POSTGRADUATE DIPLOMA / *NAGRAADSE DIPLOMA*

Module code: DRRS511	**Semester 1**	**NQF-Level:**
Title: Disaster Risk Studies and Climate Change Adaptation		
Module-outcomes: After the completion of this module the learners should be able to: • Define and explain the interaction between the basic concepts (i.e risk, hazards, vulnerability, resilience) that form the basis of disaster risk. • Explain the influence of disaster risk on poor communities. • Critique various disaster myths. • Understand the difference between disaster risk management, disaster risk reduction and climate change adaptation. • Explain the application of disaster risk management and climate change adaptation within the South African context. • Place climate change and adaptation within disaster risk reduction theory. • Display a basic understanding of current processes of climate change and adaptive practices to enhance societal resilience. • Analyse the link between climate change affects the risk profile of southern Africa. • Understand the concepts “adaptation” and “resilience” and how it relates to disaster risk reduction.		
Method if delivery:		
Assessment methods:		
Module code: DRRS512	**Semester 1**	**NQF-Level:**
Title: Socio-Ecological Resilience		
Module-outcomes: After the completion of this module the learners should be able to: • Critically judge the vulnerability of a community or group by applying different models of vulnerability, resilience and exposure analysis. • Accurately, appropriately monitor and communicate the nature of vulnerability and exposure to disaster risk reduction professionals, community members and critical role players. • Understand the complexity of vulnerability and resilience that extends its roots into social, economic, physical, environmental and political origins. • Ability to examine the characteristics associated with vulnerability in order to critically evaluate the scope of vulnerability assessments. • To understand the critical dimensions of exposure, vulnerability and resilience and how they contribute to or can undermine disaster impact.		
Method if delivery:		
Assessment methods:		

Module code: DRRS513	Semester 1	NQF-Level:
Title: Hazards		
Module-outcomes: After the completion of this module the learners should be able to: • Define and identify the different types of hazards. • Classify various hazards (Natural; Technological; Environmental Degradation). • Explain and critically discuss the interaction between hazards, vulnerability and disaster risk and its interaction with climate change. • Apply techniques successfully to conduct a hazard assessment within the context of changing and variable climatic conditions. • Apply specific tools to prioritise various hazards. • Show integrated knowledge about the various tools that can be used to asses, measure and monitor hazards. • Critically discuss the difference between a hazard and a disaster.		
Method if delivery:		
Assessment methods:		
Module code: DRRS514	**Semester 1**	**NQF-Level:**
Title: Disaster Risk Assessment		
Module-outcomes: After the completion of this module the learners should be able to: • Accurately, coherent and appropriately compile a disaster risk profile to determine and highlight the priority disaster risk areas through the examination of hazards, vulnerability and capacity. • Understand the complexity of hazard definitions through the utilisation of different tools and techniques. • Critically interpret, evaluate and review disaster risk profiles, in order to produce comprehensive disaster risk reduction strategies within the sustainable development context. • Select, evaluate and document critical facilities in communities, reflect on these facilities and address through appropriate strategies how they contribute to the identification of high-risk areas. • Integrated knowledge of and engagement in community capacity and resiliency building in response to the findings of disaster risk assessments. • Critically understand and apply theories and techniques relevant to disaster risk and climate change for better disaster risk assessment.		
Method if delivery:		
Assessment methods:		
Module code: DRRS515	**Semester 1**	**NQF-Level:**
Title: Research Methodology		
Module-outcomes: After the completion of this module the learners should be able to: • Understand the code of conduct, values and ethics of post-graduate study. • Have a basic orientation on the nature of scientific knowledge and the epistemology of the humanities. • Master and apply the more specific aspects of research design and execution		

that must result in the presentation of a research proposal and the writing of a research report.
- Think critically and proceed with scientific reasoning whenever necessary through the collection, analysis, synthesis and assessment of data.

Method if delivery:

Assessment methods:

Module code: DRRS521	**Semester 2**	**NQF-Level:**

Title: Urban Disaster Risk

Module-outcomes:

After the completion of this module the learners should be able to:

- Explain the role of urbanisation in increasing disaster risk.
- Investigate environmental hazards (through climate change) and their dynamic within an urban setting.
- Compare urban risk variables in order to choose the correct course of action.
- Assess technological and human-made hazards within the urban setting.
- Promote community disaster risk assessment in urban settings.
- Explain rural-urban linkages which leads to heightened disaster risk.
- Investigate urban risk reduction priorities

Method if delivery:

Assessment methods:

Module code: DRRS522	**Semester 2**	**NQF-Level:**

Title: Preparedness and Response

Module-outcomes:

After the completion of this module the learners should be able to:

- Conduct disaster preparedness planning.
- Apply the various phases associated with disaster response and recovery.
- Show knowledge of and be able to explain the types of disaster assessments.
- Demonstrate knowledge and discuss disaster assessment process in full.
- Show knowledge of and critically explain the importance of logistical preparedness in disaster relief.
- Critically discuss the practical considerations for various sectors of relief.
- Demonstrate a critical understanding of the Incident Command System, its role and how it functions.
- Demonstrate the ability to ensure a transition from disaster recovery to development.

Method if delivery:

Assessment methods:

Module code: DRRS523	**Semester 2**	**NQF-Level:**

Title: Planning and Project Management

Module-outcomes:

After the completion of this module the learners should be able to:

- Demonstrate competence in designing systems, strategies and programmes for public policy implementation.
- Apply appropriate project management competencies in programme development and delivery.

- Apply relevant performance management systems in programme monitoring and evaluation.

Method if delivery:

Assessment methods:

Module code: DRRS524	**Semester 2**	**NQF-Level:**

Title: Research Project

Module-outcomes:

After the completion of this module the learners should be able to:

- Understand the code of conduct, values and ethics of post-graduate study.
- Have a basic orientation on the nature of scientific knowledge and the epistemology of the humanities.
- Master and apply the more specific aspects of research design and execution that must result in the presentation of a research proposal and the writing of a research report.
- Think critically and proceed with scientific reasoning whenever necessary through the collection, analysis, synthesis and assessment of data.

Method if delivery:

Assessment methods:

Module code: ECOM515	**Semester 1**	**NQF-Level: 8**

Title: Title: Agriculture and Economic Development

Module outcomes:

To foster more rapid economic development Demonstrate integrated knowledge and understanding of principles of technical, allocative , scale and economic efficiencies, Have the ability to analyse agriculture's role in the development of underdeveloped communities/countries;Be able to identify barriers to agricultural development and to examine critically remedial agricultural policies and well-known tools of economic analysis

Method if delivery:

Assessment methods:

Module code: ECOM516	**Semester 1**	**NQF-Level: 8**

Title: Agricultural Statistics Research I

Module outcomes:

Demonstrate knowledge and understanding of applications of linear regression and the general linear model to agricultural economic data, Be able to and use and interpret at least two econometric software for data analysis to be able to analyse data, Demonstrate the ability to discuss the problems of estimation when classical assumptions of linear regression are violated, Be able to use application of Chi-square analysis in the estimation of Index numbers and time series analysis in the agricultural sector.

Method if delivery:

Assessment methods:

Module code: ECOM517	Semester 1	NQF-Level: 8
Title: Quantitative Methods in Agricultural Economics		
Module outcomes: Demonstrate knowledge and engagement in this area of study to be able to use basic mathematical methods to identify pressing agricultural problems; Translate identified problem into a simple mathematical model to allow easier understanding and to aid agricultural problem solving; Demonstrate commendable competency in numeric skills;Derive outcomes, analyse and interpret output from mathematical and statistical models; Implement the analysis and evaluation of numerical solutions to business problems; Communicate the results of quantitative analyses in the contexts of agricultural problems to policy makers; and Demonstrate the ability to access, process and manage current economic literature in this area of study.		
Method if delivery:		
Assessment methods:		
Module code: ECOM518	**Semester 1**	**NQF-Level: 8**
Title:Agricultural Micro-Economics		
Module outcomes: Upon completion of this module, students are expected: To have knowledge and demonstration of understanding of relevant terms, rules, concepts, principles and theories to describe microeconomics To be able to apply this knowledge and these principles in the real world situations. To conduct economic analysis in agricultural and related enterprises. To advise agricultural stakeholders on micro-economics matters		
Method if delivery: Full time		
Assessment methods: Formative: • Quizzes • Written assignments • Class tests Assessment method Summative: End of semester examination		
Module code: ECOM519	**Semester 1**	**NQF-Level: 8**
Title: Agricultural Production Economics		
Module outcomes: Upon completion of this module, students are expected to: Be able to optimize the objective function of a farming community or a nation within a framework of limited resources Provide guidance to individual farmers on how to efficiently and cost-effectively use their resources		
Method if delivery: Full time		

Assessment methods:

- Assessment methods: Formative:
- Quizzes
- Written assignments
- Class tests

Assessment method Summative:
End of semester examination

Module code: ECOM520	**Semester 1**	**NQF-Level: 8**

Title: Agricultural marketing

Module-outcomes: Upon completion of this module, learners are expected to have acquired:
-Knowledge and understanding of the theory, methods, principles and techniques of agricultural marketing and price analysis to be able to advise farmers on agricultural marketing issues;
-Knowledge and understanding of the complexities and uncertainties of the different components of agricultural risk management in the context of South African agriculture;
-The ability to use a range of skills to identify and analyse real world problems regarding agricultural marketing and ethically develop creative response to these problems and issues;
-The ability to individually and as part of a group, communicate in writing and orally present creative ideas effectively to a range of audiences.

Method if delivery:

Assessment methods: - Formal Formative

- Class tests
- Assignments

Assessment Methods - Summative changed to:
Closed book written exam

Module code: ECOM525	**Semester 2**	**NQF-Level: 8**

Title: Agricultural Production Economics

Module outcomes:
knowledge and engagement in this study area to be able to optimise the objective and production function of the farming community within a framework of limited resources; the ability to guide and advise individual farmers on how to use their resources in the most efficient way and facilitate the use of resources from an economic point of view; knowledge and an understanding of the analysis of components of agricultural risk and its mechanisms; and Knowledge and the ability to apply technical farm efficiency analysis.

Method if delivery:

Assessment methods:

Module code: ECOM526	Semester 2	NQF-Level: 8
Title: Agricultural Project Appraisal		
Module outcomes: To able to demonstrate understanding of project analysis and management process, various aspects of agricultural projects cycle, costs and benefits of agricultural projects , plan and manage an agricultural and/or rural development project, and major project management knowledge areas.		
Method if delivery:		
Assessment methods:		
Module code: ECOM527	**Semester 2**	**NQF-Level: 8**
Title: Agricultural Macro Economics		
Module outcomes: To have knowledge and demonstration of understanding of relevant terms, rules, concepts, principles and theories to describe microeconomics and be able to apply these knowledge and principles in the real world situations. Conduct economic analysis in agricultural and related enterprises.Advise agricultural stakeholders on micro-economics matters.		
Method if delivery:		
Assessment methods:		
Module code: ECOM528	**Semester 2**	**NQF-Level: 8**
Title: Agricultural Marketing		
Module outcomes: knowledge and understanding of the theory, methods, principles and techniques of agricultural marketing and price analysis to be able to advise farmers on agricultural marketing issues; knowledge and understanding of the complexities and uncertainties of the different components of agricultural risk management in the context of South African agriculture; the ability to use a range of skills to identify and analyse real world problems regarding agricultural marketing and ethically develop creative response to these problems and issues; the ability to individually and as part of a group, communicate in writing and orally present creative ideas effectively to a range of audiences.		
Method if delivery:		
Assessment methods:		
Module code: ECOM529	**Semester 2**	**NQF-Level: 8**
Title: Research methods and Project		
Module outcomes: Demonstrate knowledge of and understanding of agricultural economics research methods, Engage in this field to be able to identify a research proposal and formulate a proposal in the agricultural economics environment,Demonstrate the ability to critically review information gathering, synthesise data, evaluate and manage information, Be able to prepare and present information using appropriate information technology and write a report offering creative insights, interpretations and solutions to problems in this field of study.		

Method if delivery:
Assessment methods:

NAS.13.2 BACHELOR OF SCIENCE HONOURS / *BACCALAUREUS SCIENTIAE HONNEURS*

Module code:AHAM611	**Semester 1**	**NQF-Level: 8**
Title: Diseases I		
Module outcomes: Learners will be able to demonstrate an advanced understanding of the diseases studied in the theory in order to work independently as the assist the veterinarian in the examination, diagnosis and treatment of but not limited to anthrax, brucellosis, clostridium, salmonella, foot and mouth disease, blue tongue, babesia, heartwater, anaplasmosis, aphosphorosis, milkfever, acetonemia and selected toxicities. Describe the relationship between the diseases studied and nutrition. Describe the prevention of the diseases studied. Describe the epidemiological concepts related to the disease studied.		
Method of delivering:		
Assessment Methods		
Module code:AHAM612	**Semester 1**	**NQF-Level: 8**
Title: Adv App Vet Science I		
Module outcomes: Learners will be able to prepare a literature review for a research project, write up on the materials and methods to be used in a research project. Describe the methods statistical analysis that they will use in their research. Prepare a research proposal and prepare a written scientific report on the research work done.		
Method of delivering:		
Assessment Methods		
Module code:AHAM613	**Semester 1**	**NQF-Level: 8**
Title: Veterinary External Parasites		
Module outcomes: Learners will be able to describe the life cycles of the ticks, flies, mosquitoes, fleas, lice, and mites of veterinary importance in large and small stock in Southern Africa. Describe the effect of these parasites on the health of large and small stock. Describe the importance of management in the treatment and management of these parasitic diseases. Describe the effects of climate and other factors effecting these occurrence in large and small stock. Describe those parasitic diseases which are zoonoses. Describe the use of insecticides and other means of control of these parasitic diseases in large and small stock. Identify external parasites found on large and small stock. Carry out table inspection for sheep scab. Prepare dip tanks for dipping of large and small stock, including the calculation of dilution rates and the mixing of the insecticide in the dip tank. Treat external parasites using topical and injectable medication.		
Method of delivering:		
Assessment Methods		
Module code:AHAM614	**Semester 1**	**NQF-Level: 8**
Title: Molecular Biology 1		

Module outcomes: Basic understanding of Molecular Biology, understanding the basic structure of DNA, understanding the basic structure of RNA, understanding the basic structure of proteins, understanding DNA replication, Understanding the basis of transcription of information from DNA to RNA, Understanding the translation of mRNA, rRNA, tRNA. Understanding the translation of mRNA into protein. GENES:Understanding the concept of a gene, understanding the structure of a gene, understanding the universal code and codons, understanding the relationship between a gene and a protein. The bacterial chromosome / Genome: Understanding the toxins and toxoids as protein encoded by genes in pathogens, understanding antibiotics as produced by microbes and encoded in genes, understanding pathogenicity as encoded by DNA/genes, Understanding features promoting pathogenicity in bacteria.		
Method of delivering:		
Assessment Methods		
Module code:AHAM615	**Semester 1**	**NQF-Level: 8**
Title: Veterinary Community Health I (Dairy Hygiene)		
Module outcomes: Dairy Hygiene: Understanding of the anatomy and physiological processes related to milking. Competency in the hygienic harvesting of milk. Competency in mastitic control. Competency in milk processing. Competency in milk testing. Food Safety: Understanding of the HACCP and PRP systems. Competency in the safe handling of food. Understanding of the food safety microbiology		
Method of delivering:		
Assessment Methods		
Module code:AHAM616	**Semester 1**	**NQF-Level: 8**
Title: Veterinary Nutrition I		
Module outcomes: Learners will be able to describe the various analytical procedures used in determining the composition of feeds, describe the role of water in nutrition and compare digestion in the ruminant and monogastric animals. Describe terminology related to digestion. Describe nutritional interrelationships. Describe the important mineral deficiencies in South Africa. Describe the important mineral toxicities in South Africa. Describe the use of vitamins and premixes in the diet. Describe the role of protein and amino acids in the nutrition of animals. Describe the use of roughage by the ruminant. Describe the role of nutrition in the prevention of disease.		
Method of delivering:		
Assessment Methods		

Module code:AHAM618	Semester 1	NQF-Level: 8
Title: Virology And Immunology		
Module outcomes: Learners will be able to define the terms related to the study of viruses and immunity. Describe the kinds and classes of immunity. Describe cellular and humoral immunity. Describe the RNA and DNA viruses. Describe replication. Describe hypersensitivity. Describe the various viral diseases studied.		
Method of delivering:		
Assessment Methods		
Module code:AHAM619	**Semester 1**	**NQF-Level: 8**
Title Veterinary Immunology		
Module outcomes: Learners will be able to prepare a research proposal. Prepare a complete literature review.		
Method of delivering:		
Assessment Methods		
Module code:AHAM621	**Semester 1**	**NQF-Level: 8**
Title: Vet Immunology		
Module outcomes: Learners will be able to describe the immune response. Describe the role of antibodies in the immune response. Describe humoral and cellular immunity. Describe the cell types in immunity. Describe the immunoglobulins. Describe the different types of immunity. Discuss the immunity to bacteria, virus, protozoa, helminths and other disease causing entities. Describe hypersensitivity and complement as they relate to infections. Vaccinate animals in the field. Detect antibodies in the lab using Rose Bengal, CFT and ELISA. In practical sessions learners immunize animals in the field and use various methods of antibody detection in the lab including Rose Bengal, CFT, ELISA.		
Method of delivering:		
Assessment Methods		

Module code:AHAM623	Semester 1	NQF-Level: 8
Title: Veterinary Internal Parasites		
Module outcomes: Learners will be able to demonstrate an advanced understanding of the life cycles of the nematode, cestode, and trematode parasites of the livestock. Demonstrate an advance understanding of the effect of these parasites on livestock. Demonstrate the interrelationship of management, climate and other factors with these parasitic diseases. Describe the zoonoses which exist among these parasitic diseases. Describe the use of anthelmintics and other mediations in the control of these parasitic diseases. Describe the role of management in the prevention of these diseases. Prepare faecal flotations and identify the ova under the microscope. Treat livestock for internal parasites using a wide range of medications.		
Method of delivering:		
Assessment Methods		
Module code:AHAM624	**Semester 1**	**NQF-Level: 8**
Title: Molecular Biology II		
Module outcomes: Students should be able to demonstrate an understanding of the following: the differences in genomic and plasmid DNA, the role of a vector DNA, intergration and a cloning vector, the concept of genetic transfer, the difference between a donor and a recipient, the Conjugation as a method of genetic transfer, the process of transformation, the process of electroporation, transposable elements, selectable markers, plasmid-borne drug resistance markers, gene cloning systems, animal cell transformation techniques, restriction enzymes, gene expression, gene amplification and Electrophoresis.		
Method of delivering:		
Assessment Methods		
Module code:AHAM625	**Semester 1**	**NQF-Level: 8**
Title: Veterinary Community Health Ii (Meat Hygiene)		
Module outcomes: Discuss meat hygiene. Describe the anatomical and physiological processes related to meat science. Discuss the process of the conversion of muscle to meat. Demonstrate competency in the hygienic slaughter of livestock and poultry. Demonstrate competency in the abattoir procedures and hygiene. Discuss Food Safety. Demonstrate an understanding of the HACCP and PRP systems. Demonstrate competency in the safe handling of food. Discuss food safety microbiology		
Method of delivering:		
Assessment Methods		

Module code:AHAM626	Semester 1	NQF-Level: 8
Title: Veterinary Nutrition II		
Module outcomes: Learners will be able to describe strategic for feeding animals during drought. Describe some lick formulations. Balance a ration for protein, minerals, etc. Describe feeding strategies for cows milked in communal grazing areas. Describe feeding strategies for beef cows in communal grazing areas. Describe feeding strategies for pigs kept by communal farmers. Describe feeding strategies for chickens kept by communal farmers		
Method of delivering:		
Assessment Methods		
Module code:APMM611	**Semester 1**	**NQF-Level: 8**
Title: Fluid Dynamics I		
Module outcome: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Euler and Lagrange coordinates, material derivatives and control volumes, Reynolds transport theorem. Conservation of mass, momentum and energy. Rotation and rate of shear. Constitutive equations. Viscosity coefficients. Navier-Stokes equations. Newtonian fluids. Boundary conditions.		
Method of delivering:		
Assessment Methods: Class tests and assignments that integrate the module outcomes.		
Module code:APMM612	**Semester 1**	**NQF-Level: 8**
Title: Financial Modelling Ii		
Module outcomes: On completion of this module the student should be able to demonstrate • knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes; • knowledge of the characteristics, construction and evaluation of derivatives (futures and options); • knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices; • the ability to apply theory and suitable numerical techniques to calculate option prices.		
Method of delivering:		
Assessment Methods: Class tests and assignments that integrate the module outcomes.		
Module code:APMM613	**Semester 1**	**NQF-Level: 8**
Title: Numerical Analysis		
Module outcomes: On completion of this module the student should be able to demonstrate • knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes; • knowledge of the characteristics, construction and evaluation of		

derivatives (futures and options);
- knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
- the ability to apply theory and suitable numerical techniques to calculate option prices.

Method of delivering:

Assessment Methods: Class tests and assignments that integrate the module outcomes.

Module code:APMM614	**Semester 1**	**NQF-Level: 8**

Title: Financial Modelling I

Module outcomes:
On completion of this module the student should be able to demonstrate
- knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes;
- knowledge of the characteristics, construction and evaluation of derivatives (futures and options);
- knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
- the ability to apply theory and suitable numerical techniques to calculate option prices.

Module code:APMM615	**Semester 1**	**NQF-Level: 8**

Title: Fluid Dynamics II

Module outcomes:
On completion of this module the student should be able to demonstrate
- knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes;
- knowledge of the characteristics, construction and evaluation of derivatives (futures and options);
- knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
- the ability to apply theory and suitable numerical techniques to calculate option prices.

Method of delivering:

Assessment Methods: Class tests and assignments that integrate the module outcomes.

Module code:APMM616	**Semester 1**	**NQF-Level: 8**

Title: Symmetries Of Differential Equations I

Module outcomes:
n completion of this module the student should be able to demonstrate
- knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes;
- knowledge of the characteristics, construction and evaluation of derivatives (futures and options);
- knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
- the ability to apply theory and suitable numerical techniques to calculate option prices.

Method of delivering:

Assessment Methods		
Module code:APMM621	**Semester 1**	**NQF-Level: 8**
Title: Symmetries Of Differential Equations Ii		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Computing symmetries of partial differential equations, Black-Scholes equation, Hamilton-Jacobi-Bellman equation, zero-coupon bond pricing model equation, fundamental valuation equation in the double-root model of term structure, etc		
Method of delivering:		
Assessment Methods		
Module code:APMM622	**Semester 1**	**NQF-Level: 8**
Title: Advanced Numerical Analysis		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Introduction to numerical analysis (overview of APPM612); numerical solution of ordinary differential equations (single and systems, initial and boundary conditions); partial differential equations.		
Method of delivering:		
Assessment Methods		
Module code:APMM623	**Semester 1**	**NQF-Level: 8**
Title: Calculus Of Variations		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Mathematical preliminaries, introductory problems, geodesics, brachiostochrone, minimum surface of revolution, parametric representation, isoparametric problems, geometrical optics, Fermat`s principle, dynamics of particles, two independent variables, the vibrating string, isoperimetric problem leading to Sturm-Liouville systems.		
Method of delivering:		
Assessment Methods		

Module code:APMM624	Semester 1	NQF-Level: 8
Title: Industrial Mathematics		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Preliminaries of mathematical models of industrial mathematics. Case studies of some problems of industrial mathematics involving transport of heat energy or mass, continuous casting, water filtration, laser drilling, factory fires, irrigation and so on.		
Method of delivering:		
Assessment Methods		

Module code:APMM625	Semester 1	NQF-Level: 8
Title: Project		
Module outcomes: After completion of this module, the student should, taking in account previous studies, be able to do the following: On completion of this module the student should: • have mastered introductory research methods in the subject; • be able to read and understand literature in a mathematical journal; • be able to handle references and sourcing; • be able to perform scientific literature searches; • be able to apply knowledge and skill from different subdisciplines in an integrated fashion in the solution of mathematical problems; • be able to communicate the subject content orally and in written form (in appropriate scientific language and appropriate programmes); • be able to work together in a team on a topic.		
Method of delivering:		
Assessment Methods		

Module code:APPM611	Semester 1	NQF-Level: 8
Title: Symmetries of differential equations I		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: One-parameter groups of differential transformations, groups admitted by differential equations, symmetries of differential equations, introduction to Lie algebras, integration of ordinary differential equations using symmetries, Noether symmetries		
Method of delivering: Full Time		

Assessment Methods

Module code: APPM612	**Semester 1**	**NQF-Level: 8**

Title: Numerical Analysis / Numeriese Analise

Module outcomes:

Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Introduction to numerical analysis (mathematical preliminaries, error analysis, computer programming); solution of systems of linear and non-linear equations; interpolation and approximation; numerical differentiation and integration; numerical linear algebra (eigenvalues and eigenvectors).

Module uitkomste:

Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

Inleiding tot numeriese analise (wiskundige voorbereiding, foutanalise, rekenaarprogrammering); oplossing van stelsels lineêre en nie-lineêre vergelykings; interpolasie en approksimasie; numeriese differensiasie en integrasie; numeriese lineêre algebra (bepaling van eiewaardes en eievektore

Method of delivering: Full Time

Assessment Methods

Module code: APPM613	**Semester 1**	**NQF-Level: 8**

Title: Theory of partial differential equations

Module outcomes:

Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

- Refinement of undergraduate paradigms:
- Review of introductory concepts: First-order linear equations; Flows, vibrations and diffusions; Initial and boundary conditions.
- Waves and Diffusions: Review of wave and diffusion equation; Causality and energy; Comparison of waves and diffusions.
- Boundary value problems (review of basic concepts): Separation of variables; Review of Dirichlet, Neumann, and Robin condition; Fourier coefficients (review of real variable theory, introduction to complex theory).
- Fourier series: Review of undergraduate theory; Orthogonality and general Fourier series; Completeness; Gibbs phenomenon; Inhomogenous boundary conditions.
- Harmonic functions: Review of Laplace's equation and rectangles; Cubes; Poisson's Formula.
- Introduction to Green's identities and Green's functions: Green's first and second identity; Review of Green's functions; half-space and sphere.
- Boundaries in the plane and space.
- Introduction to distributions and transforms.
- Red = revision of third year

Module uitkomste:

Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

- *Verfyning van voorgraadse paradigmas:*
- *Oorsig van inleidende konsepte: Eerste orde lineêre vergelykings; Vloed, vibrasie en diffusie; Aanvangs- en randvoorwaardes.*
- *Golwe en Diffusie: Oorsig oor golf- en diffusievergelyking; Kousaliteit en energie; Vergelyking van golwe en diffusies.*
- *Randwaardeprobleme (oorsig oor basiese konsepte): Skeiding van veranderlikes, Hersiening van Dirichlet, Neumann, en Robin voorwaarde; Fourier koëffisiënte (hersiening van reële teorie, inleiding tot komplekse teorie).*
- *Fourierreekse: Oorsig oor voorgraadse teorie; Ortogonaliteit en algemene Fourier reekse; Volledigheid; Gibbs verskynsel; Nie-homogene randvoorwaardes*
- *Harmoniese funksies: Oorsig oor Laplace se vergelyking en reghoeke; Kubusse; Poisson se Formule.*
- *Inleiding tot Green identiteite en Green funksies: Green se eerste en tweede identiteit; oorsig oor Green funksies; half-ruimte en die bol.*
- *Randvoorwaardes in die plat vlak en Euklidiese ruimte.*
- *Inleiding to distribusies en transforms.*

Method of delivering: Full Time

Assessment Methods

Module code: APPM614	**Semester 1**	**NQF-Level: 8**

Title: Financial Modelling I

Module outcomes:

On completion of this module the student should be able to demonstrate

- knowledge and insight to model and solve financial decision modelling problems using suitable mathematical methods and computer programmes;
- knowledge of the principles of fixed income investments, interest rate theory, cash flows, bonds and annuities;
- skills to use knowledge of principles and methods to model and solve and analyse investment choices under uncertainty;
- knowledge of mean variance analysis, optimal portfolio modelling, capital asset pricing model, factor modelling and the utility function framework;
- the ability to solve problems using suitable numerical techniques and computer packages.

Module uitkomste:

Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies,

- *kennis en insig om finansi?le besluitnemingsprobleme te modelleer en op te los met geskikte wiskundige metodes en rekenaarprogramme;*
- *kennis van die beginsels van vaste-inkomste belegging, rentekoerse, kontantvloeie, annuiteite en staatseffekte;*
- *vaardighede om kennis van die beginsel en tegnieke toe te pas om beleggingskeuses onder onsekerheid te modelleer, op te los en te analiseer;*
- *kennis van gemiddelde- variansie teorie, optimale portefeulje modellering, kapitaalbateprysingsmodellering, faktormodellering en besluitneming in die*

nutswaarderaamwerk;
• *en die vermoë om probleme met geskikte numeriese metodes en rekenaarprogramme op te los.*

Method of delivering: Full Time

Assessment Methods

Module code: APPM615	**Semester 1**	**NQF-Level: 8**

Title: Theory of ordinary differential equations

Module outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Refinement of undergraduate paradigms:
- Revision of introductory concepts.
- Waves and Diffusions: Revision of wave and diffusion equation; Introduction to causality and energy; Comparison of waves and diffusions.
- Boundary value problems: Revision of basic concepts (separation of variables, Dirichlet, Neumann, and Robin conditions, Fourier coefficients for real variables); Introduction to complex theory.

Fourier series: Revision of undergraduate theory; Orthogonality and general Fourier series; Completeness; Gibbs phenomenon; Inhomogenous boundary conditions.
Harmonic functions: Revision of Laplace's equation and rectangles; Cubes; Poisson's Formula.
Introduction to Green's identities and Green's functions: Green's first and second identity; Green's functions (revision and extension); half-space and sphere.
General eigenvalue problems.
Boundaries in the plane and space.
Introduction to distributions and transforms.

Method of delivering: Full Time

Assessment Methods

Module code: APPM616	**Semester 1**	**NQF-Level: 8**

Title: Calculus of Variations

Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Mathematical preliminaries, introductory problems, geodesics, brachiostochrone, minimum surface of revolution, parametric representation, isoparametric problems, geometrical optics, Fermat`s principle, dynamics of particles, two independent variables, the vibrating string, isoperimetric problem leading to Sturm-Liouville systems.

Method of delivering: Full Time

Assessment Methods		
Module code: APPM617	Semester 1	NQF-Level: 8
Title: Fluid Dynamics I		
Module outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Euler and Lagrange coordinates, material derivatives and control volumes, Reynolds transport theorem. Conservation of mass, momentum and energy. Rotation and rate of shear. Constitutive equations. Viscosity coefficients. Navier-Stokes equations. Newtonian fluids. Boundary conditions *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Euler en Lagrange-koördinate. Materiële afgeleide en kontrole-volumes. Reynold se transport-stelling. Behoud van massa. Behoud van momentum. Behoud van energie. Rotasie en vervormingstempo. Wesentlike vergelykings. Viskositeitskoëffisiënte, Navier-Stokes-vergelykings. Newton-vloeistowwe. Randvoorwaardes*.		
Method of delivering: Full Time		
Assessment Methods		
Module code: APPM618	**Semester 1**	**NQF-Level: 8**
Title: Biomathematics		
Module outcome: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Spatially independent models for a single species, Continuous population models: interacting species, Enzyme kinetics, Introduction to spatial variation, Travelling waves, Pattern formation, Excitable systems: nerve pulses.		
Method of delivering: Full Time		
Assessment Methods		
Module code: APPM619	Semester 1	NQF-Level: 8
Title: Applied Matrix Analysis / *Toegepaste Matriksanalise*		
Module outcome: Upon completion of this module and taking into account prior learning, the student should be able to demonstrate knowledge of and skills in applying the underlying fundamental principles, methods, and applicable theory to solve problems regarding selected aspects of the following topics: Norms, inner product spaces and orthogonality;		

Decomposition of matrices, like the orthogonal decomposition and singular value decomposition;
Diagonalization by similarity transformations;
Canonical forms for real and complex matrices – the Jordan form;
Functions of diagonalizable and nondiagonalizable matrices;
Systems of differential equations.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende geselekteerde aspekte van die volgende onderwerpe:
Norms, inwendigeprodukruimtes, en ortogonaliteit;
Ontbinding van matrikse, soos die ortogonale ontbinding en die singulierewaarde ontbinding;
Diagonalisering met behulp van gelykvormigheidstransformasies;
Kanoniese vorme vir reële en komplekse matrikse – die Jordan vorm;
Funksies van diagonaliseerbare en nie-diagonaliseerbare matrikse;
Stelsels differensiaalvergelykings.

Method of delivering: Full Time

Assessment Methods

Module code: APPM621	Semester 1	NQF-Level: 8

Title: Symmetries of Differential equations II

Module outcome:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Computing symmetries of partial differential equations, Black-Scholes equation, Hamilton-Jacobi-Bellman equation, zero-coupon bond pricing model equation, fundamental valuation equation in the double-root model of term structure, etc.

Method of delivering: Full Time

Assessment Methods

Module code: APPM622	Semester 1	NQF-Level: 8

Title: Advanced Numerical Analysis

Module outcome:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Introduction to numerical analysis (overview of APPM612); numerical solution of ordinary differential equations (single and systems, initial and boundary conditions); partial differential equations.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van

die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Inleiding tot numeriese analise (oorsig oor die inhoud van APPM612); numeriese oplossing van gewone differensiaalvergelykings (enkel en stelsel; aanvangswaarde en randwaarde); parsiële differensiaalvergelykings.

Method of delivering: Full Time

Assessment Methods

Module code: APPM623	Semester 1	NQF-Level: 8

Title: Numerical methods for partial differential equations

Module outcome:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

- Refinement and extension of undergraduate theory:
- Finite differences and parabolic equations: review finite difference approximations to derivatives and parabolic equations; local truncation error; consistency, convergence, review stability and the Crank-Nicolson implicit method.
- Hyberbolic equations and characteristic curves: review first order quasi-linear equations; Lax-Wendroff and Wendroff methods; second order quasi-linear hyperbolic equations; rectangular nets and finite difference methods for second order hyberbolic equations.
- Review of elliptic equations: Laplace's equation; curved boundaries; solution of sparse systems of linear equations.
- Finite element method for ODE's: introduction; collocation method; least squares method and the Galerkin method.
- Introduction to the finite element method for PDE's: Variational principles; examples of elements and solutions.
- Proposed textbook:
- G. Evans, J. Blackledge, P. Yardley, Numerical Methods for Partial Differential Equations, Springer, 2000.
- http://www.springer.com/gp/book/9783540761259
- Module uitkomste:
- *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:*

Verfyning en uitbreiding van voorgraadse teorie:

- *Eindige differensies en paraboliese vergelykings: oorsig oor eindige differensie benaderings tot afgeleides en paraboliese vergelykings; lokale afkappingsfout; konsistensie, konvergensie, oorsig oor stabiliteit en die Crank-Nicolson implisiete metode.*
- *Hiberboliese vergelykings en karakteristieke krommes: oorsig oor eerste-orde kwasi-lineêre vergelykings; Lax-Wendroff en Wendroff metodes; tweede orde kwasi-lineêre hiperboliese vergelykings; reghoekige nette en eindige differensie metodes vir tweede orde hiperboliese vergelykings.*

- *Oorsig oor elliptiese vergelykings: Laplace se vergelyking; geboë rande; oplos van yl stelsels lineêre vergelykings.*
    - *Eindige element metode vir gewone DV's: inleiding; kollokasie metode; kleinste kwadrate metode en die Galerkin metode.*
- *Inleiding tot die eindige element metode vir PDV's: Variasiebeginsels; voorbeelde van elemente en oplossings.*

Method of delivering: Full Time

Assessment Methods

Module code: APPM624	**Semester 1**	**NQF-Level: 8**

Title: Financial Modelling II

Module outcome:
On completion of this module the student should be able to demonstrate
• knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes;
• knowledge of the characteristics, construction and evaluation of derivatives (futures and options);
• knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
• the ability to apply theory and suitable numerical techniques to calculate option prices.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies,
• *kennis, insig en vaardighede om finansi?le afgeleide instrumente te modelleer en op te los met geskikte wiskundige metodes en rekenaarprogramme;*
• *kennis van eienskappe en konstruksie en die evaluering van afgeleide instrumente (onder andere termynkontrakte en opsies);*
• *insig in die wiskundige aspek, die stogastiese modellering van aandeelpryse en die berekeningsalgoritmes van opsiepryse;*
• *die vermoë om die teorie en geskikte numeriese metodes toe te pas om opsiepryse te kan bereken.*

Method of delivering: Full Time

Assessment Methods

Module code: APPM625	**Semester 1**	**NQF-Level: 8**

Title: Financial modelling III

Module outcome:
After completion of this module the student should be able to do the following:
demonstrate knowledge and skills in applying the principles and applicable methods to solve problems in the field of the following subjects:
Dimensional analyses: Examples of models that are chosen based on the student's previous knowledge and future aims with regards to studies, research etc.
Be able to do time series analises.
Making predictions from models.

Using computer programming skills to solve practical phenomena.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, die volgende te kan doen
kennis en vaardighede te kan demonstreer in die toepassing van die beginsels en toepaslike metodes om probleme op te los rakende die terrein van die volgende onderwerpe:
Dimensionele analise: Voorbeelde van modelle wat gekies word op grond van studente se vorige kennis en toekomstige fokus met betrekking tot studies, navorsing etc.
Tydreeks analise kan doen.
Voorspellings kan maak.
Rekenaarvaardighede kan gebruik in die oplos van praktiese verskynsels.

Method of delivering: Full Time

Assessment Methods

Module code: APPM626	**Semester 1**	**NQF-Level: 8**

Title: Control Theory

Module outcome:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Introduction to optimal control theory and mechanical systems. Mathematical foundations; a variety of applications (amongst others minimum time problems and minimum fuel problems); singular cases.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Inleiding tot optimale beheerteorie en meganiese stelsels. Wiskundige onderbou; ? verskeidenheid toepassings (waaronder minimumtyd- en minimumbrandstofprobleme); singuliere gevalle.

Method of delivering: Full Time

Assessment Methods

Module code: APPM627	**Semester 1**	**NQF-Level: 8**

Title: Fluid Dynamics II

Module outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Flow lines, vorticity. Kelvin's theorem, Bernoulli and Crocco equations. Vorticity equation. Ideal fluids. Stream function, complex potential and complex velocity. Uniform flow. Source and sink flow. Cylinder flow with and without circulation.

Blasius laws. Force and moment. Joukowski transformation. Different types of airfoils. Exact solution of Navier-Stokes equations for a few solvable problems.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Vloeilyne, werwellyne. Kelvin se stelling, Bernoulli- en Crocco-vergelykings, werwelvergelyking. Ideale vloeistowwe: Stroomfunksie en komplekse potensiaal en komplekse snelheid. Uniforme vloei. Bron- en put-vloei. Silinder-vloei met en sonder sirkulasie. Blasius se wette. Krag en moment. Joukowski-transformasie. Dravlakke van verskillende tipes. Eksakte oplossings van die Navier-Stokes-vergelykings vir enkele oplosbare probleme.

Method of delivering: Full Time

Assessment Methods

Module code: APPM628	Semester 1	NQF-Level: 8

Title: Industrial Mathematics

Module outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Preliminaries of mathematical models of industrial mathematics. Case studies of some problems of industrial mathematics involving transport of heat energy or mass, continuous casting, water filtration, laser drilling, factory fires, irrigation and so on

Method of delivering: Full Time

Assessment Methods

Module code: APPM671	Semester 1	NQF-Level: 8

Title: Project

Module outcomes:

After completion of this module, the student should, taking in account previous studies, be able to do the following:
On completion of this module the student should:
- have mastered introductory research methods in the subject;
- be able to read and understand literature in a mathematical journal;
- be able to handle references and sourcing;
- be able to perform scientific literature searches;
- be able to apply knowledge and skill from different subdisciplines in an integrated

fashion in the solution of mathematical problems;
- be able to communicate the subject content orally and in written form (in

appropriate
scientific language and appropriate programmes);
• be able to work together in a team on a topic.
Na voltooiing van hierdie module behoort die studente, die volgende te kan doen:
• *inleidende navorsingstegnieke in die vakgebied bemeester;*
• *literatuur in 'n Wiskundige vaktydskrif lees en verstaan;*
• *verwysings en bronne korrek hanteer;*
• *wetenskaplike literatuursoektogte uitvoer;*
• *kennis en vaardighede van verskillende subdissiplines geïntegreerd toepas in die oplos van wiskundige probleme;*
• *die vak mondelings en skriftelik in toepaslike wetenskaplike taal kommunikeer; en*
• *in 'n span oor 'n onderwerp saam te werk*

Method of delivering: Full Time

Assessment methods:
Formative:
Initial presentation of project proposal in the second quarter.
Assessment methods – summative:
Present the chosen topic verbally using standard resources of the field of study (Beamer/Powerpoint).

Module code: ARSM611	**Semester 1**	**NQF-Level: 8**

Title:Nuclear Physics

Module outcomes:
Students should understand and be able to explain the Principles of Radioactivity, Properties of a nucleus, Basic features of radioactivity and the radioactive decay process. The radiations emitted by radioactive substance and their interaction with matter. Comparison of Atomic decays.
Students should understand and be able to explain the application of nuclear energy, the nuclear reaction , reactor physics, nuclear reaction kinetics and some aspects of reactor operation, accelerator principles and designs, applications in research, medicine, industry and engineering
Students should also be able be able to use different detecting and measuring techniques.

Method of delivering: Full Time

Assessment Methods

Module code: ARSM612	**Semester 1**	**NQF-Level: 8**

Title: Nuclear Chemistry

Module outcomes:

Students should be able to demonstrate, a thorough knowledge on the work performed by a nuclear analytical laboratory, the analytical techniques performed, processes conducted and the instruments applied to measure radioactivity, a

functional knowledge on basic principles and concepts of the sensitivity requirements of radioactivity measurements to obtain meaningful results in problem solving activities, the application of applicable examples in the estimation/calculation of the cost for the implementation of a Radioactive Monitoring Programme (RMP), a functional knowledge of radiochemistry, the typical work performed by a radiochemical plant and how these radiochemicals are built into molecules to be used as radiopharmaceuticals, a general knowledge of the principles and basic concepts of the field of radiotherapy as well as diagnostic and therapeutic radiopharmaceuticals, and be able to evaluate the choice of radionuclide for types of cancer and a functional knowledge on the nuclear fuel cycle and the associated issues of nuclear security and nuclear forensics

Method of delivering: Full Time

Assessment Methods

Module code: ARSM671	**Semester 1**	**NQF-Level: 8**

Title: Research Project

Module outcomes:

Ability to articulate a research proposal, carry out literature review, design a research strategy, carry out experiments specific to a given problem, analytically interpret results of research or experiments and produce a research report.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM612	**Semester 1**	**NQF-Level: 8**

Title: Pasture Management

Module outcomes:

Learners will be able to identify pastures types; produce various categories of animals on pastures. Establish and maintain various types of pastures.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM613	**Semester 1**	**NQF-Level: 8**

Title:Pop & Qyantitative Genetics

Module outcomes:

Theory:

Genetic characteristics of a population; factors that change gene frequencies; quantitative vs qualitative characters; variation; values and measurement of quantitative characters; heritability and repeatability: their measurements and uses in animal breeding; Genotype x

environment interaction; inbreeding and relationship; correlated characters. Upon completion of this module learners will be able to apply their knowledge of population and quantitative genetics for the improvement of farm animals.

Practicals:

Estimation of phenotypic and genetic parameters in farm animals.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM614	**Semester 1**	**NQF-Level: 8**

Title:Ruminant Prod Science

Module outcomes:

Theory:

Dairy, beef and small - stock production, study of different production systems, feeding & high-yield ruminants. Production yield (milk, beef, mutton). Improving efficiency. Upon completion of this module learners will be able to advice farmers on the management of dairy and beef cattle and small stock.

Practical:

Management of dairy, beef and small stock.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM615	**Semester 1**	**NQF-Level: 8**

Title: Feed Evaluation & Feeding Practices

Module outcomes:

Theory:

In-depth study on the evaluation of feeds, theoretical aspects and computation of balanced rations for farm animals. Feeding management of ruminants and non-ruminants. Upon completion of this module learners will be able to demonstrate in-depth understanding of nutritional concepts.

Practicals:

Computation of balanced rations for individual animals. Experimental studies on the relationship between nutrient intake and animal production.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM616	**Semester 1**	**NQF-Level: 8**

Title: Research Project

Module outcomes:

The learners will be able to carry out literature review, write research proposal and start to carry out research experiments.

Practical:

Selection of research project topic by learners in consultation with the supervisor in the relevant field of specialisation. Development of methodology and the initial presentation of the proposal. The learners will start the experimental or fieldwork and data collection

Method of delivering: Full Time

Assessment Methods

Module code: ASCM621	**Semester 1**	**NQF-Level: 8**

Title: Rangeland (Veld) Management

Module outcomes:

Module outcomes:

The learners will be able to identify veld types. To produce various categories of animals and rangeland. To conserve and maintain South African velds

Method of delivering: Full Time

Assessment Methods

Module code: ASCM622	**Semester 1**	**NQF-Level: 8**

Title: Conservation & Management Of Wildlife

Module outcomes:

Theory:

Planning facilities. Marketing of game and products. Restoration of environment and assessment of its impacts.

Practicals:

Visits to game reserve to acquaint students with wildlife conservation practices. Students should learn about wildlife nutrition and maintenance of health.

Method of delivering: Full Time

Assessment Methods

Module code: ASCM623	**Semester 1**	**NQF-Level: 8**

Title: Advanced Livestock Breeding

Module outcomes:

Theory:

Principles of quantitative genetics and Matrix algebra; Prediction of breeding value and producing ability from the animal's own records, sib records, progeny records, pedigree records; The selection index procedure: selection index using different sources of information: single

records of individual and relatives, using means of records of individual and relatives; Selection for several traits: tandem selection, selection by independent culling levels, correlated response to selection for a single trait, selection for total economic value, restricted selection index; Mating systems: assortative mating, inbreeding, line crossing, line breeding, crossbreeding, grading-up. Upon completion of this module learners will be able to apply their knowledge of animal breeding for livestock improvement.

Practical:

Students will have projects with small stock; visits to breeding farms and research stations

Method of delivering: Full Time

Assessment Methods

Module code: ASCM624	**Semester 1**	**NQF-Level: 8**

Title: Monosgastric Animal Prod

Module outcomes:

Theory:

Physiology and nutrition of different production cycles of pigs and poultry, breeding systems for poultry and pigs, production systems. Upon completion of this module learners will be able to advise farmers on the management of poultry and pigs.

Practical:

Management of monogastric animals

Method of delivering: Full Time

Assessment Methods

Module code: ASCM625	**Semester 1**	**NQF-Level: 8**

Title: Digestive Physiology

Module outcomes:

Theory:

Digestion, fermentation, absorption and metabolism, energy, protein, vitamins and mineral requirements, deficiencies and imbalances for maintenance, growth, pregnancy and lactation. Voluntary feed intake. Upon completion of this module learners will be able to describe the digestion and metabolism of the various feedstuffs and their effects on animals performance.

Practical:

Studies of rumen function

Method of delivering: Full Time

Assessment Methods

Module code: ASCM626	**Semester 1**	**NQF-Level: 8**

Title: Research Project

Module outcomes:

The learners will be able to develop skills associated with scientific experimental design, data analysis, scientific report writing and an opportunity to orally present and defend the results.In practical sessions learners will continue with the research experiment, including the collection of samples, analysis of samples, organization of data, analysis of data statistically, discussion of the results and publication of results in a mini dissertation.

Method of delivering: Full Time

Assessment Methods

Module code: BCHN611	**Semester 1**	**NQF-Level: 8**

Title: **Analytical Biochemistry**

Module-outcomes:

After completion of the module BCHN611, the student should demonstrate:

- applied knowledge and understanding of numerous analytical techniques that can be used in biochemical investigations.
- an ability to critically evaluate the sources of knowledge on these analytical techniques from text books, journal publications and internet resources.
- specialized skills to utilise these analytical techniques to investigate specific biochemical problems including inherited-, non-communicable- and infectious diseases.
- the ability to effectively present and communicate results obtained with these analytical techniques.
- an ability to identify and critically reflect on the ethical, legal and social implications, as well as the professional conduct required for biochemical research and diagnostics.

Module uitkomste:

Na voltooiing van die module BCHN611, behoort die student:

- *toegepaste kennis en insig te hê van analitiese tegnieke wat gebruik kan word in biochemiese ondersoeke.*
- *die vermoë te hê om op kritiese wyse die kennisbronne aangaande hierdie analitiese tegnieke vanuit boeke, tydskrifpublikasies en internet-bronne te evalueer.*
- *gespesialiseerde vaardighede te hê om hierdie analitiese metodes te gebruik om spesifieke biochemiese vraagstellings mee te ondersoek, insluitende aangebore-, nie-oordraagbare en aansteeklike siektes.*
- *die vermoë te hê om op effektiewe wyse terugvoer te gee oor resultate wat met behulp van hierdie analitiese tegnieke verkry is.*
- *die vermoë te hê om die etiese, regstegniese en sosiale implikasies, asook die professionele gedrag wat nodig is vir biochemiese navorsing en diagnostiek, te identifiseer en te beredeneer.*

Method of delivering: Full Time

Assessment Methods – Formal Formative
The formative assessments include individual assignments and discussions.
Assessment Methods – Summative
The summative assessment consists of formal tests or assignments for each of the subsections of the course at appointed times by every student.
Assessment Plan – English
The module mark is calculated by taking the average of all the formal tests and/or assignments.

Module code: BCHN612	**Semester 1**	**NQF-Level: 8**

Title: **Advanced Metabolism**

Module-outcomes:
After completion of the module BCHN612, the student should demonstrate:

- integrated knowledge and understanding of the theory of human metabolism, the human metabolome and analytical techniques for metabolic profiling;
- the ability to evaluate the metabolome of humans critically and to trace abnormalities back to a possible enzyme defect, cofactor deficiency, inhibiting compounds like diet, environmental factors or medication;
- the ability to propose additional analyses to investigate potential metabolic defects and finally to confirm the defect;
- the ability to identify a possible treatment based on the metabolism, presence of possible toxic substances formed in the alternative metabolism and deficiency of important biological compounds which are not formed due to the defect.
- the ability to identify ethical issues regarding genetic defects.

Module uitkomste:
Na voltooiing van die module BCHN612, behoort die student:

- *'n geïntegreerde kennis en begrip van die teorie van mens metabolisme, die mens metaboloom en analitiese tegnieke vir metaboliese profilering te hê;*
- *die vermoë ontwikkel om die metaboloom krities te evalueer en abnormaliteite te kan terug voer na aangebore ensiemdefekte, kofaktor gebreke, of enige ander inhiberende stowwe soos dieetsfaktore, omgewingsfaktore en medikasie;*
- *die vermoë te hê om addisionele analises voor te stel om potensiële metaboliese defekte verder te ondersoek en uiteindelik te bevestig;*
- *die vermoë hê om moontlike behandeling voor te stel gebaseer op die metabolisme, teenwoordigheid van toksiese metaboliete wat in alternatiewe weë gevorm word en gebreke van belangrike biologiese verbindings wat nie gevorm word as gevolg van die defek.*
- *die vermoë te hê om etiese problematiek rakende genetiese defekte te identifiseer.*

Method of delivering: Full Time

Assessment methods:
Assessment Methods –Formative assessments consist of in-class presentations, in-class assignments and take-home assignments.
Assessment Methods – Summative
The summative assessment consists of an examination paper that will be written at

an appointed time by every student.

Assessment Plan

The take-home formative assessment assignments contribute 40% and the summative assessment opportunity 60% to the module mark.

Module code: BCHN621	**Semester 2**	**NQF8Level: 8**

Title: **Advanced Molecular Biology**

Module-outcomes:

After completion of the module BCHN621, the student should demonstrate:

- integrated knowledge and understanding of the forefront and emerging topics, methods, advances and challenges in molecular biology;
- an ability to assimilate multiple sources of knowledge such as books, journals and the internet on particular topics within the field of molecular biology, and critically evaluate and review this knowledge;
- an ability to present and communicate the forefront of molecular biology on a particular topic effectively, offer creative insights, rigorous interpretations and solutions to specific problems; the ability to identify, demarcate, analyze, critically reflect on and effectively apply relevant knowledge to address complex problems in molecular biology by using appropriate methods;
- the ability to identify and address ethical issues in molecular biology based on critical reflection on suitability of different ethical value systems and an understanding of professional conduct required of a professional biochemist.

Module uitkomste:

Na voltooiing van die module BCHN621, behoort die student:

- *'n geïntegreerde kennis en begrip van die voorpunt en ontluikende onderwerpe, metodes, ontwikkelinge en uitdagings in molekulêre biologie te hê;*
- *die vermoë ontwikkel het om 'n verskeidenheid van bronne van inligting en kennis, soos boeke, joernale en die internet oor 'n spesifieke onderwerp in molekulêre biologie te assimileer en krities die inligting te evalueer;*
- *die vermoë te hê om die voorpunt van molekulêre biologie op 'n bepaalde onderwerp effektief aan te bied en te kommunikeer en om met kreatiewe insigte, weldeurdagte interpretasies oplossings vir spesifieke probleme te kan voorstel;*
- *die vermoë te hê om komplekse probleme in die molekulêre biologie af te baken, te analiseer, krities te bedink en effektief op te los deur die gebruik van toepaslike metodes;*
- *die vermoë te hê om etiese kwessies in molekulêre biologie te kan identifiseer en aanspreek gebaseer op 'n kritiese nadenke van toepaslike verskillende etiese waardesisteme en 'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele biochemikus verwag kan word.*

Method of delivery: Full Time

Module code: BCHN622	**Semester 2**	**NQF8Level: 8**

Title: **Bioenergetics**

Module-outcomes:

After completion of the module BCHN622, the student should demonstrate:

- applied knowledge and understanding of the eukaryotic biochemical pathways and cellular components involved in bioenergetics, as well as the

genetics involved.

- an ability to critically evaluate the sources of knowledge on these topics from text books, journal publications, internet resources. Furthermore, to understand and evaluate the methodologies that was used in these sources.
- specialized skills to assimilate how these interrelated topics can be associated with inherited-, non-communicable- and infectious diseases in humans.
- the ability to effectively present and communicate a critical review on these topics, with the ability to identify and predict the consequences of biological problems.
- an ability to identify and critically reflect on the ethical, legal and social implications, as well as the professional conduct required for research and diagnostics related to these biological topics.

Module uitkomste:
Na voltooiing van die module BCHN622, behoort die student:

- *'n toegepaste kennis en insig van eukariotiese biochemiese weë en sellulêre komponente betrokke by bioënergetika, asook die genetika betrokke.*
- *die vermoë te toon om op ? kritiese wyse kennisbronne vanuit boeke, tydskrifpublikasies en internet-bronne te evalueer. Verder, om die metodologieë wat gebruik is in hierdie bronne te verstaan én te evalueer.*
- *gespesialiseerde assimileringsvaardighede van die wyse hoe hierdie verwante temas met aangebore-, nie-oordraagbare en aansteeklike siektes verbind kan word.*
- *die vermoë te hê om op 'n effektiewe wyse 'n kritiese oorsig van hierdie temas aan te bied en te kommunikeer, met die vermoë om die gevolge van biologiese probleme te identifiseer en te voorspel.*
- *die vermoë te hê om die etiese, regstegniese en sosiale implikasies, asook die professionele gedrag wat nodig is om navorsing en diagnostiek op hierdie biologiese temas te doen, te identifiseer en te beredeneer.*

Method of delivering: Full Time

Assessment methods:

Assessment Methods – Formal Formative

The formative assessments include individual in-class presentations and discussions.

Assessment Methods – Summative

The summative assessment consists of an examination paper that will be written at an appointed time by every student.

Assessment Plan – English

The participation mark will be determined from an individual class presentation and discussion session on a selected topic. A written examination will follow at the end of the module. The participation mark and examination mark will contribute 30% and 70%, respectively, to the module mark.

Module code: BCHN623	Semester 2	NQF-Level: 8

Title: **Advanced drug Discovery**

Module outcomes:

After completion of module BCHN623, the student will demonstrate:

integrated knowledge and understanding of the forefront and emerging topics, methods, advances and challenges in drug discovery and metabolism;

an ability to assimilate multiple sources of knowledge such as books, journals and the internet on particular topics within the field of molecular biology, and critically evaluate and review this knowledge;

an ability to present and communicate the forefront of molecular biology on a particular topic effectively, offer creative insights, rigorous interpretations and solutions to specific problems; the ability to identify, demarcate, analyze, critically reflect on and effectively apply relevant knowledge to address complex problems in molecular biology by using appropriate methods; the ability to identify and address ethical issues in molecular biology based on critical reflection on suitability of different ethical value systems and an understanding of professional conduct required of a professional biochemist

Method of delivery: Full time

Asssessment methods: Assessment methods: Assessment Methods –Formative assessments consist of in-class presentations, in-class assignments and take-home assignments. Assessment Methods – Summative The summative assessment consists of an examination paper that will be written at an appointed time by every student. Assessment Plan The take-home formative assessment assignments contribute 40% and the summative assessment opportunity 60% to the module mark.

Module code: BCHN671	Semester 1 & 2	NQF-Level: 8

Title: **Biochemistry research project / *Biochemie Navorsingprojek***

Module-outcomes:
After completion of the module BCHN671, the student should demonstrate:
sufficient knowledge to plan, conduct and report results of a scientific research project in Biochemistry;
an ability to assimilate multiple sources of knowledge such as books, journals and the internet on particular topics within the field of Biochemistry, and critically evaluate, review and integrate this knowledge to prepare a literature study and motivate a research proposal;
the ability to design project-oriented experiments, identify appropriate methods and singlehandedly perform experiments;
the ability to critically evaluate, interpret, present and communicate results of experiments in a scientific way and write a report on the project;
the ability to identify ethical issues in biological research (theory and applications) , communicate their own point of view as well as those of the scientific, medical and general community and have an understanding of professional conduct required of

a professional biochemist.
Module uitkomste:
Na voltooiing van die module BCHN621, behoort die student bewys te lewer van:
genoegsame kennis en kundigheid om 'n wetenskaplike navorsingsprojek in Biochemie te kan beplan, uitvoer en daaroor verslag te doen;
die vermoë om 'n verskeidenheid van bronne van inligting en kennis, soos boeke, joernale en die internet oor 'n spesifieke onderwerp in Biochemie te assimileer, krities die inligting te evalueer en die kennis te kan integreer in 'n literatuuroorsig en 'n navorsingsvoorstel te kan motiveer;
die vermoë om projek georiënteerde eksperimente te kan ontwerp, toepaslike metodes te identifiseer en eiehandig eksperimente te kan uitvoer;
die vermoë om resultate van eksperimente krities te kan evalueer, interpreteer, op wetenskaplike wyse te kan aanbied en kommunikeer en 'n verslag oor die projek te kan skryf;
die vermoë om etiese kwessies in biologiese navorsing (teorie en praktyk) te kan identifiseer en hulle eie siening asook die siening van die wetenskaplike en mediese gemeenskap en die algemene publiek te kommunikeer en 'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele biochemikus verwag kan word.

Method of delivering: Full Time

Assessment Methods – Formal Formative
The formative assessment includes an initial individual oral project plan presentation during March.
Assessment Methods – Summative
The final summative assessment consists of a mark for the written project report and oral presentation of the project.
Assessment Plan – English
The module mark is composed of the initial oral project plan presentation (30%) and final summative assessment (70%). For the latter the oral project presentation and written project report each counts 50%.

Module code: BEHM622	**Semester 2**	**NQF-Level: 8**

Title: Further Animal Behaviour

Module outcomes:
The learners will be on completion of the course, able to identify the main bacterial groups

Method of delivering:

Assessment methods:

Module code: BMCM613	**Semester 1**	**NQF-Level: 8**

Title: Bacteriology

Module outcomes:
The learners will be on completion of the course, able to identify the main bacterial groups.

Method of delivering:		
Assessment methods:		
Module code: BMCM614	**Semester 1**	**NQF-Level: 8**
Title: Virology And Immunology		
Module outcomes: At the completion the course, students are expected to demonstrate awareness of the major groups of vertebrate viruses and be able to explain the key concepts andDdescribe current key areas of advance in virology, e.g. AIDS and cancer. Demonstrate capacity for critical scientific analysis of issues in virology and communicate in writing an awareness of concepts and debates in virology.		
Method of delivering:		
Assessment methods:		
Module code: BMCM621	**Semester 2**	**NQF-Level: 8**
Title: Mycology		
Module outcomes: Upon completion of this module learners will have the ability to identify and characterize different forms of fungi. Ability to relate fungal nutrition and metabolism to economic implications. Ability to interpret, evaluate/analyse and apply fungal bio-technological data		
Method of delivering:		
Assessment methods:		
Module code: BMCM622	**Semester 2**	**NQF-Level: 8**
Title:Environmental And Industrial Microbiology		
Module outcomes: The learners will know ways of sampling water and foods for contaminants. The role of the root nodule and possible microbial use on pollution. Micro-organisms and food poisoning. Genetic engineering		
Method of delivering:		
Assessment methods:		
Module code: BWIA 671	**Semester 1 & 2**	**NQF-Level: 8**
Title: **Actuarial Risk Management (A301/CA1)**		
Module-outcomes: On completion of the module, the student should be able to demonstrate:		

- Integrated knowledge of the main areas of actuarial practice and critical understanding of the use of the actuarial control cycle to monitor, measure and manage risk effectively.
- The ability to formulate, justify and present plausible and appropriate solutions to business problems
- The ability to behave professionally in a commercial environment and to take relevant factors and issues into account in the formulation of solutions.
- The ability to apply professional integrity, conduct and responsibility required by the actuarial profession.
- Demonstrate the ability to learn independently and as part of a group. Manage time, work to deadlines and prioritise workloads

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Discuss and apply the actuarial control cycle in a variety of practical commercial situations.
- Analyse the main features and risks of financial products and contracts and to propose and evaluate effecient risk management stategies.
- Present reasoned arguments, both in technical and non-technical language.
- Identify relevant stakeholders and how to take appropriate account of their requirements when giving actuarial advice
- Present information in a professional and ethically sound manner

Module code: BWIB611	**Semester 1**	**NQF-Level: 8**

Title: **Statistical Learning I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Statistical Learning, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate Statistical Learning methods in solving complex problems related to this field.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.

- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of supervised and unsupervised Statistical Learning models, its assessment and selection, and the techniques associated with these concepts.
- Use the designated software package to explore and manipulate data set(s) associated with a specific problem, apply suitable Statistical Learning methods to the data, and select the most effective method based on a critical assessment of the results.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Statistical Learning.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB612	**Semester 1**	**NQF-Level:8**

Title: **Introduction to Business Intelligence**

Module-outcomes: On completion of the module, the student should be able to demonstrate:

Integrated knowledge and critical understanding with regard to the field of Business Intelligence, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.

- The ability to design, create, retrieve, and present results from a variety of data structures in order to effectively support business decision-making.

- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
  The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:
Describe, compare, combine, apply, and critically examine a range of Business Intelligence (BI) principles and practices (e.g. BI framework, architecture, technology trends, operational and decision support data, database fundamentals, dimensional modelling, alternative data warehouse methodologies), and the techniques associated with these concepts.

- Develop various data models from business rules and from other types of data models
- Use the designated software packages to construct diverse data structures, query the data, and develop reports from the retrieved data.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Business Intelligence.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.

- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB613	**Semester 1**	**NQF-Level: 8**

Title: **Problem Solving using Simulation**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Simulation, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate Simulation methods in solving complex problems.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable.

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of Simulation principles and practices (e.g. Monte Carlo and discrete-event simulation, resampling, queuing theory, and Markov chain), and the techniques associated with these concepts.
- Identify the Simulation methods that can appropriately address a particular problem, select the most suitable method(s), use the designated software packages to apply the selected technique(s), and critically assess and

interpret the results.

- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Simulation.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB621	**Semester 2**	**NQF-Level:8**

Title: **Statistical Learning II**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Statistical Learning, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate Statistical Learning methods in solving complex problems related to this field.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.

- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of supervised and unsupervised Statistical Learning models, its assessment and selection, and the techniques associated with these concepts.
- Use the designated software package to explore and manipulate data set(s) associated with a specific problem, apply suitable Statistical Learning methods to the data, and select the most effective method based on a critical assessment of the results.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Statistical Learning.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module

Module code: BWIB622	**Semester 2**	**NQF-Level: 8**

Title: **Forecasting for Business**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Forecasting, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the

effectiveness of a range of appropriate Forecasting methods in solving complex problems related to this field.

- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of time series and survival models, and the techniques associated with these concepts.
- Use the designated software package to explore and manipulate data set(s) associated with a specific problem, select and apply the most suitable Forecasting method to the data, and critically assess and interpret the results.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Forecasting.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-

modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module

Module code: BWIN611	**Semester 1**	**NQF-Level: 8**

Title: **Quantitative Risk Analysis I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate integrated knowledge of the theories, methods and techniques in the field of Quantitative Risk Analysis.
- The learner should be able to demonstrate the ability to interrogate multiple sources of knowledge in the modelling of financial and insurance risk management.
- Demonstrate an understanding of risk classification and risk measurement concepts and techniques

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:
- Implement his/her specialist knowledge to analyse and evaluate market risk.
- Explain the modelling and management of market risk in financial institutions.
- Develop / propose an integrated risk measurement (e.g. Value-at-Risk) framework by applying statistical methods and techniques.
- Explain the concepts of risk classification and analyse and criticize risk measurement concepts in financial risk management.
- Show an awareness of how individual risks might be categorised in different ways.
- Describe the relationship between systematic risk, non-systematic or specific risk, and concentration of risk.
- Describe the properties and limitations of common risk measures.
- Recommend a specific choice of model based on the results of both quantitative and qualitative analysis of financial or insurance data.

Module code: BWIN613	**Semester 1**	**NQF-Level: 8**

Title: **Financial Engineering I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and understanding of the use of stochastic calculus theory to model and price financial securities.
- The ability to analyse different types of risk and apply the appropriate hedging instrument in each case.
- The ability to communicate effectively, orally and in writing
- The ability to identify, evaluate and address accurately his/ her learning needs in a self-directed manner, and to facilitate collaborative learning processes.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Formulate valuation problems in mathematical forms using appropriate notation
- Critically evaluate modern financial theories and select the appropriate instruments for different risk management applications.
- Price simple derivative securities, using appropropriate software, if applicable.
- Develop and communicate his or her ideas and opinions in well-formed arguments, using appropriate academic, professional, or occupational discourse.

Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIN614	**Semester 1**	**NQF-Level: 8**

Title: **Investment Theory I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and understanding of the principles of portfolio selection, diversification and asset pricing.
- The ability to apply the principles of risk management and control to the appraisal, selection and management of investments;
- The ability to communicate effectively, orally and in writing and to make use of appropriate technologies in all communications to lay and professional audiences
- Identify, evaluate and address accurately his or her learning needs in a self-directed manner, and to facilitate collaborative learning processes.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Discuss and develop portfolio investment strategies working individually or in groups
- Think independently and solve complex portfolio choice problems, select assets and
  manage portfolios.
- Analyse and critically evaluate the performance of an investment manager.
- Develop solutions to corporate, risk and investment management problems
- Develop and communicate his or her ideas and opinions in well-formed arguments, using appropriate academic, professional, or occupational discourse.

Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIN615	**Semester 1**	**NQF-Level: 8**

Title: **Financial Modelling and Optimisation I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of

Financial Modelling and Optimisation, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.

- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate numerical approaches in solving complex optimisation problems relevant in finance.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Describe, formulate, apply, and critically examine a range of financial optimisation models, its assessment and selection, and the solution techniques associated with these models.

- Use the designated software package to capture the mathematical models associated with a specific problem, apply suitable optimisation algorithms to find solutions, and select the most effective algorithm based on a critical assessment of the results.

- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Financial Modelling and Optimisation.

Module code: BWIN621	**Semester 2**	**NQF-Level: 8**

Title: **Quantitative Risk Analysis**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate integrated knowledge of the theories, methods and techniques in the field of Quantitative Risk Analysis.
- The learner should be able to demonstrate the ability to interrogate multiple sources of knowledge in the modelling of financial and insurance risk management.
- Demonstrate an understanding of risk classification and risk measurement concepts and techniques.
- Demonstrate the ability to use statistical methods and techniques (e.g. univariate and multivariate distributions, correlations, time series, etc.) to analyse risk concepts (e.g. market risk, credit risk, operational risk and underwriting risk).
- Demonstrate the ability to critically evaluate financial risk management problems in financial institutions and provide solutions to these problems.

- Communicate effectively, orally and in writing and to make use of appropriate technologies in all communications.
- Demonstrate the ability to apply and implement risk models in software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Implement his/her specialist knowledge to analyse and evaluate credit risk.
- Explain the modelling and management or credit risk, in financial institutions.
- Develop / propose an integrated risk measurement (e.g. Value-at-Risk) framework by applying statistical methods and techniques.
- Explain the concepts of risk classification and analyse and criticize risk measurement concepts in financial risk management.
- Show an awareness of how individual risks might be categorised in different ways. (Market Risk vs. Credit Risk)
- Recommend a specific choice of model based on the results of both quantitative and qualitative analysis of financial or insurance data.
- Analyse quantitative credit data by applying statistical methods (e.g. univariate and multivariate distributions, correlations, time series, etc.)
- Analyse and implement financial risk models in software packages (e.g SAS/IML and MS Excel).
- Present information in a professional and ethical sound manner
- Develop, optimise and take responsibility for own learning needs, able to track own learning progress and apply, evaluate and reflect on relevant learning strategies, management of all resources to successfully realise all outcomes of the module
- Take responsibility to co-operate effectively as a member of a group to ensure that task outcomes are met.

Module code: BWIN622	**Semester 2**	**NQF-Level: 8**

Title**: Pricing of Derivatives A**

Module-outcomes:

- Critical understanding and knowledge of single-period and multi-period discrete time financial market models and continuous time models; and integrated knowledge of continuous time hedging strategies. Strong backgrounds in calculus, linear algebra, real analysis and probability theory are recommended
- The ability to formulate and apply fundamental theorems of Financial Mathematics, the Feynman-Kac Stochastic Representation Formula, the Martingale Representation Theorem, the Girsanov Theorem, and the Ito Formula. The ability to derive continuous time hedging strategies.
- The ability to plan and conduct research according to standard protocol and to employ appropriate processes, procedures and techniques.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative

insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.

- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable.

Method of delivering: Full Time

Assessment methods:

Module code: BWIN623

Title**: Financial Engineering II**

Module-outcomes:

- After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of the mathematical modelling of financial problems (e.g. general options and interest derivatives pricing).
- Demonstrate an understanding of numerical procedure and techniques in modelling finical instruments
- Demonstrate the ability to derive mathematical formulas to price derivatives by using previous knowledge in other disciplines like statistics, computer science and economics in an integrative way.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- Demonstrate the ability to critically evaluate real world problems in financial pricing and provide solutions to these problems.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement mathematical approaches in derivative prising using designated software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments.

Method of delivering:

Assessment methods:

Module code: BWIN625	**Semester 2**	**NQF-Level: 8**

Title: **Financial Modelling Optimisation**

Module-outcomes:

- After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of the mathematical formulation of financial optimisation

problems.

- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate numerical approaches in solving complex optimisation problems relevant in finance.
- Demonstrate the ability to derive mathematical formulas to solve financial optimisation problems by using previous knowledge in other disciplines like statistics, computer science and economics in an integrative way.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- Demonstrate the ability to critically evaluate real world problems in financial optimisation and provide solutions to these problems.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement numerical approaches for solving financial optimisation problems using designated software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments.

Method of delivering: Full Time

Assessment methods:
Students have mastered the outcomes if they are able to:

- Conduct and write a report with reference to the current academic discourse on a specified financial optimisation problem.
- Describe, formulate, apply, and critically examine a range of financial optimisation models, its assessment and selection, and the solution techniques associated with these models.
- Explain the concepts of numerical methods used in Financial Modelling and Optimisation for e.g., Simplex Method for linear programming and Branch-and-Bound for Integer Linear Programming.
- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Financial Modelling and Optimisation.
- Analyse and implement numerical approaches in solving financial optimisation problems in software packages (e.g SAS/IML and MS Excel).
- Present information in a professional and ethical sound manner
- Use the designated software package to capture the mathematical models associated with a specific problem, apply suitable optimisation algorithms to find solutions, and select the most effective algorithm based on a critical assessment of the results

Module code: BWIR622	Semester 2	NQF-Level: 8

Title: **Research Module: Financial Engineering and Pricing of Derivatives**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of the mathematical modelling of financial problems (e.g. general options, derivatives pricing, continuous time hedging strategies).
- Demonstrate an understanding of numerical procedure and techniques in modelling finical instruments.
- The ability to formulate and apply fundamental theorems of Financial Mathematics.
- The ability to derive continuous time hedging strategies.
- Demonstrate the ability to derive mathematical formulas to price derivatives by using previous knowledge in other disciplines like statistics, computer science and economics in an integrative way.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- Demonstrate the ability to critically evaluate real world problems in financial engineering and derivative pricing and provide solutions to these problems.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement mathematical approaches in derivative prising using designated software packages (e.g SAS/IML, MatLab and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Implement his/her specialist knowledge to analyse and evaluate financial instruments.
- Conduct and write a report with reference to the current academic discourse on a specified financial instrument.
- Describe, compare, combine, apply, and critically investigate, through a research project, a range of contiguous claims pricing models, its assessment and selection, and the techniques associated with contiguous claims.
- Explain the relationship between a volatility smile and the risk-neutral probability measure used in binomial pricing
- Explain the concepts of numerical methods used in Financial Engineering and derivative pricing for e.g. Least Squares Monte Carlo, Finite Differences for pricing exotic options found in insurance, single-period and multi-period

discrete time financial market models, the Feynman-Kac Stochastic Representation Formula, the Martingale Representation Theorem, the Girsanov Theorem, the Ito Formula

- Deriving continuous time hedging strategies, solving simple stochastic differential equations analytically and solving more complex stochastic differential equations using numerical methods.
- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Financial Engineering and Pricing of Derivatives.
- Analyse and implement financial engineering and derivative pricing models in software packages (e.g SAS/IML, MatLab and MS Excel).
- Present information in a professional and ethical sound manner.

Implement and analysing using software package (e.g MS Excel or SAS/IML and SAS/ETS) to implement numerical procedures to price more general (including path-dependent) options and derive hedging strategies using for e.g. binomial trees, finite difference methods and Monte Carlo simulation.

Module code: BWIR623	**Semester 2**	**NQF-Level: 8**

Title: **Forecasting for Business**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Forecasting, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate Forecasting methods in solving complex problems related to this field.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others

where applicable

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of time series and survival models, and the techniques associated with these concepts.
- Use the designated software package to explore and manipulate data set(s) associated with a specific problem, select and apply the most suitable Forecasting method to the data, and critically assess and interpret the results.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Forecasting.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.

Track own learning progress and manage all resources successfully to realise all outcomes of the module

Module code: BWIR671	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Research Module: Financial Engineering and Financial Modelling**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of the mathematical modelling of financial problems (e.g. general options and interest derivatives pricing, financial optimisation problems).
- Demonstrate an understanding of numerical procedure and techniques in modelling finical instruments.

- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate numerical approaches in solving complex optimisation problems relevant in finance.
- Demonstrate the ability to derive mathematical formulas to price derivatives by using previous knowledge in other disciplines like statistics, computer science and economics in an integrative way.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- Demonstrate the ability to critically evaluate real world problems in financial pricing and optimisation and provide solutions to these problems.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement mathematical approaches in derivative prising and financial optimisation using designated software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Implement his/her specialist knowledge to analyse and evaluate financial instruments.
- Conduct and write a report with reference to the current academic discourse on a specified financial instrument.
- Describe, formulate, apply, and critically examine a range of financial optimisation models, its assessment and selection, and the solution techniques associated with these models.
- Explain the relationship between a volatility smile and the risk-neutral probability measure used in binomial pricing
- Explain the concepts of numerical methods used in Financial Engineering and Optimisation for e.g. Least Squares Monte Carlo, Finite Differences for pricing exotic options found in insurance, Simplex Method for linear programming and Branch-and- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Financial Engineering and Optimisation.
- Analyse and implement financial engineering and optimisation models in software packages (e.g SAS/IML and MS Excel).
- Present information in a professional and ethical sound manner
- Implement and analysing using software package (e.g MS Excel or SAS/IML and SAS/ETS) to implement numerical procedures to price more general

(including path-dependent) options using for e.g. binomial trees, finite difference methods and Monte Carlo simulation.

Use the designated software package to capture the mathematical models associated with a specific problem, apply suitable optimisation algorithms to find solutions, and select the most effective algorithm based on a critical assessment of the results.

Module code: BWIR672	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Research Module: Financial Modelling and Optimisation**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of the mathematical formulation of financial optimisation problems.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate numerical approaches in solving complex optimisation problems relevant in finance.
- Demonstrate the ability to derive mathematical formulas to solve financial optimisation problems by using previous knowledge in other disciplines like statistics, computer science and economics in an integrative way.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- Demonstrate the ability to critically evaluate real world problems in financial optimisation and provide solutions to these problems.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement numerical approaches for solving financial optimisation problems using designated software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments.

Method of delivering: Full Time

Assessment methods: Students have mastered the outcomes if they are able to:

- Conduct and write a report with reference to the current academic discourse on a specified financial optimisation problem.
- Describe, formulate, apply, and critically examine a range of financial optimisation models, its assessment and selection, and the solution techniques associated with these models.
- Explain the concepts of numerical methods used in Financial Modelling and

Optimisation for e.g., Simplex Method for linear programming and Branch-and-Bound for Integer Linear Programming.

- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Financial Modelling and Optimisation.
- Analyse and implement numerical approaches in solving financial optimisation problems in software packages (e.g SAS/IML and MS Excel).
- Present information in a professional and ethical sound manner
- Use the designated software package to capture the mathematical models associated with a specific problem, apply suitable optimisation algorithms to find solutions, and select the most effective algorithm based on a critical assessment of the results.

Module code: CHEN611 will become NCHE611	**Semester 1**	**NQF-Level: 8**

Title: **Advanced Organic Chemistry**

Module-outcomes:

After completion of the module NCHE611, the student should demonstrate:

- integrated knowledge and understanding of the theory of the three themes: T1) molecular orbital theory, T2) advanced reactions and mechanisms, and T3) advanced structural elucidation;
- an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of organic chemistry, and critically evaluate and review that knowledge to deepen the understanding of organic chemistry;
- supervised research skills by selecting and implementing synthesis and analytical methods to effectively execute a planned research design, communicate findings and conclusions by means of a written report in a scientific manner;
- the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in organic chemistry by using appropriate methods;

Module uitkomste:

Na voltooiing van die module NCHE611, behoort die student:

- *'n geïntegreerde kennis en begrip van die teorie van die drie temas te hê: T1) molekulêre orbitaalteorie, T2) gevorderde reaksies en meganismes en T3) gevorderde struktuuropklaring;*
- *die vermoë te kon ontwikkel om 'n verskeidenheid bronne van kennis soos boeke, joernale en die internet binne die veld van organiese chemie te assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van organiese chemie te verdiep;*
- *onder toesig navorsingsvaardighede te kan demonstreer deur die seleksie en toepassing van sintetiese en analitiese metodes om effektief 'n navorsingsontwerp uit te voer en die resultate en gevolgtrekkings m.b.v. 'n*

wetenskaplik geskrewe verslag te kommunikeer;

- *die vermoë te hê om probleme in organiese chemie met toepaslike metodes te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;*
- *'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word.*

Method of delivering: Full Time

Assessment methods:
Participation mark

- Theory 2 assignments 70%
- Continuous participation in class 30%
- Practicals Practical report 50%
- Oral tests on experiments 50%

The theory and practical marks each contributes 50% to the participation mark where the theory mark is obtained from the three themes (T1 = 20%, T2 = 20% and T3 = 10%).

Examination mark
Summative assessment consists of a paper of 4h on the theory that will be written at an appointed time by every student.
Module mark
Participation mark: Examination mark is 1:1 and the passing mark is 50%.

Module code: CHEN612 will become NCHE612	**Semester 1**	**NQF-Level: 8**

Title: **Advanced Physical Chemistry**

After completion of the module CHEN612, the student should demonstrate:

- integrated knowledge and understanding of the theory of the three subjects: 1) quantum chemistry and molecular spectroscopy, 2) statistical thermodynamics, and 3) reaction kinetics;
- an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of physical chemistry, and critically evaluate and review that knowledge to deepen the understanding of physical chemistry;
- supervised research skills by selecting and implementing experimental methods to effectively execute a planned research design, communicate findings and conclusions by means of a written report in a scientific manner;
- the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in physical chemistry by using appropriate methods;
- an understanding of the ethical and professional conduct required of a professional chemist.

Module uitkomste:
Na voltooiing van die module CHEN612, behoort die student:

- *'n geïntegreerde kennis en begrip van die teorie van die drie onderwerpe te hê: 1) kwantumchemie en molekulêre spektroskopie, 2) statistiese termodinamika en 3) reaksiekinetika;*
- *die vermoë te kon ontwikkel om 'n verskeidenheid bronne van kennis soos*

boeke, joernale en die internet binne die veld van fisiese chemie te assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van fisiese chemie te verdiep;

- *onder toesig navorsingsvaardighede te kan demonstreer deur die seleksie en toepassing van eksperimentele metodes om effektief 'n navorsingsontwerp uit te voer en die resultate en gevolgtrekkings m.b.v. 'n wetenskaplik geskrewe verslag te kommunikeer;*

- *die vermoë te hê om probleme in fisiese chemie met toepaslike metodes te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;*

- *'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word.*

Method of delivering: Full Time

Assessment methods:

Quantum chemistry and spectroscopy: Prof E.L.J. Breet

Assessment method:

The contribution of this sub-module to the participation mark for CHEN612 (according to allocated credit marks) consists of the marks of (1) two written class tests and (2) the written report on an experiment (E1), based on the rotation/vibration and electronic spectra of selected compounds. The contribution of this sub-module to the examination mark is in the same ratio than the contribution to the total number of credits for CHEN612. In practice the contribution of each of the three sub-modules are added up to calculate the final participation and examination mark. Then the module mark is the average of the participation mark and the examination mark for the three modules.

Module code: CHEN613 will become NCHE613	**Semester 1**	**NQF-Level: 8**

Title: **Advanced Inorganic Chemistry**

Module-outcomes:

fter completion of the module NCHE613, the student should demonstrate:

- applied knowledge and critical understanding of mechanisms related to the most important types of reactions occurring in inorganic chemistry;
- an ability to access and interpret multiple resources of knowledge such as books, journals and the internet within the field of inorganic chemistry, critically evaluating and reviewing that knowledge and the manner in which the knowledge was produced with a view to judge the applicability and value of the knowledge towards deeper understanding of inorganic chemistry;
- the ability to select, apply and critically judge the effectiveness of the implementation of a range of supervised advanced synthesis techniques in inorganic chemistry to successfully execute a planned research design, evaluate and communicate the research findings by means of a written scientific report;
- the ability to identify, demarcate, analyse, critically reflect on and effectively

address complex or abstract problems and challenges related to inorganic chemistry with theory-driven arguments employing appropriate knowledge and methods;

- the ability to make autonomous ethical and professional decisions and take full responsibility for his/her work and practices and the safety of others within different professional and academic environments.

Module uitkomste:

- *Na voltooiing van die module NCHE613, behoort die student:*
- *toegepaste kennis en kritiese begrip van meganismes wat verband hou met die belangrikste tipes reaksies in anorganiese chemie te hê;*
- *die vermoë ontwikkel om toegang te verkry tot, en interpretasie van, verskeie bronne van kennis soos boeke, joernale en die internet binne die veld van anorganiese chemie en krities die inligting te evalueer en hersien asook die wyse waarop die kennis geproduseer is met die oog op die toepaslikheid en waarde van die kennis te oordeel, om sodoende die begrip van anorganiese chemie te verdiep;*
- *die vermoë ontwikkel om onder toesig, die seleksie, toepassing en beoordeling van 'n verskeidenheid gevorderde sintese tegnieke in anorganiese chemie te demonstreer, om sodoende 'n beplande navorsingsontwerp suksesvol uit te voer, te evalueer en die bevindinge d.m.v. 'n skriftelike wetenskaplike verslag te kommunikeer;*
- *die vermoë te hê om komplekse of abstrakte probleme en uitdagings wat verband hou met anorganiese chemie te kan identifiseer, af te baken, te analiseer, krities te bedink en effektief aan te spreek d.m.v. teorie-gedrewe argumente gebaseer op toepaslike kennis en metodes;*
- *die vermoë hê om outonoom etiese en professionele besluite te neem en die volle verantwoordelikheid vir sy/haar werk en praktyke en die veiligheid van ander binne verskillende professionele en akademiese omgewings te neem.*

Method of delivering: Full Time

Assessment methods:

Participation mark:

• Theory: Assignments	8%
• 2 class tests	17%
• Practicals: Preliminary practical reports	8%
• Final practical reports	17%

Examination mark:

• 3h paper on the theory contents of course	50% (minimum 40%)

Module mark:

• Participation mark + Examination mark	100% (minimum 50%)

Module code: CHEN614 will become NCHE621	Semester 1	NQF-Level: 8

Title: **Molecular modelling (Elective)**

Module-outcomes:
After completion of the CHEN614 module, the student should demonstrate:

- integrated knowledge and critical understanding of a variety of mathematical models developed for description of molecules and chemical reactions and an ability to critically evaluate and review multiple mathematical models to choose a suitable mathematical model for his/her particular molecule or reaction and do the necessary mathematical processing with commercial modelling software packages;

- the ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant/appropriate mathematical models with a view to apply these models to real world chemical problems;

- advanced ability to effectively interpret and apply theoretical calculated modelling data with a view to explain or predict experimental data;

- the ability to analyse, select and effectively apply modelling data in chemistry literature and to reflect on and then address complex or abstract problems in chemistry; and

- the ability to identify, demarcate, analyse, critically reflect on and effectively address complex problems related to chemistry and apply theory-based solutions with evidence-driven arguments.

Module uitkomste:
Na voltooiing van die CHEN614 module behoort die student die volgende te demonstreer:

- *geïntegreerde kennis en kritiese verstaan van 'n verskeidenheid wiskundige modelle, wat ontwikkel is om molekule en chemiese reaksies te beskryf en die vermoë besit om verskeie wiskundige modelle krities te evalueer en hersien om sodoende 'n geskikte model vir sy/haar spesifieke molekuul of reaksie te kies en die nodige wiskundige verwerking met kommersiële sagteware pakette te doen;*
- *die vermoë om die effektiwiteit van toepassing van 'n reeks van relevante/geskikte wiskundige modelle te kies, toe te pas en krities te oordeel met die vooruitsig om die modelle op regte wêreld problem toe te pas;*
- *gevorderde vermoë om teoreties berekende modelleringsdata effektief te verklaar en toe te pas om eksperimentele data te verduidelik of te voorspel;*
- *die vermoë modelleringsdata in chemiese literatuur te analiseer, te kies en effektief toe te pas en om komplekse of abstrakte probleme in chemie te oordink en op te los; en*
- *die vermoë om te identifiseer, af te baken, te analiseer, krities te oordink en komplekse probleem verwant aan chemie aan te spreek en teoretiesgedrewe oplossings vir bewysgedrewe agrumente te vind.*

Method of delivering: Full Time

Assessment methods:
The methodology used in this module does not lend itself to formative assessment,

thus no participation mark is built up.

The assessment is done on a computer. Because of its practical nature 3½ hours are available for the assessment.

One summative assessment takes place during which the following are measured:

Theoretical section

- Theoretical insights 50%
- Ability to interpret molecular modelling results.
- Practical section 50%
- Practical skills to interpret molecular modelling results

Skills in interpreting self-calculated molecular modelling results

Module code: CHEN671 will become NCHE671	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Research Project**

Module-outcomes:
At the end of this module the student should:

- have the ability to demonstrate knowledge of safety measures and procedures in the laboratory;
- demonstrate the ability how to tackle, execute and complete a research project by
- being able to identify and analyze a problem, collection of relevant information and data, interpretation, analysis and evaluation of the information and data and the planning and communication of the research project

Module uitkomste:
Na voltooiing van die module CHEN671, behoort die student:

- *geïntegreerde kennis en begrip van navorsingsmetodologie te hê en die vermoë om 'n chemie-verwante navorsingsprojek suksesvol uit te voer;*
- *die vermoë hê om 'n verskeidenheid bronne van kennis soos boeke, joernale en die internet te assimileer en krities die inligting te evalueer en te hersien;*
- *'n projekvoorstel te kan formuleer;*
- *onder toesig navorsingsvaardighede te kan demonstreer deur die seleksie en toepassing van eksperimentele metodes om effektief 'n navorsingsontwerp uit te voer;*
- *die resultate en gevolgtrekkings op 'n wetenskaplik wyse te kan kommunikeer;*
- *die vermoë te hê om probleme wat geassosieer word met die spesifieke projek te identifiseer, af te baken, te analiseer, krities te bedink en effektief op te los deur gebruik te maak van toepaslike metodes;*
- *'n begrip te hê van die veiligheid, etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word in 'n navorsingsomgewing.*

Method of delivering: Full Time

Assessment methods:

In addition to the results obtained during the project, the effort that was put into the project as well as the execution and presentation of the project will be assessed. Summative assessment consists of a weighed mark composed of the following: project proposal (5%), summary (5%), poster presentation (15%), oral presentation (15%), research article (30%) and carrying out of the project (30%)

Module code: CHEN621 will become NCHE627	**Semester 2**	**NQF-Level: 8**

Title: **Homogeneous catalysis (Elective)**

Module-outcomes:
After completion of the module CHEN621, the student should demonstrate:

- integrated knowledge and understanding of the following: principles of green chemistry, definitions and descriptions of concepts in catalytic chemistry, background knowledge of organometallic chemistry of importance in homogeneous catalysis, important homogeneous catalytic reactions and the industrial application thereof;
- the ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of homogeneous catalysis, and critically evaluate and review that knowledge to deepen the understanding of homogeneous catalysis;
- the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in homogeneous catalysis by using appropriate methods;
- an understanding of the ethical and professional conduct required of a professional chemist.

Module uitkomste:

- *Na voltooiing van die module CHEN621, behoort die student:*
- *'n geïntegreerde kennis en begrip van die teorie van die volgende te hê: beginsels van groenchemie, definisies en beskrywing van begrippe in katalitiese chemie, agtergrondkennis oor organometaalchemie van belang in homogene katalise, belangrike homogene katalitiese reaksies en industriële toepassing daarvan;*
- *die vermoë te hê om 'n verskeidenheid bronne van kennis soos boeke, joernale en die internet binne die veld van homogene katalise te assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van homogene katalise te verdiep;*
- *die vermoë te hê om probleme in homogene katalise met toepaslike metodes te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;*
- *'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word*

Method of delivering: Full Time

Assessment methods:
The module mark consists of a single summative assessment in the form of a single paper of 1.5h to be written on the indicated day and date by every student (see Year programme). The required mark for a pass is 50%.

Module code: CHEN622 will become NCHE628	Semester 2	NQF-Level: 8

Title: **Coal Chemistry (Elective)**

Module-outcomes:
After completion of the module CHEN622, the student should demonstrate:

- integrated knowledge and understanding of the theory behind coal structure, coal characterization and coal utilization;
- an ability to critically interrogate multiple sources of knowledge, such as books, journals and existing coal characterization data within the field of coal science and critically evaluate that knowledge;
- the ability to identify, demarcate, analyze, critically reflect on and effectively address complex problems/challenges related to coal utilization;
- the ability to identify ethical issues regarding coal utilization.

- *Module uitkomste:*
- *Na voltooiing van die module CHEN622, behoort die student:*
- *'n geïntegreerde kennis en begrip van die teorie rakende steenkoolstruktuur, steenkoolkarakterisering en steenkoolgebruik te hê;*

- *die vermoë ontwikkel het om 'n verskeidenheid van bronne van inligting en kennis, soos boeke, joernale en bestaande steenkoolkarakteriseringsdata binne die gebied van steenkoolwetenskap te assimileer en krities te evalueer;*
- *die vermoë te hê om komplekse probleme/uitdagings binne die gebied van steenkoolwetenskap af te baken, te analiseer, krities te bedink en effektief op te los;*
- *die vermoë te hê om etiese problematiek rakende steenkoolgebruik te identifiseer.*

Method of delivering: Full Time

Assessment methods:
Formative assessment consists of the written solutions to the problem statements which contribute 50% to the participation mark. During a tutorial every student will present an extensive problem statement allocated to him/her beforehand.. This presentation will be evaluated by the other students and lecturers concerned. This provides the other 50% of the module mark. A summative assessment opportunity consisting of a 2h paper will be written. This summative assessment will provide the examination mark. The final mark or module mark for this module will be composed of a 60% contribution by the summative assessment opportunity (examination) and a 40 % contribution by the formative assessment opportunities (participation mark).

Module code: CHEN623 will become NCHE629	Semester 2	NQF-Level: 8

Title: **Membrane science and technology (Elective)**

Module-outcomes:
After completion of the module CHEN623, the student should demonstrate:

1. An integrated knowledge of the concepts and definitions used in membrane science;

2. the ability to identify and critically solve complex problems related to the calculations commonly used in membrane technology;

3. an understanding of the ethical and professional conduct required of a professional scientist;

Module uitkomste:

Na voltoiïng van die module CHEN623, behoort die student

1. 'n geïntegreerde kennis van die konsepte en definisies wat in membraanwetenskap gebruik word te kan demonstreer;

2. Die vermoë te besit om komplekse probleme wat met die berekeninge wat algemeen in membraantegnologie verband hou te identifiseer en krities op te los;

3. 'n Begrip te toon van die etiese en professionele gedrag wat van 'n wetenskaplike vereis word.

Method of delivering: Full Time

Assessment methods:
Participation mark:

- Theory On-going formative assessment 67%
- Problem solution 33%

Examination mark:
Summative assessment opportunity consists of a single 2h paper on the theory. This paper will be written on the indicated day and date by every student (see Year programme).
Module mark:
Participation mark : Examination mark is 1 : 1 and 50% should be obtained for a pass.

Module code: CHEM621 willbecome NCHE622	**Semester 2**	**NQF-Level: 8**

Title: **Polymer Chemistry (Elective)**

Module-outcomes:
After completion of the module CHEN621 the student should demonstrate:

- integrated knowledge of and engagement in polymer chemistry relating to:
- structure and morphology of polymers
- different polymerization mechanisms
- mechanical properties of polymers
- analytical techniques
- different families of polymers

Students should have the ability to utilize Organic Chemistry skills to design monomers to produce new polymers.

Module uitkomste:

Na voltooing van die module CHEN621, behoort die student:

• 'n geintegreerde kennis en begrip van polimeerchemie te hê met inbegrip van

o die struktuur en morfologie van polimere

o verskillende polimerisasie meganismes

o meganiese eienskappe van polimere *o analitiese tegnieke* *o verskillende polimeer families* • *Studente moet ook die vermoe beskik om kennis van Organiesechemie te gebruik om nuwe monomere te formuleer om nuwe polimere te kan produseer.*		
Method of delivering: Full Time		
Assessment methods: Module mark: Assignment : Examination mark : Practical mark is 1 : 4 and 50% is required to pass. Formative assessment consists of an assignment on a specific theme in polymer chemistry (20% of the module mark). Summative assessment consists of a single1.5h paper (80% of the module mark) that will be written by the student on the indicated day and date (see Year program).		
Module code: CHEM622 willbecome NCHE623	**Semester 2**	**NQF-Level: 8**
Title: **Advanced structural clarification (Elective)**		
Module-outcomes: After completion of the module CHEM622, the student should demonstrate: 1. integrated knowledge of and engagement in the theory and application of NMR as an analytical technique for the structural elucidation of organic compounds by using one- (1H, 13C, DEPT), two-dimensional (HSQC, HETCOR, Inadequate, COSY, NOESY, ROESY) experiments and the spectroscopy of important half spin nuclei (15N, 31P, 19F). 2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of NMR, and critically evaluate and review that knowledge to deepen the understanding of NMR as analysis technique; 3. advanced ability to effectively use / apply knowledge mastered in the interpretation process of NMR spectra with a view to structurally elucidate synthesized products. 4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in organic chemistry by using NMR as analytical technique. 5. an understanding of the ethical and professional conduct required of a professional chemist. *Module uitkomste:* *Na voltooiing van die module CHEM622, behoort die student:* *1. 'n geïntegreerde kennis en begrip van die teorie en toepassing van KMR as ? analitiese tegniek vir die struktuuropklaring van organiese verbindings deur van een- (1H, 13C, DEPT) en twee dimensionele (HETCOR, HSQC, COSY, Inadequate, NOESY, ROESY) eksperimente en die spektroskopie van belangrike halfspinkerne (15N, 31P, 19F) gebruik te maak;* *2. die vermoë te kon ontwikkel om 'n verskeidenheid bronne van kennis soos boeke, joernale en die internet binne die veld van organiese chemie te assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van organiese chemie te verdiep;* *3. gevorderde vermoë om die effektiewe gebruik / toepassing kennis*		

bemeester in die interpretasie proses van KMR-spektra met die doel om gesintetiseerde produkte struktureel op te los.
4. die vermoë te hê om probleme in organiese chemie deur van KMR as analitiese tegniek gebruik te maak, te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;
5. 'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word.

Method of delivering: Full Time

Assessment methods:
Formative assessment consists of the solutions to the written problem statements. The final mark for this module is composed of a 100% contribution of the formative assessment opportunities.

Module code: CHEM623 willbecome NCHE624	**Semester 2**	**NQF-Level: 8**

Title: **Environmental Chemistry (Elective)**

Module-outcomes:
After completion of the module CHEM623, the student should demonstrate:
1. integrated knowledge and understanding of the basic principles of environmental chemistry theory related to: water, atmosphere and soil, as well as environmental risk assessment and management;
2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of environmental chemistry, and critically evaluate and review that knowledge to deepen the understanding of environmental chemistry;
3. communicate findings and conclusions in a scientific manner;
4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in environmental chemistry by using appropriate methods;
5. an understanding of the ethical and professional conduct required of a professional environmental chemist.

Module uitkomste:
Na voltooiing van die module CHEM623, behoort die student:
1. geïntegreerde kennis en begrip van die basiese beginsels van omgewingchemie teorie te hê wat verband hou met: water, atmosfeer en grond, sowel as omgewingsrisiko-assessering en bestuur;
2. die vermoë te hê om verskeidenheid bronne van kennis soos boeke, joernale en die internet binne die veld van omgewingschemie te kan assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van omgewingschemie te verdiep;

3. bevindinge en gevolgtrekking te kan kommunikeer in ? wetenskaplik wyse;
4. die vermoë te hê om probleme in omgewingschemie met toepaslike metodes te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;
5. 'n begrip te hê van die etiese en professionele gedrag wat van ? professionele omgewingschemikus verwag kan word.

Method of delivering: Full Time

Assessment methods:
Formative assessment consists of oral and/or written problem solving or tests. A summative assessment consisting of an examination opportunity contributes the remaining 50% of the module mark.

Module code: CHEM624 will become NCHE625	**Semester 2**	**NQF-Level: 8**

Title: **Techniques for Organic synthesis (Elective)**

Module-outcomes:
After completion of the module CHEM624, the student should demonstrate:

1. integrated knowledge of and critical understanding and application of advanced organic synthesis techniques, particularly focused on retrosynthetic analysis;

2. the ability to critically interrogate multiple sources of knowledge such as books, journals relevant to advanced organic synthetic strategies and critically evaluate and review that knowledge with a view to advance their understanding of organic chemistry;

3. the ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant synthetic strategies with a view to predict routes to small molecule synthesis;

4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve complex synthetic problems in advanced organic chemistry;

5. an understanding of the ethical and professional conduct required of a professional chemist.

Module uitkomste:
Na voltooiing van die module CHEM624, behoort die student:

1. 'n geïntegreerde kennis en kritiese begrip en toepassing van gevorderde organiese sintese tegnieke, veral gefokus op retrosintetiese analise;

2. die vermoë te kon ontwikkel om 'n verskeidenheid bronne van kennis soos boeke, joernale en die internet binne die veld van gevorderde organiese sintese strategiëe te assimileer en krities die inligting te evalueer en te hersien om sodoende die begrip van organiese chemie te verdiep;

3. die vermoë te kon ontwikkel om uit 'n verskeidenheid relevante sintese strategiëe te selekteer, toe te pas en die effektiwiteit van die strategie krities te kan evalueer, met die oog daarop om sintese roetes na organiese verbindings te voorspel;

4. die vermoë te hê om sintese probleme in organiese chemie met toepaslike metodes te identifiseer, af te baken, te analiseer, krities te bedink en dan effektief op te los;

5. 'n begrip te hê van die etiese en professionele gedrag wat van 'n professionele chemikus verwag kan word
Method of delivering: Full Time
Assessment methods: Formative assessment (100%) consists of an oral presentation of his/her findings to his/her co-students and lecturers (50%) and a written report of the specific literature study (50%).

Module code: CHEM626 will become NCHE626	**Semester 2**	**NQF-Level: 8**

Title: **Electrochemistry (Elective)**

Module-outcomes:
After completion of the CHEM626 module, the student should demonstrate:

- an integrated knowledge and critical understanding of the theoretical foundation with regard to (i) electrolysis cells, electron transfer reactions (redox reactions), mass transfer, and electrical potential, (ii) the importance of the electrolyte solution as well as the electrical double layer, (iii) the kinetics of electron transfer reactions, (iv) experimental setup and the factors affecting it, and (v) specific electrochemical techniques employed in the laboratory in studying electron transfer;

- an ability to critically interrogate multiple sources of knowledge such as books, scientific papers and the internet within the field of electrochemistry, with specific reference to electron transfer reactions, so as to critically review and evaluate that knowledge with a view of obtaining a deeper understanding and appreciation of the theory and practice of interrogating electron transfer processes;

- skills related to experimental research and practice, under appropriate supervision, by implementing the necessary procedures and methods to effectively execute a planned research design, effectively report on the experimental research findings, and extract relevant conclusions on topics that include (i) the application of the Nernst equation to calculate basic thermodynamic quantities (e.g. potential), (ii) the setup and use of a three electrode cell coupled to a potentiostat, (iii) the application of specific electrochemical techniques that include cyclic voltammetry, linear polarisation, hydrodynamic methods and potential step methods so as to study and interrogate electron transfer reactions;

- an advanced ability to link an appropriate experimental design/technique to a theoretical description (in the form of a mathematical equation) so as to extract experimental information (e.g. electron transfer) on a specific electrochemical system under investigation;

- problem solving skills related to the interface between theory and experiment and to analyse and critically reflect on the outcome/result;

- an understanding of the ethical and professional conduct required of a professional chemist and the ethical application of electrochemistry.

Module uitkomste:
Na voltooiing van die CHEM626 module, behoort die student te demonstreer dat:

- *hy/sy oor 'n geïntegreerde kennis en kritiese verstaan beskik van die teoretiese fondasie met betrekking tot (i) elektrolise selle, elektronoordrag reaksies (redoksreaksies), massa oordrag en elektriese potensiaal, (ii) die belangrikheid van die elektroliet oplossing sowel as die elektriese dubbellaag, (iii) die kinetika van elektronoordrag reaksies, (iv) eksperimentele opstelling en die faktore wat dit beïnvloed, en (v) spesifieke elektrochemiese tegnieke aangewend in die laboratorium in die bestudering van elektronoordrag;*
- *hy/sy die vermoë beskik om krities verskeie bronne van kennis soos boeke, wetenskaplike artikels en die internet binne die veld van elektrochemie, met spesifieke verwysing na elektronoordrag reaksies, te ondersoek, ten einde 'n kritiese oorsig en evaluering van die kennis te bekom met die oog op die verkryging van ? meer in diepte verstaan en waardering van die teorie en toepassing van die ondersoek na elektronoordrag reaksies;*
- *hy/sy, onder gepaste toesig, beskik oor eksperimentele navorsing- en toepassingsvaardighede deur die nodige prosedures en metodes te implimenteer ten einde ? beplande navorsingontwerp uit te voer, die navorsingsresultate te rapporteer, en relevante gevolgtrekkings te maak aangaande onderwerpe wat insluit (i) die toepassing van die Nernst vergelyking om basiese termodinamiese groothede (bv. potensiaal) te bepaal, (ii) die opstelling en gebruik van ? drie elektrode sel gekoppel aan ? potensiostaat, (iii) die toepassing van spesifieke elektrochemiese tegnieke wat siklovoltammetrie, lineêre polarisasie, hidrodinamiese tegnieke en potensiaal stap metodes insluit, ten einde elektronoordrag reaksies te ondersoek;*
- *hy/sy oor 'n gevorderde vermoë beskik om toepaslike eksperimentele ontwerp/tegnieke te koppel aan 'n teoretiese beskrywing (in die vorm van 'n wiskundige vergelyking) te einde eksperimentele inligting (bv. elektronoordrag) eie aan 'n spesifieke elektrochemiese sisteem te onttrek;*
- *hy/sy oor probleemoplossing vaardighede beskik met betrekking tot die koppelvlak tussen teorie en praktyk en te kan analiseer en krities te besin oor die uitslag/resultaat;*
- *hy/sy 'n verstaan en waardering het van die etiese en professionele gedrag wat van 'n professionele chemikus verwag word asook die etiese toepassing van elektrochemie.*

Method of delivering: Full Time

Assessment methods:
A summative assessment in the form of a written exam is to be completed by each candidate.

Module code: CISM611	**Semester 1**	**NQF-Level: 8**

Title: Algorithms and data structures

Module outcomes:

Technical skills, personal skills and social skills. The following topics will be covered, basic algorithmic analysis, algorithmic strategies, fundamental computing algorithms, distributed algorithms, graphs and trees, fundamental data structures,

and recursion, geometric modelling, parallel algorithms, event-driven programming, cryptographic algorithms, fundamental data structures, fundamental programming constructs, automata theory.		
Method of delivering:		
Assessment methods		
Module code: CISM612	**Semester 1**	**NQF-Level: 8**
Title: Programming languages and objects		
Module outcomes: Technical skills, personal skills and social skills. The following topics will be covered, overview of programming languages, virtual machines, introduction to language translation, declarations and types, abstraction mechanisms, object oriented programming, functional programming, language translation systems, type systems, programming language semantics, and programming language design.		
Method of delivering:		
Assessment methods		
Module code: CISM613	**Semester 1**	**NQF-Level: 8**
Title: Operating Systems		
Module outcomes: Technical skills, personal skills and social skills. Topics to be covered, overview of operating systems, operating systems principles, concurrency, scheduling and dispatch, and memory management, device scheduling, security and protection, file systems, real-time and embedded systems, fault tolerance, system evaluation		
Module code: CISM624	**Semester 2**	**NQF-Level: 8**
Title:Networks to Net-Centric Computing		
Module outcomes: Technical skills, personal skills and social skills. Topics to be covered, Introduction to net-centric computing, communication and networking, network security, the web as an example of client-server computing, building web applications, and network manage-ment, compression and decompression, multimedia data technologies, wireless and mobile computing.		
Method of delivering:		
Assessment methods		
Module code: CISM625	**Semester 2**	**NQF-Level: 8**
Title: Database Systems		
Module outcomes: Technical skills, personal skills and social skills. Information models and systems, database systems, data modelling, relational databases, database query languages, relational database design, transactional processing, distributed databases, physical design, data mining and data warehousing, hypertext and hypermedia, multimedia information and systems, digital libraries.		
Method of delivering:		
Assessment methods		

Module code: CISM626	Semester 2	NQF-Level: 8
Title: Artificial Intelligence		
Module outcomes: Technical skills, personal skills and social skills. The following topics will be covered fundamental issues in intelligent systems, search and constraint satisfaction, knowledge representation and reasoning, advanced search, advanced knowledge representation and reasoning, agents, natural language processing, machine learning and neural networks, AI planning systems and robotics		
Method of delivering:		
Assessment methods		
Module code: CISM671	**Year module**	**NQF-Level: 8**
Title: Project		
Module outcomes: Technical skills, personal skills and social skills. The following topics will be covered Foundations of HCI, graphical users interface (GUI) design, GUI design, Software design, software tools and environments, software processes, software requirements and specifications, software validation, software evolution, software projects management, team management, communications skills and elective topics		
Method of delivering:		
Assessment methods		
Module code: CNRM 615	**Semester 1**	**NQF-Level: 8**
Title:Conservation of Natural resources		
Module outcomes: After completion of the CNRM 615 module, the student should demonstrate: • detailed knowledge of the flora of southern Africa and a clear understanding of the status of land degradation in South Africa • demonstrate how to determine the current status of land degradation in South Africa, especially in terrestrial ecosystems • Apply basic ecological principles; discuss ecological interactions and populations and examples thereof, understand and apply basic principles with regard to plant growth dynamics and landscape ecology; explain the current situation of LAND DEGRADATION IN SA with REGARD TO RANGELANDS AND LAND as a resource; • Apply basic ecological principles to evaluate an ecological problem, especially regarding land degradation (woody plant invasion and desertification).		
Method of delivering:		
Assessment methods		
Module code: CNRM 625	**Semester 1**	**NQF-Level: 8**
Title: Further conservation of natural resources		
Module outcomes: After completion of the CNRM 616 module, the student should demonstrate: • detailed knowledge of the current status of environmental challenges in		

southern Africa, especially South Africa

- demonstrate how to determine the current status of land degradation in South Africa, especially regarding wetland ecosystems
- Apply basic ecological principles; discuss ecological interactions and populations and examples thereof, understand and apply basic principles with regard to plant growth dynamics and landscape ecology; explain the current situation of LAND DEGRADATION IN SA with REGARD TO WETLANDS AND WETLANDS as a resource;
- Apply applicable ecological principles to solve the current water crisis in South Africa, especially regarding water provision.
- Solve specific environmental problems, especially regarding semi-arid areas and the application of herbicides and pesticides in the agriculture sector.

Method of delivering:

Assessment methods

Module code: ECOM613	**Semester 1**	**NQF-Level: 8**

Title:Land Resource Economics

Module outcomes:

To able to demonstrate an understanding of input-output relationship affecting land use , the impact of institutional factors on land use, framework for environmental economic-economic development, property in land use, acquisition and transfer of ownership rights, describe patterns of land and resource use in South Africa and develop a sustainable resource management strategy

Method if delivery:

Assessment methods:

Module code: ECON623	**Semester**	**NQF-Level: 16**

Title: **Risk Management**

Module-outcomes:

After the successful completion of this module, the student must be able to demonstrate:

• integrated knowledge of and engagement in risk management and critical understanding and application of relevant risk management frameworks, methods and techniques relevant to the field of risk management,
• advanced ability to effectively apply risk management methods and techniques with a view to manage risk within an organisation,
• critical analysis of alternative approaches to managing the various types of risk within an organisation and the ability to offer value-driven and logical arguments for judgements,
• the ability to identify, demarcate, analyse, and effectively address complex issues related to risk management within an organisation and apply practice-driven solutions with theory-driven arguments,
• flexibility and adaptability to apply their specialised knowledge and professional skills to practical risk management contexts,
• acceptable behaviour within the academic environment, inclusive of adherence to rules on plagiarism and copyright principles, and the ability to interact and

collaborate effectively with others whilst taking co-responsibility for his/her own learning progress.
Module uitkomste:
Met voltooiing van die module behoort die student die volgende te demonstreer:

- *geïntegreerde kennis van en verdieping in risikobestuur en kritiese verstaan van die toepassing van relevante risikobestuur raamwerke, -metodes en –tegnieke wat verband hou met die vakrigting van risikobestuur,*
- *gevorderde vermoë om doeltreffend risikobestuur metodes en tegnieke toe te pas met die doel om risiko binne 'n organisasie te bestuur,*
- *kritiese ontleding van alternatiewe benaderings om die verskeie risikotipes te bestuur binne 'n organisasie en die vermoë om waardegedrewe en logiese argumente vir besluite te verskaf,*
- *die vermoë om komplekse probleme wat verband hou met risikobestuur binne 'n organisasie te identifiseer, af te baken, te analiseer en doeltreffend aan te spreek en om praktykgerigte oplossings toe te pas met teorie-gedrewe argumente,*

- *die buigsaamheid en aanpasbaarheid te besit om hulle spesialis kennis en professionele vaardighede toe te pas binne praktiese risikobestuur kontekste, en*
- *aanvaarbare gedrag binne die akademiese omgewing, ingesluit die nakoming van die reëls oor plagiaat en kopieregbeginsels, en die vermoë om effektief met ander saam te werk en te reageer, terwyl medeverantwoordelikheid vir sy/haar eie leerproses geneem word.*

Method if delivery:Full-time or part-time

Assessment methods: Formal formative assessment methods could include, but might not be limited to, assignments, group assignments and scheduled tests. Memoranda with correct and/or suggested solutions are also compiled, including mark allocation indicating the knowledge and skills students must demonstrate to pass the assessment activity. The number of formal formative assessments will be communicated to students in a module overview document.

Module code: ELEM611	**Semester 1**	**NQF-Level: 8**

Title: Embedded Systems

Module outcomes - At the end of this module, the student is expected to:

- Demonstrate understanding of basic principles and concepts of embedded systems design
- Demonstrate understanding of all aspects of design and development of embedded systems, including hardware and embedded software development
- Learn the architecture of a specific microcontroller and the techniques to program it
- Understand applied computing principles in emerging technologies and applications for embedded systems
- Know about test equipment and instrumentation
- Develop practical skills and ability to apply scientific and engineering theory to real-world design of embedded systems
- Proffer micro-controller-based solutions to simple practical problems

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays,

tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM612	**Semester 1**	**NQF-Level: 8**

Title: Analogue Communication Systems

Module outcomes - At the end of this module, the student is expected to:

- Understand basic concepts of communication systems
- Understand principles and techniques of analysis and design of analogue communication systems
- Understand modulation and demodulation of analogue signals along with associated system design issues
- Acquire knowledge of power and bandwidth constraints and performance in the presence of additive noise
- Be able to apply the fundamental principles to modern communication system, including AM and FM radio, television, telecommunications, wireless communication, modems, satellite communication, optical fibre communication, and many others.
- Be able to evaluate and interpret Fourier transforms of signals by using properties of the Fourier transform.
- Be able to evaluate the autocorrelation and energy or power spectral density of a deterministic signal.
- Be able to characterize a band-pass signal in terms of in-phase and quadrature components, envelope, and phase.
- Be able to characterize double-sideband, amplitude, and single-sideband modulation in terms of bandwidth and power efficiency.
- Be able to describe phase and frequency modulated signals in the time domain, and tone modulated signals in the frequency domain.
- Be able to estimate the bandwidth of a phase or frequency modulated waveform.
- Be able to determine filter specifications and tuning range for a super-heterodyne receiver.
- Be able to compute the power spectral density of a random process.
- Be able to compute the autocorrelation and power spectral density of a filtered random process.
- Be able to specify narrowband noise in terms of low-pass random noise.
- Be able to compute pre- and post-detection signal-to-noise ratios for linear modulation systems.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments,

interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM613	**Semester 1**	**NQF-Level: 8**

Title: Electronic Instrumentation

Module outcomes - At the end of this module, the student is expected to:

- Possess good understanding of fundamental principles and concepts of measurement and instrumentation, as well as physical principles and electrical characteristics for several common instrument transducers
- Acquire necessary skills for analysis and design of instrumentation systems
- Demonstrate knowledge of basic principles and techniques of instrumentation
- Acquire the capability to design analogue and digital circuits utilized in electronic instrumentation
- Show good knowledge of electronic signal-conditioning circuits required to convert the electrical changes in the transducers to signal which can be interpreted accurately by a microprocessor or embedded controller
- Demonstrate the ability to apply knowledge gained to practical, real-life applications

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM614	**Semester 1**	**NQF-Level: 8**

Title: Optoelectronics and Optical Communications Systems

Module outcomes - At the end of this module, the student is expected to:

- To understand operating principles of optoelectronic devices used in various current and future information processing and transmission systems
- To understand the principles of optical fiber operation
- To acquire knowledge about the operation of optical networks and optical network technology such as SONET
- To understand the basic properties of optical fields.
- To understand the fundamental principles of optical amplification and lasers.
- To understand and design basic optical dielectric waveguide.
- To understand the functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver.
- To understand the properties of optical fiber that affect the performance of a communication link.
- To understand how semiconductor lasers work, and differentiate

between internal modulation and external electro-optic modulation.
- To understand basic optical amplifier operation and its effect on signal power and noise in the system.
- To design a basic optical communication link.
- To understand analog (CATV, Radio over Fiber) and digital (SONET or Synchronous Optical Network) transmission technologies.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM625	**Semester 2**	**NQF-Level: 8**

Title: Control Systems

Module outcomes - At the end of this module, the student is expected to:

- To understand the theory and practice of control system engineering
- To understand classical control theory and fundamentals of modern control theory
- To know about various control systems and how the different system variables interact and affect the system performance
- To understand concepts affecting the operation analysis and stabilization of control systems.
- To understand the open-loop and closed-loop (feedback) systems.
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems.
- To be able to relate mathematical representations in Feedback Control Systems.
- To be able to discriminate and evaluate the concept and importance of a Control System model and its applicability.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM626	**Semester 2**	**NQF-Level: 8**

Title: Engineering Electromagnetics

Module outcomes - At the end of this module, the student is expected to:

- To develop an understanding of the fundamental concepts of electromagnetic fields, with an emphasis on wave propagation.
- To understand the relationship between basic electromagnetic concepts and the performance of devices, circuits, and systems
- To determine parameters associated with waves on lossless and lossy transmission lines, including frequency, phase velocity, attenuation and phase constants.
- To be able to solve transient problems involving initially uncharged or charged transmission lines with resistive and reactive loads.

To be able to design transmission line terminations

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM627	**Semester 2**	**NQF-Level: 8**

Title: Digital Communications Systems

Module outcomes - At the end of this module, the student is expected to:

- To understand basic concepts of Digital Communication
- To have an exposure to error control coding
- To gain some knowledge of spread spectrum modulation schemes
- To be able to describe pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To be able to analyse baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
- To be able to determine maximum bit rates for zero-inter-symbol interference (ISI) regimes and for controlled ISI regimes.
- To be able to implement error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.
- To be able to demonstrate some knowledge on notion of spread-spectrum techniques including pseudo-noise sequences, direct-sequence spread-spectrum and frequency-hop spread-spectrum.
- To understand pseudo- noise sequences, a notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space Dimensionality and processing gain, Probability of error Frequency-hop spread spectrum, Maximum length and Gold codes.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve

both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM628	**Semester 2**	**NQF-Level: 8**

Title: Power Electronics

Module outcomes - At the end of this module, the student is expected to:

- Understand basic concepts of power electronics
- Know about power converters with non-ideal devices and elements
- Demonstrate knowledge of power electronic devices
- Acquire skills to analyse and design power electronic circuits
- Understand the quadrant operation of various types of converters and their control requirements, selection of converters, components, etc.
- Develop skills and techniques for analysing steady-state characteristics of power converters
- Understand various types of converters and their control requirements, selection of converters, components, etc.
- Be able to select and design important elements of a power converter system
- Be able to apply the theories of power electronic converters and control system design to implement power converter systems which are appropriate for specific applications
- Apply theories of power electronics to practical industrial problems

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELEM671	**Semester 1 & 2**	**NQF-Level: 8**

Title Project

Module outcomes - At the end of this module, the student is expected to:

- To develop more specialised skills as part of a generic training for South African scientists
- To acquire aspects of practical training essential for functioning as a professional natural scientist in a work environment
- To become a physical scientists with a broad range of design, analytic and innovative skills for multi-disciplinary approach to problem solving
- To become a scientist/technologist with general applied competencies within the physical scientific context
- To develop enhanced skills of observation, problem-solving, effective communication, analysis and critical thinking
- To possess tools necessary for entering a path to be professional

industrial or academic practitioner in the field of applied science and technology
- To acquire aspects of academic training such as understanding of the scientific literature and the ability to identify and solve problems in the field of study
- To provide South Africa with graduates that are ready to enter the research world of physical sciences.

Method of delivery: laboratory exercises and reports, written and oral presentations and seminars in an individual and or group context, mini-projects, computer programme outputs and/or demonstrations, and field trip reports

Assessment methods: laboratory experiments, electronic designs, software programming, written and oral presentations and seminars, report-writing, mini-projects, etc,

Module code: ELYM611	**Semester 1**	**NQF-Level: 8**

Title: Microprocessor Systems Design

Module outcomes:
The student should be able to describe and layout a simple microprocessor based system together with support hardware. Topics to be covered; Von-Neumann and Harvard architecture. Hardware configurations. Low-level programming.Interfacing to the external world

Method of delivery:

Assessment methods:

Module code: ELYM612	**Semester 1**	**NQF-Level: 8**

Title: Signals, Circuits And Systems

Module outcomes:
The student should be able to understand the relationship between analogue and digital signals, the representation of analogue signals by discrete sampling, the basics of digital signal processing and the role of digital signal processors as well as acquire the ability to design algorithms for recovery of signals.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELYM613	**Semester 1**	**NQF-Level: 8**

Title: Electronic Instrumentation - Sensors And Transducers

Module outcomes:
The student should be able to explain the operation of existing sensors, and the manner in which sensors fit into systems and devise new sensors for specific

applications based on the principles imparted

Method of delivery:

Assessment methods:

Module code: ELYM614	**Semester 1**	**NQF-Level: 8**

Title:

Module outcomes :
At the end of this module, the student is expected to:

- To understand operating principles of optoelectronic devices used in various current and future information processing and transmission systems
- To understand the principles of optical fiber operation
- To acquire knowledge about the operation of optical networks and optical network technology such as SONET
- To understand the basic properties of optical fields.
- To understand the fundamental principles of optical amplification and lasers.
- To understand and design basic optical dielectric waveguide.
- To understand the functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver.
- To understand the properties of optical fiber that affect the performance of a communication link.
- To understand how semiconductor lasers work, and differentiate between internal modulation and external electro-optic modulation.
- To understand basic optical amplifier operation and its effect on signal power and noise in the system.
- To design a basic optical communication link.
- To understand analog (CATV, Radio over Fiber) and digital (SONET or Synchronous Optical Network) transmission technologies.

Method of delivery: Use of study guides, PowerPoint slides; video documentations and demos; interactive sessions with students; laboratory experiments and design projects; formative and summative assessments (tutorials, assignments, essays, tests and exams).

Assessment methods: Integrated assessments with be used, which will involve both formative and summative assessments. The following is a list formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects. Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%.

Module code: ELYM624	Semester 1	NQF-Level: 8
Title: Computational Methods		
Module outcomes: The student should acquire skills in the translation of physical problems into models that can be manipulated on a computer, designing and building such models using a high level programming language like Fortran		
Method of delivery:		
Assessment methods:		
Module code: ELYM625	**Semester 1**	**NQF-Level: 8**
Title: Embedded Controllers		
Module outcomes: The student should demonstrate a thorough knowledge of embedded controller architecture, applications, programming and interfacing with the external world. The student should be very familiar with the PIC series of micro-controllers at both the hardware level and the software level, in particular the PIC16f877.		
Method of delivery:		
Assessment methods:		
Module code: ELYM626	**Semester 1**	**NQF-Level: 8**
Title: Electromagnetics		
Module outcomes: Students should acquire theory and methods applied in the solution of relatively rigorous electromagnetic problems such as scattering from objects of arbitrary shapes, and ability to design and analyse antennas for various applications in communication.		
Method of delivery:		
Assessment methods:		
Module code: ELYM671	**Semester 1**	**NQF-Level: 8**
Title: Honours Project		
Module outcomes: The student should acquire the ability to formulate a problem, research it and arrive at a solution, and present the solution in a coherent and professional manner in the form of a report, a working model and other outputs. The ability to use the library and other resources is also a clear outcome.		
Method of delivery:		
Assessment methods:		
Module code: ENTM616	**Semester 1**	**NQF-Level: 8**
Title: Applied Entomology		
Module outcomes: Recognize insect pest-structure, life histories and behaviour. Taxonomy of insect pest-importance in veterinary science, medicine stored product, agriculture and medicine		

Method if delivery:		
Assessment methods:		
Module code: EXTM 514	**Semester 1**	**NQF-Level: 8**
Title: Rural Community Development		
Module outcomes: To be able to identify and apply different community development theories and models, give advise to agrocilyural stakeholders on rural develpment strategies, develop a rural devcelopment strategy, analyse rural community development programmes.		
Method if delivery:		
Assessment methods:		
Module code: EXTM 515	**Semester 1**	**NQF-Level: 8**
Title: Essentials of Agricultural Extension		
Module outcomes: To able to demonstrate an understanding of community development theories and models, identify relevant technologies in community development, develop a rural development strategy and give advise agricultural stakeholders on rural development strategies		
Method if delivery:		
Assessment methods:		
Module code: EXTM 516	**Semester 1**	**NQF-Level: 8**
Title: Elements of Communication in Extension		
Module outcomes: To able to identify and use the elements of communication process, analyse the elements of communication process in extension, use different communication methods in extension, and develop a communication strategy in extension		
Method if delivery:		
Assessment methods:		
Module code: EXTM 525	**Semester 2**	**NQF-Level: 8**
Title: Research Methods and Project		
Module-outcomes: Demonstrate knowledge of and understanding of agricultural extension research methods, Engage in this field to be able to identify a research proposal and formulate a proposal in the agricultural extension environment, Demonstrate the ability to critically review information gathering, synthesise data, evaluate and manage information, Be able to prepare and present information using appropriate information technology and write a report offering creative insights, interpretations		

and solutions to problems in this field of study		
Method if delivery:		
Assessment methods:		
Module code: EXTM 526	**Semester 2**	**NQF-Level: 8**
Title: Change in Agriculture		
Module outcomes: To able to demonstrate an understanding of agricultural and rural development models, demonstrate understanding of the development strategy, identify and develop an agricultural development strategy and identify factors affecting and promoting chande in agriculture.		
Method if delivery:		
Assessment methods:		
Module code: EXTM 527	**Semester 2**	**NQF-Level: 8**
Title: Leadership Development in Extension		
Module outcomes: To able to demonstrate an understanding of leadership principles, identify different leadership types and tasks, give advise to agricultural stakeholders, promote participation in leadership process.		
Method if delivery:		
Assessment methods:		
Module code: FSCM611	**Semester 1**	**NQF-Level: 8**
Title: Agricultural Statistics		
Module outcomes: • develop appropriate statistical hypothesis and design for different research problems, • recognize when and how to apply some widely used hypotheses testing procedures, • apply analysis of variance (ANOVA) procedures to test hypotheses from widely recognized experimental designs		
Method if delivery: Contact lecture and practical data analysis using commercial statistical software from well recognized experimental designs in agriculture		
Assessment methods: Formative assessment for this module will include practical assignments and tests. Assignments are designed to assist learners in mastering the concepts covered in each study unit. There will be two tests, the first test will be based on 50% of the study material and the second test will be based on the remaining 50% of the study material.		

Module code: FSKH611 Will become NPHY611	Semester 1	NQF-Level: 8

Title: **Classical Mechanics**

Module-outcomes:
Upon completion of this course the student should be able to derive, understand and be able to apply the following by identifying problems and solving them creatively:

- Newtonian mechanics
- Lagrangian mechanics including the derivation of constraints and formulating the Lagrange function and solving these problems using the Euler-Lagrange equations
- Central-force problems and rigid-body problems
- Hamiltonian mechanics including Legendre transformations, canonical transformations, and canonical invariants
- Noether's theorem: Deriving conservation laws and finding symmetries
- Particle collisions

Method of delivering: Full Time

Assessment methods:
Home assignments, class tests, examination

Module code: FSKH612 Will become NPHY612	Semester 1	NQF-Level: 8

Title: **Quantum Mechanics** I

Module-outcomes:
Upon completion of this course the student should understand the basic principles of quantum mechanics and its implication on the atomic and sub-atomic level:

- Understand the central concepts and principles of quantum mechanics: the Schrödinger equation, the wave function and its physical interpretation, stationary and non-stationary states, time evolution and expectation values.
- Interpret and discuss physical phenomena in light of the uncertainty relation.
- Gain a basic understanding of the formalism and 'language' of quantum mechanics and how it relates to linear algebra.
- Grasp the concepts of spin and angular momentum, as well as their quantization- and addition rules.

Secondly, the student should master the basic mathematical methods used in quantum mechanics:

- Be able to independently solve the Schrödinger equation for simple one-dimensional systems.
- Use the solution to compute probabilities, expectation values, uncertainties and time evolution.
- Similarly, solve simple problems in two and three dimensions in various coordinate systems, e.g. by using separation of variables in the Schrödinger equation.
- Give concise physical interpretations and arguments for the validity of the mathematical solutions.

- Be able to work in Dirac and matrix notation.

Method of delivering: Full Time

Assessment methods:
Class tests, dicussions, assignments, examination

Module code: FSKH613 **Will become NPHY 613**	**Semester 1**	**NQF-Level: 8**

Title: **Electrodynamics**

Module-outcomes:
The students will develop an understanding of

- the potential formulation of electrodynamics
- dipole radiation
- radiation from accelerated point charges
- applications of radiation theory to astrophysically important rdiation mechanisms
- relativistic electrodynamics.

Method of delivering: Full Time

Assessment methods:
Weekly homework assignments, class participation, class tests and final examination.

Module code: FSKH614 **Will become NPHY631**	**Semester 1**	**NQF-Level: 8**

Title: **Plasma Physics elective**

Module-outcomes: Upon completion of this course the student would:

- Have a general knowledge of the occurrence of plasmas, especially space plasmas, and the applications of plasma physics.
- Be able to describe the motion of singly charged particles in increasingly complex electric and magnetic fields.
- Derive and understand the meaning of a complete set of fluid equations for a plasma.
- Have a working knowledge of plasma wave properties, specifically plasma oscillations, electron plasma waves, ion (acoustic) waves and electromagnetic waves in magnetic fields with different orientations.
- Understand diffusion and mobility in weakly-ionised gases and diffusion in fully-ionised plasmas.
- Understand the meaning of distribution functions, and study the equations of kinetic theory.
- Apply the above knowledge to identify and creatively solve problems in plasma physics.

Method of delivering: Full-time

Assessment methods:
Class tests, discussions, assignments, examination

Module code: FSKH671 **Will become NPHY671**	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Project I**

Module-outcomes:
Upon completion of this module, the student should be familiar with the particular research methodology of one, or a combination of, Physics, Astronomy and Astrophysics, Space Physics, and Physics in Application, which includes

- with guidance, to identify and scientifically formulate a problem statement
- a thorough investigation of existing advanced knowledge as reflected in relevant scientific literature
- to conduct appropriate research for solving the problem
- scientific evaluation of the results within the context of the problem statement, and
- scientific communication of the results in the form of a report and presentation

Method of delivering: Full Time- Research & Presentation

Assessment methods:
Student will be assessed in an integrated manner on:

- identifying a problem in one of or a combination of Physics, Astronomy and Astrophysics, Space Physics, and Physics in Application, and the scientific formulation of such problem
- a scientific literature study
- conducting relevant research utilising appropriate methodology towards solving the problem
- scientific evaluation of the results within the context of the problem statement, and
- scientific communication of the results in the form of a report which meets the requirements of scientific prescriptions

Module code: FSKH621 **Will become NPHY 636**	**Semester 2**	**NQF-Level: 8**

Title: **Quantum Mechanics II**

Module outcomes: Upon successful completion of this module the student should have a formal knowledge of the physical and mathematical basis of the following aspects in quantum mechanics:

- Non-degenerate and degenerate perturbation theory
- Application of the above to the hydrogen atom
- Multiparticle systems
- Time-dependent perturbation theory and the application thereof on radiative transitions in simple systems
- The semi-classical description of the interaction between radiation and charged particles
- Quantization of the electromagnetic field.

Apart from the formal aspects, students will also apply their knowledge to solving relevant quantum-mechanical problems covering all of the above aspects.

Method of delivering: Contact (Lectures)

Assessment methods:
Class tests, homework problems, examination.

Module code: FSKH622 Will become NPHY621	Semester 2	NQF-Level: 8
Title: **Statistical Mechanics**		
Module-outcomes: 1. Knowledge of Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein statistics for the description of classical and quantum-mechanical thermodynamic systems. 2. A wide range of applications on laboratory and astrophysical systems, by way of problem solutions and computational physics		
Method of delivering: Full Time- Lectures		
Assessment methods: Class tests, homework problems, examination. Participation mark (40%) calculated from frequent class tests and assignments; 60% from final exam.		
Module code: FSKH623 Will become NPHY622	**Semester 2**	**NQF-Level: 8**
Title: **Computer Physics**		
Module-outcomes: After completing this module the student will have the skills and necessary background knowledge to • Solve differential equations (partial and ordinary) as applicable to classical physics of which examples include planetary motion, oscillatory systems, wave propagation, trajectories of moving bodies and potentials and fields • Apply the fast Fourier transform and calculate a power spectrum from signals or periodic data. • Simulate physical systems involving stochastic processes (e.g. random walk and diffusion) using Monte Carlo methods. • Be able choose an appropriate scheme to integrate and differentiate numerically. • To compute, visualize and communicate data and results in a scientific manner. Throughout this course you will also learn about and use additional software packages (tools) and become more familiar with a scientific programming language.		
Method of delivering: Full Time (Research)		
Assessment methods: Student will be assessed by means of assignments in the form of limited dissertations pertaining to particular problems and the solving of these using a computer. The student has to demonstrate that he/she has mastered a particular technique and found the correct solution, and must present this scientifically.		
Module code: FSKH672 will phase out	**Semester 1 & 2**	**NQF-Level: 8**
Title: **Project II**		
Module-outcomes: Upon completion of this module, the student should be familiar with the particular research methodology of one or a combination of Physics, Astronomy and		

Astrophysics, Space physics, and Physics in Application, which includes:

- with guidance, to identify and scientifically formulate a problem statement
- a thorough investigation of existing advanced knowledge as reflected in relevant scientific literature
- to conduct appropriate research for solving the problem
- scientific evaluation of the results within the context of the problem statement, and
- scientific communication of the results in the form of a report

Method of delivering: Full Time (Navorsing)

Assessment methods:
Student will be assessed in an integrated manner on:

- identifying a problem in one of, or a combination of, Physics, Astronomy and Astrophysics, Space Physics, and Physics in Application, and the scientific formulation of such problem
- a scientific literature study
- conducting relevant research utilising appropriate methodology towards solving the problem
- scientific evaluation of the results within the context of the problem statement, and
- scientific communication of the results in the form of a report which meets the requirements of scientific prescriptions.

Module code: GEOM611	**Semester 1**	**NQF-Level: 8**

Title: Geography, Ideas And Methods

Module outcomes:

Students Will be able to explain and synthesize the main ideas, methods and developments in the field of geography. The following topics will be covered, Geography, development since ancient times to and including 19th and 20th century movements such as the Gaia hypothesis, role of GIS.

Method of delivering: Full Time

Assessment methods:

Module code: GEOM612	**Semester 1**	**NQF-Level: 8**

Title: Selected Fields In Human Geography

Module outcomes:

The learner should acquire sufficient expertise in an area of study to proceed to a master of arts program. The following topics will be covered, Any of the sub-disciplines of human geography, cultural, economic, agricultural, historical, environmental, urban, population, industrial, rural and so on.

Method of delivering: Full Time

Assessment methods:

Module code: GEOM613	Semester 1	NQF-Level: 8
Title: Geographic Information Systems Techniques		
Module outcomes: To understand the GIS theories and technical issues. Topic to be covered; Data collection, inputs and accuracy. Data quality and standards. Creating and maintainingdatabases. GIS visualization products and cartographic communication. Spatial analysis. Project management and GIS implementation		
Method of delivering: Full Time		
Assessment methods:		

Module code: GEOM614	Semester 1	NQF-Level: 8
Title:Environment Problems and Management in Africa		
Module outcomes: Students will understand the environmental and management problems of Africa as a whole and Southern Africa in particular. The following topics will be covered, environmental problems in Africa and environmental management in South Africa.		
Method of delivering: Full Time		
Assessment methods:		

Module code: Old code: GEO 757 New code: GEOM 621	Semester 1or 2	NQF-Level: 8
Title: Techniques And Methods In Geography		
Module outcomes: Students will be able to use techniques to do independent geographic research and they will cover the following topics, Selected field work techniques in human geography. Selected fieldwork techniques in physical in physical geography. Introduction and application of remote sensing. Introduction and application of GIS. Introduction and application of GPS		
Method of delivering: Full Time		
Assessment methods:		

Module code: Old code: GEO 767 New code: GEOM 622	Semester 1or 2	NQF-Level: 8
Title: Selected Fields in Physical Geography		

Module outcomes:

The learner should acquire sufficient expertise in an area of study to proceed to an MSc and the topics to be covered are any of the sub-disciplines of geomorphology.

Method of delivering: Full Time

Assessment methods:

Module code: Old code: GEO 787 New code: GEOM 623	**Semester 1or 2**	**NQF-Level: 8**

Title: Applications In Geographic Information Systems

Module outcomes:

Students must be able to demonstrate knowledge of the theoretical aspects of managing a GIS, practical project management skills and use of different GIS applications. Databases and data analysis; GIS managemnt and applications . G-bussiness: GIS assets, constraints, risks and strategies, Operational aspects of GIS, New developments in GIS , Software training in ArcGIS.

Method of delivering: Full Time

Assessment methods:

Module code: Old code: GEO 797 New code: GEOM 624	**Semester 1or 2**	**NQF-Level: 8**

Title: Rural Geography

Module outcomes:
Students will achieve competency in the critical analysis of changing rural landscapes and production systems. The following topics will be covered, an analysis of the ways in which rural production systems and landscape are changing with particular emphasis on South Africa.

Method of delivering: Full Time

Assessment methods:

Module code: Old code: GEO 798 New code: GEOM 671	**Semester 1or 2**	**NQF-Level: 8**

Title: Research Project

Module outcomes:

The ability to produce a research report

Method of delivering: Full Time

Assessment methods:

Module code: GGFS671	Semester 1 & 2	NQF-Level: 8

Title: **Introduction to Earth Observation**

Module-outcomes:

On completion of the module, the candidates should be able to demonstrate:

1. integrated knowledge of the principles and fundamentals of earth observation and a critical understanding regarding its application to environmental science,
2. ability to interrogate multiple sources of knowledge, including primary scientific sources, to evaluate the application of earth observation to environmental science to build knowledge and processes of knowledge production,
3. ability to apply and critically judge the relevance of a range of observation methods, as well as an awareness of the spatial and temporal context of the different methods, to obtain information about an earth system process, in order to solve practical and theoretical problems,
4. ability to analyse, select and apply scientific research methods to observations in order to address environmental problems and then to communicate the findings in an academically appropriate format,
5. the ability to identify, critically reflect on and effectively solve problems by using appropriate observations from a variety of different platforms,
6. demonstrate an awareness of the scope and complexity of ethical and value systems from both the environmental and human perspective with regard to earth observation.

Module uitkomste:

Na voltooiing van die module, moet die student die volgende kan demonstreer:

1. geïntegreerde kennis van die beginsels en grondslae van aardwaarneming en 'n kritiese begrip ten opsigte van die toepassing daarvan in omgewingswetenskappe;
2. die vermoë om veelvoudige kennisbronne te ontgin, insluitend primêre wetenskaplike bronne, om die toepassing van aardwaarneming in omgewingswetenskappe te evalueer ten einde kennis en kennisgenererende prosesse te bemeester;
3. die vermoë om 'n reeks waarnemingsmetodes toe te pas en die toepaslikheid daarvan krities te evalueer, asook 'n bewustheid van die ruimtelike en temporele konteks van die verskillende metodes, te einde inligting oor 'n aardstelproses in te win met die oog op die oplossing van teoretiese en praktiese;
4. die vermoë om wetenskaplike navorsingsmetodes te analiseer, te selekteer en effektief toe te pas op aardwaarneming ten einde omgewingsprobleme aan te spreek, en om die bevindinge op 'n akademiese aanvaarbare wyse te kommunikeer;
5. die vermoë om probleme te identifiseer, krities daarop te reflekteer en effektief op te los met behulp van toepaslike waarnemings vanaf 'n verskeidenheid platforms;
6. 'n bewustheid van die omvang en kompleksiteit van etiese en waardestelsels vanuit beide die omgewings- en menslike perspektief met betrekking tot aardwaarneming data.

Method of delivering: Full Time

Assessment methods:

Module code: GGFS672	Semester 1 & 2	NQF-Level: 8

Title: **Air pollution**

Module-outcomes:

On completion of the module students should be able to:

1. Integrate multiple sources of information and knowledge to assess air quality of an area, accounting for air pollution emissions, ambient air quality, transport of air pollutants and prevailing meteorology;
2. Understand and critically assess the principles and implementation of air pollution modelling;
3. Independently investigate literature on the current state of knowledge, recognise current research needs and formulate appropriate research responses in the area of air pollution;
4. Demonstrate the ability to provide insight as an expert and provide potential solutions for an area experiencing air pollution problems;
5. The ability to take full responsibility for his/her work and to recognise the moral and ethical issues that relate to air pollution information and data collection and to conduct him/herself in the appropriate manner.

Module uitkomste:

Na voltooiing van die module moet die student in staat te wees om:

1. *verskeie inligtingsbronne en kennis te integreer om die lugkwaliteit van 'n bepaalde gebied te bepaal, deur die bronne van lugbesoedeling, buitelug-luggehalte, vervoer van lugbesoedelstowwe in die atmosfeer en heersende meteorologie in berekening te bring;*
2. *die beginsels en toepassing van lugbesoedelingmodellering te verstaan en krities te evalueer;*
3. *onafhanklik die literatuur oor die huidige stand van kennis te ondersoek, die huidige navorsingsbehoeftes te herken en 'n toepaslike navorsingsbenadering te formuleer op die vakgebied van lugbesoedeling;*
4. *die vermoë te demonstreer om as 'n kenner insig en moontlike oplossings vir 'n gebied met lugbesoedelingsprobleme, te verskaf;*
5. *om volle verantwoordelikheid vir sy/haar werk te neem en om die morele en etiese kwessies rondom die versameling van lugbesoedelingsinligting en -data te herken en op 'n gepaste wyse daarmee om te gaan.*

Method of delivering:

Assessment criteria:

Students have mastered the outcomes if they are able to:

1. Source, integrate and interpret literature independently;
2. Understand the input requirements of air pollution models, interpret air pollution modelling outputs and understand and account for their limitations;
3. Integrate collected knowledge and data to assess the air quality of a region taking into account:

a. pollution emissions
b. ambient air quality
c. atmospheric transport of pollutants from the area and outside the area
d. the prevailing meteorology

e independently identify research needs in air pollution and devise a research plan to investigate appropriate solutions.

Module code: HDGH 611	**Semester 1**	**NQF-Level: 8**

Title: Geohydrology

Module outcomes:

After completion of the module, the student will demonstrate knowledge and critical comprehension of the following:

- Basic groundwater terminology and definitions.
- Borehole slug test analysis and interpretation thereof.
- Various borehole pump test techniques and the application thereof; including the analysis and interpretation of pump test results.
- Identification of groundwater flow regimes and fracture positions based on pump test data.
- Borehole tracer tests and the application thereof.
- Calculation / estimation of the sustainable yield of a borehole.
- Recharge calculation methods and the application thereof.
- Groundwater assessments and groundwater Reserve determinations.
- Applicable interpolation techniques for the generation of groundwater level maps.
- Basic groundwater modelling concepts both on regional and local scale.

Na voltooiing van die module sal die student kennis en kritiese begrip te demonstreer van die volgende:

- *Basiese grondwater terminologie en definisies.*
- *Boorgat giettoets analise en interpretasie.*
- *Verskeie boorgatpomp toets tegnieke en die toepassing daarvan, insluitend die analise en interpretasie van die pomp toetsuitslae.*
- *Identifisering van grondwater vloei patrone en fraktuur posisies gebaseer op pomp toetsdata.*
- *Boorgat speur toetse en die toepassing daarvan.*
- *Berekening / skatting van volhoubare opbrengs van 'n boorgat.*
- *Aanvulling berekeningsmetodes en die toepassing daarvan.*
- *Grondwater asseserings en grondwater reserwe bepalings.*
- *Toepaslike interpolasie tegnieke vir grondwatervlak karate.*

Basiese grondwater modellering konsepte beide op streek- en plaaslike skaal.

Method of delivering: Full Time

Assessment methods:

- Participation Mark = Class Tests (50%) + Assignments (50%)
- Examination Mark = Written Examination (100%)
- Final Mark = Participation Mark (50%) + Examination Mark (50%)
- Requirements for successful completion of the module:
    - All assignments must be completed.
    - Examination minimum of 50%
- *Deelnamepunt = Klastoetse (50%) + Opdragte (50%)*
- *Eksamenpunt = Geskrewe Eksamen (100%)*

- *Finalepunt = Deelnamepunt (50%) + Eksamenpunt (50%)*
- *Vereistes vir die suksesvolle voltooiing van die module:*
    - *Alle opdragte moet voltooi wees.*

Eksamen minimum van 50 %

Module code: HDGH 612	**Semester 1**	**NQF-Level: 8**

Title: Environmental hydrology

Module outcomes:
Module outcomes:
On completion of the module, the candidates should be able to demonstrate:
1. A comprehensive knowledge of key terms and concepts used in hydrology.
2. A background knowledge of the physical processes involved in hydrology related to the occurrence, circulation and distribution of water.
3. A working knowledge of available tools and methods used for hydrological computation and measurement.
4. The ability to interrogate, analyse and manage multiple sources of data for hydrological computation and measurement.
5. The ability to identify and effectively solve practical hydrological problems through the means of applied scientific methodologies.
Na voltooiing van die module, moet die student die volgende kan demonstreer:
1. 'n Omvattende kennis van sleutelterme en konsepte wat in hidrologie gebruik word.
2. 'n Agtergrondkennis van die fisiese prosesse betrokke by hidrologie wat verband hou met die voorkoms, sirkulasie en verspreiding van water.
3. 'n Werkende kennis van beskikbare gereedskap en metodes wat gebruik word vir hidrologiese berekening en meting.
4. Die vermoë om verskeie bronne van data vir hidrologiese berekening en meting te ondervra, te analiseer en te bestuur.
5. Die vermoë om praktiese hidrologiese probleme deur middel van toegepaste wetenskaplike metodologieë te identifiseer en effektief op te los.

Method of delivering: Full Time

Assessment methods:
Assessment methods:

- Participation Mark = Class Tests (50%) + Assignments (50%)
- Examination Mark = Written Examination (100%)
- Final Mark = Participation Mark (50%) + Examination Mark (50%)
- Requirements for successful completion of the module:
    - All assignments must be completed.
    - Examination minimum of 50%
- *Deelnamepunt = Klastoetse (50%) + Opdragte (50%)*
- *Eksamenpunt = Geskrewe Eksamen (100%)*
- *Finalepunt = Deelnamepunt (50%) + Eksamenpunt (50%)*
- *Vereistes vir die suksesvolle voltooiing van die module:*
    - *Alle opdragte moet voltooi wees.*

Eksamen minimum van 50 %

Module code: HDGH 613	Semester 1	NQF-Level: 8

Title: Spatial analysis

Module outcomes:

At the end of the module the student should be able to demonstrate:

1. An integrated knowledge of analytical procedures within GIS.
2. An ability to critically interrogate multiple sources of information within the field of GIS, and critically evaluate and review the information and the manner in which it was produced.
3. The ability to assess and interpret spatial and temporal data to address real world problems.
4. Advanced ability to effectively apply GIS processes to hydrological/geohydrological data analyses e.g. the generation of water level maps, catchment delineation, etc.
5. Proficiency in the use of GIS techniques to create maps related to the field of hydrology and geohydrology that can effectively convey the information.
6. The ability to analyse, select and effectively apply scientific research methods to address hydrological/geohydrological problems and then communicate the research findings in an appropriate academic format.

Aan die einde van die module moet die student in staat wees om die volgende te demonstreer:

1. Geëintegreerde kennis van die analitiese prosedures relevant tot GIS.
2. Die vermoë om veelvoudige inligtingsbronne in GIS te ondersoek en om inligting en inligtingsgenererende prosesse krities te evalueer.
3. Die vermoë om ruimtelike en temporale data toe te pas en te interpreteer om werklike wêreldprobleme aan te spreek.
4. Die gevorderde vermoë om GIS prosesse effektief toe te pas op ruimtelike data analises insluitend die skep van watervlak kaarte, afbakening van opvanggebiede, ens.
5. Vaardighede in die gebruik van GIS tegnieke om hidrologiese en geohidrologiese probleme aan te spreek en doelmatige kaarte wat relevante inligting doeltreffend oordra.
6. Die vermoë om wetenskaplike navorsings metodes te analiseer, selekteer en effektief toe te pas op hidrologiese/geohydrologiese probleme en die bevindinge op 'n toepaslike akademiese wyse te kommunikeer.

Method of delivering: Full Time

Assessment methods:

- Participation Mark = Class Tests (50%) + Assignments (50%)
- Examination Mark = Written Examination (100%)
- Final Mark = Participation Mark (50%) + Examination Mark (50%)
- Requirements for successful completion of the module:
  - All assignments must be completed.
  - Examination minimum of 50%
- Deelnamepunt = Klastoetse (50%) + Opdragte (50%)
- Eksamenpunt = Geskrewe Eksamen (100%)
- Finalepunt = Deelnamepunt (50%) + Eksamenpunt (50%)
- Vereistes vir die suksesvolle voltooiing van die module:
  - Alle opdragte moet voltooi wees.
  - Eksamen minimum van 50 %

Module code: HDGH 621	Semester 2	NQF-Level: 8

Title: Hydrochemistry

Module outcomes:

- The ability to apply knowledge of the theories, research methodologies, and techniques relevant to Hydrochemistry and demonstrate the ability to interrogate and evaluate multiple sources of knowledge in this field.
- The ability to understand the complexities and uncertainties of selecting and applying appropriate procedures or techniques to conceptualize and solve problems pertaining to the field of hydrochemistry.
- Key focus areas of this module will include hydrochemistry theory applicable to environmental related problems. This will include current methodologies and theory used in Industry.
- The ability to apply a range of specialised skills in the field of Hydrochemistry through the analysis of problems, drawing on previous knowledge and a range of methods appropriate to the field.
- The ability to produce accurate, coherent and appropriate presentation of research findings and the communication thereof.
- The ability to apply self-critical learning skills with the use of specific learning strategies of known and new resources to successfully realize all outcomes of this module.\
- Die vermoë om kennis van die teorieë, navorsingsmetodologieë en tegnieke relevant tot Hidrochemie toe te pas en die vermoë demonstreer om verskeie bronne van kennis in hierdie veld te ondersoek en evalueer.
- Die vermoë om die kompleksiteit en onsekerhede te verstaan wat saamhang met die seleksie, toepassing en gebruik van toepaslike prosedures of tegnieke om problem in die veld van hidrochemie te konseptualiseer en op te los.
- Die module se hoofsaaklik fokus op hidrochemie teorie wat toepassing vind in omgewingsverwante problem. Dit sal dus teorie en metodologieë insluit wat huidiglik in die industrie gebruik word.
- Die vermoë om 'n verskeidenheid van gespesialiseerde vaardighede toe te pas in die Hidrochemiese veld deur die ontleding van komplekse probleme, gebruik van vorige kennis en verskeidenheid van metodes wat geskik is vir hierdie veld.
- Die vermoë om akkurate, logiese en gepaste en aanbiedinge te produseer asook die kommunikasie daarvan.
- Die vermoë om self- kritiese leer toe te pas met die gebruik van spesifieke strategieë van bekende en nuwe leerhulpbronne om al die uitkomste van hierdie module suksesvol te bereik.

Method of delivering: Full Time

Assessment methods:

- Participation Mark = Class Tests (50%) + Assignments (50%)
- Examination Mark = Written Examination (100%)
- Final Mark = Participation Mark (50%) + Examination Mark (50%)
- Requirements for successful completion of the module:
  - All assignments must be completed.
  - Examination minimum of 50%
- Deelnamepunt = Klastoetse (50%) + Opdragte (50%)
- Eksamenpunt = Geskrewe Eksamen (100%)
- Finalepunt = Deelnamepunt (50%) + Eksamenpunt (50%)
- Vereistes vir die suksesvolle voltooiing van die module:
  - Alle opdragte moet voltooi wees.
  - Eksamen minimum van 50 %

Module code: ITRI611	**Semester 1**	**NQF-Level: 8**

Title: **Data Warehouses I**

Module-outcomes:

At the end of this module the student should have insight and a basic knowledge of data warehousing. Students should have sufficient theoretical knowledge to participate in discussion with practitioners. Furthermore, students should be able to develop a small data warehouse according to a prescribed methodology until the data presentation phase. On theoretical level, the student should have insight and a basic knowledge of the following concepts of data warehousing: General data warehousing concepts; the data warehouse lifecycle; alternative data warehousing methodologies; dimensional modelling; requirements collection; extract, load and transform (ETL) functions. From a practical perspective, students should demonstrate the ability to: Understand user requirements; setup suitable software products; develop a dimensional model; perform ETL; create a data warehouse browser. Suitable documentation should be developed for the practical work.

Module uitkomste:

Na voltooiing van hierdie module behoort die student 'n insig in en basiese kennis te hê van datapakhuise. Studente behoort voldoende kennis te hê om met praktisyns in gesprek te tree. Daarbenewens behoort studente 'n klein datapakhuis volgens 'n voorgeskrewe metodologie tot by die data-aanbiedingsfase te kan ontwerp. Op teoretiese vlak behoort die student insig in en basiese kennis te hê van die volgende begrippe van datapakhuise: algemene datapakhuisbegrippe; die lewensiklus van die datapakhuis; alternatiewe datapakhuismetodologieë; dimensionele modellering; versameling van vereistes; en ekstraheer- laai- en transformeer- (ETL) funksies. Vanuit 'n praktiese perspektief beskou, behoort studente die vermoë te demonstreer om: gebruikersbenodigdhede te begryp; geskikte programmatuurprodukte op te stel; 'n dimensionele model te ontwikkel; ETL uit te voer; en 'n datapakhuisblaaier te skep. Geskikte dokumentasie behoort vir die praktiese werk ontwikkel te word.

Method of delivering: Full Time / Part Time

Assessment methods:

Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI612	Semester 1	NQF-Level: 8
Title: **Linear Programming I**		
Module-outcomes: After completion of this module, students should know the following and be able to apply it: ▪ Introduction to modelling and linear programming ▪ Linear algebra and geometric representations ▪ The simplex method ▪ Artificial variables and convergence aspects ▪ Implementation aspects, data handling and optimisation ▪ Duality and sensitivity analysis Complexity aspects and other algorithms		
Method of delivering: Full Time / Part Time		
Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).		
Module code: ITRI613	**Semester 1**	**NQF-Level: 8**
Title: **Databases I**		
Module-outcomes: ITRI613 involves the studying of advanced database management systems and administration. Advanced aspects such as query optimization and analysis are covered and this is supported by practical work which focusses on large data sets. The module has two study divisions: Study Division 1: The aim of this division is to provide the student with the necessary background knowledge on the theory and application of databases. Furthermore, the base is determined regarding the knowledge and skills to know the typical architecture of a Database Management System (DBMS) and do the basic calculations regarding large-scale databases to determine the cost implications of specific approaches of large-scale databases. Study Division 2: The aim of this division is to provide the student with the necessary knowledge and skills to create, implement and maintain large-scale databases (VLDB) and manage possible problems. Outcomes of the module: On completion of division 1 students should be able to: • Discuss the purpose and architecture of a typical Database Management System (DBMS); • Write SQL statements in Relational Algebra (RA), convert a RA to SQL and to discuss a RA as basis for a query; • Describe the way SQL and other approaches are supposed to execute; • Explain the way large files are managed and do calculations to determine the cost implications; • Describe the organization of different index approaches and do calculations to determine the cost implications. On completion of division 2 students should be able to: • Describe the architecture of a Database Management System and prepare the Database Environment according to a well-known DBMS like Oracle or SQL Server; • Apply typical functions of a DBA that may include: creating a database; managing DB storage; administering user security; managing schema objects;		

managing data and concurrency; Undo Data; implementing DB security and handle Database maintenance and backups.

Module uitkomste:

ITRI613 behels die bestudering van gevorderde databasisbestuurstelsels (DBBS) en die administrasie daarvan. Gevorderde aspekte soos navraagoptimering en analise word gedek en dit word ondersteun deur praktiese werk wat fokus op groot data stelle. Die module bestaan uit twee leerafdelings:

Leerafdeling 1: Die doel van hierdie afdeling is om die student die nodige agtergrondkennis oor die teorie en toepassing van databasisse te gee. Verder word die basis vasgelê ten opsigte van kennis en vaardighede om die tipiese argitektuur van ? databasisbestuurstelsel (DBBS) te ken en die basiese berekenings te kan doen om die koste-implikasies van bepaalde benaderings ten opsigte van grootskaalse databasisse te bepaal.

Leerafdeling 2: Die doel van hierdie afdeling is om die student met die nodige kennis en vaardighede toe te rus om grootskaalse databasisse te kan skep, implementeer en in stand te hou asook om moontlike probleme te bestuur.

Uitkomste van die module:

Na voltooiing van leereenheid 1, behoort studente in staat te wees om:

- *Die doel en argitektuur van ? tipiese databasisbestuurstelsel (DBBS) te ken en te bespreek;*
- *? SQL uitdrukking in relasie-algebra (RA) te kan skryf, dit te kan omskakel na SQL en ? RA uitdrukking as basis vir ? navraag te kan bespreek;*
- *die wyse te bespreek wat SQL en ander benaderings veronderstel is om uit te voer;*
- *die wyse te verduidelik waarvolgens groot lêers bestuur word en berekenings te doen om koste-implikasies te bepaal;*
- *die organisering en werking van verskeie indeksbenaderings te beskryf en berekenings te doen om die koste-implikasies te bepaal.*

Na voltooiing van leereenheid 2, behoort studente in staat te wees om:

- *die argitektuur van ? Databasisbestuurstelsel (DBBS) te kan beskryf en ? databasisomgewing te kan voorberei volgens welbekende DBBSs soos Oracle of SQL Server;*
- *tipiese funksies van ? DBA te kan toepas wat insluit: skep van ? DB; bestuur van DB stoor; administrering van sekuriteit; bestuur van skema objekte; bestuur van data en gelyktydige gebruikers/transaksies; herstel (Undo) van aksies; implementering van sekuriteit en hantering DB instandhouding en rugsteun.*

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI614	Semester 1	NQF-Level: 8

Title: **Information Systems Engineering I**

Module-outcomes:

- After the successful completion of this module, the student must be able to demonstrate:
- integrated knowledge of basic project management skills and critical understanding and application of frameworks, models, tools and techniques relevant to the information technology project environment,
- the ability to select, apply and critically judge the effectiveness of the implementation of relevant/appropriate methods, techniques and tools to complete an IT project,
- advanced ability to effectively explain how the project management knowledge areas and process groups are related with a view to IT project management,
- an ability to critically explore the project management knowledge areas (scope, time, cost, quality, human resources, communication, risk, stakeholder and procurement) and critically evaluate and review that knowledge and the manner in which the knowledge relates to IT project management,
- ability to communicate effectively in a variety of formats (oral, written, visual and electronic) to diverse audiences and for various purposes in the context of IT project management,
- the ability to complete a project where theoretical project management principles will be applied to a realistic IT related case study.

Module uitkomste:

- *Na voltooiing van hierdie module, moet die student in staat wees om die volgende te demonstreer:*
- *geïntegreerde kennis van basiese projekbestuursvaardighede en kritiese verstaan en toepassing van raamwerke, modelle, werktuie en tegnieke relevant tot die inligtingstegnologie projek omgewing*
- *die vermoë om die effektiwiteit van die implementering van relevante/gepaste metodes, tegnieke en werktuie te kies, toe te pas en krities te evalueer om 'n IT projek te voltooi*
- *gevorderde vermoë om die verwantskap tussen die projekbestuur kennisareas en prosesgroepe met verwysing na IT projekbestuur effektief te verduidelik*
- *die vermoë om die projekbestuurkennisareas (omvang, tyd, koste, kwaliteit, menslike hulpbronne, kommunikasie, risiko, belanghebbendes en verskaffing) krities te ondersoek en daardie kennis en die wyse waarop die kennisareas relevant is tot IT projekbestuur, krities te evalueer en te hersien*
- *die vermoë om effektief te kan kommunikeer met diverse gehore, in 'n verskeidenheid van formate (mondelings, geskrewe, visueel en elektronies) met verskillende doelwitte in die konteks van IT projekbestuur*
- *die vermoë om ' n projek te voltooi waar die teoretiese projekbestuurbeginsels toegepas sal word in 'n IT-verwante gevallestudie*

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI615	Semester 1	NQF-Level: 8

Title: **Computer Security I**

Module-outcomes:

- Discuss concepts of computer and information security and weaknesses in computerized environments and understand how the threats can be controlled.
- Know basic encryption and decryption schemes as well as the most important encryption systems generally used.
- Construct and validate encryption algorithms in a programming language of their choice.
- Understand operating system controls, and reliable operating systems.
- Identify security problems in computer systems, programs and information in businesses and recommend measures to address these.
- Understand that security systems and controls should be completed meticulously and in the agreed manner and that confidential information should be treated as such.
- Understand that computer resources should be used ethically and responsibly.
- Investigate and explain current and new trends in information security.

Module uitkomste:

- *Konsepte van rekenaar- en inligtingsekuriteit en swakplekke in gerekenariseerde omgewings te beskryf en te verstaan hoe sulke bedreigings gekontroleer kan word.*
- *Basiese enkripsie- en dekripsie-skemas assok die belangrikste enkripsiestelsels wat algemeen gebruik word te ken.*
- *Enkripsie algoritmes in 'n programmeertaal van hul keuse te bou en te bekragtig.*
- *Bedryfstelselkontroles en betroubare bedryfstelsels te verstaan.*
- *Sekuriteitsprobleme rakende rekenaarstelsels en programme en inligting in ondernemings te identifiseer en maatreëls daarvoor aan te beveel.*
- *Te verstaan dat sekuriteitsmaatreëls met noukeurigheid en op ooreengekome wyse voltooi moet word en dat inligting rakende die kliënt met die nodige vertroulikheid hanteer moet word.*
- *Te verstaan dat rekenaarhulpbronne eties en verantwoordelik gebruik moet word.*
- *Om ondersoek in te stel na huidige en toekomstige tendense in inligtingsekuriteit en dit te kan verduidelik.*

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI616	Semester 1	NQF-Level: 8

Title: **Artificial Intelligence I**

Module-outcomes:

After completion of this module, the students should be able to:

- describe the principles of knowledge-based agents;
- define propositional logic (both syntax and semantics);
- draw inferences in propositional logic;
- define predicate logic (both syntax and semantics);
- translate problem descriptions in predicate logic;
- draw inferences in predicate logic;
- construe resolution proofs;
- build a simple proof feeder for predicate logic;
- work together in groups;
- communicate effectively, orally as well as in writing, by using appropriate technology; and act in an ethical way in regard to all aspects concerning artificial intelligence.

Module uitkomste;

Aan die einde van die module moet die student in staat wees om die volgende te doen:

- *Kunsmatige Intelligensie te kan definieer en ?n definisie krities te kan ev*
- *alueer*
- *Die historiese grondslae en geskiedenis van die vak te kan beskryf*
- *Logiese Agente en die omgewings waarin hulle opereer te kan bespreek*
- *Die begrip Rasionaliteit te kan definieer en toe te pas op Intelligente Agente*
- *Probleme te kan oplos deur van*
- *verskeie ingeligte en oningeligte soekmetodes gebruik te*
- *maak*
- *Die geskiedenis en toepassings van neurale netwerke te kan beskryf*
- *Die Biologiese inspirasie vir neurale netwerke te kan verduidelik*
- *Verskeie neurale netwerkmodelle en argitekture te kan bes*
- *preek en te kan gebruik om*
- *praktiese probleme mee op te los*
- *Inligting uit verskeie modules te kan integreer en te kan aanwend in die oplos van*
- *praktiese probleme (die uitkoms sal bereik word met behulp van een of meer*
- *geïntegreerde evaluerings)*
- *Saam te werk in groepe*
- *Effektief te kan kommunikeer, mondelings sowel as skriftelik deur van toepaslike*
- *tegnologie gebruik te maak.*
- *- Eties op te tree in alle aspekte rakende Kunsmatige Intelligensie*

Method of delivering: Full Time / Part Time

Assessment methods:

Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI617	Semester 1	NQF-Level: 8

Title: **Image Processing I**

Module-outcomes:

Context:

On theoretical level, the student should have insight and a basic knowledge of concepts and mathematical background of image processing. From a practical perspective students should demonstrate the ability to apply this knowledge to solve image processing problems.

Upon successful completion of the module the students will be able to:

- Discuss basic concepts of image processing with reference to examples of the use of image processing, different imaging modalities, human visual perception, image acquisition, sampling and quantization, representation of digital images and relationships between pixels;
- Discuss and practically implement image enhancement in the spatial domain with reference to grey level transforms as well as spatial filters for smoothing and sharpening of images;
- Discuss and practically implement image enhancement in the frequency domain with reference to the Fourier transform and its properties as well as smoothing, sharpening and homomorphic filters;
- Discuss and practically implement colour image processing with reference to the different colour models and both pseudo-colour and full-colour processing;

Discuss and practically implement different image compression algorithms.

Method of delivering: Full Time / Part Time

Assessment methods:

Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI618	Semester 1	NQF-Level: 8

Title: **Decision Support Systems I**

Module-outcomes:

- Mastered the knowledge of methods and techniques relevant to Decision Support Systems through the engagement in the field of IT.
- The ability to evaluate the effect of multiple input sources of knowledge to processes or systems.
- Understanding the complexities and uncertainties of selecting and applying techniques to unfamiliar problems in an operational environment.
- The ability to use a range of specialized techniques to identify, analyze and address complex or abstract problems appropriate to the application field, discipline or practice.
- Communicate and defend the selected specialized techniques and applications to an appropriate field, discipline or practice.
- Develop own learning strategies by being creative to sustain independent learning and academic development.
- Demonstrate an ability to operate independently and take full responsibility for his or her own work.

Module uitkomste:

- *Bemeester die kennis van metodes en tegnieke toepaslik vir Besluitneming*

Stelsels deur die verbintenis in die veld van IT.

- *Die vermoee om die effek van meervoudige insette in prosesse en stelsels te evalueer.*
- *Verstaan die kompleksiteit in terme van die onbekende wanneer keuses en toepassings van tegnieke vir probleem oplossing gekies word in 'n operasionele omgewing*
- *Die vermoee om 'n reeks gespesialiseerde tegnieke te gebruik deur kompleks of abstrakte probleme te analiseer toepaslik tot die evaluerings gebied.*
- *Kommunikeer en verdedig die gebruik van geselekteerde tegnieke vir die toepassings op 'n toepaslike veld, disipline of praktyk*
- *Ontwikkel eie kennis deur kreatief te wees vir volhoubare kennis en akademiese ontwikkeling*
- *Demonstreer die vermoee om onafhanklik te werk en volle verantwoordelikheid te aanvaar vir sy werk*

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation)

School: Computer, Statistical and Mathematical Sciences	**Subject Group: Computer Science and Information Systems**	
Module code: ITRI621	**Semester 2**	**NQF-Level: 8**

Title: **Data Warehouses II**

Module-outcomes:
At the end of this module the student should have insight and knowledge of data warehousing. Students should have sufficient theoretical knowledge to participate in discussion with practitioners. Furthermore students should be able to develop a small data warehouse according to a prescribed methodology. On theoretical level, the student should have insight and a basic knowledge of the following concepts of data warehousing: Technical data warehousing architecture, more advance dimensional modelling, Business Intelligence (BI) applications and Maintenance of BI systems. From a practical perspective students should demonstrate the ability to: Create an OLAP cube, use MDX and create end-user applications. Students should also link from Excel's pivot table function to their OLAP cube. Suitable documentation should be developed for the practical work.

Module uitkomste:

Teen die einde van die module behoort die student oor die nodige insig omtrent en basiese kennis van datapakhuise te beskik. Studente behoort voldoende teoretiese kennis te hê om met praktisyns in gesprek te tree. Daarbenewens behoort studente 'n klein datapakhuis volgens 'n voorgeskrewe metodologie te ontwikkel. Op teoretiese vlak behoort die student insig in en basiese kennis te hê van die volgende begrippe van datapakhuise: tegniese datapakhuisargitektuur, meer gevorderde dimensionele modellering, bedryfsintelligensie(BI) toepassings en die instandhouding van BI-stelsels. Vanuit 'n praktiese perspektief behoort studente die vermoë demonstreer om 'n OLAP-kubus op te stel, MDX te kan gebruik en eindgebruikertoepassings op te stel. Studente behoort ook Excel se spiltabelfunksie aan hul OLAP-kubus te kan verbind. Geskikte dokumentasie behoort vir die praktiese werk ontwikkel te word.

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI622	Semester 2	NQF-Level: 8
Title: **Linear Programming II**		
Module-outcomes: After successful completion of this module, the students should be able to know and apply the following: ▪ Decomposition techniques for large scale LP ▪ Stochastic programming ▪ Integral programming ▪ Minimum-cost network flow algorithms ▪ Transportation and allocation problems ▪ Maximum flow algorithms ▪ Shortest path algorithms.		
Method of delivering: Full Time / Part Time		
Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).		
Module code: ITRI623	**Semester 2**	**NQF-Level: 8**
Title: **Databases II**		
Module-outcomes: The outcome of this module is to provide the student with the necessary background knowledge on the theory and application of databases. Furthermore, the base is determined regarding the knowledge and skills to know the typical architecture of a Data Base Management System (DBMS) and do the basic calculations regarding the large databases to determine the cost implications of specific approaches of large-scale databases. Finally, equip the student with the necessary knowledge and skills to create, implement and maintain a very large database (VLDB), manage possible problems and backup and recover a very large database (VLDB). On completion of this module students should possess: • manage database systems that help companies and corporations effectively and efficiently store, manage, and retrieve large volumes of data; • update out-dated systems or integrate old data into a new system/s; • test existing systems and make changes or troubleshoot problems when necessary; • keep the database system functioning properly and add or delete users as needed; • responsible coordinating the maintenance of data integrity, back-up systems, and security with network administrators; • think logically, concentrate, and pay attention to details because those in this field are often required to pay attention to several tasks at once; • work as part of a team;		

• provide data to external systems using exports, and include external data using imports; • track database performance and troubleshoot problems; • develop a complete database and demonstrate administrative tasks; • investigate new technologies in the field of database including but not limited to NoSQL; and • analyse and write advanced SQL statements such as functions or triggers to assist with data integrity.. *Module uitkomste:* *Die uitkoms van hierdie module is om die student die nodige agtergrondkennis te gee oor die teorie en toepassing van databasisse. Verder word die basis bepaal met betrekking tot die kennis en vaardighede om die tipiese argitektuur van 'n databasisbestuurstelsel (DBMS) te ken en die basiese berekeninge van die groot databasisse te doen om die koste-implikasies van spesifieke benaderings van grootskaalse databasisse te bepaal. Uiteindelik, rus die student toe met die nodige kennis en vaardighede om 'n baie groot databasis (VLDB) te skep, te implementeer en in stand te hou, moontlike probleme en rugsteun te bestuur en 'n baie groot databasis (VLDB) te herstel.* *Na voltooiing van hierdie module behoort die student in staat te wees om:* • *databasisstelsels te bestuur wat maatskappye en korporasies help om groot hoeveelhede data effektief en doeltreffend te stoor, bestuur en op te haal;* • *oud stelsels by te werk of ou data in 'n nuwe stelsel / s te integreer;* • *bestaande stelsels toets en veranderings maak of probleme oplos wanneer dit nodig is;* • *die databasisstelsel behoorlik te funksioneer en gebruikers te voeg of te verwyder soos benodig;* • *verantwoordelike koördinering van die instandhouding van data-integriteit, back-up stelsels en sekuriteit met netwerkadministrateurs;* • *logies te dink, te konsentreer en aandag te skenk aan besonderhede omdat dit in hierdie veld dikwels vereis word om op verskeie take gelyktydig aandag te skenk;* • *te werk as deel van 'n span;* • *data verskaf aan eksterne stelsels deur gebruik te maak van uitvoere, en sluit eksterne data in deur invoer te gebruik;* • *databasisprestasie dop en probleme oplos;* • *'n volledige databasis te ontwikkel en administratiewe take te demonstreer;* • *ondersoek nuwe tegnologie op die gebied van databasis, insluitend maar nie beperk tot NoSQL nie; en* • *gevorderde SQL-stellings soos funksies of snellers te analiseer en te skryf om te help met data-integriteit.*
Method of delivering: Full Time / Part Time
Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI624	Semester 2	NQF-Level: 8
Title: **Information Systems Engineering II**		
Module-outcomes: At the end of the semester the students will have a sound knowledge of the different system development methodologies. This knowledge includes: System development methods, underlying approaches on which the system development methodologies are based, development process models which are used in system development methods, development techniques and tools which are used in system development methods.. *Module uitkomste:* *Aan die einde van die semester sal die studente goeie kennis dra van verskillende stelselontwikkelingsmetodologieë.* *Dit sluit in stelselontwikkelingsmetodes, onderliggende benaderings* *waarop stelselontwikkelingsmetodes gebaseer is, ontwikkelingsprosesmodelle wat gevolg* *word in stelselontwikkelingsmetodes, ontwikkelingstegnieke en hulpmiddels wat gebruik* *word in stelselontwikkelingsmetodes.*		
Method of delivering: Full Time / Part Time		
Assessment methods:Formative and summative assessment (Tests, exams, prac evaluation).		
Module code: ITRI625	**Semester 2**	**NQF-Level: 8**
Title: **Computer Security II**		
Module-outcomes: Discuss database concepts regarding information security and understand how threats can be controlled. Discuss network security threats and possible countermeasures. Discuss administrative security within an IT environment and its economic aspects. Ensure business continuity by formulating security and business continuity plans and by performing risk analysis. Identify and discuss privacy and legal issues within computer security. Understand that security systems should be completed meticulously and in the agreed manner and that confidential information should be handled as such. Understand that computer resources should be used ethically and responsibly. The students should know social and ethical issues within computer and information security. *Module uitkomste:* *Databasiskonsepte rondom inligtingsekuriteit te kan bespreek en te verstaan hoe hierdie bedreigings gekontroleer kan word.* *Netwerksekuriteitbedreigings te beskryf en te weet watter maatreës daarteen ingestel kan word.* *Administratiewe sekuriteit in 'n IT-omgewing te bespreek en die ekonomiese aspekte daarvan te verstaan.* *Besigheidskontinuiteit te verseker deur die formulering van sekuriteit and besigheidskontinuiteits planne en deur die uitvoering van risiko-analise.* *Privaatheid en regsimplikasies binne rekenaarsekuriteit te identifiseer en te*		

bespreek.
Te verstaan dat sekuriteitsmaatreëls met noukeurigheid en op ooreengekome wyse voltooi moet word en dat inligting rakende die kliënt met die nodige vertroulikheid hanteer moet word.
Te verstaan dat rekenaarhulpbronne eties en verantwoordelik gebruik moet word. Die leerders moet kennis dra van sosiale en etiese kwessies in rekenaar- en inligting sekuriteit.

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI626	**Semester 2**	**NQF-Level: 8**

Title: **Artificial Intelligence II**

Module-outcomes:
After completion of this module, the students should be able to:
- describe the principles of knowledge-based agents;
- define propositional logic (both syntax and semantics);
- draw inferences in propositional logic;
- define predicate logic (both syntax and semantics);
- translate problem descriptions in predicate logic;
- draw inferences in predicate logic;
- construe resolution proofs;
- build a simple proof feeder for predicate logic;
- work together in groups;
- communicate effectively, orally as well as in writing, by using appropriate technology; and
  act in an ethical way in regard to all aspects concerning artificial intelligence.

Module uitkomste;
Aan die einde van die module moet die student in staat wees om die volgende te kan doen:
- die beginsels van kennisgebaseerde agente te kan beskryf;
- proposisielogika te kan definieer (beide sintaksis en semantiek);
- gevolgtrekkings ("inferences") te kan maak in proposisielogika;
- predikaatlogika te kan definieer (beide sintaksis en semantiek);
- probleembeskrywings in predikaatlogika tekan vertaal;
- gevolgtrekkings ("inferences") in predikaatlogika te kan maak;
- resolusiebewyse te kan konstrueer;
- ?n eenvoudige bewysvoerder vir predikaatlogika te kan bou;
- in groepe saam te werk;
- effektief te kan kommunikeer, mondelings sowel as skriftelik,
deur van toepaslike
tegnologie gebruik te maak; en
- eties op te tree ten opsigte van alle aspekte rakende kunsmatige intelligensie

Method of delivering: : Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI627	Semester 2	NQF-Level: 8

Title: **Image Processing II**

Module-outcomes:
Context:
This module builds on the concepts already mastered in ITRI617, Image Processing I. On theoretical level, the student should have insight and a basic knowledge of concepts and mathematical background of image processing. From a practical perspective students should demonstrate the ability to apply this knowledge to solve image processing problems. Module-outcomes:
Upon successful completion of the module the students will be able to:

- Discuss the use of mathematical morphology in image processing.
- Discuss different image segmentation techniques with reference to edge detection and linking as well as thresholding of images.
- Discuss the representation and description of images with reference to the description of boundaries and regions as well as the use of principal component analysis.
- Discuss the practical use of image processing.

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI628	Semester 2	NQF-Level: 8

Title: **Decision Support Systems II**

Module-outcomes:
Mastered the knowledge of methods and techniques relevant to Decision Support Systems through the engagement in the field of IT.
The ability to evaluate the effect of multiple input sources of knowledge to processes or systems.
Understanding the complexities and uncertainties of selecting and applying techniques to unfamiliar problems in an operational environment.
The ability to use a range of specialised techniques to identify, analyse and address complex or abstract problems appropriate to the application field, discipline or practice.
Communicate and defend the selected specialised techniques and applications to an appropriate field, discipline or practice.
Develop own learning strategies by being creative to sustain independent learning and academic development.
Demonstrate an ability to operate independently and take full responsibility for his or her own work.
Module uitkomste:
Bemeester die kennis van metodes en tegnieke toepaslik vir Besluitneming Stelsels deur die verbintenis in die veld van IT.
Die vermoee om die effek van meervoudige insette in prosesse en stelsels te evalueer.
Verstaan die kompleksiteit in terme van die onbekende wanneer keuses en toepassings van tegnieke vir probleem oplossing gekies word in 'n operasionele omgewing

Die vermoee om 'n reeks gespesialiseerde tegnieke te gebruik deur kompleks of abstrakte probleme te analiseer toepaslik tot die evaluerings gebied.
Kommunikeer en verdedig die gebruik van geselekteerde tegnieke vir die toepassings op 'n toepaslike veld, disipline of praktyk
Ontwikkel eie kennis deur kreatief te wees vir volhoubare kennis en akademiese ontwikkeling
Demonstreer die vermoee om onafhanklik te werk en volle verantwoordelikheid te aanvaar vir sy werk

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRI671	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Project**

Module outcomes:
On completion of this module, you should be able to:

- Have knowledge with regard to the conducting of research;
- write a critical review of a journal article;
- compose a research proposal and planning;
- conduct research;
- write a research report;
- develop an artefact with appropriate life cycle and documentation;
- do a presentation of research and results

Module uitkomste:
Nadat jy hierdie module suksesvol afgehandel het, behoort jy in staat te wees om:

- *kennis te hê in verband met die doen van navorsing;*
- *'n kritiese oorsig te skryf van ? joernaalartikel;*
- *'n navorsingsvoorstel en beplanning op te stel;*
- *navorsing te doen;*
- *'n navorsingsverslag te skryf;*
- *'n artefak te ontwikkel met toepaslike lewensiklus en dokumentasie;*
- *'n voorlegging te doen van navorsing en resultate.*

Method of delivering: Full Time / Part Time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITWV671	**Semester 1**	**NQF-Level: 8**

Title: Research Methodology and Project

Module Outcomes:
The outcomes as described for the Honours Bachelors of Science module are further refined and rounded off by this Master of Science. The qualifiers in this program will be familiar with the general scientific methods of research, with emphasis on research methodologies related to the study fields of Information Technology/Information Systems/Computer Science. These include:

- identification and formulation of a problem statement;
- thorough investigation of existing knowledge as reflected in appropriate
- scientific literature;
- appropriate research to solve the problem;
- scientific evaluation of the results in the context of the problem statement;
- scientific communication of the results in the form of a dissertation.

Method of delivering: Full Time / Part Time		
Assessment methods:		
Module code: MARS621	**Semester 2**	**NQF-Level: 8**
Title:Radiation and Environment		
Module outcomes: Environmental and Radiation protection I The students should be able to understand Radiobiological Concepts, viz: i. Radiation interactions, Biological target, Normal tissue response, Biochemical and or biological damage, Cell survival ii. Students should be competent in working with radiation and radio-nuclides safely and to use detectors and monitors for the iii. measurements of main radiation parameters. Students should be competant in explaining the concepts of Environmental and Radiation protection, viz: i. Exposure circumstances, Normal exposure and Potential exposures ii. Practices, Interventions and Radiation safety iii. Quantities and measurements iv. External dose assessment and Internal dose assessment		
Method of delivering:		
Assessment methods:		
Module code: MARS622	**Semester 2**	**NQF-Level: 8**
Title:Radioactive Waste Minimisation and Management		
Module outcomes: Students should be able to identify and explain the fundamental principles of radioactive waste management, explain approaches to waste categorization and identify and explain the principles for rehabilitation. They should also identify decommissioning options and explain legislation on radioactive waste management		
Method of delivering:		
Assessment methods:		
Module code: MAYM611	**Semester 1**	**NQF-Level: 8**
Title: Abstract Algebra I		
Module Outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Groups – Sylow theorems, classification of finite groups. Rings – Prime and maximal ideals, unique factorisation domains, Noetherian rings. Fields – Field extensions, applications to geometrical constructions. Galois theory		
Method of delivering:		

Assessment methods:

Module code: MAYM612	Semester 1	NQF-Level: 8

Title: Theory Of Ordinary Differential Equation

Module outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Refinement of undergraduate paradigms:
- Revision of introductory concepts.
- Waves and Diffusions: Revision of wave and diffusion equation; Introduction to causality and energy; Comparison of waves and diffusions.
- Boundary value problems: Revision of basic concepts (separation of variables, Dirichlet, Neumann, and Robin conditions, Fourier coefficients for real variables); Introduction to complex theory.

Fourier series: Revision of undergraduate theory; Orthogonality and general Fourier series; Completeness; Gibbs phenomenon; Inhomogenous boundary conditions.
Harmonic functions: Revision of Laplace's equation and rectangles; Cubes; Poisson's Formula.
Introduction to Green's identities and Green's functions: Green's first and second identity; Green's functions (revision and extension); half-space and sphere.
General eigenvalue problems.
Boundaries in the plane and space.
Introduction to distributions and transforms.

Method of delivering:

Assessment methods:

Module code: MAYM613	Semester 1	NQF-Level: 8

Title: Measure And Integration Theory I

Module Outcomes:

On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge of, and skills in applying the underlying concepts, methods and applicable theory to solve problems in the area covered by the following themes:

sigma-algebras, measurable spaces, Borel sets, measurable functions, Borel functions, monotone classes of functions, measure theory, image of a measure, integration theory, properties of the integral, monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, comparison of the Lebesgue- and Riemann-integrals, evaluation of Lebesgue integrals, continuity and differentiability of functions defined by Lebesgue integrals.

Method of delivering:

Assessment methods:

Module code: MAYM614	Semester 1	NQF-Level: 8

Title: Topology

Module Outcomes:

On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge of, and skills in applying the underlying concepts, methods and applicable theory to solve problems in the area covered by the following themes:

sigma-algebras, measurable spaces, Borel sets, measurable functions, Borel functions, monotone classes of functions, measure theory, image of a measure, integration theory, properties of the integral, monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, comparison of the Lebesgue- and Riemann-integrals, evaluation of Lebesgue integrals, continuity and differentiability of functions defined by Lebesgue integrals.

Method of delivering:

Assessment methods:

Module code: MAYM615	Semester 1	NQF-Level: 8

Title: Complex Function Theory

Module Outcomes:

Upon completion of this module and taking into account prior learning, the student should be able to, demonstrate knowledge of and skills in applying the underlying fundamental principles, methods, and theory to solve problems regarding selected aspects of the following topics:

Möbius transformations; Montel's theorem; Riemann mapping theorem; infinite products of analytic functions; approximation of analytic functions; analytic continuation; harmonic functions; entire functions of finite order; the range of analytic functions.

Method of delivering:

Assessment methods:

Module code: MAYM621	Semester 1	NQF-Level: 8

Title: : Functional Analysis I

Module Outcomes:

On completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skills in applying the underlying principles, methods and applicable theory to solve problems pertaining to the following topics:

Metric spaces: Introduction to metric spaces; some classical examples; topological

concepts; convergence of sequences; Cauchy sequences and completeness of metric spaces; examples of important complete and incomplete metric spaces.

Vector spaces and normed spaces: convergence of sequences and series in normed spaces; Schauder bases; finite dimensional normed spaces; compactness in normed spaces and its role in the characterisation of finite dimensional normed spaces.

Linear and bounded linear operators on normed spaces; linear functionals and bounded linear functionals and the algebraic dual space of a vector space; the concept of algebraically reflexive space; the algebraic reflexivity of finite dimensional spaces.

Spaces of bounded linear operators on normed spaces; dual spaces of normed spaces; some examples of dual spaces of well known normed spaces.

The Hahn-Banach theorem for the extension of linear functionals and some applications; adjoint operators on dual spaces; reflexive Banach spaces; the Uniform Boundedness Theorem and some applications; weak and strong convergence of sequences in normed spaces; the Open Mapping Theorem and the Closed Graph Theorem and some applications.

Method of delivering:

Assessment methods:

Module code: MAYM622	**Semester 1**	**NQF-Level: 8**

Title: Abstract Algebra II

Module Outcomes:

Upon completion of this module and taking into account prior learning, the student should be able to, demonstrate knowledge and skills to apply fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Rings – Radicals,chain conditions.

Modules over rings – Basic definitions and properties, free modules, exact sequences, simple and semisimple modules, Hom, projective and injective modules, flat modules, purity

Method of delivering:

Assessment methods:

Module code: MAYM623	**Semester 1**	**NQF-Level: 8**

Title: Evolution Of Mathematical Ideas

Module Outcomes:

On completion of this module the student should have knowledge and insight, as well as the skills to apply

basic principles and applicable methods to solve problems in the following topics:

Introduction to the history of mathematics; knowledge of the history of mathematics with emphasis on matters llike important persons and viewpoints, development of ideas, application of methods and solution of problems according to the knowledge of that era.

Method of delivering:

Assessment methods:

Module code: MAYM624	**Semester 1**	**NQF-Level: 8**

Title: Fundamentals Of Mathematics

Module Outcomes:

Upon completion of this module the students should be able to, with due consideration of previous studies, demonstrate knowledge of and ability in applying the principles and applicable methods to solve problems regarding the following topics:

- Axioms of set theory (ZFC), consequences of the axiom of choice, operations on sets, cardinal and ordinal numbers,

- A selection of topics based on the following: Boolean algebras, the development of the natural and the real number systems, the Schröder-Bernstein theorem, well-orderings, cardinal and ordinal arithmetic.

Method of delivering:

Assessment methods:

Module code: MAYM625	**Semester 1**	**NQF-Level: 8**

Title: Project

Module Outcomes:
After completion of this module, the student should, taking in account previous studies, be able to do the following:
On completion of this module the student should:
- have mastered introductory research methods in the subject;
- be able to read and understand literature in a mathematical journal;
- be able to handle references and sourcing;
- be able to perform scientific literature searches;
- be able to apply knowledge and skill from different subdisciplines in an integrated
fashion in the solution of mathematical problems;
- be able to communicate the subject content orally and in written form (in appropriate
scientific language and appropriate programmes);
- be able to work together in a team on a topic.

Method of delivering:

Assessment methods:

Module code: MCHE611	Semester 1	NQF-Level: 8
Title: Physical Chemistry		
Module outcomes: Should have an advanced and critical knowledge in the fields of thermodynamics, quantum mechanics, statistical thermodynamics, spectroscopy and macromolecules. Should be able to read and understand scientific literature in these fields		
Method of delivering:		
Assessment methods:		
Module code: MCHE612	**Semester 1**	**NQF-Level: 8**
Title: Inorganic Chemistry I		
Module outcomes: Calculate styx numbers and deduce structures of boron compounds understand and explain differences and similarities between d and f block elements interpret ligand substitution reactions in terms of SN1, SN2 and SN1CB mechanisms. Understand and explain inner and outer sphere redox mechanisms.		
Method of delivering:		
Assessment methods:		
Module code: MCHE613	**Semester 1**	**NQF-Level: 8**
Title: Organic Chemistry I		
Module outcomes: Proficiency in major methods of carbon-carbon formation, mechanism of carbon-carbon formation. Demonstrate understanding of basic features and examples of organic polymers		
Method of delivering:		
Assessment methods:		
Module code: MCHE614	**Semester 1**	**NQF-Level: 8**
Title: Analytical Chemistry I		
Module outcomes: Ability to select a suitable chromatographic technique for the separation of a given mixture; use a gas and/or liquid chromatograph for quantitations; derive potentiometric and amperometric titration curves; set-up potentiometric and amperometric titration apparatus and to carry out the titrations; perform determinations for atomic and molecular species using a spectrophotometer.		

Method of delivering:		
Assessment methods:		
Module code: MCHE625	**Semester 2**	**NQF-Level: 8**
Title: Physical Chemistry II		
Module outcomes: Should have advanced and critical knowledge in chemical kinetics, electrochemistry and surface chemistry. Should be able to read and understand scientific literature in these fields		
Method of delivering:		
Assessment methods:		
Module code: MCHE626	**Semester 2**	**NQF-Level: 8**
Title: Inorganic Chemistry II		
Module outcomes: Demonstrate ability to predict lattice defects in solids, describe the structures of solid solutions metal clusters and semiconductors. Predict stability or organometallics using 18 electron rule. Organise the syntheses and reactivity of organometallics by ligand type, prescribe and explain catalysis involving organometallics.		
Method of delivering:		
Assessment methods:		
Module code: MCHE627	**Semester 2**	**NQF-Level: 8**
Title: Organic Chemistry II		
Module outcomes: Demonstrate knowledge of synthetic routes and chemical reactions of heterocyclic, polycyclic aromatic and non aromatic heterocyclic compounds.Ability to evaluate molecular structure using spectroscopic techniques. Knowledge of the Chemistry of natural products e.g. carbohydrates and proteins.		
Method of delivering:		
Assessment methods:		
Module code: MCHE628	**Semester 2**	**NQF-Level: 8**
Title: Analytical Chemistry II		
Module outcomes: Ability to carry out determinations using a voltammograph; use the various voltametric methods for the determination of analytes from minor to trace levels;		

appreciate the scope of application of thermal and calorimetric methods; perform determinations of biochemical species (for example, enzymes) by kinetic methods; describe the automatic and automated instrumentation that is used in industrial applications.		
Method of delivering:		
Assessment methods:		
Module code: MCHE629	**Semester 2**	**NQF-Level: 8**
Title: Research Project		
Module outcomes: Ability to define simple research problems, conduct research to solve the problems and present the results both orally and as a research report.		
Method of delivering:		
Assessment methods:		
Module code: MCHE671	**Semester 2**	**NQF-Level: 8**
Title: Research Project		
Module outcomes:		
Method of delivering:		
Assessment methods:		
Module code: MTHS611	**Semester 1**	**NQF-Level: 8**
Title: Fundamentals of Mathematics		
Module outcome: Upon completion of this module the students should be able to, with due consideration of previous studies, demonstrate knowledge of and ability in applying the principles and applicable methods to solve problems regarding the following topics: • Axioms of set theory (ZFC), consequences of the axiom of choice, operations on sets, cardinal and ordinal numbers, • A selection of topics based on the following: Boolean algebras, the development of the natural and the real number systems, the Schröder-Bernstein theorem, well-orderings, cardinal and ordinal arithmetic. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* • *Die aksiomas van versamelingsleer (ZFC), die gevolge van die keuse-aksioma, bewerkings op versamelings, kardinaal- en ordinaalgetalle;* • *'n Keuse van onderwerpe gebasseer op die volgende: Boolese algebras, die ontwikkeling van die natuurlike en reële getallestelsels, die Schröder-Bernstein stelling, welordenings, kardinaal- en ordinaalrekene.*		

Method of delivering: Fulltime		
Assessment methods:		
Module code: MTHS612	**Semester 1**	**NQF-Level: 8**
Title: Abstract Algebra I		
Module outcome: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Groups – Sylow theorems, classification of finite groups. Rings – Prime and maximal ideals, unique factorisation domains, Noetherian rings. Fields – Field extensions, applications to geometrical constructions. Galois theory M*odule uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Groepe – Sylow-stellings, klassifikasie van eindige groepe.* *Ringe – Priem- en maksimale ideale, eenduidigefaktorisering-gebiede, Noetherse ringe.* *Liggaamsteorie – Uitbreidingsliggame, toepassing op meetkundige konstruksies. Galois-teorie.*		
Method of delivering: Fulltime		
Assessment methods:		
Module code: MTHS613	**Semester 1**	**NQF-Level: 8**
Title: Matrix Analysis		
Module outcome: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding the properties of different classes of matrices and their applications to matrix functions and canonical forms. In particular selected aspects of the following topics: Partition matrices, Rank and Eigenvalues; Matrix polynomials and functions of matrices; Canonical forms (for example the Jordan form); Numerical Ranges; Matrix norms; Special classes of matrices; Positive semidefinite, Unitary and Normal matrices, and their properties. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die eienskappe van verskillende klasse matrikse en hul toepassings tot matriksfunksies en*		

kanoniese vorms. In die besonder geselekteerde aspekte van die volgende onderwerpe:

Matrikspartisies, Rang en Eiewaardes;
Matrikspolinome en funksies van matrikse;
Kanoniese vorms (soos bv die Jordan vorm);
Numeriese Waardeversamelings;
Matriksnorms;
Spesiale klasse matrikse;
Positief semi-definiete, Unitêre, en Normale matrikse, en hul eienskappe.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS614	**Semester 1**	**NQF-Level: 8**

Title: Measure and integrationTheory I

Module outcome:
On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge of, and skills in applying the underlying concepts, methods and applicable theory to solve problems in the area covered by the following themes:
sigma-algebras, measurable spaces, Borel sets, measurable functions, Borel functions, monotone classes of functions, measure theory, image of a measure, integration theory, properties of the integral, monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, comparison of the Lebesgue- and Riemann-integrals, evaluation of Lebesgue integrals, continuity and differentiability of functions defined by Lebesgue integrals.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, die kennis van, en vaardighede demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
sigma-algebras, meetbare ruimtes, Borel versamelings, meetbare funksies, Borel-funksies, monotone klasse funksies, maatteorie, beeldmate, integrasieteorie, eienskappe van die integraal, monotone konvergensiestelling, Fatou se lemma, Lebesgue se gedomineerde konvergensiestelling, vergelyking van die Lebesgue-integraal met die Riemann-integraal, berekenings met die Lebesgue-integraal, kontinuïteit en differensieerbaarheid van funksies gedefinieer deur Lebesgue-integrale.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS615	Semester 1	NQF-Level: 8

Title: Functional Analysis I

Module outcome:

On completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skills in applying the underlying principles, methods and applicable theory to solve problems pertaining to the following topics:

Metric spaces: Introduction to metric spaces; some classical examples; topological concepts; convergence of sequences; Cauchy sequences and completeness of metric spaces; examples of important complete and incomplete metric spaces.

Vector spaces and normed spaces: convergence of sequences and series in normed spaces; Schauder bases; finite dimensional normed spaces; compactness in normed spaces and its role in the characterisation of finite dimensional normed spaces.

Linear and bounded linear operators on normed spaces; linear functionals and bounded linear functionals and the algebraic dual space of a vector space; the concept of algebraically reflexive space; the algebraic reflexivity of finite dimensional spaces.

Spaces of bounded linear operators on normed spaces; dual spaces of normed spaces; some examples of dual spaces of well known normed spaces.

The Hahn-Banach theorem for the extension of linear functionals and some applications; adjoint operators on dual spaces; reflexive Banach spaces; the Uniform Boundedness Theorem and some applications; weak and strong convergence of sequences in normed spaces; the Open Mapping Theorem and the Closed Graph Theorem and some applications.

Module uitkomste:

Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los op die terrein van die volgende onderwerpe:

Metriese ruimtes: Topologiese begrippe; konvergensie van rye; Cauchy-rye en volledigheid van metriese ruimtes; voorbeelde van enkele bekende volledige en nie-volledige metriese ruimtes. Vervolledigingvan metriese ruimtes.

Vektorruimtes en normeerde ruimtes: Banach-ruimtes en voorbeelde van sulke ruimtes; konvergensie van rye en reekse in normeerde ruimtes; Schauder-basisse; eindig-dimensionele normeerde ruimtes; kompaktheid in normeerde ruimtes en die rol daarvan in die karakterisering van eindig-dimensionele normeerde ruimtes.

Lineêre en begrensde lineêre operatore op normeerde ruimtes; lineêre funksionale en begrensde lineêre funksionale en die algebraïese duaalruimte van 'n vektorruimte en die begrip algebraïes refleksiewe ruimte; algebraïes refleksiwiteit van eindig-dimensionele ruimtes;

Ruimtes van begrensde lineêre operatore op normeerde ruimtes; Duaalruimtes van normeerde ruimtes; enkele voorbeelde van duaalruimtes van bekende normeerde ruimtes;

Die Gelykmatige Begrensdheidstelling en enkele toepassings; sterk-en swak konvergensie van rye in normeerde ruimtes; die Ope-afbeelding stelling en Geslote Grafiekstelling en enkele toepassings daarvan.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS619	Semester 1	NQF-Level: 8
Title: Real & Complex Analysis		
Module outcome: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: The axioms of the real number system; basic point-set topology; metric spaces; sequences (limit and convergence); limit and continuity of functions; convergence of sequences and series of functions; real and complex integration; Taylor and Laurent's theorem; improper integrals and the complex method for computing such integrals. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, Deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Die aksiomas van die reële getallestelsel; inleidende topologie; metriese ruimtes; rye (limiet en konvergensie); limiet en kontinuïteit van funksies; konvergensie van rye en reekse funksies; reële en komplekse integrasie; Taylor en Laurent se stellings; oneintlike integrale en die komplekse metode om sulke integrale te bereken*		
Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: MTHS621	**Semester 1**	**NQF-Level: 8**
Title: Topology		
Module outcome: Upon completion of this module the students should , with due consideration to previous studies, be able to demonstrate knowledge of and ability in applying the principles and applicable methods to solve problems with regard to the following topics: Basic topological concepts, continuity, compactness, nets and the inadequacy of sequences, product spaces and Tychonoff's theorem, normal sets and Urysohn' lemma, nets and filters, separation axioms and regularity, compactness (revisited), local en para-compactness, compactifications, metrisability, connectedness. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels en toepaslike metodes om probleme op te los rakende die terrein van die volgende onderwerpe:* *Basiese topologiese konsepte, kontinuiteit, kompaktheid, nette en die onvoldoendheid van rye,* *produk ruimtes en Tychonoff se stelling, normale versamelings en Urysohn se lemma, nette* *en filters, skeidingsaksiomas en regulariteit, kompaktheid (herbesoek), lokaal- en*		

parakompaktheid,
kompaktifiserings, metriseerbaarheid, samehangendheid.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS622	**Semester 1**	**NQF-Level: 8**

Title: Abstract Algebra II

Module outcome:
Upon completion of this module and taking into account prior learning, the student should be able to, demonstrate knowledge and skills to apply fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Rings – Radicals,chain conditions.
Modules over rings – Basic definitions and properties, free modules, exact sequences, simple and semisimple modules, Hom, projective and injective modules, flat modules, purity
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los op die terrein van die volgende onderwerpe:
Ringe – Radikale,kettingvoorwaardes.
Module oor ringe – Basiese definisies en eienskappe, vrye module, eksakte rye, eenvoudige en semi-eenvoudige module, Hom, projektiewe en injektiewe module, plat module, suiwerheid.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS 623	**Semester 1**	**NQF-Level: 8**

Title: Complex Function Theory

Module outcome:
Upon completion of this module and taking into account prior learning, the student should be able to, demonstrate knowledge of and skills in applying the underlying fundamental principles, methods, and theory to solve problems regarding selected aspects of the following topics:
Möbius transformations; Montel's theorem; Riemann mapping theorem; infinite products of analytic functions; approximation of analytic functions; analytic continuation; harmonic functions; entire functions of finite order; the range of analytic functions.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van, en vaardighede demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende geselekteerde aspekte van die volgende onderwerpe:
Möbius transformasies; Montel se stelling; Riemann-afbeeldingstelling; oneidige produkte van analitiese funksies; benadering van analitiese funksies; analitiese voortsetting; harmoniese funksies; heelfunksies van eindige orde; die waardeversameling van analitiese funksies

Method of delivering:		
Assessment methods:		
Module code: MTHS624	**Semester 1**	**NQF-Level: 8**
Title: Measure Theory II		
Module outcome: On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge and skills in applying the underlying concepts, methods and theory to solve problems in the area covered by the following themes: Theorems of Fubini and Radon-Nikodym, extension of measures and Caratheodory's theorem, Lebesgue-Stieltjes integrals, function spaces, types of convergence, uniform integrability *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Stellings van Fubini en Radon-Nikodym, uitbreiding van mate en Caratheodory se stelling, Lebesgue-Stieltjes integrale, funksieruimtes, tipes konvergensie, gelykmatige integreerbaarheid.*		
Method of delivering:		
Assessment methods:		
Module code: MTHS625	**Semester 1**	**NQF-Level: 8**
Title: Functional Analysis II		
Module outcomes: On completion of this module students should, taking into account preceding studies, be able to demonstrate knowledge of, and skills in using the underlying principles, methods and applicable theory to solve problems pertaining to the following topics: Inner product spaces and Hilbert spaces; orthonormality; orthogonal complements and direct sums; complementary subspaces in Hilbert spaces and orthogonal projections; orthonormal sequences; Bessel's inequality. The Riesz Theorems for bounded linear functionals and bounded sesquilinear functionals on Hilbert spaces: The characterisation of bounded linear functionals, as well as bounded sesquilinear functionals on Hilbert spaces in terms of the inner products on the Hilbert spaces; the Hilbert adjoint of a bounded linear operator on inner product spaces; introductory study of self adjoint operators. Spectral theory of bounded linear operators on normed spaces; spectral theory and the spectral representation of bounded self-adjoint operators on Hilbert spaces. If time permits, additional topics can be discussed, in dialogue with the participating students. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels grondliggend tot die vakgebied en geskikte metodes om probleme op te*		

los rakende die terrein van die volgende onderwerpe:
Inwendige produkruimtes en Hilbert-ruimtes: ortonormaliteit; ortogonale komplemente en direkte somme; komplementêre deelruimtes in Hilbert-ruimtes en ortogonale projeksies; ortonormale rye; Bessel se ongelykheid.
Riesz se stellings vir begrensde lineêre funksionale en begrensde 1½ -lineêre funksionale op Hilbert-ruimtes: Die karakterisering van begrensde lineêre funksionale, sowel as begrensde 1½-lineêre funksionale op Hilbert-ruimtes in terme van die inwendige produkte op die Hilbertruimtes; die Hilbert-toegevoegde van 'n begrensde lineêre operator op inwendige produkruimtes; inleidende studie van selftoegevoegde operatore.
Spektraalteorie van begrensde lineêre operatore op normeerde ruimtes; spektraalteorie van begrensde self-toegevoegde operatore op Hilbertruimtes en die spektraal voorstelling van begrensde self-toegevoegde operatore op Hilbertruimtes.

Method of delivering: Fulltime

Assessment methods:

Module code: MTHS626	**Semester 1**	**NQF-Level: 8**

Title: Evolution of Mathematical Ideas

Module outcome:
On completion of this module the student should have knowledge and insight, as well as the skills to apply basic principles and applicable methods to solve problems in the following topics:
Introduction to the history of mathematics; knowledge of the history of mathematics with emphasis on matters llike important persons and viewpoints, development of ideas, application of methods and solution of problems according to the knowledge of that era.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis te hê van en vaardigheid te kan demonstreer in die toepassing van die grondliggende beginsels en metodes om probleme in die volgende onderwerpe op te los:
Inleiding tot die geskiedenis van wiskunde; oorsig oor die geskiedenis van wiskunde, met klem op sake soos belangrike persone en strominge, ontwikkeling van idees, gebruik van metodes en oplos van probleme volgens die bepaalde era se kennis.

Module code: MTHS671	**Semester 1 & 2**	**NQF-Level: 8**

Title:Project

Module Outcomes:
After completion of this module, the student should, taking in account previous studies, be able to do the following:
On completion of this module the student should:

- have mastered introductory research methods in the subject;
- be able to read and understand literature in a mathematical journal;
- be able to handle references and sourcing;
- be able to perform scientific literature searches;
- be able to apply knowledge and skill from different subdisciplines in an

integrated
fashion in the solution of mathematical problems;
• be able to communicate the subject content orally and in written form (in appropriate
scientific language and appropriate programmes);
• be able to work together in a team on a topic.
Na voltooiing van hierdie module behoort die studente, die volgende te kan doen:
• *inleidende navorsingstegnieke in die vakgebied bemeester;*
• *literatuur in 'n Wiskundige vaktydskrif lees en verstaan;*
• *verwysings en bronne korrek hanteer;*
• *wetenskaplike literatuursoektogte uitvoer;*
• *kennis en vaardighede van verskillende subdissiplines geïntegreerd toepas in die oplos van wiskundige probleme;*
• *die vak mondelings en skriftelik in toepaslike wetenskaplike taal kommunikeer; en*
• *in 'n span oor 'n onderwerp saam te werk.*

Method of delivering: Fulltime

Assessment methods:
Formative:
Initial presentation of project proposal in the second quarter.
Assessment methods – summative:
Present the chosen topic verbally using standard resources of the field of study (Beamer/Powerpoint).

Module code: NCHE611	**Semester 1**	**NQF-Level: 8**

Title: Advanced Organic Chemistry

Module-outcomes: After completion of the module NCHE611, the student should demonstrate:
1. integrated knowledge and understanding of the theory of the three themes: T1) molecular orbital theory, T2) advanced reactions and mechanisms, and T3) advanced structural elucidation;
2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of organic chemistry, and critically evaluate and review that knowledge to deepen the understanding of organic chemistry;
3. supervised research skills by selecting and implementing synthesis and analytical methods to effectively execute a planned research design, communicate findings and conclusions by means of a written report in a scientific manner;
4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in organic chemistry by using appropriate methods;
5. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE612	Semester 1	NQF-Level: 8
Title: Advanced Physical Chemistry		
Module-outcomes: After completion of the module CHEN612, the student should demonstrate: 1. integrated knowledge and understanding of the theory of the three subjects: 1) quantum chemistry and molecular spectroscopy, 2) statistical thermodynamics, and 3) reaction kinetics; 2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of physical chemistry, and critically evaluate and review that knowledge to deepen the understanding of physical chemistry; 3. supervised research skills by selecting and implementing experimental methods to effectively execute a planned research design, communicate findings and conclusions by means of a written report in a scientific manner; 4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in physical chemistry by using appropriate methods; 5. an understanding of the ethical and professional conduct required of a professional chemist.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE613	**Semester 1**	**NQF-Level: 8**
Title: Advanced Inorganics Chemistry		
Module-outcomes: After completion of the module NCHE613, the student should demonstrate: 1. applied knowledge and critical understanding of mechanisms related to the most important types of reactions occurring in inorganic chemistry; 2. an ability to access and interpret multiple resources of knowledge such as books, journals and the internet within the field of inorganic chemistry, critically evaluating and reviewing that knowledge and the manner in which the knowledge was produced with a view to judge the applicability and value of the knowledge towards deeper understanding of inorganic chemistry; 3. the ability to select, apply and critically judge the effectiveness of the implementation of a range of supervised advanced synthesis techniques in inorganic chemistry to successfully execute a planned research design, evaluate and communicate the research findings by means of a written scientific report; 4. the ability to identify, demarcate, analyse, critically reflect on and effectively address complex or abstract problems and challenges related to inorganic chemistry with theory-driven arguments employing appropriate knowledge and methods; 5. the ability to make autonomous ethical and professional decisions and take full responsibility for his/her work and practices and the safety of others within different professional and academic environments.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		

Module code: NCHE614	Semester 1	NQF-Level: 8
Title: Advanced Analytical Chemistry		
Module-outcomes: After completion of the module NCHE614, the student should be able: 1. to demonstrate integrated advanced knowledge regarding surface chemistry, electrochemical, spectroscopic and separation methods; 2. to assimilate multiple sources of knowledge such as books, journals and the internet within the field of analytical chemistry, and critically evaluate and review that knowledge to deepen the understanding of analytical chemistry; 3. to understand the complexities and uncertainties of selecting, applying and interpreting appropriate procedures or techniques for unfamiliar problems in a specialised practice; 4. to identify, demarcate, analyse, critically reflect on and effectively solve problems in analytical chemistry by using appropriate techniques;		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE621	**Semester 1**	**NQF-Level: 8**
• Title: Molecule Modelling (Elective)		
Module-outcomes: After completion of the module, the student should demonstrate: • integrated knowledge and critical understanding of a variety of mathematical models developed for description of molecules and chemical reactions and an ability to critically evaluate and review multiple mathematical models to choose a suitable mathematical model for his/her particular molecule or reaction and do the necessary mathematical processing with commercial modelling software packages; • the ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant/appropriate mathematical models with a view to apply these models to real world chemical problems; • advanced ability to effectively interpret and apply theoretical calculated modelling data with a view to explain or predict experimental data; • the ability to analyse, select and effectively apply modelling data in chemistry literature and to reflect on and then address complex or abstract problems in chemistry; and • the ability to identify, demarcate, analyse, critically reflect on and effectively address complex problems related to chemistry and apply theory-based solutions with evidence-driven arguments.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE622	**Semester 1**	**NQF-Level: 8**
Title: Polymer Chemistry (Elective)		
Module-outcomes: After completion of the module CHEN621 the student should demonstrate: • integrated knowledge of and engagement in polymer chemistry relating to: o structure and morphology of polymers o different polymerization mechanisms o mechanical properties of polymers o analytical techniques o different families of polymers		

• Students should have the ability to utilize Organic Chemistry skills to design monomers to produce new polymers.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE623	**Semester 1**	**NQF-Level: 8**
• Title: Advanced Structural Clarification (Elective)		
Module-outcomes: After completion of the module CHEN621 the student should demonstrate: • integrated knowledge of and engagement in polymer chemistry relating to: o structure and morphology of polymers o different polymerization mechanisms o mechanical properties of polymers o analytical techniques o different families of polymers • Students should have the ability to utilize Organic Chemistry skills to design monomers to produce new polymers.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE624	**Semester 1**	**NQF-Level: 8**
Title: Environmental Chemistry (Elective)		
Module-outcomes: After completion of the module CHEN621 the student should demonstrate: • integrated knowledge of and engagement in polymer chemistry relating to: o structure and morphology of polymers o different polymerization mechanisms o mechanical properties of polymers o analytical techniques o different families of polymers • Students should have the ability to utilize Organic Chemistry skills to design monomers to produce new polymers.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE625	**Semester 1**	**NQF-Level: 8**
Title: Techniques for Organic Synthesis (Elective)		
Module-outcomes: After completion of the module, the student should demonstrate: 1. integrated knowledge of and critical understanding and application of advanced organic synthesis techniques, particularly focused on retrosynthetic analysis; 2. the ability to critically interrogate multiple sources of knowledge such as books, journals relevant to advanced organic synthetic strategies and critically evaluate and review that knowledge with a view to advance their understanding of organic chemistry; 3. the ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant synthetic strategies with a view to predict routes to small molecule synthesis;		

4. the ability to identify, demarcate, analyse, critically reflect on and effectively solve complex synthetic problems in advanced organic chemistry;
5. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE626	**Semester 1**	**NQF-Level: 8**

Title: Electrochemistry (Elective)

Module-outcomes: After completion of the module, the student should demonstrate:

- an integrated knowledge and critical understanding of the theoretical foundation with regard to (i) electrolysis cells, electron transfer reactions (redox reactions), mass transfer, and electrical potential, (ii) the importance of the electrolyte solution as well as the electrical double layer, (iii) the kinetics of electron transfer reactions, (iv) experimental setup and the factors affecting it, and (v) specific electrochemical techniques employed in the laboratory in studying electron transfer;
- an ability to critically interrogate multiple sources of knowledge such as books, scientific papers and the internet within the field of electrochemistry, with specific reference to electron transfer reactions, so as to critically review and evaluate that knowledge with a view of obtaining a deeper understanding and appreciation of the theory and practice of interrogating electron transfer processes;
- skills related to experimental research and practice, under appropriate supervision, by implementing the necessary procedures and methods to effectively execute a planned research design, effectively report on the experimental research findings, and extract relevant conclusions on topics that include (i) the application of the Nernst equation to calculate basic thermodynamic quantities (e.g. potential), (ii) the setup and use of a three electrode cell coupled to a potentiostat, (iii) the application of specific electrochemical techniques that include cyclic voltammetry, linear polarisation, hydrodynamic methods and potential step methods so as to study and interrogate electron transfer reactions;
- an advanced ability to link an appropriate experimental design/technique to a theoretical description (in the form of a mathematical equation) so as to extract experimental information (e.g. electron transfer) on a specific electrochemical system under investigation;
- problem solving skills related to the interface between theory and experiment and to analyse and critically reflect on the outcome/result;
- an understanding of the ethical and professional conduct required of a professional chemist and the ethical application of electrochemistry.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE627	**Semester 1**	**NQF-Level: 8**

Title: Homogeneous catalysis (Elective)

Module-outcomes: After completion of the module CHEN621, the student should demonstrate:

1. integrated knowledge and understanding of the following: principles of green chemistry, definitions and descriptions of concepts in catalytic chemistry, background knowledge of organometallic chemistry of importance in homogeneous catalysis, important homogeneous catalytic reactions and the industrial application

thereof;
2. the ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of homogeneous catalysis, and critically evaluate and review that knowledge to deepen the understanding of homogeneous catalysis;
3. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems in homogeneous catalysis by using appropriate methods;
4. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE628	**Semester 1**	**NQF-Level: 8**

Module-outcomes: After completion of the module CHEN622, the student should demonstrate:
1. integrated knowledge and understanding of the theory behind coal structure, coal characterization and coal utilization;
2. an ability to critically interrogate multiple sources of knowledge, such as books, journals and existing coal characterization data within the field of coal science and critically evaluate that knowledge;
3. the ability to identify, demarcate, analyze, critically reflect on and effectively address complex problems/challenges related to coal utilization;
4. the ability to identify ethical issues regarding coal utilization.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE629	**Semester 1**	**NQF-Level: 8**

Title: Membrane Science and Technology (Elective)

Module-outcomes: After completion of the module CHEN623, the student should demonstrate:
1. An integrated knowledge of the concepts and definitions used in membrane science;
2. the ability to identify and critically solve complex problems related to the calculations commonly used in membrane technology;
3. an understanding of the ethical and professional conduct required of a professional scientist;

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE630	**Semester 1**	**NQF-Level: 8**

Title: Electronic structure methods and solvation models (Elective)

Module-outcomes: t the end of this module the student should
1. Understand the theoretical development to the Hartree-Fock theory,
2. Understand the concept of basis sets and criterion for selection of basis sets;
3. Understand the concept of electron correlation
4. Understand the theoretical development to the Moller-Plesset perturbation theory and Density-Functional theory
5. Understand the fundamental concepts of quantum mechanical continuum solvation models
6. Be able to discuss the different energy-terms present in the interaction energy obtained using continuum solvation approaches (e.g., the polarisable continuum

solvation model)		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE631	**Semester 1**	**NQF-Level: 8**
Title: Thermodynamics of Solution (Elective)		
Module-outcomes: After completion of the NCHE631 module, the student should demonstrate: 1. integrated knowledge and understanding of the basic principle of thermodynamic of solution related to: partial properties and mixing properties, principle exact differentials for solutions and chemical potential, Ideal solution and excess/deviation properties and Activity coefficient; 2. the ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of thermodynamic of solution, and critically evaluate and review that knowledge to deepen the understanding of molecular interaction from thermodynamics data; 3. communicate findings and conclusions in a scientific manner; 4. the ability to identify, demarcate, analyse, critically reflect on and effectively propose solutions for current applications in separation/interaction of liquids mixtures based on understanding of thermodynamic of solution theories fundamentals using appropriate methods/techniques; 5. an understanding of the ethical and professional conduct required of a professional chemist.		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE632	**Semester 1**	**NQF-Level: 8**
Title: Applied Materials Chemistry (Elective)		
Module-outcomes: At the end of this module, students should be able to demonstrate an understanding of: • the basic materials chemistry that underpins current and emerging technologies as well as some of the novel classes of materials being developed for future applications. • molecular, structural, and chemical origins of the physical properties of materials such as mechanical, optical and electronic properties. • instrumental characterization methods and their interpretation. • chemical principles behind modern applications. Specific topics include batteries, solar cells, fuel cells, thermoelectrics, semiconductors, and polymers. • Determination of mechanism of chemical reaction		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NCHE633	**Semester 1**	**NQF-Level: 8**
Title: Introduction to nanomedicine (Elective)		
Module-outcomes: After completion of the module NCHE633, the student should demonstrate: 1. integrated knowledge and understanding of the basic principles of nanomedicine theory related to: synthesis, fabrication, characterization and application of nanomaterials. 2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of nanomedicine, and critically evaluate		

and review that knowledge to deepen the understanding of nanomedicine;
3. communicate findings and conclusions in a scientific manner;
4. the ability to identify, demarcate, analyse, critically reflect on and effectively propose solutions for current applications in medicine based on understanding of nanomedicine fundamentals using appropriate methods;
5. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE634	**Semester 1**	**NQF-Level: 8**

Title: Natural products in drug discovery (Elective)

Module-outcomes: After completion of the module NCHE634, the student should demonstrate:
1. integrated knowledge and understanding of the basic principles of natural products related to: drug discovery, biosynthesis, South African medicinal plants and phytochemicals.
2. an ability to assimilate multiple sources of knowledge such as books, journals and the internet within the field of natural products, and critically evaluate and review that knowledge to deepen the understanding of drug discovery from natural products;
3. communicate findings and conclusions in a scientific manner;
4. the ability to identify, demarcate, analyse, critically reflect on and effectively propose solutions for current applications in drug discovery based on understanding of natural products fundamentals using appropriate methods;
5. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE635	**Semester 1**	**NQF-Level: 8**

Title: Electrochemical sensors (Elective)

Module-outcomes: fter completion of the module NCHE635, the student should demonstrate:
1. integrated knowledge and understanding of the basic principles of electrochemical sensors, fabrication of the nanocomposites as sensors, characterization of fabricated nanosensors, appropriate electrolytes for different biological and environmental analytes and applications of electrochemical sensors
2. an ability to assimilate and apply multiple sources of knowledge such as books, journals and the internet within the field of electrochemical sensors, and critically evaluate and review that knowledge to deepen the understanding of nanosensors in chemistry;
3. communicate findings and conclusions in a scientific manner;
4. the ability to identify, demarcate, analyse, critically processed and interpret experimental data by using appropriate electrochemical techniques;
5. an understanding of the ethical and professional conduct required of a professional chemist.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NCHE671	**Semester 1 & 2**	**NQF-Level: 8**

Title: Research Project

Module-outcomes: After completion of the module CHEN671, the student should demonstrate:

1. integrated knowledge and understanding of research methodology and the ability to successfully execute a chemistry related research project;
2. the ability to assimilate multiple sources of knowledge such as books, journals and the internet, and critically evaluate and review that knowledge;
3. the ability to formulate a project proposal;
4. supervised research skills by selecting and implementing experimental methods to effectively execute a planned research design;
5. communicate findings and conclusions in a scientific manner;
6. the ability to identify, demarcate, analyse, critically reflect on and effectively solve problems associated with the specific project by using appropriate methods;
7. an understanding of the safety, ethical and professional conduct required of a professional chemist working in a research environment.

Method of delivering: Method of delivering: Fulltime and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY611	**Semester 1**	**NQF-Level: 8**

Title: Classical Mechanics

Module-outcomes: fter the completion of module NPHY611, the student should be able to demonstrate the following:

- Formal mathematical knowledge and informed understanding of the fundamental concepts and laws underpinning the sub-themes of Classical Mechanics, i.e., Newtonian and Lagrange Mechanics.
- An informed awareness of how the development of Classical physics, specifically Analytical mechanics, Hamilton mechanics including Legendre transformations and Euler Lagrange equations, has come into a wide use to development of other branch of physics such as quantum mechanics and special theory of relativity, and outline of some applications of present-day interest in pure physics.
- Knowledge, ability and skills to recall, explain the theories and be able to derive techniques applicable to the solution of the following identified classical physics problems: Variational principles and Lagrange's equation; derivation of constraints; two-body central-force problems; small oscillations; special relativity in classical mechanics; Hamilton's equation; canonical transformations and invariants; Noether's theorem: deriving conservation laws and finding symmetries; and particle collisions.
- Knowledge of the known fundamental mechanics; kinematics, i.e. the description of motion in terms of trajectory through space as time progress and dynamics which is relation between changes in a body's motion to their causes; And how they quantify the relation between the forces that act on a body and the resultant motion.
- The ability and skills to explain the theory by means of differential and integral calculus or other branches of mathematics; to solve a variety of the above-mentioned classical physics problems, to evaluate the answers and apply them to phenomena within a well-defined and familiar environment.
- The ability to manage his or her learning and implement the discipline-specific learning strategies given in the study guide NPHY611 to address learning and study problems.
- The ability to work in a group and make appropriate contributions and

sharing resources to successfully complete the practical sessions and thereby taking co-responsibility for the attainment of the outcomes by the group.
• Actions in the academic environment that adheres to the rules as stipulated by the North-West University code of conduct.

- Method of delivering:

- Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY612	**Semester 1**	NQF-Level: 8

Title: Quantum Mechanics

Module-outcomes: After the successful completion of this module, the student must be able to demonstrate:
• Advanced ability to effectively use the mathematical tools of Quantum Mechanics to describe and analyse quantum systems.
• Integrated knowledge, understanding and application of the postulates of Quantum Mechanics as well as a critical understanding and application of the concept of the state of a system and its evolution, measurements in Quantum Mechanics and the connection between Quantum and Classical Mechanics.
• Advanced ability to apply approximation methods to quantum mechanical problems.
• Integrated knowledge and coherent understanding of the approximation methods for stationary states used in Quantum Mechanics.
• Advanced ability to effectively solve simple problems which require the use of approximation methods for stationary states.
• An understanding of the approximation methods used for treating quantum mechanical systems that depend explicitly on time, and how these methods are used for studying the processes of emission and absorption of radiation.
• Advanced ability to apply the approximation methods for time dependent Hamiltonians to simple problems.

Method of delivering:

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY613	**Semester 1**	**NQF-Level: 8**

Title: Electrodynamics

Module-outcomes: Upon completion of this course, the student is expected to:
• Master the concept of the potential formulation of electrodynamics, the connection between potentials and fields, and understand the concept of gauge invariance;
• Be able to evaluate potentials and fields for various charge and current configurations, including point charges;
• Master the concept of retarded potentials and fields;
• Understand the connection between electromagnetic fields and radiation, and be able to identify terms in the electromagnetic fields that contribute to radiation;
• Have a basic understanding of the radiation produced by oscillating electric and magnetic dipoles and by accelerated point charges;
• Master the concepts of special relativity, Lorentz transformations and the four-vector formulation of relativistic kinematics and mechanics;
• Master the co-variant formulation of relativistic electrodynamics in terms of the field tensor.

Method of delivering:		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NPHY621	**Semester 2**	**NQF-Level: 8**
Title: Statistical Mechanics		
Module-outcomes: Upon completion of this course the student would: • Have a detailed and integrated knowledge of statistical mechanics, as especially applicable to the specialized fields of quantum mechanics and solid state physics. • Be able to describe the state of a large system in terms of particle distributions with increasing complexity. • Derive and understand the meaning of the Fermi-Dirac and Bose-Einstein distributions. • Understand the meaning of these distribution functions, and how these are related to macroscopic quantities. • Demonstrate a detailed knowledge of the statistical nature of matter and how this can be described mathematically. • Apply the above specialized skills and integrated knowledge to identify and creatively solve complex and unfamiliar problems at the forefront of the field in statistical mechanics by selecting and applying the correct problem solving techniques, and evaluating and critically reviewing the rigorous solutions acquired by referring to multiple sources in the scientific literature, taking full responsibility for the work done.		
Method of delivering:		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NPHY622	**Semester 2**	**NQF-Level: 8**
Title: Computational Physics		
Module-outcomes: Upon completion of this course the student would: • Solve differential equations (partial and ordinary) as applicable to classical physics of which examples include planetary motion, oscillatory systems, wave propagation, trajectories of moving bodies and potentials and fields • Apply the fast Fourier transform and calculate a power spectrum from signals or periodic data. • Simulate physical systems involving stochastic processes (e.g. random walk and diffusion) using Monte Carlo methods. • Be able choose an appropriate scheme to integrate and differentiate numerically. • To compute, visualize and communicate data and results scientifically.		
Method of delivering:		
Assessment methods: Oral presentations, written assignments, examination		
Module code: NPHY631	**Semester 2**	**NQF-Level: 8**
Title: Plasma Physics (Elective)		
Module-outcomes: Upon completion of this course the student would: • Have a detailed and integrated knowledge of the occurrence of plasmas, especially the specialized field of space plasmas, and the applications of plasma physics. • Be able to describe the motion of singly charged particles in increasingly		

complex electric
and magnetic fields.

- Derive and understand the meaning of a complete set of fluid equations for a plasma.
- Demonstrate a detailed knowledge of plasma wave properties, specifically plasma oscillations, electron plasma waves, ion (acoustic) waves and electromagnetic waves in magnetic fields with different orientations.
- Understand diffusion and mobility in weakly-ionised gases and diffusion in fully-ionised
plasmas.
- Understand the meaning of distribution functions, and study the equations of kinetic
theory.
- Apply the above specialized skills and integrated knowledge to identify and creatively solve complex and unfamiliar problems at the forefront of the field in plasma physics by selecting and applying the correct problem solving techniques, and evaluating and critically reviewing the rigorous solutions acquired by referring to multiple sources in the scientific literature, taking full responsibility for the work done.

Method of delivering:

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY632	**Semester 2**	**NQF-Level: 8**

Title: Introduction to General Relativity (Elective)

Module-outcomes: After the successful completion of this module, the student must be able to demonstrate:

- In-depth knowledge and understanding of the scientific and historical context and reasons why the General Theory of Relativity came into being as a generalisation of the Special Relativity Theory.
- Understanding and evaluation of the criticisms against Newtonian gravity, as well as the changed concept of gravitation from being a force in 3D space plus time, to a property of the geometry of 4D spacetime.
- Integrated knowledge, understanding and application of the fundamental assumptions of General Relativity, as well as the role played by the Equivalence Principle and the equality of inertial and gravitational masses.
- Advanced ability to apply specialized skills in relation to complex relativistic principles to describe the orbits of photons and particles in a particular gravitational field using a spacetime metric and the Geodesic Equation.
- Integrated knowledge and coherent understanding of the implications of the spherically symmetric Schwarzschild geometry which is a solution to Einstein's field equations. Rigorous interpretation of the implications of this solution.
- Conduct in the academic environment that adheres to the rules as stipulated by the North-West University code of conduct, taking full responsibility and accountability for own work.

Method of delivering:

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY633	**Semester 2**	**NQF-Level: 8**

Title; Introduction to Stellar Astrophysics (Elective)

Module-outcomes: Upon completion of this course the student would:

- Have a detailed and integrated knowledge of Stellar Astrophysics, as especially in terms of the structure of the atmospheres and interior.
- Be able to describe the structure of a star from its centre to the surface
- Derive and understand all four stellar structure equations
- Derive and understand the various energy transport mechanisms (convection and radiation) .
- Demonstrate a detailed knowledge of concepts such stellar magnitudes, colours and their relationship to stellar effective temperature, as well the HR diagram.
- Apply the knowledge about photometry and spectroscopy to determine physical properties of stars
- Apply the above specialized skills and integrated knowledge to identify and creatively solve complex and unfamiliar problems at the forefront of the field in stellar astrophysics by selecting and applying the correct problem solving techniques, and evaluating and critically reviewing the rigorous solutions acquired by referring to multiple sources in the scientific literature, taking full responsibility for the work done.

Method of delivering:

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY634	**Semester 2**	**NQF-Level: 8**

Title: Nuclear Physics (Elective)

Module-outcomes: At the end of this module, students should be able to:

- Understand and explain elements of quantum mechanics, nuclear properties and the force between nucleons.
- Explain the Principles of Radioactivity and Properties of a nucleus.
- Identify the Basic features of radioactivity and the radioactive decay process.
- Describe the radiations emitted by a radioactive substance and their interaction with matter.
- Compare and explain the nuclear reactions and nuclear energy.
- Understand and explain the applications of physics in accelerators, astrophysics and the nuclear reactors.
- Apply accelerator principles and designs.
- Discuss the applications of nuclear physics in medicine, nuclear industry and engineering.
- Apply different detecting and measuring techniques to monitor nuclear particles.

Method of delivering:

Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY635	**Semester 2**	**NQF-Level: 8**

Title; Solid State Physics (Elective)

Module-outcomes: t the end of this module the student should be able to:

- Demonstrate an understanding of how solids are held together and the principles of their structure determination experimentally.
- Describe the crystal types, the Miller indices and the reciprocal lattice.
- Have an understanding of the elastic properties of solids and lattice vibrations.
- Demonstrate an understanding of the properties of metals on the basis of the free and nearly free electron gas models.

• Understand what makes a material a metal, insulator or semiconductor in terms of the band theory. • Demonstrate an understanding of the magnetic properties of condensed matter and describe the basic classification of magnetic solids.
Method of delivering:
Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY636	**Semester 2**	**NQF-Level: 8**

Title: Quantum Mechanics II (Elective)
Module-outcomes: After the successful completion of this module, the student must be able to demonstrate: • Advanced ability to effectively use the mathematical tools of Quantum Mechanics in more advanced topics. • Integrated knowledge, understanding and formulating quantum mechanics in terms of the state (density) operator. • Advanced ability to apply the formulation in terms of the state operator to quantum mechanical problems. • Integrated knowledge and coherent understanding of the relativistic treatment of quantum mechanics and the implications thereof. • Advanced ability to effectively solve simple problems that requires relativistic quantum mechanics. • An understanding of the basics of open quantum systems. • Advanced ability to apply the ideas of open quantum systems analytically as well as numerically.
Method of delivering:
Assessment methods: Oral presentations, written assignments, examination

Module code: NPHY671	**Semester 1 & 2**	**NQF-Level: 8**

Title: Research Project
• **Modules outcomes:** • Obtain applied knowledge at the forefront of field and understand the theories and methodologies, methods and techniques of the particular research topic chosen. • Have an understanding on how to apply knowledge in a particular context. • Ability to interrogate multiple sources of knowledge and to evaluate knowledge in a specialist area. • Ability to use range of specialized skills to identify, analyse and address complex or abstract problems. • Ability to critically review information gathering, synthesis of data, evaluation and management processes in specialized contexts. • Present and communicate academic ideas and texts effectively. Offer creative insights, rigorous interpretations and solutions. • Apply learning strategies self-critically to address professional and ongoing learning needs of self and others
Method of delivering:
Assessment methods: Oral presentations, written assignments, examination

Module code: OMBE622	**Semester 2**	**NQF-Level: 8**
Title: **Applied Hydrology**		
Module-outcomes:		

After completion of the module, the student will demonstrate knowledge and critical comprehension of the following:

- Risk assessment methodologies (stochastic and fuzzy logic).
- Development and application of analytical models in the field of hydrology and geohydrology.
- Introduction to numerical groundwater and surface water modelling.
- Analytical element modelling (groundwater).
- Mine flooding modelling (open pit and underground).
- Flood peak estimation through applying the Rational and SCS methods - other methods are left for self-study.
- Flood line determination.

Module uitkomste:

Na voltooiing van die module sal die student kennis en kritiese begrip te demonstreer van die volgende:

- *Risiko assesseringsmetodes (stogasties en "fuzzy logic").*
- *Ontwikkeling en toepassing van analitiese modelle op die gebied van hidrologie en geohidrologie.*
- *Inleiding tot numeriese grondwater en oppervlakwater modellering.*
- *Analitiese Element Modellering (grondwater).*
- *Myne vloed modellering (oopgroef en ondergrondse myne).*
- *Vloedpiek skatting deur die toepassing van die Rasionele en SCS metodes - ander metodes geoormerk vir selfstudie.*
- *Vloedlyn bepaling.*

Method of delivering: Full-time

The method of teaching/presentation will be governed by the subject material and the unique class requirements. Teaching methods will include formal lectures by lecturer, interactive contact sessions, self-study, project work, practical, excursions

Assessment methods:

Methods: Tests, assignments and exam

- After completion of the module, the student should be able to:
- Setup an analytical model through the use of Excel.
- Perform risk analysis making use of analytical models.
- Describe the setup, operation, constraints and boundary conditions associated with a numerical groundwater and surface water models.
- Apply the Analytical Element Model to groundwater problems.
- Perform a mine flooding prognosis for both open pit and underground mines.
- Calculate a flood peak making use of the Rational method and the SCS method.
- Use a flood peak estimation and calculate the associated flood lines.

Module code: OMBE623	**Semester 2**	**NQF-Level: 8**

Title: **Groundwater Geology**

Module-outcomes:

After completion of the module, the student will demonstrate the following:

- Have an integrated knowledge of the geology of South Africa.
- Have a critical understanding of the theories and the geophysical methods (Magnetometer, Electro-Magnetic, Resistivity, Gravitational, Seismic and Radiometric) applied in groundwater investigations.
- Be able to develop conceptual models by making use of geological and hydrogeological information.
- Be able to plan and execute geophysical surveys.
- The ability to select, evaluate and apply a range of different but appropriate geophysical systems and techniques related to geohydrology.
- Be able to interpret geophysical results and write a geophysical report.

Module uitkomste;

Na voltooiing van die module moet die student die volgende demonstreer:

- *'n Geïntegreerde kennis van die geologie van Suid-Afrika .*
- *'n Kritiese begrip van die teorieë en die geofisiese metodes (Magnetometer , Elektromagneties , Resistiwiteit , Gravitasie , Seismies en Radiometries) wat toegepas word in grondwater ondersoeke .*
- *In staat wees om konseptuele modelle te ontwikkel deur gebruik te maak van geologiese en hidrogeologiese inligting.*
- *In staat wees om geofisiese opnames te beplan en uit te voer.*
- *Die vermoë om 'n verskeidenheid van verskillende, maar gepaste geofisiese stelsels en tegnieke te kies, evalueer en toe te pas in die geohidrologiese veld.*
- *In staat wees om geofisiese resultate te interpreteer en 'n skryf geofisiese verslag te skryf.*

Method of delivering: Full-time

The method of teaching/presentation will be governed by the subject material and the unique class requirements. Teaching methods will include formal lectures by lecturer, student self-study, discussion groups, student presentations, videos, demonstrations, practical field work and field visits.

Assessment methods:

Methods: Tests, assignments and exam

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

- Use, explain and apply key definitions, terminologies, concepts, principles and other requirements related to groundwater geology correctly.
- Interrogate the meaning and application of key instruments and principles related to groundwater geology.
- Source new resources and utilise the resources provided to extract, analyse, summarise and/or apply the relevant information to solve problems posed in assignments, tests and examinations.
- Accurately, coherently and appropriately present information generated from fieldwork in a written format.
- Achieve the learning objectives in an effective and expeditious manner.

Module code: OMBE624	Semester 2	NQF-Level: 8

Title: **Geohydrology**

Module-outcomes:

- After completion of the module, the student will demonstrate knowledge and critical comprehension of the following:
- Basic groundwater terminology and definitions.
- Borehole slug test analysis and interpretation.
- Various borehole pump test techniques and the application thereof including the analysis and interpretation of pump test results.
- Identification of groundwater flow regimes and fracture positions based on pump test data.
- Borehole tracer tests and the application thereof.
- Calculation / estimation of sustainable yield of a borehole.
- Recharge calculation methods and the application thereof.
- Groundwater assessments and groundwater reserve determinations.
- Applicable interpolation techniques for groundwater level maps.
- Basic groundwater modelling concepts both on regional and local scale.

Module Uitkomste:

Na voltooiing van die module sal die student kennis en kritiese begrip te demonstreer van die volgende:

- *Basiese grondwater terminologie en definisies.*
- *Boorgat giettoets analise en interpretasie.*
- *Verskeie boorgatpomp toets tegnieke en die toepassing daarvan, insluitend die analise en interpretasie van die pomp toetsuitslae.*
- *Identifisering van grondwater vloei patrone en fraktuur posisies gebaseer op pomp toetsdata.*
- *Boorgat speur toetse en die toepassing daarvan.*
- *Berekening / skatting van volhoubare opbrengs van 'n boorgat.*
- *Aanvulling berekeningsmetodes en die toepassing daarvan.*
- *Grondwater asseserings en grondwater reserwe bepalings.*
- *Toepaslike interpolasie tegnieke vir grondwatervlak karate.*
- *Basiese grondwater modellering konsepte beide op streek- en plaaslike skaal.*

Method of delivering: Full-time

The method of teaching/presentation will be governed by the subject material and the unique class requirements. Teaching methods will include formal lectures by lecturer, student self-study, discussion groups, student presentations, videos, demonstrations and practical field work.

Assessment methods:

Methods: Tests, assignments and exam

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

- Apply Darcy's law taking into account effective hydraulic conductivity.
- Use step and multi-rate pump test data to recommend the appropriate pumping rate for the constant rate test.

- Analyse and interpret pump test data to determine applicable aquifer parameters.
- Identify groundwater flow regimes and fracture positions based on pump test data.
- Recommend the sustainable yield of a borehole based on the methods described in the pump test manual.
- Estimate recharge based on the following methods: Chloride, EARTH, SVF, CRD and Isotopes.
- Perform a groundwater assessment and a groundwater reserve determination.
- Do basic groundwater modelling on aquifer scale as well as wellfield scale.

Module code: OMBE625	**Semester 2**	**NQF-Level: 8**

Title: **Introduction to Hydrology and Integrated Water Resources Management**

Module-outcomes:
Students have mastered the outcomes if they are able to:

- Demonstrate knowledge to enable engagement and critique of current research and practices within the field of hydrology and integrated water resources management and to engage in systematic and disciplined thinking about the matters and issues related to the scarce water resource.
- Are able to interrogate multiple sources of knowledge in hydrology and integrated water resources management, and have the ability to evaluate knowledge and processes of knowledge production.
- To apply and critically judge the effectiveness of the implementation of appropriate strategies and techniques to the solution of problems related to hydrology and integrated water resources management.
- Analyse and apply specialised problem solving skills in hydrology and integrated water resources management.
- Analyse, select and effectively apply carefully supervised scientific research methods to reflect on and then address hydrological and integrated water resources management problems and communicate the research findings in an academically appropriate format.
- Demonstrate an ability to operate effectively within a system of integrated water resources management.
- Recognise and deal responsibly with the moral and ethical issues that relate to hydrology and integrated water resource management.

Method of delivering: Full time only. Teaching methods will include formal lectures by lecturer, student self-study, discussion groups, student presentations, videos, demonstrations and case study work.

Assessment methods:
Formative: Individual tutorials. Individual and group assignments. Class tests. Practical exercises and reports after completion of certain study units.
Summative: Theoretical and/or practical exam at the end of the module.

Module code: OMBE673	Semester 1 & 2	NQF-Level: 8
Title: **Research Project**		
Module-outcomes: At the end of the module the student should be able to demonstrate: The ability to analyse, select and effectively apply scientific research methods within the field of Geography and Environmental Management to address real world problems. The ability to effectively communicate the research findings in an academically appropriate format. The ability to recognise the moral and ethical issues that relate to the research project and to treat them in a responsible manner. *Module uitkomste;* *Aan die einde van die module moet die student in staat wees om die volgende te demonstreer:* *Die vermoë om wetenskaplike navorsingsmetodes te analiseer, selekteer en effektief toe te pas in die veld van Geografie en Omgewingsbestuur om werklike wêreldprobleme aan te spreek.* *Die vermoë om die navorsingsbevindinge op 'n effektiewe en akademies aanvaarbare wyse te kommunikeer.* *Die vermoë om die morele en etiese kwessies wat verband hou met die navorsingsprojek te identifiseer en om op 'n verantwoordelike wyse daarmee om te gaan.*		
Method of delivering: Teaching and learning will be undertaken through delivery techniques relevant to the specific requirements and background of the particular subject. Initially formal lectures will be presented by the lecturere and will gradually be replaced with self-study. Other techniques that will be applied include group work, simulations, modelling, lectures, literature studies, etc		
Assessment methods: Research report written in the prescribed format		

Module code: OMBO611	Semester 1	NQF-Level: 8
Title: **Introduction to Environmental Management**		
Module-outcomes: 1.Critically discuss the definition of environmental management. 2. Demonstrate an in-depth understand of the Deming Cycle (PDCA) and how it relates to environmental management. 3. Provide a holistic perspective of the key challenges facing environmental management and sustainability. 4. Critically discuss the strengths and weaknesses of different environmental management approaches and tools. 5. Critically reflect on the governance, biophysical, social and economic dimensions of sustainability and how it relates to environmental management *Module uitkomste:* *1. Die definisie van omgewingsbestuur krities te bespreek.* *2. Die Deming Cycle (PDCA) krities te bespreek in verband met omgewingsbestuur.* *3. 'n Holistiese perspektief te voorsien van die sleuteluitdagings vir omgewingsbestuur en volhoubaarheid.* *4. Die sterk- en swakpunte van die verskillende benaderings en instrumente in*		

omgewingsbestuur krities te bespreek.

5. Krities te dink oor die bestuurs-, bio-fisiese, sosiale en ekonomiese dimensies van volhoubaarheid en hoe dit verband hou met omgewingsbestuur.

Method of delivering:

Assessment methods: Written and oral assignments completed individually and as a member of a group.

Module code: OMBO613	**Semester 1**	**NQF-Level: 8**

Title: **Introduction to GIS**

Module-outcomes:

At the end of the module the student should be able to demonstrate:

1. An integrated knowledge of and engagement in GIS and critical understanding and application of theories and techniques relevant to GIS.
2. The ability to collect and manage spatial data in both file format and database management format and understand the complex nature of spatial data and how they are different from non-spatial data.
3. The ability to select, apply and critically judge the effectiveness of spatial data with a view to map making.
4. A critical understanding of how GIS aids in management decisions.
5. The ability to analyze, select and effectively apply scientific research methods to address spatial problems and then communicate the research findings in an appropriate academic format.

Module uitkomste:

Aan die einde van die module moet die student in staat wees om die volgende te demonstreer:

1. Geïntegreerde kennis van en betrokkenheid in GIS en 'n kritiese begrip en toepassing van teorieë en tegnieke relevant tot GIS.

2. Die vermoë om ruimtelike data in te samel en te bestuur in beide lêerformaat en in 'n databasisbestuurstelselformaat en die komplekse aard van ruimtelike data en hoe dit verskil van nie-ruimtelike data te verstaan.

3. Die vermoë om toepaslike ruimtelike data te kan selekteer en die effektiwiteit daarvan krities te beoordeel met die oog op kaartproduksie.

4. Kritiese begrip toon van hoe GIS bestuursbesluite kan ondersteun.

5. Die vermoë om wetenskaplike navorsings metodes te analiseer, te selekteer en effektief toe te pas op ruimtelike probleme en die bevindinge op 'n toepaslike akademiese wyse te kommunikeer.

Method of delivering:

Assessment methods:

Theoretical and/or practical exam at the end of the module

Module code: OMBO614	**Semester 1**	**NQF-Level: 8**

Title: **GIS Applications**

At the end of the module the student should be able to demonstrate:

1. An integrated knowledge of and engagement in GIS and critical understanding of the theoretical underpinnings of organizational and analytical procedures within GIS.

2. An ability to critically interrogate multiple sources of knowledge within the field of GIS, and critically evaluate and review that knowledge and the manner in which the knowledge was produced with a view to using GIS.

3. The ability to apply spatial analysis to address real world spatial problems and mapping applications and critically evaluate how GIS assists management decisions.
4. Advanced ability to effectively apply GIS processes to spatial data analysis and to develop a critical understanding of the limitations of GIS methodologies.
5. Proficiency in the use of GIS techniques to create maps that are fit for purpose and effectively convey the information.
6. The ability to analyse, select and effectively apply scientific research methods to address spatial problems and then communicate the research findings in an appropriate academic format.
7. The ability to recognise the moral and ethical issues that relate to sensitive spatial data and to treat them in a responsible manner.

Module uitkomste:

Aan die einde van die module moet die student in staat wees om die volgende te demonstreer:

1. *Geëintegreerde kennis van en betrokkenheid in GIS asook 'n begrip van teorieë, organisatoriese en analitiese prosedures relevant tot GIS.*
2. *Die vermoë om veelvoudige kennisbronne in GIS te ondersoek en om kennis en kennisgenererende prosesse te evalueer in die gebruik van GIS.*
3. *Die vermoë om ruimtelike analise toe te pas op werklike werêldprobleme en karteringstoepassings en die bydrae van GIS tot bestuurbesluite krities evalueer.*
4. *Die gevorderde vermoë om GIS prosesse effektief toe te pas op ruimtelike data analises en om 'n kritiese begrip te ontwikkel vir die beperkinge van GIS metodologieë.*
5. *Vaardighede in die gebruik van GIS tegnieke vir die skep van doelmatige kaarte wat relevante inligting doeltreffend oordra.*
6. *Die vermoë om wetenskaplike navorsings metodes te analiseer, selekteer en effektief toe te pas op ruimtelike probleme en die bevindinge op 'n toepaslike akademiese wyse te kommunikeer.*
7. *Die vermoë om die morele en etiese kwessies wat verband hou met sensitiewe ruimtelike data te identifiseer en om op 'n verantwoordelike wyse daarmee om te gaan.*

Method of delivering:

Assessment methods: Theoretical and/or practical exam at the end of the module

Module code: OMBO678	Semester 1 & 2	NQF-Level: 8

Title: **Environmental Management I**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

1. Integrated knowledge of and a critical understanding regarding concepts, principles, topics and instruments relevant to environmental management according to the principles of equity, sustainability and efficiency.
2. The ability to interrogate multiple sources of knowledge in environmental management, and to evaluate knowledge and processes of knowledge production.
3. The ability to apply and critically judge the effectiveness of the implementation of a range of relevant methods, systems and procedures required to solve practical and theoretical problems in environmental management.
4. The ability to identify, critically reflect on and effectively solve problems related to environmental management.
5. Ability to critically analyse, select and apply scientific research methods to address environmental management problems and then to communicate the findings in an academically appropriate format.
6. Demonstrate an ability to act as an expert in the field of environmental management.
7. The ability to take full responsibility for his/her work and to recognise the moral and ethical issues that relate to sensitive environmental data and to treat them in a responsible manner.

Module uitkomste:

a voltooiing van die module, moet die student die volgende kan demonstreer:

1. *Geïntegreerde kennis van en 'n kritiese begrip oor konsepte, beginsels, onderwerpe, en instrumente relevant tot omgewingsbestuur volgens die beginsels van gelykheid, volhoubaarheid en doeltreffendheid.*
2. *Die vermoë om veelvoudige kennisbronne in omgewingsbestuur te ontgin en om kennis en kennisgenererende prosesse te evalueer.*
3. *Die vermoë om die effektiwiteit van die implimentering van 'n reeks relevante metodes, stelsels en prosedures wat nodig is om praktiese en teoretiese probleme met betrekking tot omgewingsbestuur op te los, te kan toepas en krities te kan evalueer.*
4. *Die vermoë om krities en effektief probleme betreffende omgewingsbestuur te kan identifiseer, daarop te reflekteer asook op te los.*
5. *Die vermoë om wetenskaplike navorsingsmetodes krities te analiseer, te selekteer en effektief toe te pas op omgewingsbestuur en die bevindinge op 'n aanvaarbare akademiese wyse te kommunikeer.*
6. *Demonstreer die vermoë om as 'n kundige op te kan tree binne die gebied van omgewingsbestuur.*
7. *Die vermoë om ten volle verantwoordelikheid vir sy/haar werk te neem en om die morele en etiese kwessies wat verband hou met sensitiewe omgewingsbestuuradata te identifiseer en om op 'n verantwoordelike wyse daarmee om te gaan.*

Method of delivering:

Assessment methods:

The learning process will continually be enhanced through the following:

Individual tutorials.

Individual and group assignments.

Individual and/or group presentations.
Practical exercises and reports after completion of certain study units and/or excursions

Module code: OMBO679	Semester 1 & 2	NQF-Level: 8

Title: **Environmental Analysis I**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

1. Knowledge of and engagement in the field of environmental assessment, an understanding of the concepts, principles, theories and instruments relevant to environmental assessment, as well as an understanding of how to apply such knowledge in a particular context.
2. An ability to interrogate multiple sources of knowledge in environmental assessment and to evaluate knowledge and processes of knowledge production.
3. An understanding of the complexities and uncertainties of selecting or applying appropriate procedures, processes or techniques to practical and theoretical problems in environmental assessment.
4. An ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to environmental assessment.
5. An ability to critically review information gathering, evaluation and management processes in environmental assessment in order to develop creative responses to problems and issues.
6. An ability to present and communicate academic, professional or occupational ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to problems and issues relevant to environmental assessment.
7. Demonstrate an ability to act as an expert in the field of environmental assessment.
8. An ability to take full responsibility for his/her work and to recognise the moral and ethical issues that relate to sensitive environmental data and to treat them in a responsible manner.

Module uitkomste:

Na voltooiing van die module, moet die student die volgende kan demonstreer:

1. Kennis van en betrokkenheid in die terrein van omgewingsassessering, begrip van die relevantw konsepte, beginsels, teorië, asook begrip van hoe om sodanige kennis in die spesifieke konteks toe te pas.
2. Die vermoë om verskeie kennisbronne in omgewingsassessering te ontgin en om kennis en kennisgenererende prosesse te evalueer.
3. Begrip van die kompleksiteite en onsekerhede oor die keuse of toepassing van toepaslike prosedures, prosesse of tegnieke op praktiese of teoretiese probleme in omgewingsassessering.
4. Die vermoë om verskeie gespesialiseerde vaardighede te gebruik om komplekse en abstrakte probleme te identifiseer, te analiseer en aan te spreek deur sistematies gebruik te maak van die gepaste kennisbasis en toepaslike metodes in omgewingsassessering.

5. Die vermoë om inligtingsinsamelingstegnieke, evaluering en bestuursprosesse in omgewingsassessering krities te ondersoek om sodoende kreatiewe

oplossings vir probleme en vraagstukke te ontwikkel.

6. *Die vermoë om akademiese, professionele of beroepsidees en tekste effektief vir verskeie gehore aan te bied en te kommunikeer met kreatiewe insigte, akkurate interpretasies en oplossings vir probleme en vraagstukke relevant tot omgewingsassessering.*
7. *Demonstreer die vermoë om as 'n kundige op te tree binne die gebied van omgewingsassessering.*
8. *Die vermoë om ten volle verantwoordelikheid vir sy/haar werk te neem en om die morele en etiese kwessies wat verband hou met sensitiewe omgewingsdata te identifiseer en om op 'n verantwoordelike wyse daarmee om te gaan.*

Method of delivering:

Assessment methods:
The achievement of module outcomes will be tested in the following ways:
Theoretical and/or oral exam at the end of the module.

Module code: OMBO681	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Environmental Assessment 1**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Knowledge of and engagement in the field of environmental assessment, an understanding of the concepts, principles, theories and instruments relevant to environmental assessment, as well as an understanding of how to apply such knowledge in a particular context.
- An ability to interrogate multiple sources of knowledge in environmental assessment and to evaluate knowledge and processes of knowledge production.
- An understanding of the complexities and uncertainties of selecting or applying appropriate procedures, processes or techniques to practical and theoretical problems in environmental assessment.
- An ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to environmental assessment.
- An ability to critically review information gathering, evaluation and management processes in environmental assessment in order to develop creative responses to problems and issues.
- An ability to present and communicate academic, professional or occupational ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to problems and issues relevant to environmental assessment.
- Demonstrate an ability to act as an expert in the field of environmental assessment.
- An ability to take full responsibility for his/her work and to recognise the moral and ethical issues that relate to sensitive environmental data and to treat them in a responsible manner.

Method of delivering: Teaching methods may include formal lectures by lecturer,

student self-study, discussion groups, student presentations, videos, demonstrations and case study work

Assessment methods: The learning process will continually be enhanced through the following:

- Individual tutorials;
- Individual and group assignments;
- Individual and/or group presentations;
- Class tests; and
- Practical exercises.

The achievement of module outcomes will be tested in the following ways: Theoretical and/or oral exam at the end of the module.

Module code: OMBW611	**Semester 1**	**NQF-Level: 8**

Title: **Fundamentals of Waste Management**

Module-outcomes:
At the end of the module the student should be able to:

- An integrated knowledge of and engagement in integrated waste management and critical understanding and application of theories, techniques and requirements relevant to waste management;
- The ability to gather multiple sources of knowledge and information within the field of integrated waste management, and evaluate, review and apply this knowledge;
- An understanding of the complex nature of knowledge transfer applicable to integrated waste management and how it relates to unfamiliar contexts and other fields of environmental management.
- The ability to select, evaluate and apply a range of different but appropriate tools, techniques, requirements and best practices related to integrated waste management, and to reflect on and propose suggestions to effectively manage waste throughout the entire waste management life cycle.

Module uitkomste:

- *Na afloop van die module moet die student die volgende demonstreer:*
- *Geïntegreerde kennis van en betrokkenheid by geïntegreerde afvalbestuur, en van teorieë, tegnieke en vereistes ten opsigte van afvalbestuur sowel as die vermoë om hierdie konsepte krities te evalueer en toe te pas.*
- *Die vermoë om kennis en inligting oor geïntegreerde afvalbestuur in te samel en te evalueer, te hersien, en toe te pas.*
- *Verstaan die komplekse aard van geïntegreerde afvalbestuur en lewer ingeligte kommentaar oor hoe dit met onbekende kontekste en ander dissiplines in omgewingsbestuur verband hou.*
- *Die vermoë om 'n reeks verskillende, maar toepaslike hulpmiddels, tegnieke, vereistes en beste praktyke wat op geïntegreerde afvalbestuur betrekking het, te selekteer, te evalueer en toe te pas, en om na te dink en voorstelle te maak vir doeltreffende afvalbestuur oor die hele*

afvalbestuurlewensiklus heen

Method of delivering:Full time or part time

Assessment methods:
The learning process will continually be enhanced through the following: Class tests; and Assessment forms by lectures on achievement of learning objectives.

Module code: OMBW612	**Semester 1**	**NQF-Level: 8**

Title: **Waste Management Law and Governance**

Module-outcomes:
At the end of the module the student should be able to:

- An integrated knowledge of and engagement in integrated waste management legislation and governance, and critical understanding and application of these legal requirements (including international obligations, policies, laws, regulations, norms and standards, etc) relevqant to waste management;
- The ability to gather multiple sources of knowledge and information applicable to waste management legislation and governance, and evaluate, review and apply this knowledge;
- An understanding of the complex nature of knowledge transfer applicable to waste management legislation and governance, and how it relates to unfamiliar contexts and other fields of environmental management.
- The ability to select, review, evaluate and apply a range of different but appropriate legislative requirements related to integrated waste management, and to reflect on and propose suggestions to effectively manage waste within the South African legal framework.

Module uitkomste;

Na afloop van die module moet die student die vermoe het om die volgende te demonstreer:

- *Geïntegreerde kennis van en betrokkenheid by geïntegreerde afvalbestuur, wetgewing en owerheidsbestuur er sowel as die vermoë om die wetgewing te verstaan en toe te pas (insluitend internastionaleverpligtinge, beleide, wetgewing, regulasies en norme en standaarde) wat van toepassing is op afvalbestuur.*
- *Die vermoë om kennis en inligting wat van toepassing is op afvalbestuurswetgewing en owerheidsbestuur in te samel en krities te evalueer, te hersien, en toe te pas.*
- *Verstaan die komplekse aard van afvalbestuurswetgewing en owerheidsbestuur en lewer ingeligte kommentaar oor hoe dit met onbekende kontekste en ander dissiplines in omgewingsbestuur verband hou.*
- *• Die vermoë om 'n reeks verskillende, maar toepaslike hulpmiddels, tegnieke, vereistes en beste praktyke wat op afvalbestuurswetegewing en owerheidsbestuur betrekking het, te selekteer, krities te evalueer en toe te pas, en om na te dink en voorstelle te maak vir doeltreffende afvalbestuur binne die Suid-Afrikaanse wetsraamwerk.*

Method of delivering:

Assessment methods:
The learning process will continually be enhanced through the following: Class tests; and Assessment forms by lectures on achievement of learning objectives.

Module code: OMBW621	**Semester 2**	**NQF-Level: 8**

Title: **New Waste Management Solutions**

Module outcomes:
After completion of the module, the student will demonstrate the following:

- An integrated knowledge and understanding of integrated waste management solutions and technologies, and understanding the application of these solutions and technologies as it relates to integrated waste management;
- The ability to gather multiple sources of knowledge and information within the field of waste management innovation and technology, and evaluate, review and apply this knowledge;
- An understanding of the complex nature of knowledge transfer applicable to integrated waste management solutions and technologies and how it relates to unfamiliar contexts and other fields of environmental management, and more specifically to integrated waste management;
- The ability to select and evaluate a range of different but appropriate solutions and technologies related to integrated waste management, and to reflect on and propose suggestions to divert waste away from landfilling by implementing the proposed technologies;.

Module uitkomste:
Na afloop van die kursus moet die student die student die volgende demonstreer:

- *Geïntegreerde kennis van en betrokkenheid by geïntegreerde afvalbestuursoplossings en tegnologie, sowel as die vermoë om hierdie konsepte krities te evalueer en toe te pas soos wat dit verband hou met integreerde afvalsbestuur.*
- *Die vermoë om kennis en inligting in die veld van afvalsbestuur innovasie en tegnologie in te samel en krities te evalueer, te hersien, en toe te pas.*
- *Kontekstualiseer die komplekse aard van geïntegreerde afvalbestuur oplossings en tegnologie en lewer ingeligte kommentaar oor hoe dit met onbekende kontekste en ander dissiplines in omgewingsbestuur verband hou en meer spesifiek tot geïntegreerde afvalbestuur.*
- *Die vermoë om 'n reeks verskillende, maar toepaslike oplossings en tegnologie wat op geïntegreerde afvalbestuur betrekking het, te selekteer, krities te evalueer en toe te pas, en om na te dink en voorstelle te maak om weg te doen met die weggooi van afval deur die voorgestelde tegnologie te implementeer.*

Method of delivering: Full time or part time

Assessment methods:
"The learning process will continually be enhanced through the following:
Class tests; and
Assessment forms by lectures on achievement of learning objectives."

Module code: OMSA622	Semester 2	NQF-Level: 8
Title: **Weeds: interactions and control**		
Module-outcomes: 1) Have a broad knowledge of the fundamental theory and recent developments of Conservation Ecology, as derived from multiple sources within the field of specialization. 2) Assess the system processes and identify research problems associated with Conservation Ecology. 3) Select and apply various methodologies required to practice Conservation Ecology. 4) Be aware of the scope and complexity of ethical and value systems from both the environmental and human perspective. 5) Make informed decisions about conservation management by integrating principles of ecology and conservation biology. 6) Simulate communicating conservation management strategies to stakeholders. *Module uitkomste:* *1) Moet ? breë kennis hê van die fundamentele teorie en onlangse ontwikkelinge van Bewaringsekologie, soos afgelei vanaf veelvuldige bronne in hierdie veld van spesialisasie.* *2) Evalueer die stelselprosesse en identifiseer navorsingsvrae wat met Bewaringsekologie geassosieer word.* *3) Selekteer en pas verskeie metodes toe wat vereis word om Bewaringsekologie te beoefen.* *4) Wees bewus van die omvang en kompleksiteit van etiese- en waardesisteme van beide die omgewing en menslike perspektiewe.* *5) Neem ingeligte besluite oor bewaringsbestuur deur beginsels van ekologie en bewaringsbiologie te integreer.* *6) Simuleer hoe om bewaringsbestuur strategie aan belanghebbendes te kommunikeer.*		
Method of delivering: Method of delivering: Fulltime and part-time		
Assessment methods: Oral presentations, written assignments, examination		
Module code: OMSA623	**Semester 2**	**NQF-Level: 8**
Title: **Plant pathology**		
Module-outcomes: After completion of this module, the student will be able to: • integrate knowledge of the principles of taxonomy and general characteristics of plant disease causing organisms and understand types of diseases and disease epidemiology on economically important crops. • demonstrate detailed knowledge of disease epidemiology, interactions between pathogens, environment and plants and yield loss determination and apply these in development of integrated disease management strategies. • select, evaluate and apply a range of different but appropriate disease management strategies and recommend management strategies. • demonstrate an awareness of the scope and complexity of ethical and value systems from both the environmental and human perspective with regard to disease management decisions in complex agricultural environments.		

- plan and conduct research on the effect of diseases on plants, do damage evaluations and interpret data.
- produce and communicate information and demonstrate ability to present and communicate academic principles of integrated disease pest management to stakeholders.

Module uitkomste:

Na die voltooiing van die module, sal die student die volgende kan demonstreer:

- *geïntegreerde kennis van die beginsels van taksonomie en algemene eienskappe van plantsiekte-veroorsakende organismes en begrip van die tipes siektes asook siekte-epidemiologie in ekonomies-belangrike gewasse.*
- *gedetailleerde kennis van epidemiologie, interaksies tussen patogene, omgewing en plante, asook oesverliesbepaling en die toepassing hiervan in ontwikkeling van geïntegreerde plantsiektebestuurstrategieë.*
- *die vermoë om 'n wye reeks toepaslike plantsiektebestuurstrategieë te selekteer, evalueer en toe te pas en aanbevelings te maak in hierdie verband.*
- *bewustheid van die omvang en kompleksiteit van etiese en waardesisteme vanuit beide 'n omgewings en menslike perspektief rakende siektebeheerbesluite in komplekse lanbou-omgewings.*
- *vermoë om navorsing op die effek van plantsiektes op plante te beplan, skadebepalings te doen en data te interpreteer.*
- *die vermoë om inligting te produseer en te kommunikeer asook om die akademiese beginsels rakende geïntegreerde siektebestuur aan belanghebbendes te kommunikeer.*

Method of delivering: Full time and part-time

Assessment methods: Oral presentations, written assignments, examination

Module code: OMSB611	**Semester 1**	**NQF-Level: 8**

Title: **Conservation Ecology**

Module-outcomes:

After completion of this module, the student will be able to:

- Have a broad knowledge of the fundamental theory and recent developments of Conservation Ecology, as derived from multiple sources within the field of specialization.
- Assess the system processes and identify research problems associated with Conservation Ecology.
- Select and apply various methodologies required to practice Conservation Ecology.
- Be aware of the scope and complexity of ethical and value systems from both the environmental and human perspective.
- Make informed decisions about conservation management by integrating principles of ecology and conservation biology.
- Simulate communicating conservation management strategies to stakeholders

Module uitkomste;

- *Moet breë kennis hê van die fundamentele teorie en onlangse ontwikkelinge van Bewaringsekologie, soos afgelei vanaf veelvuldige bronne in hierdie veld van spesialisasie.*
- *2) Evalueer die stelselprosesse en identifiseer navorsingsvrae wat met Bewaringsekologie geassosieer word.*
- *3) Selekteer en pas verskeie metodes toe wat vereis word om*

Bewaringsekologie te beoefen.

- *4) Wees bewus van die omvang en kompleksiteit van etiese- en waardesisteme van beide die omgewing en menslike perspektiewe.*
- *5) Neem ingeligte besluite oor bewaringsbestuur deur beginsels van ekologie en bewaringsbiologie te integreer.*
- *6) Simuleer hoe om bewaringsbestuur strategie aan belanghebbendes te kommunikeer.*

Method of delivering: Full time and part time

Assessment methods:Written assignments, oral presentations and written exam.

Module code: OMSB621 will become OMSB629	**Semester 1**	**NQF-Level: 8**

Title: **Genome Analysis and Bio-informatics**

Module-outcomes:

- After completion of this module, the student will be able to:
- Demonstrate applied knowledge and critical understanding regarding aspects relevant to genome analysis and bioinformatics.
- Demonstrate an ability to interrogate multiple sources of knowledge in genome analysis and bioinformatics and to evaluate knowledge and processes of knowledge production.
- Demonstrate the ability to apply and critically judge the effectiveness of the implementation of a range of relevant methods, systems and procedures required to solve practical and theoretical problems in genome analysis and bioinformatics.
- Demonstrate your skills regarding elementary research techniques, group work, report writing and problem solving.
- Demonstrate the ability to critically reflect and effectively solve problems related to genome analysis and bioinformatics.
- Effectively identify, evaluate and address his/her learning needs in a self-directed manner, and to facilitate collaborative learning processes.
- Demonstrate the ability to present and communicate academic ideas and text effectively to a range of audiences of problems and issues in genome analysis and bioinformatics.

Method of delivering: Contact and Distance

Assessment methods: Written assignments, oral presentation and written examination

Module code: OMSB624 will becomeOMSB613	**Semester 1**	**NQF-Level: 8**

Title: **Biodiversity Planning**

Module-outcomes:

After completion of this module, the student will be able to:

- Applied knowledge pertaining to the field of conservation planning and the manner in which it is applied and implemented in South Africa.
- An ability to critically interrogate multiple sources of knowledge within the field of biodiversity conservation, and critically evaluate and review that knowledge and the manner in which it was produced with a view to facilitate conservation action.
- The skill of selecting the appropriate methodologies and procedures for identifying and spatially mapping areas of critical importance for biodiversity conservation.
- The ability to access, interpret and discuss information on conservation and biodiversity planning initiatives in South Africa.
- The ability to interpret and treat sensitive data on critical and sensitive

biodiversity in responsible manner.

Module uitkomste:

- *Toegepaste kennis met betrekking tot die veld van bewaringsbeplanning en die wyse waarop dit toegepas en geïmplementeer word in Suid-Afrika.*
- *2) 'n Vermoë om veelvuldige bronne van kennis binne die veld van biodiversiteitsbewaring krities te ondersoek en die wyse waarop dit bewaringsinisiatiewe fasiliteer te evalueer.*
- *3) Die vaardigheid om die geskikte metodologieë en prosedures te selekteer vir die identifisering en ruimtelike kartering van gebiede van kritieke belang vir biodiversiteitsbewaring.*
- *4) Die vermoë om toegang te verkry tot inligting oor bewaring en biodiversiteitsbeplanning inisiatiewe in Suid-Afrika en dit te interpreteer en bespreek.*
- *5) Die vermoë om sensitiewe data wat handel oor kritiese en sensitiewe biodiversiteit op 'n verantwoordelike wyse te interpreteer en te hanteer.*

Method of delivering: Full time and part time

Assessment methods: Written assignments, oral presentation and written examination

Module code: OMSB625 will become OMSB614	**Semester 1**	**NQF-Level: 8**

Title: **Biomonitoring and Risk Assessment**

Module-outcomes:

After completion of this module, the student will be able to:

- Have a broad knowledge of the fundamental theory and recent developments of Biomonitoring and Risk Assessment, as derived from multiple sources within the field of specialization.
- Assess the environmental/taxonomic processes and identify research problems associated with Biomonitoring and Risk Assessment.
- Select and apply various methodologies required to develop Biomonitoring and Risk Assessment programs.
- Be aware of the scope and complexity of ethical and value systems from both the environmental and human perspective.
- Make informed decisions about species or habitat management based on the outcomes of Biomonitoring and Risk Assessment programs.
- Simulate communicating outcomes management suggestions from Biomonitoring and Risk Assessment programs to stakeholders.

Module uitkomste:

- *Moet breë kennis hê van die fundamentele teorie en onlangse ontwikkelinge van Biomonitering en Risiko Assessering, soos afgelei vanaf veelvuldige bronne in hierdie veld van spesialisasie.*
- *2) Evalueer die omgewings/taksonomiese prosesse en identifiseer navorsingsvrae wat met Biomonitering en Risiko Assessering geassosieer word.*
- *3) Selekteer en pas verskeie metodes toe wat vereis word om programme te ontwikkel vir Biomonitering en Risiko Assessering.*
- *4) Wees bewus van die omvang en kompleksiteit van etiese- en waardesisteme van beide die omgewing en menslike perspektiewe.*
- *5) Neem ingeligte besluite oor habitat bestuur wat gebaseer is op die uitkomste van Biomonitering en Risiko Assessering programme.*
- *6) Simuleer hoe om bestuursvoorstelle van Biomonitering en Risiko*

Assessering programme aan belanghebbendes te kommunikeer.

Method of delivering: Full time and part time

Assessment methods:
Written assignments, oral presentation and written examination.

Module code: OMSB627	**Semester 2**	**NQF-Level: 8**

Title: Herpetology in Practise

Module-outcomes:
After completion of this module, the student will be able to:

- Integrated knowledge and critical understanding of the herpetology discipline.
- Ability to critically interrogate multiple sources of knowledge within the field of herpetology, and critically evaluate and review that knowledge.
- Ability to select and apply knowledge and skills to correctly make use of appropriate methods and techniques to work with amphibians and reptiles.
- Ability to integrate specimen characteristics and other aids to correctly identify species of herpetofauna.
- Skills and knowledge to assess causes that threaten herpetofauna as well as awareness of issues surrounding the conservation of herpetofauna including threats and management.
- Ability to critically judge the ethical/professional conduct of the herpetologist and to apply this conduct.

Method of delivering: Full time

Assessment methods:
Written assignments, oral presentation and written examination..

Module code: OMSB628	**Semester 2**	**NQF-Level: 8**

Title: Coral Reef Ecology

Module-outcomes:

- An integrated knowledge and critical understanding of coral reef ecology.
- The ability to locate and interrogate multiple sources of knowledge related to coral reef ecology.
- The ability to critically evaluate and contextualize the knowledge and accompanying insights.
- The ability to correctly select and apply knowledge and skills to make use of appropriate methods and techniques relevant to coral reef ecology.
- The ability to identify and classify the different animal and algal taxa associated with coral reefs, and the ecological roles that they play.
- Skills, knowledge and insights to assess pressures and changes that threaten coral reefs.
- Skills, knowledge and insights of management and conservation options related to coral reefs.
- The ability to identify and formulate the ethical and health considerations of working and research on coral reefs.

Method of delivering: Full time

Assessment methods:
Written assignments, oral presentation and written examination

Module code: OMSE611	Semester 1	NQF-Level: 8

Title: **Environmental Soil Science (GDKN 122, GDKN 211 and GDKN 221 are pre-requisites for this module)**

Module-outcomes:

On completion of this module the student should:

- have an understanding of how to apply fundamental knowledge, such as soil mechanics and the double layer theory, to evaluate/interrogate environmental soil issues and the rehabilitation practices thereof
- have an understanding the complexities of soils sampling and analysis procedures and techniques with application to solving unfamiliar problems relating to soils in the environment;
- have the ability to use the range of specialized skills applied in soil science to identify, evaluate and address complex problems in the soil environment;
- have the ability to critically review information gathered from field and soil analytical data, in specialized contexts like soil erosion and soil nutrient availability be able to develop creative responses to environmental soil problems and issues;
- be able to present and communicate scientific knowledge of soils and creative insights into environmental soil problems, academically and professionally to managers and decision makers;
- be able to operate effectively within a soil environmental setting, understanding the integrated and interrelated nature of the different properties of soils;
- be able to self-critically evaluate ongoing learning and professional development and be able to employ learning strategies to address personal needs and the needs of other students;
- be fully accountable and take full responsibility for his/her own decision-making, actions, and delivered work as well as his/her use of both academic, laboratory or natural resources.

Module uitkomste:

- *Verstaan hoe om fundamentele kennis, soos grondmeganika en die dubbellaag teorie, toe te pas om omgewingsgrondprobleme en die rehabilitasie daarvan te ondersoek en te evalueer.*
- *Begrip besit vir die kompleksiteit van grondmonsterneming en -analise prosedures en tegnieke, vir aanwending in die oplos van onbekende probleme in gronde in die omgewing.*
- *Die vermoeë besit om die verskeidenheid gespesialiseerde vaardighede in gebruik in grondkunde te kan gebruik om komplekse grondprobleme in die omgewing te identifiseer, evalueer en aan te spreek.*
- *Die vermoeë besit om inligting verkry vanaf analitiese veld en grond data, krities te evalueer tot op volg gespesialseerde kontekste, soos grond erosie of nutriënt beskikbaarheid, en om daarvolgens kreatiewe voorstelle vir die omgewingsgrondprobleme te lewer.*
- *In staat wees om wetenskaplike kennis en kreatiewe insigte rondom die*

oplos van omgewingsgrondprobleme, akademies en professioneel aan bestuurders en besluitnemers oor te dra.

- *In staat wees om effektief in omgewingsgrondkunde te werk deur die geïntegreerde en interafhanklike aard van die verskeie grondeienskappe te verstaan.*
- *In staat wees om selfkrities voortgesette leer en professionele ontwikkeling te evalueer en die regte leer-stratigieë te kan toepas om persoonlike behoeftes en, waar van toepassing, die behoeftes van ander studente, aan te spreek.*
-
- *Volle aanspreekbaarheid en verantwoordelikheid vir sy/haar eie besluitnemings, opterdes en werk asook in sy/haar gebruik van hulpbronne, hetsy akademies, laboratorium of natuurlik van aard*

Method of delivering: Full time

Assessment methods:

- Work assignments during the semester.
- Semester test.
- Examination at the end of the module.

Module code: OMSE612	**Semester 1**	**NQF-Level: 8**

Title: Introduction to Landscape ecology

Module outcomes:

On completion of the module, the student should be able to demonstrate:

- integrated knowledge of and engagement in the field of landscape ecology and critical understanding of the scope and context of landscape ecology, scale and scaling, patterns and processes in the landscape and analyses methods of landscape structure and function.
- the ability to critically evaluate the principles and concepts of landscape ecology and integrate them with other aspects of environmental management.
- the ability to critically interrogate peer-reviewed scientific publications in the field of landscape ecology and critically evaluate and review how scale, scaling, patterns and processes are addressed by studying various case studies.
- the ability to select, evaluate and effectively apply different methods in landscape structure and function analyses to reflect on and then address complex environmental problems in urban environments.
- the ability to identify, demarcate, analyse, critically reflect on and effectively address complex problems related to scale and scaling in environmental sciences and apply landscape ecological principles based on the theoretical background.
- accurate, coherent, appropriate and creative presentation and verbal communication skills of current and previous landscape ecological research with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism.
- the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner.

Module uitkomste:

Wanneer die module voltooi is, moet die student:

- *geïntegreerde kennis hê van en betrokkenheid in die veld van landskapsekologie asook kritiese begrip van die omvang en konteks van*

landskapsekologie, graad en gradering, patrone en prosesse in die landskap en analise-metodes van landskapstruktuur en –funksie.

- *die vermoë besit om die beginsels en begrippe van landskapsekologie krities te evalueer en met ander aspekte van omgewingswetenskappe te integreer.*
- *die vermoë besit om krities ondersoek te doen van eweknie-beoordeelde wetenskaplike publikasies in die veld van landskapsekologie en krities te evalueer hoe graad, gradering, patrone en prosesse aangespreek word deur verskeie gevalle studies te bestudeer.*
- *die vermoë besit om verskillende metodes in landskapstruktuur en –funksie-analises te selekteer, evalueer en effektief toe te pas en dan op komplekse omgewingsprobleme in stedelike omgewings te reflekteer hulle en aan te spreek.*
- *die vermoë besit om komplekse probleme wat verband hou met graad en gradering in die omgewingswetenskappe te identifiseer, af te baken, te analiseer, krities op te reflekteer en effektief aan te spreek en om landskapsekologiese beginsels gebaseer op 'n teoretiese agtergrond, toe te pas.*
- *akkurate, samehangende, geskikte en kreatiewe aanbiedings en verbale kommunikasie vaardighede besit van huidige en vorige landskapsekologiese ekologiese navorsing met die begrip van en respek vir intellektuele eiendomswaarde, kopiereg en reëls met betrekking tot plagiaat.*
- *die rol en aanspreeklikheid van die mens/industrie as 'n onderdeel van die omgewing en die beskerming daarvan op eties verantwoordbare manier demonstreer.*

Method of delivering: Full time

Assessment methods:

Module code: OMSE613	**Semester 1**	**NQF-Level: 8**

Title: **Resilience Thinking in Ecology**

Module-outcomes:
On completion of the OMSE613 module, the student should be able to demonstrate:

- integrated knowledge of and engagement in Resilience Thinking and critical understanding and application of different theories in Systems Thinking relevant to Ecology.
- coherent understanding of thresholds and adaptive cycles as the two central themes that underpin Resilience Thinking.
- the ability to explore different principles for building resilience in social-ecological systems.
- the ability to reflect and apply Resilience Thinking in his/her field of ecological research interest.
- the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner

Method of delivering: Full time and part time

Assessment methods:
Closed book written examination.

Module code: OMSE621	Semester 2	NQF-Level: 8

Title: **Restoration of degraded ecosystems**

- **Module-outcomes:**
- On completion of the module, the student should be able to demonstrate:
- integrated knowledge of the different biomes, land use types and capability classes, including land tenure, land reform, as well as the socio-economic and bio-physical factors that could influence the long-term sustainability of rangeland management strategies.
- understand the complex nature of community based natural resource management principles in rangeland management and restoration ecology.
- an ability to critically evaluate the role of plant- and animal functional types in ecosystem dynamics, their role in ecosystem services and be able to apply them in the development of models to understand changes in plant populations and rangeland management.
- the ability to select, evaluate and effectively apply different multivariate data analysis techniques used in terrestrial ecology and rangeland management.
- understand, evaluate and apply all the principles necesarry to develop a restoration management plan.
- the ability to critically interrogate and use peer-reviewed scientific publications in the field of rangeland management and restoration ecology.
- accurate, coherent, appropriate and creatively present through written and verbal communication skills current rangeland management and restoration applications with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism.
- the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner

Module uitkomste:

Wanneer die module voltooi is, moet die student die volgende demonstreer:

- *geïntegreerde kennis van die verskillende biome, tipes landgebruik en geskiktheidsklase, insluitend grond besit, gebruik en hervormings beleide, asook die sosio-ekonomiese en bio-fisiese faktore wat die volhoubare bestuur van die natuurlike weiveld oor die lang-termyn kan beinvloed.*
- *die komplekse probleem van gemeenskapsgebaseerde natuurlike hulpbronbestuur in natuurlike weiding en restourasie vestaan.*
- *die vermoë besit om die rol van plant- en dierfunksionele tipes in ekosisteemdinamika en die rol daarvan in ekosisteemdienste verstaan en evalueer en in die ontwikkeling van modelle om die veranderinge in plantpopulasies en weiveldbestuur toe te pas.*
- *die vermoë besit om verskillende meervoudige dataanalitiese metodes wat in landekologie en weiveldbestuur gebruik word te selekteer, evalueer en effektief toe te pas.*
- *verstaan, evalueer en die beginsels van 'n restourasiebestuursplan toe te pas.*
- *die vermoë besit om krities wetenskaplike publikasies ten opsigte van natuurlike weiveldbestuur en restourasie ekologie te analiseer, evalueer en effektief te gebruik.*
- *akkurate, samehangende, geskikte en kreatiewe aanbiedings deur*

geskrewe en verbale kommunikasie vaardighede oor natuurlike weiveldbestuur en restorasie te maak met die begrip van en respek vir intellektuele eiendomswaarde, kopiereg en reëls met betrekking tot plagiaat.

- *die rol en aanspreeklikheid van die mens/industrie as 'n onderdeel van die omgewing en die beskerming daarvan op eties verantwoordbare manier demonstreer.*

Method of delivering: Full time and part time

Assessment methods: Written assignments, oral presentation and written examination.

Module code: OMSE622	**Semester 2**	**NQF-Level: 8**

Title: **Urban Ecology**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- integrated knowledge of and engagement in the field of urban ecology and critical understanding of the scope and historical development of urban ecology, different approaches in urban ecological studies and the application of urban ecological principles in conservation of biodiversity and ecosystem services , urban planning and design and urban agriculture.
- the ability to critically evaluate the principles and concepts of urban ecology and integrate them with other aspects of environmental management
- the ability to critically interrogate peer-reviewed scientific publications and integrate them with urban ecological theories and discuss how they could be used to advance sustainability and resilience of urban areas
- the ability to analyse, select, and effectively apply scientific methods in conceptual approaches such as urbanization gradients, landscape ecology, ecosystem budgets and urban social-ecological systems to reflect on and then address complex environmental problems in urban environments.
- the ability to identify, demarcate, analyse, critically reflect on and effectively address complex problems related to an increase in urbanization and apply urban ecological principles based on the theoretical background
- accurate, coherent, appropriate and creative presentation and verbal communication skills of current and previous urban ecological research with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism
- • the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner

Module uitkomste:

Wanneer die module voltooi is, moet die student:

- *geïntegreerde kennis hê van en betrokkenheid in die veld van stedelike ekologie asook kritiese begrip van die omvang en historiese ontwikkeling van stedelike ekologie, verskillende benaderings in stedelike ekologiese studies en die toepassing van stedelike ekologiese beginsels in bewaring van*

biodiversiteit en ekosisteemdienste, stedelike beplanning en ontwerp en stedelike landbou.

- *die vermoë besit om die beginsels en begrippe van stedelike ekologie krities te evalueer en met ander aspekte van omgewingswetenskappe te integreer.*
- *die vermoë besit om krities ondersoek te doen van eweknie-beoordeelde wetenskaplike publikasies en te integreer met stedelike ekologiese teorieë en bespreek hoe dit gebruik kan word om volhoubaarheid en veerkragtigheid in stedelike gebiede te bevorder.*
- *die vermoë besit om wetenskaplike metodes in konsepsuele benaderings soos verstedelikingsgradiënte, landskapsekologie, ekosisteembegrotings en stedelike sosio-ekologiese sisteme te analiseer, selekteer, en effektief toe te pas om op komplekse omgewingsprobleme in stedelike omgewings te reflekteer en aan te spreek.*
- *die vermoë besit om komplekse probleme wat verband hou met 'n toename in verstedeliking te identifiseer, af te baken, te analiseer, krities op te reflekteer en effektief aan te spreek en om stedelike ekologiese beginsels gebaseer op 'n teoretiese agtergrond, toe te pas.*
- *akkurate, samehangende, geskikte en kreatiewe aanbiedings en verbale kommunikasie vaardighede besit van huidige en vorige stedelike ekologiese navorsing met die begrip van en respek vir intellektuele eiendomswaarde, kopiereg en reëls met betrekking tot plagiaat.*
- *die rol en aanspreeklikheid van die mens/industrie as 'n onderdeel van die omgewing en die beskerming daarvan op eties verantwoordbare manier demonstreer.*

Method of delivering: Full time and part time

Assessment methods: Written assignments, oral presentation and written examination.

Module code: OMSE623	**Semester 2**	**NQF-Level: 8**

Title: **Plant ecophysiology and stress physiology**

Module outcome:

After completing the module you should be able to:

- Integrate and assess the various physiological and biochemical stress responses of plants and to critically understand the interaction between plants and its environment.
- Demonstrate an understanding of the basic concepts of plant stress, acclimation and adaptation.
- Identify, analyse, evaluate and to critically reflect the challenges of plant survival.
- Effectively implement stress adaptations and acclimations and to develop and communicate his or her own ideas of plant responses to environmental stress.
- Analyse, select and effectively apply plant strategies to address environmental impacts.

- Demonstrate the ability to identify, demarcate, analyse, critically reflect on and effectively address challenges related to plant stress and survival and to apply physiological and biochemical principals with current environmental challenges.
- Demonstrate the ability to take full responsibility for his or her own work, decision-making and use of resources.

Module uitkomste:

Na voltooiing van die module moet jy in staat wees om:

- *Die verskillende fisiologiese en biochemiese stremmingsreaksies te integreer en te evalueer en om die interaksies tussen plante en hul omgewing krities te kan verstaan.*
- *? Begrip van die basiese konsepte van plant stres, akklimasie en adaptasie te demonstreer.*
- *Die uitdagings van plant oorlewing te identifiseer, ontleed, evalueer en om krities daaroor na te dink.*
- *Effektiewelik stres aanpassings en akklimatisering te implementeer en om die ontwikkeling en kommunikasie van hom of haar eie idees te ontwikkel van plant reaksies tot omgewingstres.*
- *Plant stress strategieë te analiseer, selekteer en effektiewelik toe te pas om omgewings impakte aan te spreek.*
- *Die vermoeë te kan demonstreer om die uitdagings wat verband hou met stress en oorlewing te kan identifiseer, af te baken, te analiseer, krities daaroor na te dink en om fisiologiese en biochemiese beginsels, wat verantwoordelik is vir huidiglike omgewings uitdagings, toe te pas.*
- *7. Die vermoeë te kan demonstreer*

Method of delivering: Full time and part time

Assessment methods: Written assignments, oral presentation and written examination.

Module code: OMSE625	**Semester 2**	**NQF-Level: 8**

Title: **Advanced Ecotoxicology**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- integrated knowledge of and engagement in the field of ecotoxicology and critical understanding and application of toxicity testing using standard test methods, exposure routes, mode of action of toxicants, biotransformation, detoxification, biodegradation and biomarkers in the field of environmental risk assessment.
- an understanding of bioaccumulation, the effects of contaminants at increasing levels of ecological organization, and the regulatory aspects of the field addressing the technical issues of risk assessment.
- he/she can discuss the principles and concepts of ecotoxicology and integrate this with other aspects of environmental management.
- the ability to critically interrogate peer-reviewed scientific publications and integrate it with ecotoxicological theories and discuss how it could be used to address environmental pollution events.
- he/she has the ability to evaluate national/international trends in

ecotoxicology and integrating it with theoretical peer-reviewed published knowledge.
- an ability to present and communicate the concept of risk analysis in ecotoxicology and how it relates to environmental pollution.
- the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner.

Module uitkomste:

Wanneer die module voltooi is, moet die student:

- *geïntegreerde kennis hê van en betrokkenheid in die veld van ekotoksikologie asook kritiese begrip en toepassing van toksisiteit toets met behulp van standaard toets metodes, blootstelling roetes, metode van werking van gifstowwe, biotransformasie, ontgifting, biodegradasie en biomerkers in die gebied van die omgewing risiko-evaluering*
- *'n begrip het van bioakkumulasie, die gevolge van besoedeling op toenemende vlakke van ekologiese organisasie, en die regulatoriese aspekte van die veld aanspreek van die tegniese kwessies van risiko-evaluering*
- *die beginsels en konsepte van ekotoksikologie bespreek en integreer met ander aspekte van omgewingsbestuur*
- *die vermoë het om krities ondersoek te doen van ewekniebeoordeelde wetenskaplike publikasies en integreer dit met ekotoksikologiese teorieë en bespreek hoe dit gebruik kan word om gebeure omgewingsbesoedeling te spreek*
- *oor die vermoë beskik om nasionale / internasionale tendense in ekotoksikologie evalueer en te integreer met teoretiese portuurbeoordeelde gepubliseerde kennis*
- *oor die vermoë beskik om oor die konsep van risiko-analise in ekotoksikologie en hoe dit verband hou met omgewingsbesoedeling aanbiedings te maak en te kommunikeer.*
- *die rol en aanspreeklikheid van die mens/industrie as 'n onderdeel van die omgewing en die beskerming daarvan op etiesverantwoordbare manier demonstreer*

Method of delivering: Fulltime and part-time

Assessment methods: Written assignments, oral presentation and open book written examination

Module code: OMSE626	**Semester 2**	**NQF-Level: 8**

Title: **Microbial Ecology**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

- Integrated knowledge of and engagement in the field of microbial ecology as well as its application to environmental problems.
- That he/she can discuss the principles and concepts of microbial ecology and integrate this with aspects of environmental management.
- An understanding of the interactions between the physical, chemical and biological properties of ecosystems inhabited by microorganisms, as well as the complexities surrounding the selection and application of appropriate methods for microbial ecology research.
- The ability to evaluate national/international trends in microbial ecology and integrate it with theoretical peer-reviewed published knowledge to solve unfamiliar problems in microbial ecology.

- The ability to critically judge the role and accountability of humans/industry as part of the environment and protection thereof in an ethically responsible manner.
- The ability to effectively communicate academic and professional ideas and texts to a range of audiences, offering creative responses to environmental issues.
- Self-regulated learning skills and accountability for own work, learning and use of resources..

Module uitkomstes:

Wanneer die module voltooi is, moet die student:

- *Geïntegreerde kennis hê van en betrokkenheid demonstreer in die veld van mikrobiese ekologie sowel as die toepassing daarvan op omgewingsprobleme.*
- *Die beginsels en konsepte van mikrobiese ekologie kan bespreek en dit integreer met aspekte van omgewingsbestuur.*
- *Begrip toon van die interaksies tussen die fisiese, chemiese en biologiese eienskappe van ekosisteme wat deur mikroörganismes bewoon word, asook die kompleksiteite wat verband hou met die seleksie en aanwending van gepaste metodes vir mikrobiese ekologie navorsing.*
- *Onbekende probleme in mikrobiese ekologie kan oplos deur nasionale en internasionale tendense in mikrobiese ekologie te evalueer en dit te integreer met gepubliseerde teoretiese kennis wat ewe-knie geëvalueer is.*
- *'n Kritiese beoordeling kan doen van die rol en aanspreeklikheid van die mens/industrie as 'n onderdeel van die omgewing en die beskerming daarvan op 'n eties-verantwoordbare wyse.*
- *Akademiese en professionele idees en tekste effektief kan kommunikeer aan 'n verskeidenheid van gehore en daarmee saam, kreatiewe reaksie kan bied op omgewingskwessies.*
- *Self-gereguleerde leervaardighede demonstreer en aanspreeklikheid neem vir eie werk, leer en gebruik van bronne.*

Method of delivering: Full time and part time

Assessment methods: Written assignments, oral presentation and written examination

Module code: OMSE674	**Semester 1 & 2**	**NQF-Level: 8**

Title: **Research Project**

Module-outcomes:

After completion of the module, the student should demonstrate:

- an understanding of the theories, research methods and techniques relevant to the particular research project including how to interrogate multiple sources and critically reviewing information gathering.
- an understanding of the complexities and uncertainties of selecting and applying standard techniques to the unfamiliar problem of the research project.
- an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems as part of resolving the research question.
- an ability to present and communicate academic, professional or occupational ideas and concepts effectively to a range of audiences.
- an ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs as a researcher with integrity: integrity towards his/her own conduct as a researcher, but also treating the environment and biota with respect.

Module uitkomste:

• *By die afhandeling van die module, moet die student kan demonstreer dat hy/sy:*

• *die teorieë, navorsingsmetodes en tegnieke relevant tot die besondere navorsingsprojek begryp en 'n verskeidenheid bronne vir toepaslike inligting krities kan evalueer vir ontginning.*

• *die kompleksiteite en onsekerhede betrokke by die keuse en toepassing van standaardtegnieke op die onbekende probleem van die navorsingsprojek begryp.*

• *'n reeks gespesialiseerde vaardighede kan gerbuik om komplekse of abstrakte probleme te identifiseer, te analiseer en aan te spreek in die oplossing van die navorsingsvraag.*

• *akademiese, professionele en beroepsgerigte idees en konsepte effektief aan 'n verskeidenheid gehore kan kommunikeer.*

• *op 'n selfkritiese wyse, leerstrategieë sy/haar eie professionele en voortgesette leerbehoeftes as 'n navorser met integriteit kan toepas: integriteit teenoor sy/haar eie optrede as wetenskaplike, maar ook deur die omgewing en biota met respek te behandel.*

Method of delivering: Full time or part time

Assessment methods: • Presentation at mini-conference, as well as marks for research related skills training, e.g. project proposal, literature review, statistics assignment. Research report written in the prescribed format.

Module code: OMSG611	**Semester 1**	**NQF-Level: 8**

Title: **Environmental geochemistry (GLGN112 and GLGN311 are pre-requisites for this module)**

Module-outcomes:

The ability to apply knowledge of the theories, research methodologies, and techniques relevant to Environmental Geochemistry and demonstrate the ability to interrogate and evaluate multiple sources of knowledge in this field.

The ability to understand the complexities and uncertainties of selecting, applying or use of appropriate procedures or techniques to a range of unfamiliar abstract problems relevant to Environmental Geochemistry.

The ability to apply a range of specialized skills in the field of Environmental Geochemistry through the analysis of complex problems, drawing on previous knowledge and a range of methods appropriate to the field.

The ability to critically judge the ethical and professional conduct of self and others, take responsibility for own work and practices as well as to effect change in conduct where necessary; with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism.

The ability to produce accurate, coherent, appropriate and creative presentation and communication of innovative and new professional ideas/texts/methods/research findings etc. to a range of audiences, through critically reviewing information, processing, synthesizing, managing and evaluating information/data offering critical and creative insight and solutions to problems.

The ability to operate effectively within a team/system and/or manage a

team/group and demonstrate logical and critical understanding of the roles of all role players/ team members in order to solve complex problems, monitoring the progress of the team/group and taking responsibility for task outcomes and application of appropriate resources.
The ability to apply self-critical learning skills with the use of specific learning strategies of known and new resources to successfully realize all outcomes of this module.
Module uitkomste:
Die vermoë om kennis van die teorieë , navorsingsmetodologieë en tegnieke relevant tot Omgewingsgeochemie toe te pas en die vermoë demonstreer om verskeie bronne van kennis in hierdie veld te ondersoek en evalueer.
Die vermoë om die kompleksiteit en onsekerhede te verstaan wat saamhang met die seleksie, toepassing en gebruik van toepaslike prosedures of tegnieke op 'n verskeidenheid van onbekende abstrakte probleme relevant tot Omgewingsgeochemie.
Die vermoë om 'n verskeidenheid van gespesialiseerde vaardighede toe te pas in die Omgewingsgeochemie veld deur die ontleding van komplekse probleme, gebruik van vorige kennis en verskeidenheid van metodes wat geskik is vir hierdie veld.
Die vermoë om die etiese en professionele gedrag van jouself en ander krities te beoordeel, verantwoordelikheid te neem vir eie werk en praktyke asook om verandering teweeg te bring in gedrag waar nodig ; met 'n begrip en respek vir intellektuele eiendomsooreenkomste , kopiereg en reëls oor plagiaat.
Die vermoë om akkurate , logies, gepaste en kreatiewe aanbiedinge en kommunikasie van innoverende en nuwe professionele idees / tekste / metodes / navorsingsbevindinge ens te produseer vir 'n verskeidenheid gehore deur krities te beoordeling van inligting, verwerking, sintetisering, bestuur en evaluering van inligting / data om kritiese en kreatiewe insig en oplossings vir probleme te bied.
Die vermoë om doeltreffend te funksioneer binne 'n span / stelsel en / of bestuur van 'n span / groep en om logiese en kritiese begrip van die rolle van alle rolspelers / spanlede en vermoë om komplekse probleme op te los te demonstreer, die monitering van die vordering van die span / groep en verantwoordelikheid te neem vir taak uitkomste en toepassing van toepaslike hulpbronne.
Die vermoë om self- kritiese leer toe te pas met die gebruik van spesifieke strategieë van bekende en nuwe leerhulpbronne om al die uitkomste van hierdie module suksesvol te bereik.

Method of delivering: Full time

Assessment methods: Written assignments, oral presentations, partial open book examination

Module code: OMSG621	Semester 2	NQF-Level: 8

Title: **Environmental Mineralogy (GLGN 122 and GLGN211 are pre-requisites for this module)**

Module-outcomes:

On completion of these outcomes the student should be able to demonstrate:

- integrated knowledge of and engagement in environmental mineralogy, and critical understanding and application of theories and current research methodologies and techniques relevant to environmental mineralogy;
- the ability to critically review information to give accurate, coherent, appropriate and creative presentation and communication of new scientific findings, investigative methods and research findings in the field of environmental mineralogy to peers, with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism;
- self-regulating learning skills by developing own learning-strategies;
- the ability to critically judge the ethical conduct of others in the application of solutions regarding (potential) pollution of the environment en endangering life, as well as critical reflection on the suitability of different ethical value systems applied in environmental mineralogy;
- take full responsibility for own work, decision-making and use of resources, as well as full accountability for decisions and actions of others where appropriate (group work).

Module uitkomste:

- *Na voltooiing van die module, behoort die student in staat te wees om die volgende te demonstreer:*
- *geïntegreerde kennis van en betrokkenheid by omgewingsmineralogie, kritiese begrip en toepassing van teorieë en huidige navorsingsmetodologie en tegnieke relevant in omgewingsmineralogie;*
- *die vermoeë om inligting krities te beoordeel om akkurate, samehangende, geskikte en kreatiewe aanbiedings en kommunikasies van nuwe wetenskaplike bevindings, ondersoekmetodes en navorsingsbevindinge in die veld van omgewingsmineralogie, aan te bied vir 'n eweknie gehoor, met begrip van en respek vir intellektuele eiendom, kopiereg en reëls oor plagiaat;*
- *selfregulerende leervaardighede deur ontwikkeling van eie leerstrategieë;*
- *die vermoeë om die etiese gedrag van ander krities te beoordeel in die toepassing van oplossings betreffende (potensiële) besoedeling van die omgewing en bedreiging van lewe, asook kritiese besinning oor die geskiktheid van verskillende etiese waardestelsels toegepas in omgewingsmineralogie;*
- *5. neem volle verantwoordelikheid vir eie werk, besluitneming en gebruik van bronne, asook volle aanspreeklikheid vir besluite en optredes van ander waar van toepassing (groepwerk).*

Method of delivering:Full time

Assessment methods:

- oral reporting relating to prepared work;
- some assessment tests;
- individual and group assignments submitted as written papers or oral presentations during contact sessions.

Formal examination at the end of the semester.

Module code: OMSG622	**Semester 2**	**NQF-Level: 8**

Title: **Applied environmental geology (GLGN 112, GLGN221 and GLGN321 are pre-requisites for this module)**

Module-outcomes:

On completion of this module, the successful learner should be able to demonstrate their ability to:

- apply knowledge of the theories, research methodologies, and techniques relevant to Applied Environmental Geology and interrogate and evaluate multiple sources of knowledge in this field;
- understand the complexities and uncertainties of selecting, applying or transferring appropriate procedures or techniques to a range of unfamiliar abstract problems;
- apply a range of specialized skills in the field of Environmental Geology through the analysis of complex problems, drawing on the body of knowledge and a range of methods appropriate to the field;
- critically judge the ethical and professional conduct of self and others, take responsibility for own work and practices as well as to effect change in conduct where necessary, with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism;
- produce accurate, coherent, appropriate and creative presentation and communication of innovative and new professional ideas/texts/methods/research findings etc. to a range of audiences, through critically reviewing information, processing, synthesizing, managing and evaluating information/data offering critical and creative insight and solutions to problems;
- operate effectively within a team/system and/or manage a team/group and demonstrate logical and critical understanding of the roles of all role players/ team members in order to solve complex problems, monitoring the progress of the team/group and taking responsibility for task outcomes and application of appropriate resources;
- apply self-critical learning skills with the use of specific learning strategies of known and new resources to successfully realize all outcomes of this module.
- *Module uitkomste:*
- *Die vermoë om kennis van die teorieë , navorsingsmetodologieë en tegnieke relevant tot Omgewingsgeochemie toe te pas en die vermoë demonstreer om verskeie bronne van kennis in hierdie veld te ondersoek en evalueer.*
- *Die vermoë om die kompleksiteit en onsekerhede te verstaan wat saamhang met die seleksie, toepassing en gebruik van toepaslike prosedures of tegnieke*

op 'n verskeidenheid van onbekende abstrakte probleme.

- *Die vermoë om 'n verskeidenheid van gespesialiseerde vaardighede toe te pas in die veld van Omgewingsgeologie deur die ontleding van komplekse probleme , gebruik van vorige kennis en verskeidenheid metodes wat geskik is vir hierdie veld.*
- *Die vermoë om krities te beoordeel die etiese en professionele gedrag van die self en ander , neem verantwoordelikheid vir eie werk en praktyke asook om verandering teweeg in gedrag waar nodig; met 'n begrip en respek vir intellektuele eiendomsooreenkomste , kopiereg en reëls oor plagiaat.*
- *Die vermoë om akkurate , logies, gepaste en kreatiewe aanbiedinge en kommunikasie van innoverende en nuwe professionele idees / tekste / metodes / navorsingsbevindinge ens te produseer vir 'n verskeidenheid gehore deur krities te beoordeling van inligting, verwerking, sintetisering, bestuur en evaluering van inligting / data om kritiese en kreatiewe insig en oplossings vir probleme te bied.*
- *Die vermoë om doeltreffend te funksioneer binne 'n span / stelsel en / of bestuur van 'n span / groep en om logiese en kritiese begrip van die rolle van alle rolspelers / spanlede en vermoë om komplekse probleme op te los te demonstreer, die monitering van die vordering van die span / groep en verantwoordelikheid te neem vir taak uitkomste en toepassing van toepaslike hulpbronne.*
- *Die vermoë om self- kritiese leer toe te pas met die gebruik van spesifieke strategieë van bekende en nuwe leerhulpbronne om al die uitkomste van hierdie module suksesvol te bereik.*

Method of delivering: Fulltime

Assessment methods: Written assignments, oral presentations, partial open book examination

Module code: OMSP611	**Semester 1**	**NQF-Level: 8**

Title: **Principles of integrated pest management**

Module-outcomes:

After completion of this module, the student will be able to:

- integrate knowledge of host plant resistance and biological-, cultural- and chemical control and critically understand the principles of integrated pest management.
- understand the impact of pest management measures in complex agricultural systems.
- select, evaluate and apply a range of different and appropriate pest management strategies to solve problems encountered in the field of pest management.
- demonstrate an awareness of the scope and complexity of ethical and value systems from both the environmental and human perspective with regard to pest management decisions.
- conduct theory driven arguments to solve complex challenges within the field of integrated pest management.
- produce and communicate information and demonstrate ability to present and communicate academic principles of integrated pest

management to stakeholders.

Module uitkomste:

Na voltooiing van die module, sal die student die volgende kan demonstreer:

- *geïntegreerde kennis van gasheerplantweerstand en biologiese-, kulturele- en chemiese beheer asook ? kritiese begrip van die beginsels van geïntegreerde plaagbestuur.*
- *begrip van die impak van plaagbestuursmaatreëls in komplekse landboustelsels.*

die vermoë om ? reeks verskillende en toepaslike plaagbestuurstrategieë te selekteer, te evalueer en toe te pas om sodoende probleme wat in die veld van plaagbestuur voorkom, op te los.

- *bewustheid van die omvang en kompleksiteit van etiese en waardesisteme van beide die omgewings- en menslike perspektief met betrekking tot plaagbestuursbesluitneming.*
- *die vermoë om teoriegedrewe argumente te voer om komplekse uitdagings in die veld van geïntegreerde plaagbestuur op te los.*
- *die vermoë om inligting te produseer en hierdie inligting asook akademiese beginsels rakende geïntegreerde plaagbestuur aan belangegroepe te kommunikeer.*

Method of delivering: Full time and part time

Assessment methods: Oral presentations, written assignments, examination

Module code: OMSP622	**Semester 2**	**NQF-Level: 8**

Title: **GM crops and integrated pest management**

Module-outcomes:

After completion of this module, the student will be able to:

- integrate knowledge of genetically modified crops, resistance evolution processes, insect resistance management to enhance Integrated Pest Management startegies.
- understand the target and-non-target effects of genetically modified crops or co-used products in the environment, and be able to apply ecological models in a risk assessment process.
- be able to critically investigate sources of knowledge within the field of genetically modified crops, and critically evaluate that knowledge.
- demonstrate an awareness of stewardship responsibilities and application thereof in the context of genetically modified crops.
- prepare and present oral and written reports and use appropriate platforms to communicate academic principles regarding use of biotechnology in agriculture.

Module uitkomste:

By die voltooiing van die module, sal die student die volgende kan demonstreer:

- *geïntegreerde kennis van geneties-gemodifiseerde gewasse, die prosesse van evolusie van weerstandigheid en insekweerstandbestuur strategieë, om geïntegreerde plaagbestuur strategieë te verbeter.*
- *begrip van die teiken en nie-teiken effekte van geneties-gemodifiseerde*

gewasse of produkte wat daarmee saam gebruik word in die omgewing, asook duie vermoë om ekologiese modelle te gebruik in ? risiko-assesseringsproses.

- *die vermoë om kritiese ondersoek te doen van kennisbronne in die veld van geneties-gemodifiseerde gewasse, en om hierdie kennis krities te evalueer.*
- *bewustheid van rentmeesterskap-verantwoordelikhede en toepassing daarvan in die konteks van geneties-gemodifiseerde gewasse*
- *die vermoë om geskrewe en mondelinge verslae voor te berei en van toepaslike forums gebruik te maak om akademiese beginsels rakende die gebruik van biotegnologie in landbou aante bied.*

Method of delivering: Full time and part time

Assessment methods: Oral presentations, written assignments, examination

Module code: OMSP623	**Semester 2**	**NQF-Level: 8**

Title: **Nematodes and crops**

Module-outcomes:

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

- applied knowledge about Nematology, an understanding of the relevant theories and research methodologies, how to integrate, evaluate and practically apply such knowledge.
- an understanding of the complexities and uncertainties of selecting and applying appropriate standard procedures, processes or techniques to unfamiliar problems experienced in Nematology.
- an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods used in Nematology research.
- an ability to identify and address ethical issues related to Nematology research based on critical reflection and ethical value systems, take full responsibility and accountability for own work, learning and decision-making and use of resources.
- an ability to critically review information gathering, evaluation and management processes in Nematology to develop creative solutions, present and communicate academic, professional and occupational ideas effectively to a range of audiences in the field of Nematology.

Module uitkomste:

Na voltooiing van die module, sal die student die volgende kan demonstreer:

- *toegepaste kennis van Nematologie, begrip van die relevante teorieë en navorsingsmetodologieë, hoe om kennis te integreer, evalueer en toe te pas.*
- *begrip van die kompleksiteite en onsekerhede rakende die seleksie asook toepassing van toepaslike standaard-prosedures, prosesse en tegnieke om onbekende probleem in Nematologie aan te spreek.*
- *die vermoë om n reeks van gespesialiseerde vaardighede te gebruik om komplekse of abstrakte probleme in Nematologie te analiseer en aan te spreek deur sistematies gebruik te maak van kennis en metodes in hierdie vakgebied.*
- *die vermoë om etiese aspekte rakende Nematologienavorsing te identifiseer en aan te spreek deur middel kritiese evaluasie en etiese waardestelsels, asook verantwoordelikheid en aanspreeklikheid te neem vir eie werk, navorsing en besluitneming en benutting van hulpbronne.*
- *die vermoë om inligting te bekom, te evalueer en bestuursprosesse te*

ontwikkel om kreatiewe oplossings te vind vir probleme in Nematologie; asook die vermoë om akademiese en professionele idees doeltreffend aan te bied vir n wye reeks belanghebbendes in die veld van Nematologie.

Method of delivering: Full time and part time

Assessment methods: Oral presentations, written assignments, examination

Module code: OMSP624	**Semester 2**	**NQF-Level: 8**

Title: **Arthropoda/plant interactions**

Module-outcomes:

At the end of the module the student should be able to demonstrate:

Applied knowledge of environmental hydrology and demonstrate an understanding of the research methodologies, methods and techniques, to interrogate multiple sources of knowledge and to evaluate knowledge relevant to the fields of hydrology and aquatic ecology, as well as an understanding of how to apply such knowledge in a particular context.

An understanding of the complexities of selecting, applying appropriate processes or techniques to assess ecological drivers and responders in environmental hydrology.

An ability to use a range of specialised skills to identify, analyse and address environmental hydrology issues drawing systematically on the body of knowledge and methods appropriate to the fields of hydrology and aquatic ecology.

An ability to critically review information gathering, evaluation and management processes in the different disciplines that constitute of environmental hydrology in order to develop creative responses to problems and issues.

An ability to identify and address ethical issues based on critical reflection on the suitability of different ethical value systems to specific areas in the fields of hydrology, aquatic ecology and water resources management and to take full responsibility for own work, learning, decision-making and use of resources.

An ability to present and communicate academic and professional ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to problems and issues with regard to environmental hydrology (environmental drivers: water quality, hydrology and geomorphology and environmental responders: riparian vegetation, macroinvertebrates and fish) and the water resources management application thereof.

An ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the disciplines that relate to environmental hydrology.

Module uitkomste:

Aan die einde van die module moet die student in staat wees om:

Kennis aangaande omgewingshidrologie toe te pas en die verstaan van navorsingsmetodiek, metodes en tegnieke te demonstreer, om veelvoudige bronne van kennis te ondersoek, die kennis wat relevant tot ekologie en omgewingshidrologie te evalueer en verstaan hoe om die kennis binne 'n gegewe konteks toe te pas.

Om die kompleksiteit van die seleksie en toepassing van geskikte prosesse en tegnieke te verstaan wat gebruik word om ekologiese drywers en reageerders in omgewingshidrologie te bepaal.

Die vermoë besit om 'n reeks gespesialiseerde vaardighede te gebruik om omgewingshidrologie kwessies te identifiseer, analiseer en aanspreek deur sistematies die kennisbron en metodes wat van toepassing in die velde van ekologie en hidrologie te ontgin.

Die vermoë besit om die insameling van inligting, evaluering en bestuursprosesse in die omgewingshidrologie dissiplines krities te beoordeel en om in staat te wees om kreatiewe oplossings vir probleme en kwessies te ontwikkel.
Die vermoë besit om etiese kwessies te identifiseer en aan te spreek deur krities oor die toepaslikheid van die etiese waardesisteme in die velde van hidrologie, akwatiese ekologie en water hulpbronbestuur te reflekteer en om vir eie werk, leer, besluitneming en gebruik van hulpbronne verantwoordelikheid te neem.
Die vermoë besit om akademiese en professionele idees effektief aan verskillende teikengehore oor te dra en te kommunikeer en daardeur kreatiewe insig, deeglike interpretasie en oplossings tot probleme in omgewingshidrologie en waterhulpbronbestuur te bied.
Om op 'n kritiese wyse leerstrategieë vir eie professionele ontwikkeling en vir voortgesette leer in die vakdissiplines van omgewingshidrologie toe te pas.

Method of delivering Full time and part time:

Assessment methods: Oral presentations, written assignments and exam

Module code: OMSW611	**Semester 1**	**NQF-Level: 8**

Title: **Aquatic Ecosystems: Pollution and Ecotoxicology**

Module-outcomes:
On completion of the module, the student should be demonstrate:

- knowledge of a broad range of methods to infer aquatic ecosystem health based on the community structure of aquatic biota across various trophic levels.
- knowledge of appropriate monitoring methodologies used to assess anthropogenic impacts and pollution on the quality of inland waters.
- interpretation and application of appropriate indices and assessment techniques used to infer aquatic ecosystem health.
- determine appropriate monitoring methods for application in a wide variety of aquatic habitat types.
- independent assessment and interpretation of data without external influence or duress.
- synthesis of data and evaluation of information arising from diverse sources regarding microbiological, ecotoxicological and biological monitoring of pollution in aquatic ecosystems.
- the ability to use and distinguish appropriate sources of information.

Module uitkomste:
By voltooiing van die module moet die student die volgende demonstreer:
kennis oor 'n wye reeks metodes om akwatiese ekostelselgesondheid af te lei vanuit die gemeenskapstruktuur van die akwatiese biota in die verskeie trofiese vlakke.
kennis van die geskikte moniteringsmetodes wat gebruik word om antropogeniese impakte en die effek van besoedeling op binnelandse water te assesseer.
interpretasie en toepassing van die toepaslike indekse en die assesseringstegnieke wat gebruik word om akwatiese ekostelselgesondheid af te lei.
bepaling van geskikte moniteringsmetodes vir toepassing in 'n groot verskeidenheid akwatiese habitattipes.
onafhanklike assessering en interpretasie van data sonder eksterne invloed of druk.
sintese van data en evaluering van inligting wat uit diverse bronne rakende mikrobiologiese, ekotoksikologiese en biologiese monitering van besoedeling in die

akwatiese ekostelsel, ontstaan.
die vermoë om te onderskei tussen, en gebruik te maak van, geskikte inligtingsbronne.

Method of delivering: Full time or part time

Assessment methods: Oral presentations, written assignments and exam.

Module code: OMSW622	**Semester 2**	**NQF-Level: 8**

Title: **Phycology**

Module-outcomes:

On completing the module the student should be able to demonstrate:

- Integrated knowledge of and engagement in phycology as well as critical understanding and application of certain theories (such as the theory of symbiosis), research methodologies and techniques relevant to the field of phycology.
- An ability to critically interrogate multiple sources of knowledge within the field of phycology, e.g. structure and characteristics of various algal taxa, and critically evaluate and review this knowledge and the manner in which the knowledge was produced in order to explain and compare the structure of different groups of algae with one another.
- The ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant skills, techniques, methods and procedures generally used in phycology.
- The ability to analyse, select and effectively apply carefully supervised scientific research methods to reflect on and then address complex or abstract problems and contribute to positive change within the field of phycological research.
- Supervised research skills by selecting and implementing suitable research methods to effectively execute a planned research design, report research findings and produce conclusions in the form of acceptable academic assignments.
- The ability to identify, demarcate, analyse, critically reflect on and effectively address complex challenges related to the formation of algal blooms and to be able to write assignments, that are strengthened with theory-driven arguments, on these problems.
- An ability to apply, in a self-critical manner, learning strategies which effectively address his/her own professional and ongoing learning needs in disciplines that relate to the study of algae.

Method of delivering Full time and part time:

Assessment methods: Assignments, class tests, presentations and written examination

Module code: OMSW624	**Semester 2**	**NQF-Level: 8**

Title: **Environmental Hydrology**

Module-outcomes:

- At the end of the module the student should be able to demonstrate:
- Applied knowledge of environmental hydrology and demonstrate an understanding of the research methodologies, methods and techniques, to interrogate multiple sources of knowledge and to evaluate knowledge relevant to the fields of hydrology and aquatic ecology, as well as an understanding of how to apply such knowledge in a particular context.
- An understanding of the complexities of selecting, applying appropriate

processes or techniques to assess ecological drivers and responders in environmental hydrology.

- An ability to use a range of specialised skills to identify, analyse and address environmental hydrology issues drawing systematically on the body of knowledge and methods appropriate to the fields of hydrology and aquatic ecology.
- An ability to critically review information gathering, evaluation and management processes in the different disciplines that constitute of environmental hydrology in order to develop creative responses to problems and issues.
- An ability to identify and address ethical issues based on critical reflection on the suitability of different ethical value systems to specific areas in the fields of hydrology, aquatic ecology and water resources management and to take full responsibility for own work, learning, decision-making and use of resources.
- An ability to present and communicate academic and professional ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to problems and issues with regard to environmental hydrology (environmental drivers: water quality, hydrology and geomorphology and environmental responders: riparian vegetation, macroinvertebrates and fish) and the water resources management application thereof.
- An ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the disciplines that relate to environmental hydrology.
- *Module uitkomste:*
- *Aan die einde van die module moet die student in staat wees om:*
- *Kennis aangaande omgewingshidrologie toe te pas en die verstaan van navorsingsmetodiek, metodes en tegnieke te demonstreer, om veelvoudige bronne van kennis te ondersoek, die kennis wat relevant tot ekologie en omgewingshidrologie te evalueer en verstaan hoe om die kennis binne 'n gegewe konteks toe te pas.*
- *Om die kompleksiteit van die seleksie en toepassing van geskikte prosesse en tegnieke te verstaan wat gebruik word om ekologiese drywers en reageerders in omgewingshidrologie te bepaal.*
- *Die vermoë besit om 'n reeks gespesialiseerde vaardighede te gebruik om omgewingshidrologie kwessies te identifiseer, analiseer en aanspreek deur sistematies die kennisbron en metodes wat van toepassing in die velde van ekologie en hidrologie te ontgin.*
- *Die vermoë besit om die insameling van inligting, evaluering en bestuursprosesse in die omgewingshidrologie dissiplines krities te beoordeel en om in staat te wees om kreatiewe oplossings vir probleme en kwessies te ontwikkel.*
- *Die vermoë besit om etiese kwessies te identifiseer en aan te spreek deur krities oor die toepaslikheid van die etiese waardesisteme in die velde van hidrologie, akwatiese ekologie en water hulpbronbestuur te reflekteer en om vir eie werk, leer, besluitneming en gebruik van hulpbronne verantwoordelikheid te neem.*
- *Die vermoë besit om akademiese en professionele idees effektief aan*

verskillende teikengehore oor te dra en te kommunikeer en daardeur kreatiewe insig, deeglike interpretasie en oplossings tot probleme in omgewingshidrologie en waterhulpbronbestuur te bied.

- *Om op 'n kritiese wyse leerstrategieë vir eie professionele ontwikkeling en vir voortgesette leer in die vakdissiplines van omgewingshidrologie toe te pas.*

Method of delivering: Full time

Assessment methods: Assignments, presentations and a written examination paper at the end of the semester..

Module code: OMSW625	**Semester 2**	**NQF-Level: 8**

Title: **Limnology**

Module-outcomes:

After completion of the module, the student should demonstrate:

- integrated knowledge of and engagement in limnology and critical understanding and application of the ecological principles relevant to freshwater ecology.
- an ability to critically interrogate multiple sources of knowledge (e.g. freshwater ecology and limnology) within the field of ecology, and critically evaluate and review that knowledge and the manner in which the knowledge was produced with a view to understanding the relationship between physico-chemical changes and algal and benthic biology interactions.
- the ability to select, apply and critically judge the effectiveness of the implementation of a range of appropriate observations and sampling techniques with a view to determining the limnological interactions and functions in freshwater ecosystems.
- supervised research skills by selecting and implementing appropriate sampling designs in freshwater lentic habitats to effectively execute a planned research design, report research findings and produce conclusions in an acceptable academic format i.e. practical reports.
- an ability to identify and address ethical issues based on critical reflection on the suitability of different ethical value systems to specific areas in the field of limnology and to take full responsibility for own work, learning, decision-making and use of resources.
- the ability to identify, demarcate, analyse, critically reflect on and effectively address complex challenges related to changes in physico-chemical characteristics of lentic freshwater systems and apply evidence-based solutions with theory-driven ecological arguments.
- an ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the disciplines that relate to limnology.

Method of delivering: Full time (Only students partaking in the ASU exchange programme)

Assessment methods: Written and oral assignments, practical report and written examination at the end of the module.

Module code: OMSW626	**Semester 2**	**NQF-Level: 8**

Title: **Animal Ecology**

Module-outcomes:

After completion of the module, the student should demonstrate:

- integrated knowledge of and engagement in animal ecology and critical understanding and application of the ecological principles relevant to animal

ecology.

- an ability to critically interrogate multiple sources of knowledge (e.g. relationships of animals to their physical, chemical and biological habitats) within the field of ecology, and critically evaluate and review that knowledge and the manner in which the knowledge was produced with a view to understanding the relationship between these habitat and their distributions.
- the ability to select, apply and critically judge the effectiveness of the implementation of a range of appropriate observations and sampling techniques with a view to determining the ecological functions in terrestrial ecosystems.
- supervised research skills by selecting and implementing appropriate sampling designs in terrestrial ecosystems to effectively execute a planned research design, report research findings and produce conclusions in an acceptable academic format i.e. practical reports.
- an ability to identify and address ethical issues based on critical reflection on the suitability of different ethical value systems to specific areas in the field of animal ecology and to take full responsibility for own work, learning, decision-making and use of resources.
- the ability to identify, demarcate, analyse, critically reflect on and effectively address complex challenges related to increased human activities terrestrial ecosystems and apply evidence-based solutions with theory-driven ecological arguments.
- an ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the disciplines that relate to animal ecology.

Method of delivering: Full time (Only students partaking in the ASU exchange programme)

Assessment methods: Written and oral assignments, practical report and written examination at the end of the module.

Module code: OMWE611	**Semester 1**	**NQF-Level: 8**

Title: **Rehabilitation of disturbed areas**

Module-outcomes:

On completion of the module, the student should be able to demonstrate:

a/b.The Ability to apply extensive and systematic knowledge and critical understanding of the natural and anthropogenic causes of landscape degradation including soil, surface water and groundwater, the interaction between different environments and material attributes regarding rehabilitation and remedial techniques and rehabilitation and remedial techniques with the aim to restore disturbed landscapes. The ability to interrogate and evaluate multiple sources of knowledge in rehabilitation sciences will also be achieved.

c.Understanding of complex factors and processes that contribute to degradation must be able to characterize, analyze, evaluate and rehabilitation and remedial techniques must be able to be applied to solve problems;

d.The ability to apply a range of specialized rehabilitation related skills through the analysis of environmental disturbances by referring to the body of knowledge and methodologies available in this field.

e/j.The ability to evaluate and apply ethical and professional conduct and to evaluate the conduct of others or as part of a group. To function as responsible professionals with understanding and respect for intellectual property as well as copy write and plagiarism conventions.

f/g.Present ideas, methods and research findings in a coherent, appropriate and creative way to a number of different audiences. The ability to critically review information, processing and evaluating information and data to offer creative insights and solutions to problems.
h.Demonstrate the ability to operate, manage group exercises and demonstrate critical understanding of the roles of group members and monitoring the progress of task outcomes in order to solve complex problems.
i.Application of self-critical learning skills using different learning strategies of recognized and innovative resources to successfully achieve all outcomes of this module.
Module uitkomste:
Na voltooiing van die module behoort die student tot die volgende in staat wees:
a / b. Die vermoë om 'n uitgebreide en sistematiese kennis en kritiese begrip van die natuurlike en menslike oorsake van landskap degradasie insluitend grond, oppervlak-en grondwater, die interaksie tussen verskillende omgewings en materiaal eienskappe met betrekking tot rehabilitasie en remediërende tegnieke en rehabilitasie en remediërende tegnieke met die doel om landskappe te rehabiliteer. Die vermoë om verskeie bronne van kennis te ontgin en te evalueer in rehabilitasie wetenskappe sal ook bereik word.
c. Begrip van komplekse faktore en prosesse wat bydra tot degradasie te karakteriseer, ontleed, evalueer en moet in staat wees om rehabilitasie en remediërende tegnieke toe te pas om probleme op te los;
d. Die vermoë om 'n verskeidenheid van gespesialiseerde rehabilitasie verwante vaardighede toe te pas deur die ontleding van omgewings degradasie en te verwys na die liggaam van kennis en metodes beskikbaar in hierdie studie veld.
e / j. Die vermoë om etiese en professionele gedrag en die gedrag van ander te evalueer en toe te pas of as deel van 'n groep. Om as 'n verantwoordelike professionele persoon met begrip en respek vir intellektuele eiendom sowel as kopiereg en plagiaat-konvensies te kan funksioneer.
f / g. Teenwoordig idees, metodes en navorsingsresultate in 'n samehangende, gepaste en kreatiewe manier aan 'n aantal verskillende gehore. Die vermoë om inligting, verwerking en evaluering van inligting en data krities te hersien en om kreatiewe insigte en oplossings vir probleme te bied.
h. Die vermoë te demonstreer om te funksioneer en leiding te toon tydens groepswerk, en om kritiese begrip te toon van die rolle van groeplede en die monitering van die vordering van die taak uitkomste ten einde komplekse probleme op te los.
i. Toepassing van self-kritiese leer vaardighede met behulp van verskillende leerstrategieë van erkende en innoverende hulpbronne om al die uitkomste van die module suksesvol te bereik.
GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module / *Rehabilitasie van versteurde gebiede, GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module*

Method of delivering: Full time

Assessment methods:
Formative assessment of knowledge in the form of assignments that are done individually or in groups.
Summative assessment through formal examination at the end of the module

Module code: OMWP611	Semester 1	NQF-Level: 8

Title: **Pest phenology and damage symptoms**

Module-outcomes:

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

- applied knowledge of pest phenology and damage symptoms and demonstrate an understanding of the research methodologies, methods and techniques, to interrogate multiple sources of knowledge and to evaluate knowledge relevant to the fields of entomology, plant pathology, nematology and acarology, as well as an understanding of how to apply such knowledge in a particular context.
- an understanding of the complexities of selecting, applying appropriate processes or techniques to unfamiliar problems in the fields of entomology, plant pathology, nematology and acarology.
- an ability to use a range of specialised skills to identify, analyse and address pest problems drawing systematically on the body of knowledge and methods appropriate to the fields of entomology, plant pathology, nematology and acarology.
- an ability to gather and critically review information, evaluate and manage processes in the fields of entomology, plant pathology, nematology and acarology in order to develop creative responses to problems.
- an ability to present and communicate academic and professional information and ideas effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to problems and issues with regard to pests (insects, mites, nematodes and fungi) and the damage they cause.
- an ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the fields of entomology, plant pathology, nematology and acarology

Module uitkomste:

Na voltooiing van die module, sal die student die volgende kan demonstreer:

- *toegepaste kennis van plaagfenologie en skadesimptome, en begrip van navorsingsmetodologie, metodes en tegnieke om veelvuldige bronne van kennis te ondersoek en kennis rakende entomologie, plantpatologie, nematologie en akarologie te evalueer, en begrip te toon van hoe om hierdie kennis binne spesifieke konteks te gebruik.*
- *begrip van die kompleksiteite wat verband hou met die selekteer en toepas van toepaslike prosesse en tegnieke om probleme op te los in die veld van entomologie, plantpatologie, nematologie en akarologie.*
- *die vermoë om gespesialiseerde vaardighede te benut om plaagprobleme te analiseer en aan te spreek deur sistematies gebruik te maak van kennis en metodes wat toepaslik is in die velde van entomologie, plantpatologie, nematologie en akarologie.*
- *die vermoë om inligting te versamel en krities te evalueer, en om prosesse in die veld van entomologie, plantpatologie, nematologie en akarologie te evalueer.*
- *die vermoë om akademiese en professionele inligting en idees doeltreffend aan n wye reeks gehore aan te bied, kreatiewe insig te bied, en na deeglike vertolking van inligting, met oplossings na vore te kom vir plaagprobleme (insekte, myte, nematode en fungi) en die skade wat dit veroorsaak.*
- *vermoë om op kritiese wyse, leerstrategie toe te pas wat eie voortdurende en professionele leerbehoeftes in die velde van entomologie, plantpatologie,*

nematologie en akarologie aanspreek.

Method of delivering: Fulltime and part-time

Assessment methods Oral presentations, written assignments, insect collection and exam.

Module code: OMWP613	**Semester 1**	**NQF-Level: 8**

Title: **Economic damage and threshold values**

After completion of this module, the student will be able to:

- integrate knowledge of host plant resistance and biological-, cultural- and chemical control and critically understand the principles of integrated pest management.
- understand the impact of pest management measures in complex agricultural systems.
- select, evaluate and apply a range of different and appropriate pest management strategies to solve problems encountered in the field of pest management.
- demonstrate an awareness of the scope and complexity of ethical and value systems from both the environmental and human perspective with regard to pest management decisions.
- conduct theory driven arguments to solve complex challenges within the field of integrated pest management.
- produce and communicate information and demonstrate ability to present and communicate academic principles of integrated pest management to stakeholders.

Module uitkomste:

Na voltooiing van die module, sal die student die volgende kan demonstreer:

- *geïntegreerde kennis van gasheerplantweerstand en biologiese-, kulturele- en chemiese beheer asook kritiese begrip van die beginsels van geïntegreerde plaagbestuur.*
- *begrip van die impak van plaagbestuursmaatreëls in komplekse landboustelsels.*

die vermoë om verskillende en toepaslike plaagbestuurstrategieë te selekteer, te evalueer en toe te pas om sodoende probleme wat in die veld van plaagbestuur voorkom, op te los.

- *bewustheid van die omvang en kompleksiteit van etiese en waardesisteme van beide die omgewings- en menslike perspektief met betrekking tot plaagbestuursbesluitneming.*
- *die vermoë om teoriegedrewe argumente te voer om komplekse uitdagings in die veld van geïntegreerde plaagbestuur op te los.*
- *die vermoë om inligting te produseer en hierdie inligting asook akademiese beginsels rakende geïntegreerde plaagbestuur aan belangegroepe te kommunikeer.*

Method of delivering: Full Time or Part Time

Assessment methods: Oral presentations, written assignments and exam.

Module code: OMWW611	**Semester 1**	**NQF-Level: 8**

Title: **Physical, chemical and biological properties of inland water**

Module-outcomes:

At the completion of this module the student should be able to demonstrate

- knowledge of interactions between water quality variables and the structure of aquatic communities at all trophic levels.
- knowledge of management interventions to reverse anthropogenic

impacts on the quality of inland waters.

- interpretation of data in relation to guidelines and ability to determine appropriate actions and responses.
- determine existing levels of water quality based on known or previously determined parameters.
- independent assessment and interpretation of data without external influence or duress.
- synthesis of data and evaluation of information arising from diverse sources regarding management actions and the assessment and remediation of water quality in aquatic ecosystems
- demonstrate the ability to use and distinguish appropriate sources of information

Module uitkomste:

- *By voltooiing van die module, moet die student demonstreer dat: kennis dra van die interaksies tussen waterkwaliteitveranderlikes en die struktuur van akwatiese gemeenskappe op alle trofiese vlakke.*
- *kennis dra van die bestuursmatige ingrepe om antropogeniese impakte op die kwaliteit van binnelandse water om te keer.*
- *data in verband met die riglyne kan interpreteer en oor die vermoë beskik om toepaslike aksies en reaksies te bepaal.*
- *die bestaande waterkwaliteitvlakke kan bepaal gebaseer op bekende of voorafbepaalde parameters.*
- *data onafhanklik kan assesseer en interpreteer sonder eksterne beïnvloeding of druk.*
- *data kan sintetiseer en inligting vanuit diverse bronne oor bestuursaksies kan evalueer en waterkwaliteit in ekostelsels assesseer en remedieer.*
- *oor die vermoë beskik om tussen toepaslike inligtingbronne te onderskei.*

Method of delivering: Full time or part time

Assessment methods: Assignments, presentations and written examination.

Module code: OMWW614 will become OMWW617	**Semester 1**	**NQF-Levelv: 8**

Title: **Zoonoses**

Module-outcomes:

- On completion of the module, the student should be able to demonstrate:
- an understanding of the epidemiology of different types of zoonotic diseases.
- the knowledge to differentiate between food-borne, vector-borne and water-borne diseases.
- an understanding of medical, veterinary and economic importance of zoonotic diseases.
- an understanding of zoonotic pathogen genetics and immunological response of hosts.
- an understanding and application of different diagnostic techniques for zoonotic diseases.

- communication skills to advise the community or stakeholders on preventative and control strategies during disease outbreak.
- a morally responsible and ethical correct action in the face of a zoonotic outbreak.

Method of delivering: Full time or part time provided that students attend practicals

Assessment methods: Assignments, practical reports and written examination paper.

Module code: OMWW616	**Semester 1**	**NQF-Level: 8**

Title: **Estuarine and near shore marine ecology**

Module-outcomes:

After completion of the estuarine and near shore marine ecology module, the student should demonstrate:

- Integrated knowledge of and engagement in estuarine and near shore marine ecology and critical understanding and application of the ecological principles relevant to estuarine and near shore marine ecology.
- An ability to critically interrogate multiple sources of knowledge (e.g. inter tidal ecology and estuarine ecology) within the field of ecology, and critically evaluate and review that knowledge and the manner in which the knowledge was produced with a view to understanding the relationship between habitat (physical, chemical, biological) and biological interactions.
- The ability to select, apply and critically judge the effectiveness of the implementation of a range of appropriate observations and sampling techniques with a view to determining the ecological functions in intertidal and estuarine ecosystems.
- Supervised research skills by selecting and implementing appropriate sampling designs in the Tsitsikamma intertidal zone and estuary to effectively execute a planned research design, report research findings and produce conclusions in an acceptable academic format i.e. practical reports.
- An ability to identify and address ethical issues based on critical reflection on the suitability of different ethical value systems to specific areas in the fields of estuarine and marine ecology and their management and to take full responsibility for own work, learning, decision-making and use of resources.
- The ability to identify, demarcate, analyse, critically reflect on and effectively address complex challenges related to increased human activities in marine and estuarine regions and apply evidence-based solutions with theory-driven ecological arguments
- An ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the disciplines that relate to estuarine and marine ecology.

Module uitkomste:

Aan die einde van die module moet die student in staat wees om:

Geïntegreerde kennis van- en verbintenis met getyrivier en mariene ekologie hê, en 'n kritiese verstandhouding en toepassing van ekologiese beginsels wat relevant tot getyrivier en mariene ekologie toon.

Die vermoë ontwikkel om veelvuldige bronne van kennis (intergety en getyrivier ekologie) krities te ondervra en die kennis en die manier waarop dit gegenereer is krities te evalueer met die oog daarop om die verwantskap tussen die biofisiese habitat en interaksie met organismes te verstaan.
Die vermoë het om die mees geskikte waarnemings en moniteringstegnieke te selekteer en toe te pas met die doel om die ekologiese verwantskappe in intergety en getyrivierekosisteme te bepaal. Om verder die effektiwiteit van die implementering van bg. tegnieke krities te evalueer.
Onder toesig navorsingsvaardighede te ontwikkel deur die geskikste moniteringsontwerp te selekteer en dit toe te pas in die Tsitsikamma intergety streek en getyrivier en daardeur effektief 'n navorsingsplan, verslagdoening oor die resultate en die samevatting van resultate in 'n aanvaarbare akademiese formaat, nl. praktiese verslag, te bewerkstellig.
Die vermoë besit om etiese kwessies te identifiseer en aan te spreek deur krities oor die toepaslikheid van die etiese waardesisteme in die velde van getyrivier en mariene ekologie en die bestuur daarvan te reflekteer en om vir eie werk, leer, besluitneming en gebruik van hulpbronne verantwoordelikheid te neem.
Die vermoë om komplekse vraagstukke wat met die mens se invloed op mariene en getyrivier ekosisteme verband hou te identifiseer, af te baken, te analiseer krities te reflekteer oor die effektiwiteit daarvan. Dit alles teen die agtergrond van bewys-gebaseerde oplossings met ekologiese teorie argumente.
Om op 'n kritiese wyse leerstrategieë vir eie professionele voortgesette leer in die vakdissiplines van getyrivier en mariene ekologie toe te pas.

Method of delivering: Full time

Assessment methods:
Short theoretical and practical assignments completed as an individual or in groups that may be evaluated. Pracitcal reports based on the projects compelted during the compulsory field trip. Presentations by students related to the most recent information related to estuarine and near shore marine ecology. Writing an examination paper at the end of the semester.

Module code: OMWW629 will become OMWW621	**Semester 2**	**NQF-Level: 8**

Title: **Advanced Water Treatment**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- applied knowledge and critical understanding regarding aspects relevant to water quality as well as the complex nature of water resources.
- the ability to apply and critically judge the effectiveness of the implementation of a range of relevant methods, systems and procedures required to solve practical and theoretical problems in water.

your skills regarding elementary research techniques, group work, report writing and problem solving.
the ability to take full responsibility for his/her work.
the ability to critically reflect and effectively solve problems related to water.

the ability to present and communicate academic ideas and text effectively to a range of audiences of problems and issues in water purification and treatment. *Module uitkomste:* *By die voltooiing van die module, moet die student die volgende demonstreer:* • *toegepaste kennis en kritiese begrip t.o.v. relevante aspekte van water gehalte sowel as die komplekse aard van waterhulpbronne.* • *die vermoë om die effektiwiteit van die implmentering van 'n reeks relevante metodes, stelsels en prosedures wat nodig is om praktiese en teoretiese probleme op te los, te kan toepas en krities te kan evalueer.* *vaardighede betreffende elementêre navorsingstegnieke, groepswerk, skryf van 'n verslag en probleemoplossing.* *die vermoë om ten volle verantwoordelikheid vir sy/haar werk te neem.* *die vermoë om krities en effektief probleme betreffende water te kan reflekteer en op te los.* *die vermoë om akademiese idees en teks aan 'n verskeidenheid gehore t.o.v. probleme en kwessies betreffende watersuiwering en -behandeling aan te bied en te kommunikeer.*		
Method of delivering: Full time and part time.		
Assessment methods: Assessment methods: Short assignments completed individually or in groups, that may be evaluated. Tutorials by individuals or groups. Written examination at the end of the module		
Module code: PARM617	**Semester12**	**NQF-Level: 8**
Title: Parasitology		
Module outcomes: Ability to recognise, identify parasites. Ability to recognise life cycle of parasites and diseases, survey the epidemiology of parasites		
Method of delivering:		
Assessment methods:		
Module code: PARM627	**Semester12**	**NQF-Level: 8**
Title: Ecological Parasitology		
Module outcomes: To demonstrate the ability in the understanding and interpretation of host-parasite systems and immunology.		
Method of delivering:		
Assessment methods:		
Module code: PCPM611	**Semester 1**	**NQF-Level: 8**
Title: Selected Topic In Crop Science/Research Project I		
Module outcomes: The student will conduct a review of a specific topic in crop science and submit a report based on the chosen topic/research project; A field/laboratory project will be initiated. Upon completion of this module the learner will have the ablity to carry out investigations in areas of specialisation dealing with problems of practical importance, abilty to write a scientific report and ability to present a seminar orally.		
Method of delivery:		
Assessment methodes:		

Module code: PCPM612	Semester 1	NQF-Level: 8
Title: Applied Crop Physiology		
Module outcomes: The student will conduct a review of a specific topic in crop science and submit a report based on the chosen topic/research project; A field/laboratory project will be initiated. Upon completion of this module the learner will have the ablity to carry out investigations in areas of specialisation dealing with problems of practical importance, abilty to write a scientific report and ability to present a seminar orally.		
Method of delivery:		
Assessment methodes:		
Module code: PCPM613	**Semester 1**	**NQF-Level: 8**
Title: Crop Protection		
Module outcomes: Self-study, class discussion and assignments on special topics in Crop Protection, such as economics of pest control, pest control management; environment aspects of chemical control of pests; cultural practices and suppression of aspects in areas of Entomology, Pathology and Weed Science. Upon completion of this module learners will be able to apply scientific principles in practical crop protection; demonstrate critical and creative thinking in research and development in areas of crop protection..		
Method of delivery:		
Assessment methodes:		
Module code: PCPM614	**Semester 1**	**NQF-Level: 8**
Title: Agro-Meteorology		
Module outcomes: Theory: Economic significance and importance of weather; Introduction to meteorology: The earth's atmosphere; Atmospheric energy; Atmospheric moisture and precipitation; Atmospheric motion. Global climatic change and variability and its effect on agriculture. Weather patterns over Southern Africa. Drought and management of drought. Frost and frost prevention/avoidance. Use of weather data for scheduling irrigation. Weather effects on pest and disease incidence. Wind and windbreaks. Upon completion of this module Learners will be able to appreciate the importance of weather agriculture; understand the causes of climatic change and its effects on crops; design management strategies to cope with weather hazards such as drought, frost; to collect, collate, analyse and interpret climatological data. Practical: Installation, Calibration and maintenance of weather instruments of importance to agriculture. Interpretation of weather charts. Processing and visual representation of climatological data for agricultural purposes. Observation of environmental variables within plant communities and soil surface. Use of weather station instruments. Calibration and use of sensors for soil; leaf and air temperature measurement. Measurement of surface reflectivity and radiation in a canopy		
Method of delivery:		
Assessment methodes:		

Module code: PCPM621	Semester 1	NQF-Level: 8
Title Crop Production Systems		
Module outcomes: Theory: A study of the principles and practices of monoculture and crop rotation under dry land and irrigation. Tillage practice, Multiple Cropping. Assessing yield advantages in multiple cropping. Analysis of yield data from multiple cropping. Upon completion of this module learners will be able to appreciate the advantages and disadvantages of monoculture; design and discuss different crop rotational systems; appreciate the advantages and disadvantages of multiple cropping systems; to analyse and interpret yield data from multiple cropping systems; assess yield advantages in multiple cropping. Practical: Appropriate field practicals and/or observations to support theory, Statistical analysis of data from multiple cropping trialstemperature measurement. Measurement of surface reflectivity and radiation in a canopy		
Method of delivery:		
Assessment methodes:		
Module code: PCPM622	**Semester 1**	**NQF-Level: 8**
Title Soil Plant Water Relations		
Module outcomes: Theory Concepts of water potential and movement in soil - plant - atmosphere continuum; water and nutrient uptake by plants roots; determining evaporation and use water use efficiency, Water budgets; effects and measurement of water in soil and plants, research techniques in studies on soil plant water relations and their applications. Upon completion of this module. Learners will be able to apply scientific and principals in soil-plant; water relations in the management and production of crops; ability to perform measurements in soil-plant-water relations and interpret the results properly. Practical Laboratory and field exercises to support theory.		
Method of delivery:		
Assessment methodes:		

Module code: PCPM 623	Semester 1	NQF-Level: 8
Title: Horticultural Science		
Module outcomes: Theory: Economic and nutritional importance of vegetable crops. The environmental effect on vegetable production. Propagation of vegetable crops. Cultural practices of selected vegetable crops, Seed production of vegetable crops. Marketing, storage and processing of vegetable produce. Vegetable production systems. Upon completion of this module learners will be able to conduct and manage research tasks that test the effects of environmental factors on yield; demonstrate the ability to comprehend scientific literature related to the production of vegetables. Practical: Field practicals of the aspects covered in the course		
Method of delivery:		
Assessment methodes:		
Module code: PCPM624	**Semester 2**	**NQF-Level: 8**
Title: Advanced Plant Breeding		
Module outcomes: Theory: Review of basic concepts of Population and Quantitative Genetics. The Hardy-Weinberg Law and its relationship to selection, migration, mutation and mating systems. Components of phenotypic and genotypic variance, Breeding and selection methods and strategies. Plant breeding and yield stability. Project Management. Upon completion of this module learners will be able to understand and apply the Hardy-Weinberg law; Appreciate the effects of selection, migration, and mutations in populations of crop plants; relate different mating systems to selection response; estimate yield stability parameters. Practical: Problems on Hardy-Weinberg Law and components of variance, Estimating stability parameters using data from multi-location trials		
Method of delivery:		
Assessment methodes:		
Module code:PCPM625	**Semester 2**	**NQF-Level: 8**
Title: Selected Topic In Crop Science/Research Projects II		
Module outcomes: Ability to carry out investigations in areas of specialisation dealing with problems of practical importance; ability to write a scientific report; ability to present a seminar orally.		

Method of delivery:		
Assessment methodes:		
Module code: PSYM611	**Semester 1**	**NQF-Level: 8**
Title:Statistical Mechanics		
Module outcomes: A student should be able to discuss different thermodynamic phenomena found in several fields of physics. The following topics will be covered, the statistical basis of thermodynamics; elements of ensemble theory; the canonical ensemble; the grand canonical ensemble; formulation of quantum statistics; the theory of simple gases; ideal bose systems; ideal fermi systems		
Method of delivery:		
Assessment methodes:		
Module code: PHYM612	**Semester 1**	**NQF-Level: 8**
Title: Quantum Mechanics		
Module outcomes: A student should be able to use the theory learned to explain and appreciate phenomena that use microscopic particles. The following topics will be covered, Spin; dynamics of two-level systems; linear vector spaces in quantum mechanics; quantum dynamics; rotations and other symmetry operations; bound state perturbation theory; time-dependent perturbation theory		
Method of delivery:		
Assessment methodes:		
Module code: PHYM613	**Semester 1**	**NQF-Level: 8**
Title: Classical Mechanics		
Module outcomes: Ability to: recall the theories and techniques of advanced classical mechanics, apply the theories and techniques to the solution of advanced problems in classical mechanics. Topics to be covered: Variational principles and lagrange's equation; two-body central force problems; small oscillations; special relativity in classical mechanics; hamilton's equation; canonical transformation.		
Method of delivery:		
Assessment methodes:		

Module code: PHYM614	Semester 1	NQF-Level: 8
Title: Electromagnetism		
Module outcomes: Ability to: emphasize the behaviour of em waves in matter, and understand the practical applications of em waves. Solve problems of electromagnetism at an advanced level. The following topics will be covered fundamentals of electromagnetic; multiple fields; the equations of laplace and poisson; the electromagnetic field equation; electromagnetic waves. Reflection and refraction. The leinard - weichert potentials and radiation; radiation systems. Classical electron theory.		
Method of delivery:		
Assessment methodes:		
Module code: PHYM615	**Semester 1**	**NQF-Level: 8**
Title: Nuclear Physics		
Module outcomes: Ability to: recall the theories and techniques of advanced nuclear physics, apply the theories and techniques to the solution of advanced problems in nuclear physics. The following topics will be covered, nuclear deformations and the unified model. Electromagnetic interactions; weak interactions; strong interactions; nuclear interactions; scattering theory; resonant scattering and reactions. Spin of nuclei and polarization.		
Method of delivery:		
Assessment methodes:		
Module code: PHYM624	**Semester 1**	**NQF-Level: 8**
Title: Astrophysics		
Module outcomes: Learners should be able to understand concepts of stellar physics, be able to have an idea of how concepts from atomic physics are used to determine, parameters such as composition, temperature, surface gravity and velocities of stars and be able to use analytical and computational techniques to solve equations of stellar structure		
Method of delivery: Lectures		
Assessment methods: Oral presentations, written assignments, Test, examination		

Module code: PHYM626	Semester 1	NQF-Level: 8
Title: Solid State Physics		
Module outcomes: Ability to emphasize the behaviour of solids in matter and understand the practical applications of solids. Topics to be covered; Band theory; semiconductors; inharmonic effects in crystals; dielectric properties; diamagnetism; paramagnetism; ferromagnetism and anti-ferromagnetism; magnetic resonance; defect; superconductivity		
Method of delivery:		
Assessment methodes:		
Module code: PHYM627	**Semester 1**	**NQF-Level: 8**
Title: Computational Physics		
Module outcomes: A student should be able to use the theory learnt to quantify results from experimental work and projects at post-graduate level. The following topics will be covered, Laplace transforms; fourier series and integrals; vector differential calculus; partial differential equations; numerical analysis and in practical sessions computer implementation of programmes to solve common numerical problems of physics and computer-based practice on the use of common computer packages.		
Method of delivery:		
Assessment methodes:		
Module code: PHYM628	**Semester 1**	**NQF-Level: 8**
Title: Project Or Prescribed Experiments		
Module outcomes: Ability to articulate a research proposal, carry out literature review, design a research strategy, carry out experiments specific to a given problem, analytically interpret results of research or experiments and produce a research report		
Method of delivery: Reserach		
Assessment methodes: Oral presentations, Project		
Module code: PHYM871	**Semester 1**	**NQF-Level: 8**
Title: Dissertation		
Module outcomes: The qualifiers in these curricula will be familiar with the general scientific methods of research, with emphasis on the special research methodologies which include:		

a) identification and formulation of a problem statement;
b) thorough investigation of existing knowledge as reflected in appropriate scientific literature;
c) appropriate research to solve the problem;
d) scientific evaluation of the results in the context of the problem statement;
e) scientific communication of the results in the form of a dissertation.

Method of delivery: Reserach

Assessment methodes: Oral presentations, Project

Module code: PSRM611	**Semester 1**	**NQF-Level: 8**

Title: Research Projects 1

Module outcomes: Ability to prepare and submit projects proposals; a critique of literature on; a chosen topic, ability to present a seminar. Ability to carry out investigations in areas of specialization dealing with problems of practical importance; ability to write a scientific report; ability to present a seminar.

Method of delivery: Contact

Assessment methods: Witten examination, tests, assignments and practical reports.

Module code: PSRM612	**Semester 1**	**NQF-Level: 8**

Title: Soil Microbiology

Module outcomes: diversity and classification organisms in the soil; soil as an environment in organisms; distribution and importance of soil micro-organisms in the soil; important soil biological processes and activities; decomposition and soil organic matter dynamics; nitrogen transformation in the soil; biological nitrogen fixation; phosphorus transformation and mycorrhizal relationships; transformation of metals; bioremediation. Upon completion of this module learner will be able to apply microbiological technology to improve crop production; conversant with the current literature in the soil microbiology and its application in practical agriculture; ability to conduct measures in soil microbiology; learners will be able to apply microbiological technology to improve crop productions; conversant with the current literature in soil microbiology and its application in practical agriculture; ability to contact measurement in soil microbiology.

Method of delivery: Contact

Assessment methods: Witten examination, tests, assignments and practical reports

Module code: PSRM613	**Semester 1**	**NQF-Level: 8**

Title: Land and Water Management

Module outcomes: The major land and water resources of the world and South Africa-extent and distribution; major quality attributes of land and water resources. The major types of land and water resources utilization and their limitations; land management for soil fertility maintenance; water harvesting; land clearing

techniques; use of fire in land management; drainage and irrigation; agroforestry; tillage systems for soil and water conservation. Upon completion of these module learners will become aware of the major land and water resources of the world, their utilization and limitations; l[earners will be reacquainted with the techniques of land and water management different parts of the world; familiarity with current literature in land and water management.

Method of delivery: Contact

Assessment methods: Witten examination, tests, assignments and practical reports

Module code: PSRM614	**Semester 1**	**NQF-Level: 8**

Title: Agro-Meteorology

Module outcomes: Economic significance of importance of weather; Introduction to meteorology; The earth's atmosphere; Atmospheric energy; Atmospheric moisture and precipitation; Atmospheric motion. Global climatic change and variability and its effects on agriculture. Weather patterns over Southern Africa Drought and management of drought and management of drought. Frost and frost prevention/avoidance. Use of weather data for scheduling irrigation. Weather effects on pest and diseases incidence. Wind and windbreaks. . Upon completion of these module learners will be able to appreciate the importance of weather agriculture; understand the cause of climatic change and its effect on crops; design management strategies to cope with weather hazards such as drought, frost, to collect, collate, analyse and interpret climatological data.

Method of delivery: Contact

Assessment methods: Witten examination, tests, assignments and practical reports

Module code: PSRM621	**Semester 1**	**NQF-Level: 8**

Title: Research projects II (For Land Management)

Module outcomes: Continuation and finalization of Research Project initiated in PSRM 611. Further data collection and compilation, final data analysis; submission of write-up, and oral presentation of entire report.

Method of delivery: Contact.

Assessment methods: Witten examination, tests, assignments and practical reports.

Module code: PSRM622	**Semester 1**	**NQF-Level: 8**

Title: Soil Classification And Land Use Planning

Module outcomes: Fundamental concepts of soil classification; soil classification systems; international and South Africa; Land productivity and suitability maps; Land capability classes and their description; Land classification and land use planning; soil maps and their utilization in land use planning; evaluation of suitability of Land for arable, livestock and forestry use. Upon completion of these

module learners will be familiar with the different systems of classifying soils in South Africa and the world; Ability to interpret and utilize soil maps for land use planning.		
Method of delivery: Contact.		
Assessment methods: Witten examination, tests, assignments and practical reports.		
Module code: PSRM623	**Semester 1**	**NQF-Level: 8**
Title: Irrigation Management		
Module outcomes:		
Method of delivering:		
Assessment methods:		
Module code: PTSM618	**Semester 1**	**NQF-Level: 8**
Title: Higher Plant Taxonomy And Systematics		
Module outcomes: To be able to collect and prepare herbarium specimens as an inventory of plant taxa. To be able to identify and classify common plants of the North West Province. To be familiar with the construction and use of keys for the identification of plant taxa. To demonstrate the ability in interpreting bio-diversity and relationships among plants. Ability to collect, analyse and interpret taxonomic data. Ability to interpret the concept of shared derived characteristics to the classification of plant taxa.		
Method of delivering:		
Assessment methods:		
Module code: PTSM628	**Semester 1**	**NQF-Level: 8**
Title:Further Higher Plant Taxonomy And Systematics		
Module outcomes: Ability to collect, present and interpret taxonomic data. To be able to identify and classify common plants of the North West Province. Ability to identify indigenous plants of importance. Ability to analyse and evaluate bio-diversity/plant diversity in relation to conservation and eco-tourism. Ability to apply the concept of shared derived characteristics in the classification of plant taxa.		
Method of delivering:		
Assessment methods:		

Module code: RESM671	Semester 1 & 2	NQF-Level: 8
Title:Project		
Module outcomes: After completion of the module, the student should demonstrate: • an understanding of the theories, research methods and techniques relevant to the particular research project including how to interrogate multiple sources and critically reviewing information gathering. • an understanding of the complexities and uncertainties of selecting and applying standard techniques to the unfamiliar problem of the research project. • an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems as part of resolving the research question. • an ability to present and communicate academic, professional or occupational ideas and concepts effectively to a range of audiences. • an ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs as a researcher with integrity: integrity towards his/her own conduct as a researcher, but also treating the environment and biota with respect.		
Method of delivering:		
Assessment methods:		
Module code: SGSS614	**Semester 1**	**NQF-Level: 8**
Title:Research Methods		
Module outcomes:		
Method of delivering:		
Assessment methods:		
Module code: STFM611	**Semester 1 & 2**	**NQF-Level: 8**
Title: Stochastic Models		
Module outcomes: On completion of the module, the student should be able to: a) Apply the operations research or the statistical techniques to situations where customers have to be served by a single or by several service facilities. b) Identify the probability distributions at the arrivals of customers and the service times at the service facilities. c) Define concepts used in stochastic models. d) Derive formulae used in stochastic models. e) Recommend strategies to be used in processing orders.		
Method of delivering:		
Assessment methods		
Module code: STFM612	**Semester 1 & 2**	**NQF-Level: 8**
Title: Advanced Probability Theory		
Module outcomes:		

n completion of the module, the student should be able to apply the probability theory to real-life situations.
Method of delivering:
Assessment methods

Module code: STFM613	Semester 1 & 2	NQF-Level: 8
Title: Multivariate Analysis		
Module outcomes: On completion of the module, the student should be able to use a computer to: a) Do multivariate discriminate analysis b) Do factor analysis, and cluster analysis c) Do multivariate ANOVA and MANCOVA d) Apply a multidiamensional scaling to real data		
Method of delivering:		
Assessment methods		
Module code: STFM614	**Semester 1 & 2**	**NQF-Level: 8**
Title:Multivariate Analysis		
Module outcomes: On completion of the module, the student should be able to use a computer to: a) Do multivariate discriminate analysis b) Do factor analysis, and cluster analysis c) Do multivariate ANOVA and MANCOVA d) Apply a multidiamensional scaling to real data		
Method of delivering:		
Assessment methods		
Module code: STFM615	**Semester 1 & 2**	**NQF-Level: 8**
Title: Decision Theory		
Module outcomes: On completion of the module, the student should be able to: a) Evaluate the potential benefit of buying more information about the probabilities of various payoffs and spend the optimal amount of resources in this decision-making process b) Logically and objectively incorporate all the information that they have in the decision-making process c) Make the best decision even when a problem is complex and the result of each decision is uncertain		
Method of delivering:		
Assessment methods		
Module code: STFM616	**Semester 1 & 2**	**NQF-Level: 8**
Title: Applied Regression Analysis		
Module outcomes: On completion of the module, the student should be able to: a) Do logistic regression analysis, and b) Do statistical inference in real-life situations c) Fit a non-linear regression model to data		
Method of delivering:		
Assessment methods		
Module code: STFM621	**Semester 1 & 2**	**NQF-Level: 8**
Title:Project: Design Of Experiments And Sampling		
Module outcomes: On completion of the module, the student should be able to: a) Design a sample survey. b) Determine the right sample size for a sample survey, while. c) Minimizing the cost function and		

d) Optimising the allocation of sample size, n.		
Method of delivering:		
Assessment methods		
Module code: STFM671	**Semester 1 & 2**	**NQF-Level: 8**
Title:Research Project		
Module outcomes: On completion of the module, the student should be able toConduct and report on an independent research.		
Method of delivering:		
Assessment methods		
Module code: STTN611	**Semester 1**	**NQF-Level: 8**

Title: **Project I: Research project I (practice directed)**

Module outcomes:

This course offers the student the opportunity to learn practical knowledge related to client management, project planning, data collection, inference and interpretation of a practical statistical problem. Practical methods of reporting are taught, such as the way a written report, an oral report, or a paper on a finished statistics project must be presented.

After successful completion of the module the student will be able to successfully advise and oversee the planning and execution of surveys and experiments as well as the analysis of data obtained in this way. The student will also be able to make sound, scientific conclusions based on the study because the practical statistical problem is coordinated with the client from the very beginning phases of the project. Data will be collected in a meaningful way, inference concerning the research questions will be conducted and then a professional report will be compiled and a professional presentation of the work will be given.

Hierdie kursus bied die student die geleentheid om praktykgerigte kennis aan te leer, in sover dit kliënthantering, projekbeplanning, data-insameling, inferensie en interpretasie van „n spesifieke praktiese probleem van „n kliënt aangaan. Metodes van verslagdoening vir die praktyk word aangeleer, soos die manier waarop „n skriftelike verslag asook „n mondelinge verslag of referaat aangebied moet word oor die afgehandelde statistiekprojek.

Na suksesvolle voltooiing van die module sal die student suksesvol kan raadgee en toesig hou oor die beplanning en uitvoering van opnames en eksperimente sowel as met die ontleding van data wat so verkry word en met die maak van wetenskaplik verantwoorde gevolgtrekkings in dié verband, want 'n praktiese statistiese probleem word van meet af aan saam met „n kliënt beplan, data word op sinvolle wyse ingesamel en voorgestel, inferensie daaromtrent word gedoen, waarna 'n praktyk-gerigte verslag saamgestel word en 'n opsommende voordrag op professionele standaard aangebied word.

Method of delivering: Full-time

Assessment methods:

A report and a presentation.

Module code: STTN612	Semester 1	NQF-Level: 8
Title: **Statistical Data-analysis I: Models**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Integrated knowledge of linear statistical models and experimental designs, and critical understanding and application of these models and designs. An ability to assimilate information from various sources within the field of linear statistical models and critically evaluate and review this information. The ability to select, apply, and critically judge the effectiveness of the implementation of relevant statistical models. The specialised ability to effectively implement and apply linear statistical models with a view to solve real-world problems and answer questions related to the associated experimental design. *Module uitkomste:* *Na voltooiing van die module behoort die student die volgende te kan demonstreer:* *Geïntegreerde kennis van lineêre statistiese modelle en eksperimentele ontwerp, en 'n kritiese begrip en toepassing van hierdie modelle en ontwerpe.* *'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van lineêre statistiese modelle en hierdie inligting krities te evalueer en te hersien.* *Die vermoë om krities die doeltreffendheid van die implementering van toepaslike statistiese modelle te beoordeel.* *'n Gespesialiseerde vermoë om effektief lineêre statistiese modelle te implementeer en toe te pas met die oog om werklike probleme op te los en vrae wat verband hou met die gepaardgaande eksperimentele ontwerp te beantwoord.*		
Method of delivering: Full time		
Assessment methods: Class tests, assignments, and exam.		
Module code: STTN613	**Semester 1**	**NQF-Level: 8**
Title: **Resampling**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Integrated knowledge of various computer intensive methods for statistical analysis and critical understanding and application of these methods. The ability to combine knowledge gained in other statistics modules with advanced computer intensive techniques with the aim of improving statistical analysis. A deep understanding of statistical theories and computer intensive techniques with the aim of applying them in unfamiliar contexts.		

The ability to identify, analyse, and effectively solve real-world problems with the help of these computer intensive methods.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van rekenaarintensiewemetodes vir statistiese analise en 'n kritiese begrip en toepassing van hierdie metodes.

Die vermoë om kennis wat opgedoen is in ander statistiek-modules te kombineer met gevorderde rekenaarintensiewe tegnieke met die doel om statistiese analise te verbeter.

'n Diep begrip van statistiese teorieë en rekenaarintensiewe tegnieke met die doel om dit te kan toepas in onbekende scenarios.

Die vermoë om werklike probleme effektief op te los met behulp van hierdie rekenaarintensiewemetodes.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN614	**Semester 1**	**NQF-Level: 8**

Title: **Statistical Inference**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of statistical inference methods and critical understanding and application of these methods.

An ability to assimilate information from various sources within the field of statistical inference and critically evaluate and review this information.

The ability to select, apply, and critically judge the effectiveness of the implementation of the relevant statistical inference procedures.

The ability to effectively implement and apply statistical inference to solve real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van statistiese inferensie metodes en 'n kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van statistiese inferensie en hierdie inligting krities te evalueer en te hersien.

Die vermoë om krities die doeltreffendheid van die implementering van toepaslike statistiese inferensie metodes te beoordeel.

'n Vermoë om statistiese inferensie metodes effektief te implementeer en toe te pas met die oog om werklike probleme op te los.

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN615	**Semester 1**	**NQF-Level: 8**

Title: **Stochastic Processes I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of the fundamentals of stochastic processes and critical understanding and application of these processes.

An ability to assimilate information from various sources within the field of stochastic processes and critically evaluate and review this information.

The ability to solve real-world problems through the use of stochastic processes
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van die grondbeginsels van stogastiese prosesse en 'n kritiese begrip en toepassing van hierdie prosesse.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van stogastiese prosesse en hierdie inligting krities te evalueer en te hersien.

'n Vermoë om werklike probleme op te los deur middel van stogastiese prosesse.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN617	**Semester 1**	**NQF-Level: 8**

Title: **Mathematical and Computer-intensive methods I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of various computer intensive methods for statistical analysis and critical understanding and application of these methods.

An ability to assimilate information from various sources within the vast field of statistical methods requiring computer intensive calculations and critically evaluate and review this information.

The ability to identify, analyse, and effectively solve real-world problems with the help of these computer intensive methods.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van rekenaarintensiewemetodes vir statistiese analise en 'n

kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die wye veld van statistiesemetodes wat rekenaarintensiewe berekeninge vereis en hierdie inligting krities te evalueer en te hersien.

Die vermoë om werklike probleme effektief op te los met behulp van hierdie rekenaarintensiewemetodes.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN618	**Semester 1**	**NQF-Level: 8**

Title: **Financial-driven Statistics I**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of copulas and Monte Carlo simulation methods and a critical understanding and application of these methods, especially for financial applications.

An ability to assimilate information from various sources within the field of copulas and Monte Carlo simulation and critically evaluate and review this information.

The ability to effectively implement copulas and perform Monte Carlo simulations to address real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van copulas en Monte Carlo simulasie metodes en 'n kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van copulas en Monte Carlo simulasie en hierdie inligting krities te evalueer en te hersien.

'n Vermoë om copulas effektief te implementer en Monte Carlo studies uit te voer met die oog om werklike probleme aan te spreek.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN619	**Semester 1**	**NQF-Level: 8**

Title: **Nonparametric methods**

Module outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of nonparametric methods (with special emphasis on resampling methods) and critical understanding and application of these methods.

An ability to assimilate information from various sources within the field of nonparametric

methods and critically evaluate and review this information.

The ability to identify, analyse, and effectively solve problems with the help of nonparametric methods where traditional methods are not applicable.

The ability to implement nonparametric methods to solve real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van nie-parametriese metodes (veral hersteekproefnemingsmetodes) en 'n kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van nie-parametriese metodes en hierdie inligting krities te evalueer en te hersien.

Die vermoë om probleme raak te sien wat te gekompliseerd is om met tradisionele metodes op te los, en dan hierdie probleme te kan oplos met behulp van nie-parametriese metodes.

'n Vermoë om nie-parametriese metodes te gebruik om werklike probleme op te los.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN621	**Semester 2**	**NQF-Level: 8**

Title: **Research project (Research journal directed)**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

An ability to present and communicate academic or professional ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to statistical data problems and related issues.

An ability to take full responsibility for own work, decision-making, and use of resources.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Die vermoë om akademiese, professionele idees en tekste effektief vir verskeie gehore aan te bied en te kommunikeer met kreatiewe insigte, akkurate interpretasies en oplossings vir statistiese data probleme en verwante vraagstukke.

Die vermoë om volle verantwoordelikheid te neem vir eie werk, besluitneming en gebruik van hulpbronne.

Method of delivering:Full time

Assessment methods:
A written research article.

Module code: STTN622	**Semester 2**	**NQF-Level: 8**

Title: **Statistical Data-analysis II: Time Series**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of time series models and critical understanding and application of these models.

An ability to assimilate information from various sources within the field of time series models and critically evaluate and review this information.

The ability to select, apply, and critically judge the effectiveness of the implementation of relevant time series models.

The specialised ability to effectively implement and apply time series models with a view to solve real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van tydreeksmodelle en 'n kritiese begrip en toepassing van hierdie modelle.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van tydreeksmodelle en hierdie inligting krities te evalueer en te hersien.

Die vermoë om krities die doeltreffendheid van die implementering van toepaslike tydreeksmodelle te beoordeel.

'n Gespesialiseerde vermoë om effektief tydreeksmodelle te implementeer en toe te pas met die oog om werklike probleme op te los.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN623	**Semester 2**	**NQF-Level: 8**

Title: **Multivariate Statistics**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of multivariate methods and critical understanding and application of these methods.

An ability to assimilate information from various sources within the field of multivariate methods and critically evaluate and review this information.

The ability to implement multivariate methods to solve real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van meerveranderlikemetodes en 'n kritiese begrip en

toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van meerveranderlikemetodes en hierdie inligting krities te evalueer en te hersien.

'n Vermoë om meerveranderlikemetodes te gebruik om werklike probleme op te los

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN624	**Semester 2**	**NQF-Level: 8**

Title: **Discrete Data-analysis**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of methods for discrete data analysis and theoretical asymptotic methods, and critical understanding and application of these methods.

An ability to assimilate information from various sources within the field of discrete data analysis and critically evaluate and review this information.

The ability to select, apply, and critically judge the effectiveness of the implementation of various discrete data analysis models and methods.

The ability to effectively implement and apply discrete data analysis models and methods with a view to solve real-world problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van diskrete data analise metodes en teoretiese asimptotiese metodes en 'n kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van diskrete data analise en hierdie inligting krities te evalueer en te hersien.

Die vermoë om krities die doeltreffendheid van die implementering van diskrete data analise modelle en metodes te beoordeel.

'n Vermoë om effektief diskrete data analise modelle en metodes te implementeer en toe te pas met die oog om werklike probleme op te los.

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN625	Semester 2	NQF-Level: 8
Title: **Stochastic Processes II**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Integrated knowledge of advanced stochastic processes and critical understanding and application of these processes. An ability to assimilate information from various sources (including earlier modules) within the field of stochastic processes and critically evaluate and review this information. The ability to solve real-world problems through the use of stochastic processes. *Module uitkomste:* *Na voltooiing van die module behoort die student die volgende te kan demonstreer:* *Geïntegreerde kennis van gevorderde stogastiese prosesse en 'n kritiese begrip en toepassing van hierdie prosesse.* *'n Vermoë om inligting uit verskillende bronne (insluitende vorige modules) te verwerk binne die veld van stogastiese prosesse en hierdie inligting krities te evalueer en te hersien.* *'n Vermoë om werklike probleme op te los deur middel van stogastiese prosesse.*		
Method of delivering:Full time		
Assessment methods: Class tests, assignments, and exam.		
Module code: STTN626	**Semester 2**	**NQF-Level: 8**
Title: **Probability Theory**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Integrated knowledge of measure-theoretic probability theory and critical understanding and application of this theory. An ability to assimilate information from various sources within the field of probability theory and critically evaluate and review this information. Demonstrate an ability to use a range of specialised skills to analyse and address complex or abstract problems drawing systematically on the body of probability theory knowledge. *Module uitkomste:* *Na voltooiing van die module behoort die student die volgende te kan demonstreer:* *Geïntegreerde kennis van maat-teoretiese waarskynlikheidsleer en 'n kritiese begrip en toepassing van hierdie teorie.* *'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van*		

waarskynlikheidsleer en hierdie inligting krities te evalueer en te hersien.

Die vermoë om verskeie gespesialiseerde vaardighede te gebruik om komplekse en abstrakte probleme te analiseer en aan te spreek, deur sistematies gebruik te maak van 'n waarskynlikheidsleer kennisbasis.

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN627	**Semester 2**	**NQF-Level: 8**

Title: **Mathematical and Computer-intensive methods II**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of various computer intensive methods for statistical analysis and critical understanding and application of these methods.

The ability to combine knowledge gained in other statistics modules with advanced computer intensive techniques with the aim of improving statistical analysis.

A deep understanding of statistical theories and computer intensive techniques with the aim of applying them in unfamiliar contexts.

The ability to identify, analyse, and effectively solve real-world problems with the help of the
se computer intensive methods.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van rekenaarintensiewemetodes vir statistiese analise en 'n kritiese begrip en toepassing van hierdie metodes.

'n Vermoë om om kennis wat opgedoen is in ander statistiek-modules te kombineer met gevorderde rekenaarintensiewe tegnieke met die doel om statistiese analise te verbeter.

'n Diep begrip van statistiese teorieë en rekenaarintensiewe tegnieke met die doel om dit te kan toepas in onbekende scenarios.

Die vermoë om werklike probleme effektief op te los met behulp van hierdie rekenaarintensiewemetodes.

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN628	**Semester 2**	**NQF-Level: 8**

Title: **Financial-driven Statistics II**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Integrated knowledge of statistical financial models and critical understanding and

application of these models.

An ability to assimilate information from various sources within the field of statistical financial models and critically evaluate and review this information.

The advanced ability to effectively implement and apply various statistical financial models with a view to solve real-world financial problems.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Geïntegreerde kennis van finansiële statistiese modelle en 'n kritiese begrip en toepassing van hierdie modelle.

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van finansiële statistiese modelle en hierdie inligting krities te evalueer en te hersien.

'n Gevorderde vermoë om effektief finansiële statistiese modelle te implementeer en toe te pas met die oog om werklike finansiële probleme op te los.

Method of delivering:Full time

Assessment methods:
Class tests, assignments, and exam.

Module code: STTN671	**Year module**	**NQF-Level: 8**

Title: **Research Project**

Module outcomes:
On completion of the module, the student should be able to demonstrate:

An ability to assimilate multiple sources of knowledge within the field of practical statistics and critically review this knowledge with a view to solve a realworld statistical data problem.

The ability to select, apply, and critically judge the effectiveness of the implementation of a range of appropriate statistical techniques with a view to solve a realworld statistical data problem.

The ability to analyse, select and effectively apply research methods to address complex practical statistical problems.

The ability to collaborate with clients (who are typically unskilled in statistical analysis) to aid in providing real solutions to their statistical data problems.

An ability to present and communicate academic or professional ideas and texts effectively to a range of audiences, offering creative insights, rigorous interpretations and solutions to statistical data problems and related issues.

The ability to identify ethical issues based on critical reflection of ethical value systems in the context of statistical experimental design and data analysis.
Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

'n Vermoë om inligting uit verskillende bronne te verwerk binne die veld van praktiese statistiek en hierdie inligting krities te evalueer, met die oog om 'n werklike statistiese data problem op te los.

Die vermoë om krities die doeltreffendheid van die implementering van 'n wye verskeidenheid statistiese tegnieke te beoordeel met die oog om 'n werklike statistiese data probleem op te los.

Die vermoë om navorsingsmetodes te ontleed en effektief toe te pas om komplekse praktiese statistiese probleme aan te spreek.

Die vermoë om saam kliënte (wat tipies geen ervaring in statistiese analise het nie) te werk om te help om oplossings te vind vir hul statistiese data probleme.

Die vermoë om akademiese, professioneleidees en tekste effektief vir verskeie gehore aan te bied en te kommunikeer met kreatiewe insigte, akkurate interpretasies en oplossings vir statistiese data probleme en verwante vraagstukke.

Die vermoë om etiese kwessies te identifiseer op grond van kritiese besinning oor etiese waardesisteme in die konteks van statistiese eksperimentele ontwerp en dataanalise.

Method of delivery: Full Time

Assessment methods:
The final summative assessment consists of a written project report, an oral presentation of the project (preferably at a national conference), and a written report in the form of a journal article.

Module code: TGWN612	**Semester 1**	**NQF-Level: 8**

Title: **Numerical Analysis I**

Module-outcomes:
Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Introduction to numerical analysis (mathematical preliminaries, error analysis, computer programming); solution of systems of linear and non-linear equations; interpolation and approximation; numerical differentiation and integration; numerical linear algebra (eigenvalues and eigenvectors).
Module uitkomste;
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Inleiding tot numeriese analise (wiskundige voorbereiding, foutanalise, rekenaarprogrammering); oplossing van stelsels lineêre en nie-lineêre vergelykings; interpolasie en approksimasie; numeriese differensiasie en integrasie; numeriese lineêre algebra (bepaling van eiewaardes en eievektore).

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative

assessment in the form of an examination paper.

Module code: TGWN613	Semester 1	NQF-Level: 8

Title: **Partial Differential Equations I**

Module-outcomes:

Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Refinement of undergraduate paradigms:

- Revision of introductory concepts.
- Waves and Diffusions: Revision of wave and diffusion equation; Introduction to causality and energy; Comparison of waves and diffusions.
- Boundary value problems: Revision of basic concepts (separation of variables, Dirichlet, Neumann, and Robin conditions, Fourier coefficients for real variables); Introduction to complex theory.

Fourier series: Revision of undergraduate theory; Orthogonality and general Fourier series; Completeness; Gibbs phenomenon; Inhomogenous boundary conditions.
Harmonic functions: Revision of Laplace's equation and rectangles; Cubes; Poisson's Formula.
Introduction to Green's identities and Green's functions: Green's first and second identity; Green's functions (revision and extension); half-space and sphere.
General eigenvalue problems.
Boundaries in the plane and space.
Introduction to distributions and transforms.

Module uitkomste:

a voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

Verfyning van voorgraadse paradigmas:

- *Hersiening van inleidende konsepte.*
- *Golwe en Diffusie: Hersiening van golf- en diffusievergelyking; Inleiding tot kousaliteit en energie; Vergelyking van golwe en diffusies.*
- *Randwaardeprobleme: Hersiening van basiese konsepte (skeiding van veranderlikes, Dirichlet-, Neumann-, en Robin voorwaardes, Fourier koëffisïente vir reële veranderlikes); Inleiding tot komplekse teorie).*

Fourierreekse: Hersiening van voorgraadse teorie; Ortogonaliteit en algemene Fourier reekse; Volledigheid; Gibbs verskynsel; Nie-homogene randvoorwaardes
Harmoniese funksies: Hersiening van Laplace se vergelyking en reghoeke; Kubusse; Poisson se Formule.
Inleiding tot Green identiteite en Green funksies: Green se eerste en tweede identiteit; Green funksies (hersiening en aanvulling); half-ruimte en die bol.
Algemene eiewaarde probleme.
Randvoorwaardes in die plat vlak en Euklidiese ruimte.
Inleiding to distribusies en transforms.

Method of delivering: Full Time

Assessment methods:

Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN614	**Semester 1**	**NQF-Level: 8**

Title: **Financial Mathematics Modelling I**

Module-outcomes:
On completion of this module the student should be able to demonstrate

- knowledge and insight to model and solve financial decision modelling problems using suitable mathematical methods and computer programmes;
- knowledge of the principles of fixed income investments, interest rate theory, cash flows, bonds and annuities;
- skills to use knowledge of principles and methods to model and solve and analyse investment choices under uncertainty;
- knowledge of mean variance analysis, optimal portfolio modelling, capital asset pricing model, factor modelling and the utility function framework;
- the ability to solve problems using suitable numerical techniques and computer packages.

Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies,

- *kennis en insig om finansi?le besluitnemingsprobleme te modelleer en op te los met geskikte wiskundige metodes en rekenaarprogramme;*
- *kennis van die beginsels van vaste-inkomste belegging, rentekoerse, kontantvloeie, annu?teite en staatseffekte;*
- *vaardighede om kennis van die beginsel en tegnieke toe te pas om beleggingskeuses onder onsekerheid te modelleer, op te los en te analiseer;*
- *kennis van gemiddelde- variansie teorie, optimale portefeulje modellering, kapitaalbateprysingsmodellering, faktormodellering en besluitneming in die nutswaarderaamwerk;en*
- *die vermoë om probleme met geskikte numeriese metodes en rekenaarprogramme op te los.*

Method of delivering: Full Time

Assesseringsmetodes:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN615	**Semester 1**	**NQF-Level: 8**

Title: **Modelling I**

Module-outcomes:
Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Dimensional analyses: Examples of models that are chosen based on the student's previous knowledge and future aims with regards to studies and research;
Modelling with systems (differential/linear) equations;
Introductory relationship between modelling and optimisation;
Using computer programming skills to solve practical phenomena.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative

assessment in the form of an examination paper.

Module code: TGWN616	Semester 1	NQF-Level: 8

Title: **Control Theory I**

Module-outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to do the following:
Demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

- Introduction to control theory and mechanical systems.
- Mathematical foundations (amongst other matrix theory and matrix solutions of linear differential equations);
- linear control systems;
- theory of stability;
- calculus of variations;
- optimal control;
- applications.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN617	Semester 1	NQF-Level: 8

Title: **Fluid Dynamics I**

Module-outcomes:
Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Euler and Lagrange coordinates, material derivatives and control volumes, Reynolds transport theorem. Conservation of mass, momentum and energy. Rotation and rate of shear. Constitutive equations. Viscosity coefficients. Navier-Stokes equations. Newtonian fluids. Boundary conditions.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Euler en Lagrange-koördinate. Materiële afgeleide en kontrole-volumes. Reynold se transport-stelling. Behoud van massa. Behoud van momentum. Behoud van energie. Rotasie en vervormingstempo. Wesentlike vergelykings. Viskositeitskoëffisiënte, Navier-Stokes-vergelykings. Newton-vloeistowwe. Randvoorwaardes.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN622	Semester 2	NQF-Level: 8
Title: **Numerical Analysis II**		
Module-outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Introduction to numerical analysis (overview of APPM612); numerical solution of ordinary differential equations (single and systems, initial and boundary conditions); partial differential equations. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Inleiding tot numeriese analise (oorsig oor die inhoud van APPM612); numeriese oplossing van gewone differensiaalvergelykings (enkel en stelsel; aanvangswaarde en randwaarde); parsiële differensiaalvergelykings.*		
Method of delivering: Full Time		
Assessment methods: Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.		
Module code: TGWN623	**Semester 2**	**NQF-Level: 8**
Title: **Partial Differential Equations II**		
Module-outcomes: Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Refinement and extension of undergraduate theory: • Finite differences and parabolic equations: revise finite difference approximations to derivatives and parabolic equations; local truncation error; consistency, convergence, revise stability and the Crank-Nicolson implicit method. • Hyberbolic equations and characteristic curves: revise first order quasi-linear equations; Lax-Wendroff and Wendroff methods; second order quasi-linear hyperbolic equations; rectangular nets and finite difference methods for second order hyberbolic equations. • Revision of elliptic equations: Laplace's equation; curved boundaries; solution of sparse systems of linear equations. Finite element method for ODE's: introduction; collocation method; least squares method and the Galerkin method. Introduction to the finite element method for PDE's: Variational principles; examples of elements and solutions. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van*		

die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:
Verfyning en uitbreiding van voorgraadse teorie:
- *Eindige differensies en paraboliese vergelykings: hersien eindige differensie benaderings tot afgeleides en paraboliese vergelykings; lokale afkappingsfout; konsistensie, konvergensie, hersien stabiliteit en die Crank-Nicolson implisiete metode.*
- *Hiperboliese vergelykings en karakteristieke krommes: hersien eerste-orde kwasi-lineêre vergelykings; Lax-Wendroff en Wendroff metodes; tweede orde kwasi-lineêre hiperboliese vergelykings; reghoekige nette en eindige differensie metodes vir tweede orde hiperboliese vergelykings.*
- *Hersiening van elliptiese vergelykings: Laplace se vergelyking; geboë rande; oplos van yl stelsels lineêre vergelykings.*

Eindige element metode vir gewone DV's: inleiding; kollokasie metode; kleinste kwadrate metode en die Galerkin metode.

Inleiding tot die eindige element metode vir PDV's: Variasiebeginsels; voorbeelde van elemente en oplossings.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN624	**Semester 2**	**NQF-Level: 8**

Title: **Financial Mathematics Modelling II**

Module-outcomes:
On completion of this module the student should be able to demonstrate
- knowledge, insight and skills to model and solve financial derivative securities using suitable mathematical methods and computer programmes;
- knowledge of the characteristics, construction and evaluation of derivatives (futures and options);
- knowledge and insight in mathematical and stochastic modeling of share prices and computational aspects of option prices;
- the ability to apply theory and suitable numerical techniques to calculate option prices.

Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies,
- *kennis, insig en vaardighede om finansi?le afgeleide instrumente te modelleer en op te los met geskikte wiskundige metodes en rekenaarprogramme;*
- *kennis van eienskappe en konstruksie en die evaluering van afgeleide instrumente (onder andere termynkontrakte en opsies);*
- *insig in die wiskundige aspek, die stogastiese modellering van aandeelpryse en die berekeningsalgoritmes van opsiepryse;*
- *die vermoë om die teorie en geskikte numeriese metodes toe te pas om opsiepryse te kan bereken.*

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: TGWN625	Semester2	NQF-Level: 8
Title: **Modelling II**		
Module-outcomes: On completion of this module the student should be able to demonstrate knowledge and skills in applying the principles and applicable methods to solve problems in the field of the following subjects: Dimensional analyses: Examples of models that are chosen based on the student's previous knowledge and future aims with regards to studies, research, etc. Be able to do time series analyses. Making predictions from models. Using computer programming skills to solve practical phenomena. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis en vaardighede kan demonstreer in die toepassing van die beginsels en toepaslike metodes om probleme op te los rakende die terrein van die volgende onderwerpe:* *Dimensionele analise: Voorbeelde van modelle wat gekies word op grond van studente se vorige kennis en toekomstige fokus met betrekking tot studies, navorsing, ens.* *Tydreeks analise kan doen.* *Voorspellings kan maak.* *Rekenaarvaardighede kan gebruik in die oplos van praktiese verskynsels*.		
Method of delivering: Full Time		
Assessment methods: Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.		
Module code: TGWN626	**Semester 2**	**NQF-Level: 8**
Title: **Control Theory II**		
Module-outcomes: Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Introduction to optimal control theory and mechanical systems. Mathematical foundations; a variety of applications (amongst others minimum time problems and minimum fuel problems); singular cases. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Inleiding tot optimale beheerteorie en meganiese stelsels. Wiskundige onderbou; ? verskeidenheid toepassings (waaronder minimumtyd- en minimumbrandstofprobleme); singuliere gevalle.*		
Method of delivering: Full Time		
Assessment methods: Assessment methods: Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.		

Module code: TGWN627	Semester 2	NQF-Level: 8
Title: **Fluid Dynamics II**		
Module-outcomes: Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics: Flow lines, vorticity. Kelvin's theorem, Bernoulli and Crocco equations. Vorticity equation. Ideal fluids. Stream function, complex potential and complex velocity. Uniform flow. Source and sink flow. Cylinder flow with and without circulation. Blasius laws. Force and moment. Joukowski transformation. Different types of airfoils. Exact solution of Navier-Stokes equations for a few solvable problems. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *Vloeilyne, werwellyne. Kelvin se stelling, Bernoulli- en Crocco-vergelykings, werwelvergelyking. Ideale vloeistowwe: Stroomfunksie en komplekse potensiaal en komplekse snelheid. Uniforme vloei. Bron- en put-vloei. Silinder-vloei met en sonder sirkulasie. Blasius se wette. Krag en moment. Joukowski-transformasie. Dravlakke van verskillende tipes. Eksakte oplossings van die Navier-Stokes-vergelykings vir enkele oplosbare probleme.*		
Method of delivering: Full Time		
Assessment methods: Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.		
Module code: TGWN671	**Semester 1 & 2**	**NQF-Level: 8**
Title: **Project**		
Module-outcomes: After completion of this module, the student should, taking in account previous studies, be able to do the following: On completion of this module the student should: • have mastered introductory research methods in the subject; • be able to read and understand literature in a mathematical journal; • be able to handle references and sourcing; • be able to perform scientific literature searches; • be able to apply knowledge and skill from different subdisciplines in an integrated fashion in the solution of mathematical problems; • be able to communicate the subject content orally and in written form (in appropriate scientific language and appropriate programmes); • be able to work together in a team on a topic. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, die volgende te kan doen:* • *inleidende navorsingstegnieke in die vakgebied bemeester;* • *literatuur in 'n Wiskundige vaktydskrif lees en verstaan;* • *verwysings en bronne korrek hanteer;*		

- *wetenskaplike literatuursoektogte uitvoer;*
- *kennis en vaardighede van verskillende subdissiplines geïntegreerd toepas in die oplos van wiskundige probleme;*
- *die vak mondelings en skriftelik in toepaslike wetenskaplike taal kommunikeer; en*
- *in 'n span oor 'n onderwerp saam te werk.*

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISK613	**Semester 1**	**NQF-Level: 8**

Title: **Topology of Metric and Normed Spaces**

Module-outcomes:
After succesful completion of this module, the student will be able to demonstrate fundamental knowledge of and skills in the methods, abstract proofs, application of fundamental theorems in proofs and further theoretic development with respect to the following topics: Metric spaces, which include topological concepts, completeness of metric spaces, examples of some classical complete and incomplete metric spaces and the completion of metric spaces; vector spaces and normed spaces, which include Banach spaces and examples of the same, Schauder bases, compactness in normed spaces and its role in the characterisation of finite dimensional normed spaces; linear and bounded linear operators on normed spaces, linear functionals and bounded linear functionals and the algebraic dual space of a vector spaces and the concept algebraic reflexive space; spaces of bounded linear operators on normed spaces, which include (continuous) dual spaces of of normed spaces, some examples of dual spaces and the characterisation of dual spaces of classical normed spaces.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISK615	**Semester 1**	**NQF-Level: 8**

Title: **Differential Equations**

Module-outcomes:
Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Differential equations: analytical and numerical solutions;
Introduction to partial differential equations: analytical and numerical solutions;
Derivation of the Black-Scholes equation as a partial differential equations and solving of this equation using a PDE numerical solution.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN612	**Semester 1**	**NQF-Level: 8**

Title: **Abstract Algebra I**

Module-outcomes:

Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Groups – Sylow theorems, classification of finite groups;
Rings – Prime and maximal ideals, unique factorisation domains, Noetherian rings;
Fields – Field extensions, applications to geometrical constructions. Galois theory.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

Groepe – Sylow-stellings, klassifikasie van eindige groepe.
Ringe – Priem- en maksimale ideale, eenduidigefaktorisering-gebiede, Noetherse ringe.
Liggaamsteorie – Uitbreidingsliggame, toepassing op meetkundige konstruksies. Galois-teorie.

Method of delivering: Full Time

Assessment methods:Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN613	**Semester 1**	**NQF-Level: 8**

Title: **Complex Function Theory**

Module-outcomes:
Upon completion of this module, the student should be able to demonstrate knowledge and skills in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:
Möbius transformations; Montel's theorem; Riemann mapping theorem; infinite products of analytic functions; approximation of analytic functions; analytic continuation; harmonic functions; entire functions of finite order; the range of analytic functions.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van, en vaardighede demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende geselekteerde aspekte van die volgende onderwerpe:

Möbius transformasies; Montel se stelling; Riemann-afbeeldingstelling; oneidige produkte van analitiese funksies; benadering van analitiese funksies; analitiese voortsetting; harmoniese funksies; heelfunksies van eindige orde; die waardeversameling van analitiese funksies.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN614	Semester 1	NQF-Level: 8
Title: **Measure and Integration Theory I**		
Module-outcomes: On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge of, and skills in applying the underlying concepts, methods and applicable theory to solve problems in the area covered by the following themes: sigma-algebras, measurable spaces, Borel sets, measurable functions, Borel functions, monotone classes of functions, measure theory, image of a measure, integration theory, properties of the integral, monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, comparison of the Lebesgue- and Riemann-integrals, evaluation of Lebesgue integrals, continuity and differentiability of functions defined by Lebesgue integrals. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, die kennis van, en vaardighede demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die terrein van die volgende onderwerpe:* *sigma-algebras, meetbare ruimtes, Borel versamelings, meetbare funksies, Borel-funksies, monotone klasse funksies, maatteorie, beeldmate, integrasieteorie, eienskappe van die integraal, monotone konvergensiestelling, Fatou se lemma, Lebesgue se gedomineerde konvergensiestelling, vergelyking van die Lebesgue-integraal met die Riemann-integraal, berekenings met die Lebesgue-integraal, kontinuïteit en differensieerbaarheid van funksies gedefinieer deur Lebesgue-integrale.*		
Method of delivering: Full Time		
Assessment methods: Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.		
Module code: WISN615	**Semester 1**	**NQF-Level: 8**
Title: **Functional Analysis I**		
Module-outcomes: After completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skill in the underlying principles, the methods, the use and application of the theory, pertaining to the following subjects: Metric spaces: Introduction to metric spaces; some classical examples; topological concepts; convergence of sequences; Cauchy sequences and completeness of metric spaces; examples of important complete and incomplete metric spaces. Vector spaces and normed spaces: convergence of sequences and series in normed spaces; Schauder bases; finite dimensional normed spaces; compactness in normed spaces and its role in the characterisation of finite dimensional normed spaces. Linear and bounded linear operators on normed spaces; linear functionals and bounded linear functionals and the algebraic dual space of a vector space; the concept of algebraically reflexive space; the algebraic reflexivity of finite dimensional spaces.		

Spaces of bounded linear operators on normed spaces; dual spaces of normed spaces; some examples of dual spaces of well known normed spaces.

The Hahn-Banach theorem for the extension of linear functionals and some applications; adjoint operators on dual spaces; reflexive Banach spaces; the Uniform Boundedness Theorem and some applications; weak and strong convergence of sequences in normed spaces; the Open Mapping Theorem and the Closed Graph Theorem and some applications.

Module uitkomste:

Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los op die terrein van die volgende onderwerpe:

Metriese ruimtes: Topologiese begrippe; konvergensie van rye; Cauchy-rye en volledigheid van metriese ruimtes; voorbeelde van enkele bekende volledige en nie-volledige metriese ruimtes. Vervollediging van metriese ruimtes.

Vektorruimtes en normeerde ruimtes: Banach-ruimtes en voorbeelde van sulke ruimtes; konvergensie van rye en reekse in normeerde ruimtes; Schauder-basisse; eindig-dimensionele normeerde ruimtes; kompaktheid in normeerde ruimtes en die rol daarvan in die karakterisering van eindig-dimensionele normeerde ruimtes.

Lineêre en begrensde lineêre operatore op normeerde ruimtes; lineêre funksionale en begrensde lineêre funksionale en die algebraïese duaalruimte van 'n vektorruimte en die begrip algebraïes refleksiewe ruimte; algebraïes refleksiwiteit van eindig-dimensionele ruimtes;

Ruimtes van begrensde lineêre operatore op normeerde ruimtes; Duaalruimtes van normeerde ruimtes; enkele voorbeelde van duaalruimtes van bekende normeerde ruimtes;

Die Gelykmatige Begrensdheidstelling en enkele toepassings; sterk-en swak konvergensie van rye in normeerde ruimtes; die Ope-afbeelding stelling en Geslote Grafiekstelling en enkele toepassings daarvan.

Method of delivering: Full Time

Assessment methods:

Formative assessment: Homework assignments, a project and/or class tests, semester test(s).

Summative assessment: Examination of 3 hours in which the achievement of the outcomes of the module by means of practical, theoretical and insight questions are assessed.

Module code: WISN616	**Semester 1**	**NQF-Level: 8**

Title: **Fundamentals of Mathematics**

Module-outcomes:

Upon completion of this module the students should be able to, with due consideration of previous studies, demonstrate knowledge of and ability in applying the principles and applicable methods to solve problems regarding the following topics:

- Axioms of set theory (ZFC), consequences of the axiom of choice, operations on sets, cardinal and ordinal numbers,
- A selection of topics based on the following: Boolean algebras, the development of the natural and the real number systems, the Schröder-Bernstein

theorem, well-orderings, cardinal and ordinal arithmetic.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

- *Die aksiomas van versamelingsleer (ZFC), die gevolge van die keuse-aksioma, bewerkings op versamelings, kardinaal- en ordinaalgetalle;*
- *'n Keuse van onderwerpe gebasseer op die volgende: Boolese algebras, die ontwikkeling van die natuurlike en reële getallestelsels, die Schröder-Bernstein stelling, welordenings, kardinaal- en ordinaalrekene.*

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN622	**Semester 2**	**NQF-Level: 8**

Title: **Abstract Algebra II**

Module-outcomes:
pon completion of this module and taking into account prior learning, the student should be able to, demonstrate knowledge and skills to apply fundamental principles, methods and applicable theory to solve problems regarding selected aspects of the following topics:

Rings – Radicals,chain conditions.
Modules over rings – Basic definitions and properties, free modules, exact sequences, simple and semisimple modules, Hom, projective and injective modules, flat modules, purity
Module uitkomste;
a voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los op die terrein van die volgende onderwerpe:

Ringe – Radikale,kettingvoorwaardes.
Module oor ringe – Basiese definisies en eienskappe, vrye module, eksakte rye, eenvoudige en semi-eenvoudige module, Hom, projektiewe en injektiewe module, plat module, suiwerheid..

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN623	**Semester 2**	**NQF-Level: 8**

Title: **Fourier/Harmonic Analysis**

Module-outcomes:
After completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skill in the underlying principles, the methods, the use and application of the theory, pertaining to the following subjects:

Fourier Series on the circle group, convergence of Fourier series, the (harmonic)

conjugate function, Hardy spaces.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN624	**Semester 2**	**NQF-Level: 8**

Title: **Measure and Integration Theory II**

Module-outcomes:
On completion of this module the learners should, taking into account their preceding studies, be able to demonstrate knowledge and skills in applying the underlying concepts, methods and theory to solve problems in the area covered by the following themes:

Theorems of Fubini and Radon-Nikodym, extension of measures and Caratheodory's theorem, Lebesgue-Stieltjes integrals, function spaces, types of convergence, uniform integrability.

Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis en vaardighede demonstreer in die toepassing van die beginsels, metodes en toepaslike teorie om probleme op te los rakende die terrein van die volgende onderwerpe:

Stellings van Fubini en Radon-Nikodym, uitbreiding van mate en Caratheodory se stelling, Lebesgue-Stieltjes integrale, funksieruimtes, tipes konvergensie, gelykmatige integreerbaarheid.

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN625	**Semester 2**	**NQF-Level: 8**

Title: **Functional Analysis II**

Module-outcomes:
After completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skill in the underlying principles, the methods, the use and application of the theory, pertaining to the following subjects:

Inner product spaces and Hilbert spaces; orthonormality; orthogonal complements and direct sums; complementary subspaces in Hilbert spaces and orthogonal projections; orthonormal sequences; Bessel's inequality.
The Riesz Theorems for bounded linear functionals and bounded sesquilinear functionals on Hilbert spaces: The characterisation of bounded linear functionals, as well as bounded sesquilinear functionals on Hilbert spaces in terms of the inner products on the Hilbert spaces; the Hilbert adjoint of a bounded linear operator on inner product spaces; introductory study of self adjoint operators.
Spectral theory of bounded linear operators on normed spaces; spectral theory and the spectral representation of bounded self-adjoint operators on Hilbert spaces.

If time permits, additional topics can be discussed, in dialogue with the participating students.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis van en vaardighede demonstreer in die toepassing van die beginsels grondliggend tot die vakgebied en geskikte metodes om probleme op te los rakende die terrein van die volgende onderwerpe:

Inwendige produkruimtes en Hilbert-ruimtes: ortonormaliteit; ortogonale komplemente en
direkte somme; komplementêre deelruimtes in Hilbert-ruimtes en ortogonale projeksies;
ortonormale rye; Bessel se ongelykheid.
Riesz se stellings vir begrensde lineêre funksionale en begrensde 1½ -lineêre funksionale op
Hilbert-ruimtes: Die karakterisering van begrensde lineêre funksionale, sowel as begrensde
1½-lineêre funksionale op Hilbert-ruimtes in terme van die inwendige produkte op die Hilbertruimtes;
die Hilbert-toegevoegde van ? begrensde lineêre operator op inwendige produkruimtes; inleidende studie van selftoegevoegde operatore.
Spektraalteorie van begrensde lineêre operatore op normeerde ruimtes; spektraalteorie van
begrensde self-toegevoegde operatore op Hilbertruimtes en die spektraal voorstelling van begrensde self-toegevoegde operatore op Hilbertruimtes.

Method of delivering: Full Time

Assessment methods:

Formative assessment: Homework assignments, a project and/or class tests, semester test(s).

Summative assessment: Examination of 3 hours in which the achievement of the outcomes of the module by means of practical, theoretical and insight questions.

Module code: WISN626	**Semester 2**	**NQF-Level: 8**

Title: **Evolution of Mathematical Ideas**

Module-outcomes:
Upon completion of this module the student should be able to do the following:
Introduction to the history of mathematics; knowledge of the history of mathematics with emphasis on matters like important persons and viewpoints, development of ideas, application of methods and solution of problems according to the knowledge of that era.
Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, kennis te hê van en ? vaardigheid te kan demonstreer in die toepassing van die grondliggende beginsels en metodes om probleme in die volgende onderwerpe op te los:

Inleiding tot die geskiedenis van wiskunde; oorsig oor die geskiedenis van wiskunde, met klem op sake soos belangrike persone en strominge, ontwikkeling van idees, gebruik van metodes en oplos van probleme volgens die bepaalde era

se kennis

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN627	**Semester 2**	**NQF-Level: 8**

Title: **Matrix Analysis**

Module-outcomes:
Upon completion of this module, and taking into account prior learning, the student should be able to demonstrate knowledge and skill in applying the underlying fundamental principles, methods and applicable theory to solve problems regarding the properties of different classes of matrices and their applications to matrix functions and canonical forms. In particular selected aspects of the following topics:

Partition matrices, Rank and Eigenvalues;
Matrix polynomials and functions of matrices;
Canonical forms (for example the Jordan form);
Numerical Ranges;
Matrix norms;
Special classes of matrices;
Positive semidefinite, Unitary and Normal matrices, and their properties

Module uitkomste:
Na voltooiing van hierdie module behoort die studente, met inagneming van vorige studies, deeglike kennis van, en vaardigheid demonstreer in die toepassing van die beginsels, metodes en teorie om probleme op te los rakende die eienskappe van verskillende klasse matrikse en hul toepassings tot matriksfunksies en kanoniese vorms. In die besonder geselekteerde aspekte van die volgende onderwerpe:

Matrikspartisies, Rang en Eiewaardes;
Matrikspolinome en funksies van matrikse;
Kanoniese vorms (soos bv die Jordan vorm);
Numeriese Waardeversamelings;
Matriksnorms;
Spesiale klasse matrikse;
Positief semi-definiete, Unitêre, en Normale matrikse, en hul eienskappe

Method of delivering: Full Time

Assessment methods:
Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper.

Module code: WISN628	Semester 2	NQF-Level: 8
Title: **Topology**		
Module-outcomes: After completion of this module students should, taking into account preceding studies, be able to demonstrate fundamental knowledge of, and skill in the underlying principles, the methods, the use and application of the theory, pertaining to the following subjects: basic topological concepts, continuity, compactness, nets and the inadequacy of sequences, product spaces and Tychonoff's theorem, normal sets and Urysohn' lemma, nets and filters, separation axioms and regularity, compactness (revisited), local en para-compactness, compactifications, metrisability, connectedness.		
Method of delivering: Full Time		
Assessment methods: Formative assessment: Homework assignments, a project and/or class tests, semester test(s). Summative assessment: Examination of 3 hours in which the achievement of the outcomes of the module by means of practical, theoretical and insight questions		

Module code: WISN671	Semester 1 & 2	NQF-Level: 8
Title: **Project**		
Module-outcomes: At completion of this module the student should: • have mastered introductory research methods in the subject; • be able to read and understand literature in a mathematical journal; • be able to handle references and sourcing; • be able to perform scientific literature searches; • be able to apply knowledge and skill from different subdisciplines in an integrated fashion in the solution of mathematical problems; • be able to communicate the subject content orally and in written form (in appropriate scientific language and appropriate programmes); • be able to work together in a team on a subject." *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente, die volgende te kan doen:* • *inleidende navorsingstegnieke in die vakgebied bemeester;* • *literatuur in 'n Wiskundige vaktydskrif lees en verstaan;* • *verwysings en bronne korrek hanteer;* • *wetenskaplike literatuursoektogte uitvoer;* • *kennis en vaardighede van verskillende subdissiplines geïntegreerd* • *toepas in die oplos van wiskundige probleme;* • *die vak mondelings en skriftelik in toepaslike wetenskaplike taal kommunikeer; en* • *in 'n span oor 'n onderwerp saam te werk.*		
Method of delivering: Full Time		
Assessment methods: Dissertation and oral presentation		

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Module code: ASCM871	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: AGRM871	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module Outcomes: Student should be able to: • Demonstrate sound and advanced knowledge of Agronomic principles applicable to various aspects of field crop and vegetable production, which may include but not limited to tillage, soil fertility evaluation and management, plant nutrition, weed control, crop physiology and crop protection • Access, critically evaluate, analyse and synthesise existing and/or new information and data • Demonstrate ability to independently conceptualize and/or appraise research problems, conduct research and interpret findings within the context scientific knowledge to address current and future food security challenges • Demonstrate capability to integrate theory, technical information and appropriate methods in effectively analyzing and solving agricultural, resource and rural-related problems. Demonstrate appropriate level of writing and communication skills to effectively disseminate research and technical information, including the practical implications of such findings.		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: APPM871	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module outcomes: Knowledge: The student is equipped to master and apply Applied Mathematics and Mathematics research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution theories, formulate and prove theorems if necessary, and furnish practical proof of the meaningfulness, implementability and accuracy of the new solution theory. Methods for committing the above process to paper in a scientific manner are acquired. The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in the dissertation.		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: APPM872	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module outcomes:		

Knowledge: The student is equipped to master and apply research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution
theories, formulate and prove theorems if necessary, and furnish practical proof of the
meaningfulness, implementability and accuracy of the new solution theory. Methods for
committing the above process to paper in a scientific manner are acquired. The student's
thorough fundamental training acquired beforehand in selected, advanced theoretical subjects
is embodied in the dissertation.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: APPM881	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected aspects of the one or more of the following topics:
Solvability of finite dimensional integral-, differential- and operator equations; the contraction mapping principle; applications of the theory of integration, applications of complete spaces with Hilbertian and Normed structures; the Calculus of Variations

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: APPM882	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module outcomes:
This module complements and extends the material covered in APPM881 (Applicable Analysis I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:
Advanced aspects of the solvability of finite dimensional integral-, differential- and operator equations; the contraction mapping principle; applications of the theory of integration, applications of complete spaces with Hilbertian and Normed structures; the Calculus of Variations.

Method of delivering:

Assessment methods:

Dissertation (100%)

Module code: APPM883	Semester 1 & 2	NQF-Level: 9

Title: Dissertation

Module outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected aspects of one or more of the following topics:

The study of the various ways in which phenomena may be modelled by means of mathematics, namely linear vs nonlinear models, static vs dynamic models, explicit vs implicit models, discrete vs continuous models, deterministic vs stochastic models, deductive, inductive or floating models.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: APPM884	Semester 1 & 2	NQF-Level: 9

Title: Dissertation

Module outcomes:
This module complements and extends the material covered in APPM883 (Modelling I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected aspects of one or more of the following topics:

The study of the various ways in which phenomena may be modelled by means of mathematics, namely linear vs nonlinear models, static vs dynamic models, explicit vs implicit models, discrete vs continuous models, deterministic vs stochastic models, deductive, inductive or floating models.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: APPM887	Semester 1 & 2	NQF-Level: 9

Title: Dissertation

Module outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
of selected topics in Advanced Applied Mathematics not covered by the other Masters level module modules. Such topics shall be jointly determined by the supervisor of the affected student, and the chairperson of the subject group Applied Mathematics, and shall be directly related to the chosen research topic of the

student.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: BCHN872	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation (Biochemistry)**

Module-outcomes:

Scope of knowledge: specialist knowledge and understanding to engage and critique educational research and practices within the field of Biochemistry and /or to contribute to disciplined thinking about biochemical matters and issues.

Knowledge literacy and methods: an ability to evaluate current processes of knowledge production in the field of Biochemistry and to choose appropriate processes of enquiry in the area of specialisation.

Problem solving: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of biochemistry, training or development, and to report their findings in academically appropriate ways – a written presentation being the requirement of this module.

Accessing, processing and managing information: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of Biochemistry, training or development, and to report their findings in academically appropriate ways - a written presentation being the requirement of this module.

Producing and communicating information: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of biochemistry, training or development, and to report their findings in academically appropriate ways - a written presentation being the requirement of this module.

Context and systems: Candidates exhibit the potential to act as academic leaders and experts in the field of biochemistry, training and development.

Management of learning: high levels of responsibility, self-reflexivity and adaptability, with respect to the ethical implications of research, the determination of socially relevant l issues and research needs in South Africa.

Module uitkomste:

***Omvang van kennis**: spesialiskennis en begrip om aktief betrokke te raak en kritiek te lewer op opvoedkundige navorsing en praktyke binne die gebied van Biochemie en/of om 'n bydra te lewer tot gedissiplineerde denke oor biochemiese sake en kwessies.*

***Kennis geletterdheid en metodes**: vermoë om huidige prosesse van kennisproduksie te evalueer binne die gebied van Biochemie en om toepaslike prosesse van ondersoek in die relevante spesialiseringsrigting te kies.*

***Probleemoplossing**: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie, opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike manier te rapporteer – 'n geskrewe voorlegging is die vereiste vir hierdie module*

***Toegang, verwerking en bestuur van inligting**: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie, opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike manier te rapporteer - 'n geskrewe voorlegging is die vereiste vir hierdie module.*

***Vervaardiging en kommunikasie van inligting**: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie, opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike*

manier te rapporteer - 'n geskrewe voorlegging is die vereiste vir hierdie module.
Konteks en stelsels: Kandidate demonstreer die potensiaal om as akademiese leiers en kenners binne die gebied Biochemie, opleiding of ontwikkeling, op te tree.
Kontrole leer: hoë vlak van verantwoordelikheid, self-refleksiwiteit en aanpasbaarheid, met betrekking tot etiese implikasies van navorsing, die bepaling van sosiaal relevante kwessies en navorsingsbehoeftes in Suid Afrika.

Method of delivering:

Assessment methods:
Final module assessment:
Dissertation (100%)

Module code: BCHN877	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Biochemistry**

Module-outcomes:

Scope of knowledge: specialist knowledge and understanding to engage and critique biochemical research and practices within the field of Biochemistry and /or to contribute to disciplined thinking about biochemical matters and issues.

Knowledge literacy and methods: an ability to evaluate current processes of knowledge production in the field of Biochemistry and to choose appropriate processes of enquiry in the area of specialisation.

Problem solving: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of biochemistry, training or development, and to report their findings in academically appropriate ways – oral presentation being the requirement of this module.

Accessing, processing and managing information: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of Biochemistry, training or development, and to report their findings in academically appropriate ways - oral presentation being the requirement of this module.

Producing and communicating information: Candidates demonstrate the ability to conduct independent inquiry in a specialised field of biochemistry, training or development, and to report their findings in academically appropriate ways –

Context and systems: Candidates exhibit the potential to act as academic leaders and experts in the field of biochemistry, training and development.

Management of learning: high levels of responsibility, self-reflexivity and adaptability, with respect to the ethical implications of research, the determination of socially relevant l issues and research needs in South Africa.

Module uitkomste:

Omvang van kennis: spesialiskennis en begrip om aktief betrokke te raak en kritiek te lewer op biochemiese navorsing en praktyke binne die gebied van Biochemie en/of om 'n bydra te lewer tot gedissiplineerde denke oor biochemiese sake en kwessies.

Kennis geletterdheid en metodes: vermoë om huidige prosesse van kennisproduksie te evalueer binne die gebied van Biochemie en om toepaslike prosesse van ondersoek in die relevante spesialiseringsrigting te kies.

Probleemoplossing: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie, opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike manier te rapporteer – 'n mondelinge aanbieding is 'n vereiste vir hierdie module.

Toegang, verwerking en bestuur van inligting: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie,

opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike manier te rapporteer - 'n mondelinge aanbieding is 'n vereiste vir hierdie module.
Vervaardiging en kommunikasie van inligting: Kandidate demonstreer die vermoë om onafhanklike ondersoek in 'n gespesialiseerde gebied binne Biochemie, opleiding of ontwikkeling uit te voer en hul bevindinge in 'n akademies toepaslike manier te rapporteer -
Konteks en stelsels: Kandidate demonstreer die potensiaal om as akademiese leiers en kenners binne die gebied Biochemie, opleiding of ontwikkeling, op te tree.
Kontrole leer: hoë vlak van verantwoordelikheid, self-refleksiwiteit en aanpasbaarheid, met betrekking tot etiese implikasies van navorsing, die bepaling van sosiaal relevante kwessies en navorsingsbehoeftes in Suid Afrika.

Method of delivering:Full-time or part-time

Assessment methods:
Final module assessment: Oral presentation (25%)
Dissertation (75%)

Module code: BIYM871	**Semester: Year**	**NQF-Level: 9**

Title: Dissertation

Module-outcomes:

Method of delivering:

Assessment methods:

Module code: BWIA811	**Semester 1**	**NQF-Level: 9**

Title: **Enterprise-wide Risk Management**

Module-outcomes:
Objectives
On completion of the module the student will demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of:
(i)the ERM Concept and Framework.
(ii)the ERM Process.
(iii)Risk Categories and Classification.
(iv)Risk Modelling and Aggregation of Risks.
(v)Risk Measurement and Assessment.
(vi)Risk Management Tools and Techniques.
(vii)Economic Capital.
The student will also as an individual or as a member of a group demonstrate the ability to:
(a)identify, analyse and deal with complex and/or real world problems and issues drawing systematically and creatively on the theory, research methods and literature
(b)use advanced information retrieval and processing skills
(c)perform a critical analysis, synthesis and independent evaluation of quantitative and/or qualitative data
(d)undertake a study of the literature and current research
(e)effectively present and communicate the results to specialist and non-specialist audiences using the resources of an academic/professional discourse through integrated assessment of objectives (i) to (vii) in the form of project(s).

Method of delivering:

Assessment methods:

Module code: BWIA812	**Semester 1**	**NQF-Level: 9**

Title: **Enterprise-Wide Risk Management I**

Module-outcomes:
outcomes:
On completion of the module, the student should be able to demonstrate:

- After the completion of this module, the learner should be able to demonstrate integrated knowledge of the theories, methods and techniques in the field of Enterprise Risk Management.
- The learner should be able to demonstrate the ability to interrogate multiple sources of knowledge in the modelling of financial and non-financial risks.
- Demonstrate an understanding of risk classification and risk measurement concepts and techniques.
- Demonstrate the ability to use statistical methods and techniques (e.g. univariate and multivariate distributions, correlations, time series, etc.) to analyse risk concepts (e.g. market risk, credit risk, operational risk and underwriting risk).
- Demonstrate the ability to critically evaluate financial risk management problems in financial institutions and provide solutions to these problems.
- Communicate effectively, orally and in writing and to make use of appropriate technologies in all communications.
- Demonstrate the ability to apply and implement risk models in software packages (e.g SAS/IML and MS Excel).
- Demonstrate the ability to take full responsibility for his or her own work in practical assignments

Method of delivering:

Assessment methods: Students have mastered the outcomes if they are able to:

- Implement his/her specialist knowledge to analyse and evaluate financial and non-financial risks.
- Explain the modelling and management of financial and non-financial risks in financial institutions.
- Develop / propose an integrated risk measurement framework by applying statistical methods and techniques.
- Explain the concepts of risk classification and analyse and criticize risk measurement concepts in financial risk management.
- Show an awareness of how individual risks might be categorised in different ways.
- Describe the properties and limitations of common risk measures.
- Recommend a specific choice of model based on the results of both quantitative and qualitative analysis of financial or insurance data.
- Analyse quantitative data by applying statistical methods (e.g. univariate and multivariate distributions, correlations, time series, etc.)
- Analyse and implement financial risk models in software packages (e.g SAS/IML and MS Excel).

- Present information in a professional and ethical sound manner
- Develop, optimise and take responsibility for own learning needs, able to track own learning progress and apply, evaluate and reflect on relevant learning strategies, management of all resources to successfully realise all outcomes of the module
- Take responsibility to co-operate effectively as a member of a group to ensure that task outcomes are met.

Module code: BWIA821	**Semester 2**	**NQF-Level: 9**

Title: **Enterprise-wide Risk Management II**

Module-outcomes:

- On completion of the module, the student should be able to demonstrate:
- Integrated knowledge of the main areas of enterprisewide risk management and critical understanding of the approaches to monitor, measure and manage risk effectively on a integrated and holistic manner.
- The ability to formulate, justify and present plausible and appropriate solutions to business problems
- The ability to behave professionally in a commercial environment and to take relevant factors and issues into account in the formulation of solutions for enterprisewide risk management.
- The ability to apply professional integrity, conduct and responsibility required by the actuarial profession.
- Demonstrate the ability to learn independently and as part of a group. Manage time, work to deadlines and prioritise workloads

Method of delivering:

Assessment methods:

Students have mastered the outcomes if they are able to:

- Identify and assess the different risks an enterprise if exposed to, and propose and evaluate efficient risk management stategies.
- Demonstrate an understanding of risk management (including regulatory) frameworks and regimes that promote and guide the use of risk management.
- Demonstrate an understanding of economic measures of value and their uses in corporate decision making.
- Demonstrate an understanding of capital allocation tachniques and the role of risk measures Present reasoned arguments, both in technical and non-technical language.
- Identify relevant stakeholders and demonstrate the relevance of risk measurement and management to all stakeholders.
- Present information in a professional and ethically sound manner.
- Develop, optimise and take responsibility for own learning needs, able to track own learning progress and apply, evaluate and reflect on relevant learning strategies, management of all resources to successfully realise all outcomes of

the module
- Take responsibility to co-operate effectively as a member of a group to ensure that task outcomes are met.

Module code: BWIB818	Semester 1	NQF-Level: 9

Title: **Business Intelligence**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Business Intelligence, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to design, create, retrieve, and present results from a variety of data structures in order to effectively support business decision-making.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable..

Method of delivering: Full time (Contact)

Assessment methods:
Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of Business Intelligence (BI) principles and practices (e.g. BI framework, architecture, technology trends, operational and decision support data, database fundamentals, dimensional modelling), and the techniques associated with these concepts.
- Develop various data models from business rules and from other types of data models
- Use the designated software packages to construct diverse data structures, query the data, and develop reports from the retrieved data.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of

terminology appropriate to the field of Business Intelligence.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB821	**Semester 2**	**NQF-Level: 9**

Title: **Data Mining Techniques**

Module-outcomes:
After completion of module BWIB821 the student should to demonstrate:

- Advanced and integrated knowledge and critical understanding with regards to data mining principals and models.
- Specialised knowledge with regard to the use of data preparation in the field of data mining.
- An ability to appropriately deal with the principles and best practices of data mining in scenarios.
- An ability to conceptually design and develop data mining models to solve problems in the field of data mining.
- Plan and conduct research according to standard protocol and employ appropriate protocols, conventions, processes, procedures and techniques to solve problems in the field of data mining.
- Communicate effectively, orally and in writing and to make use of appropriate technologies in all communications to lay and professional audiences.

Method of delivering:

Assessment methods:
The student has reached the outcome if he/she has the ability to:

- Analyse and critically evaluate the development of data mining models (e.g. cluster analysis, decision tress, regression models, neural networks).
- Describe, compare, combine, apply and critically examine a range of data preparation techniques (e.g transform raw data into a suitable form, extract appropriate data, transform data, incorporate non-numeric data,) (in the field of data mining techniques).

- Critically evaluate the current principles and best practices of data mining in specific scenarios.
- Demonstrate the ability to apply and implement data mining models in software packages (e.g. SAS Enterprise Miner) on real world datasets.
- Develop data mining models using the applicable data preparation techniques.
- Construct and write a technical report that contains the results of a research study to solve problems in the broad field of data mining.
- Present information in a professional and ethically sound manner.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB822	Semester 2	NQF-Level:9

Title: **Contemporary Issues in Business Analytics**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Analytical Customer Relationship Management (ACRM), to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the effectiveness of a range of appropriate ACRM methods in maximising the lifetime value of an organization's customers.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable.

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of supervised and unsupervised statistical models, optimisation models, and the techniques associated with these concepts.
- Identify the analytical methods that can appropriately address particular business questions in the field of CRM, select the most suitable method(s), use the designated software packages to apply the selected technique(s) to data, and critically assess and interpret the results.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of ACRM.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions

and assignments – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in assignments on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different seminars relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIB823	**Semester 2**	**NQF-Level: 9**

Title: **Multiple Criteria Decision Making**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and critical understanding with regard to the field of Multiple Criteria Decision Making, to enable engagement with and critical evaluation of various principles and techniques relevant to this field.
- The ability to identify, select, apply, interpret, and critically judge the appropriateness of a range of mathematical programming formulations in solving complex optimisation problems relevant in finance.
- The ability to identify and critically evaluate the ethical/professional conduct of himself/herself and others in different cultural/social/professional environments, and to effect the appropriate change in such conduct

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Describe, formulate, apply, and critically examine a range of financial optimisation models, its assessment and selection, and the solution techniques associated with these models.
- Use the designated software package to capture the mathematical models associated with a specific problem, apply suitable optimisation algorithms to find solutions, and select the most effective course of action based on a critical assessment of the results.
- Work independently and be well prepared for all seminars. Contribute to discussions during seminars and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Multiple Criteria Decision Making.

Module code: BWIN811	Semester 1	NQF-Level: 9
Title: **Practical Risk Management SAS RD**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: • After the completion of this module, the learner should be able to demonstrate a comprehensive and systematic knowledge and coherent and critical understanding of risk analysis. • Identify methods of configuring SAS Risk Dimensions. • Understand the usage of SAS functions and subroutines. Understand the use of projects within a Risk Dimensions environment. • Demonstrate the ability to critically evaluate financial risk management problems in financial institutions and provide solutions to these problems. • Communicate effectively, orally and in writing and to make use of appropriate technologies in all communications. • Demonstrate the ability to apply and implement risk models in SAS Risk Dimensions. • Demonstrate the ability to take full responsibility for his or her own work in practical assignments		
Method of delivering: Assessment methods: Students have mastered the outcomes if they are able to: • Implement his/her specialist knowledge to analyse and evaluate financial risk. • Explain the modelling and management of financial risk in financial institutions. • Develop / propose an integrated risk measurement framework in SAS Risk Dimensions • Define basic terms used in risk analysis • Identify methods of configuring Risk Dimensions • Understand the usage of SAS functions and subroutines. • Understand the use of projects within a Risk Dimensions environment • Create a risk analysis environment, of limited scope, in the SAS Institute's risk management solution, SAS Risk Dimensions. • Present information in a professional and ethical sound manner • Develop, optimise and take responsibility for own learning needs, able to track own learning progress and apply, evaluate and reflect on relevant learning strategies, management of all resources to successfully realise all outcomes of the module • Take responsibility to co-operate effectively as a member of a group to ensure that task outcomes are met		
Module code: BWIN812	**Semester 1**	**NQF-Level: 9**
Title: **Pricing of Derivatives B**		
Module-outcomes: • Critical understanding and knowledge of interest rate derivative pricing models; and integrated knowledge of discrete-time and continuous-time interest rate		

models. Integrated knowledge of multifactor interest rate models. Strong backgrounds in Pricing of Derivatives A and numerical methods are recommended

- The ability to formulate and apply short rates and forward rate models.
- The ability to construct the LIBOR market and the Swap market models.
- The ability to plan and conduct research according to standard protocol and to employ appropriate processes, procedures and techniques.
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.
- The ability to take full responsibility his/her work, decisions, and use of resources, as well as full accountability for the actions and decisions of others where applicable.

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically investigate, through a research project, a range of interest rate derivative pricing models, its assessment and selection, and the techniques associated with contiguous claims.
- Use MatLab to implement basic numerical procedures to price interest rate derivative instruments in continuous time.
- Work independently and be well prepared for all seminars.
- Contribute to discussions during lectures and demonstrate knowledge of the relevant concepts and methods in various forms of assessment, by providing insight into – and solutions to – problems/questions with the correct use of terminology appropriate to the field of Interest Rate Theory.
- Demonstrate that he/she can successfully complete a research project independently and individually apply the knowledge and skills – that were gained by means of the class discussions and literature study – on theoretical principles and real-world problems.
- Act professionally, e.g. hand in a research project on time and be punctual in all operations.
- Present information in a professional and ethically sound manner.
- Critically evaluate and consider the ethical implications of decisions in appropriate contexts.
- Continuously reflect on how the different lectures relate to each other by integrating applicable knowledge, skills and values from different sub-modules in the problem solving process.

- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIN813	Semester 1	NQF-Level: 9

Title: **Practical Data Mining**

Module-outcomes:
At the end of this module the student should be able to explore and analyse data sets with the techniques studied in this module. Furthermore, the student must be able to make future predictions based on the patters occurring in historical data.
Knowledge: At the end of the course students will have acquired knowledge and insight about the application of data mining concepts in a practical context.
Module-outcomes:
Skills: After successful completion of the course students will be able to independently and by using the Enterprise Miner system of SAS, apply data mining techniques on data sets from the industry.

Method of delivering:

Assessment methods:

Module code: BWIN815	Semester 1	NQF-Level: 9

Title: **Industry Integration Project**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and understanding of practical project management including the formulation of the user requirement, the planning, scheduling and costing of the project, the determination of a base line, the execution and monitoring of the project, documentation and the presentation of the results.
- The the ability to identify, formulate and solve business/ decision making problems using appropriate qualitative and quantitative tools
- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.
- The ability to contribute and learn cooperatively in groups within various roles and learn on his/her own initiative, by applying learning strategies in a critical manner to effectively address the professional and ongoing needs of himself/herself and others.

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Formulate, plan, schedule and cost a practical business management problem.
- Demonstrate technical writing skills through writing a project proposal document
- Demonstrate oral communication skills by presentations during the formal project meeting (Business Case, Project Proposal, Project Review, Project Close-out)
- Demonstrate the ability to manage a project from conception to execution, by

conducting a real-world project, monitored on a hands-on way.
- Ability to effectively manage meetings through tools such as meeting agendas, minutes and meeting document packs.
- Demonstrate that he/she can successfully complete group assignments, solve or deal with issues related to diversity in groups, and individually apply the knowledge and skills – that were gained by means of the group discussions and assignments – on real-world problems.

Module code: BWIN816	**Semester 1**	**NQF-Level: 9**

Title: **Modern Portfolio Theory**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Advanced and integrated knowledge and understanding of the principles of investment management, including risk control techniques
- The ability to apply the principles of risk management and control to the appraisal, selection
- and management of investments.
- The ability to communicate effectively, orally and in writing and to make use of appropriate technologies in all communications to lay and professional audiences.
- The ability to take full responsibility of his/her own work and practices.

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Discuss and develop portfolio investment strategies working individually or in groups
- Think independently and solve complex portfolio choice problems, select assets and
- manage portfolios.
- Analyse and critically evaluate the performance of an investment manager.
- Make persuasive case reports and business solutions to investment professionals.
- Develop solutions to corporate, risk and investment management problems
- Present information in a professional and ethically sound manner;
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIN817	**Semester 1**	**NQF-Level: 9**

Title: **Retail Credit Risk**

Module-outcomes:
After completion of module BWIN817 the student should to demonstrate:

- Advanced and integrated knowledge and critical understanding with regard to the development of predictive models (i.e. scorecards) in the field of retail credit risk.

- Specialised knowledge with regard to the use of logistic regression in the field of retail credit risk.
- An ability to appropriately deal with the principles and practice of consumer credit risk management in scenarios and cases.
- An ability to conceptually design and develop scorecards to solve problems in the field of retail credit risk.
- Plan and conduct research according to standard protocol and employ appropriate protocols, conventions, processes, procedures and techniques to solve problems in the field of credit risk.
- Communicate effectively, orally and in writing and to make use of appropriate technologies in all communications to lay and professional audiences.
- Demonstrate the ability to take full responsibility of his/her own work and practices.

Method of delivering:

Assessment methods:

The student has reached the outcome if he/she has the ability to:

- Analyse and critically evaluate the development of predictive models.
- Develop logistic regression models correctly to address the problems identified in the field of retail credit risk.
- Critique the current principles and practice of consumer credit risk management in a specific scenarios.
- Develop (build) scorecards using the applicable statistical modelling technique and implement it in the applicable software package.
- Construct and write a technical report that contains the results of a research study to solve problems in the broad field of retail credit risk.
- Present information in a professional and ethically sound manner.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

Module code: BWIN818	**Semester 1**	**NQF-Level: 9**

Title: **Topical Research issues in Risk Analysis**

Module-outcomes:

Knowledge: At the end of this course, students should have knowledge and insight into the most recent research trends and technological breakthroughs in the area of financial risk management. Aspects that will be studied include: market risk, credit risk, liquidity risk, operational risk and model risk. The important problem of the allocation of risk capital for financial institutions will also be studied. The relationship between financial risk and insurance risk will be analysed.

Skills: Students should be able to have the skills necessary to critically evaluate cutting edge risk issues and research breakthroughs for possible practical application.

Method of delivering:

Assessment methods:

Module code: BWIR826	Semester 2	NQF-Level:9

Title: **Industry directed research project**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

- Integrated knowledge and understanding of practical project management including the formulation of the user requirement, the planning, scheduling and costing of the project, the determination of a base line, the execution and monitoring of the project, documentation and the presentation of the results.

- The the ability to identify, formulate and solve business/ decision making problems using appropriate qualitative and quantitative tools.

- The ability to effectively present and communicate, orally and in writing, relevant academic and professional information – including creative insight, rigorous interpretations, and solutions to problems – to a range of audiences with the use of appropriate technologies.

- The ability to operate independently and take full responsibility for his or her own work, and, where appropriate, to account for leading and initiating processes and implementing systems, ensuring good resource management and governance practices.

Method of delivering:

Assessment methods:
Students have mastered the outcomes if they are able to:

- Formulate, plan, schedule and cost a industry directed research problem.
- Demonstrate technical writing skills through writing a project proposal document
- Demonstrate oral communication skills by presentations during the formal project meeting (Business Case, Project Proposal, Project Review, Project Close-out)
- Demonstrate the ability to individually manage a project from conception to execution, by conducting a real-world industry project, monitored on a hands-on way
- Ability to effectively manage meetings through tools such as meeting agendas, minutes and meeting document packs.
- Demonstrate high levels of autonomy and initiative in research and professional activities.
- Take responsibility for his/her own work.

Module code: BWIN872	Semester 1 & 2	NQF-Level: 9

Title: **Dissertation**

Module-outcomes:
After the successful completion of this module, the student must be able to demonstrate:

- an ability to conduct a comprehensive review of leading and current research in risk analysis to produce research that will delineate a significant research problem,

- under supervision, the ability to design, select and apply appropriate and creative qualitative and/or quantitative techniques to complex practical and/or theoretical problems within the field of risk analysis,
- the ability to report findings and results in an ethically responsible manner,
- the capacity to discover knowledge and create coherent understanding through the retrieval, analysis, evaluation, organisation, synthesis and dissemination of information.

Method of delivering:

Assessment methods:
Assessment criteria:
The outcomes have been mastered when the student has demonstrated:
• Understanding of the nature and objectives of the study, as well as the scientific principles that form the basis of the study.
• Sufficient knowledge of related literature.
• Demonstrating mastery of the appropriate techniques and analytical methods.
• Thorough, logical and coherent evaluation of the meaningfulness of the findings.
• Critical and independent thought demonstrating insight.
• Report writing on the studies and on the attainment of the objectives in an acceptable scientific format that is systematic, logical and persuasive.

Assessment Plan:
The student shall submit a dissertation on a suitable topic.

Module code: CHEM871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
1. Specialist knowledge and understanding to engage with and critique research and practices within the field of Atmospheric Chemistry; and to contribute to disciplined thinking about relevant matters with particular reference to their area(s) of specialisation.
2. The ability to evaluate current processes of knowledge production in the field of Atmospheric Chemistry and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in the field of Atmospheric Chemistry.
4. The ability to address complex and challenging problems in a specialised field of Atmospheric Chemistry and to understand and contextualise their findings.
5. Demonstrate the ability to make ethical decisions which affect knowledge production, or complex organisational or professional issues. Critically contribute to the development of ethical standards specifically in atmospheric chemistry studies.
6. Demonstrate the ability to access, process and manage information and to communicate their findings in academically appropriate ways.
7. An understanding of the context of their research and associated consequences thereof to influence the field of Atmospheric Chemistry.
8. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility
Module uitkomste:
1. Spesialis kennis en begrip om betrokke te raak by en kritiek te lewer oor navorsing en praktyke binne die veld van Atmosferiese Chemie; en om by te dra tot

vakdissipliene denke oor relevante sake met spesifieke verwysing na hul omgewing (s) van spesialisasie.
2. Die vermoë om huidige prosesse van kennisproduksie te evalueer in die gebied van Atmosferiese Chemie en om toepaslike prosesse van ondersoek vir die spesialiteitsrigting kies.
3. 'n Bemestering van relevante metodes en prosedures wat nodig is om praktiese en teoretiese probleme op die gebied van Atmosferiese Chemie op te los.
4. Die vermoë om komplekse en uitdagende probleme aan te spreek in 'n gespesialiseerde veld van Atmosferiese Chemie en om hul bevindings te verstaan en te kan kontekstualiseer.
5. Die vermoë te demonstreer om etiese besluite te neem m.b.t. die voortbrenging van kennis, of wat komplekse organisatoriese of professionele aangeleenthede raak. Dra krities bydrae tot die ontwikkeling van etiese standaarde spesifiek in atmosferiese chemie studies.
6. Demonstreer die vermoë om inligting te verky, verwerk en bestuur en om hul bevindinge in akademies toepaslike maniere te kommunikeer.
7. 'Die begrip om hul navorsing te kontekstualiseer, asook om die verwante invloed daarvan om die gebied van Atmosferiese Chemie te begryp.
8. Selfgereguleerde leer en verantwoordelikheid vir akademiese en professionele ontwikkeling met inagneming van hul etiese verantwoordelikheid.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: CHEN 871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
The student should be able to demonstrate knowledge and understanding of current and emerging paradigms in Chemistry as well as analytical and research trends in the Science of Chemistry. The student should be able to identify and solve problems in Chemistry in a manner indicative that responsible decisions using critical and creative thinking has been applied. The student should demonstrate an understanding of the Chemical world as a dynamic interactive entity that does not exist in isolation from human kind. The student should be able to demonstrate the skills to collect, analyse, organise and critically evaluate research information, organising and managing research activities responsibly and effectively and effectively communicate research results orally and in writing using appropriate technology.

Method of delivering:

Assessment methods:

Module code: CHEN872	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:

Upon completion of this module the student should demonstrate profound knowledge of and be familiar with the development of new knowledge and skills in one of the following research fields: Chromium Technology, Catalysis and Synthesis, Membrane Technology, Electrochemistry for Energy and Environment, and Coal Chemistry, and to demonstrate systematic knowledge of the specific research methodology of this field(s), that include:

- *the identification and scientific formulation of a problem statement;*

- *a thorough investigation of existing knowledge as reflected by the applicable literature;*
- *a critical analysis of existing knowledge in the field;*
- *the execution of applicable research to solve the problem;*
- *the scientific evaluation of the results in context with the problem statement;*

the scientific communication of the results in the form of a dissertation.
Module uitkomste;

- *Na voltooiing van hierdie module behoort die student diepgaande kennis te demonstreer van en vertroud te wees met die ontwikkeling van nuwe kennis en vaardighede in een van die volgende navorsingsvelde: Chroomtegnologie, Katalise en Sintese, Membraantegnologie, Elektrochemie vir Energie en Omgewing, en Steenkoolchemie, en sistematiese kennis te demonstreer van die besondere navorsingsmetodologie van hierdie veld(e), wat insluit:*
- *die identifisering en wetenskaplike formulering van 'n probleemstelling;*
- *'n deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike wetenskaplike literatuur;*
- *'n kritiese analise van bestaande kennis in die veld;*
- *die uitvoer van toepaslike navorsing ter oplossing van die probleem;*
- *die wetenskaplike evaluering van die resultate in die konteks van die probleemstelling;*
- *• die wetenskaplike kommunikasie van die resultate in die vorm van 'n verhandeling.*

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: CHEN874	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Chemistry**

Module-outcomes:

At the end of the module the student should, in one of the following research fields: Chromium Technology, Catalysis and Synthesis, Membrane Technology, Electrochemistry for Energy and Environment, and Coal Chemistry,

- demonstrate knowledge of fundamental concepts of a topic(s) of interest;
- show extensive and systematic knowledge of a topic(s) of interest;
- analyse, evaluate and solve abstract and unfamiliar related industrial problems and to communicate, individually or in groups, these solutions in a responsible manner both orally and in writing in a prescribed format.

Module uitkomste:
an die einde van die module behoort die student in een van die volgende navorsingsvelde: Chroomtegnologie, Katalise en Sintese, Membraantegnologie, Elektrochemie vir Energie en Omgewing, en Steenkoolchemie,

- *kennis van die fundamentele begrippe van 'n onderwerp(e) van belang te demonstreer;;*
- *oor uitgebreide en sistematiese kennis van 'n onderwerp(e) van belang te beskik;*
- *• abstrakte en onbekende verbandhoudende industriële probleme te analiseer,*

evalueer en op te los en hierdie oplossings op 'n verantwoordelike wyse mondeling en skriftelik op 'n voorgeskrewe formaat individueel of in groepverband te kommunikeer.

Method of delivering: Full-time or part-time

Assessment methods: Assignment(s) and/or oral examination(s) and/or written examination(s).

Module code: CISM871	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module outcomes:
On completion of the programme the student will be able to:
- identify a relevant research problem in a particular area in the field of computer science;
- demonstrate a thorough and in depth knowledge of existing knowledge as reflected in the relevant scientific literature;
- interpret and discuss different opinions and theories in a scientific manner;
- demonstrate a thorough insight into the nature and purpose of research ;
- choose relevant research methods to solve a research problem, and apply those methods in a responsible manner;
- write a dissertation of high technical quality (with reference to use of language, illustrations, tables, graphs etc) which demonstrates his/her competence in relevant quantitative and qualitative research methodology and scientific report writing;
- carry out appropriate research to solve a research problem;
- evaluate the results in a scientific manner in the context of the problem statement;
- communicate the results in a scientifically acceptable format.

Method of delivery:

Assessment methods:
The results of the research project (dissertation) should be examined and a final mark awarded by at least an expert in the field of research.
The dissertation should be approved by the faculty and senate of he university.

Module code: DRKN871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
1. Plan, and execute new or existing research initiatives, and to create and present new knowledge and questions, based on demonstrated, integrated, and contextualised knowledge of the relevant scientific literature.
2. Contribute towards scholarly debate concerning the practice and possible implementation of the new knowledge generated.
3. Apply existing methods towards new research questions in original, creative and innovative ways to address the chosen research topic.
4. Apply and/or develop problem solving skills by using knowledge, advice, and theory in reflexive ways to address any practical and/or interpretive situations foreseen or that may arise during the study.
5. Apply all relevant ethical requirements as set out by the relevant ethical committees, procedures, and regulations
6. Collect, process, analyse, and interpret new data, findings, and information in the context of existing knowledge.
7. Produce and communicate new data, findings, analyses, and insights as presentable and potentially publishable work
8. Be held accountable for scientific integrity.

Module uitkomste:
1. Beplanning te kan doen, en uitvoering te kan gee van nuwe of bestaande navorsingsinisiatiewe, asook die generering en voordra van nuwe kennis en vrae, gegrond op bewese, geïntegreerde, en gekontekstualiseerde kennis van die spesifieke navorsingsveld.
2. Bydraes te kan lewer tot die vakkundige debat betreffende die praktyk, en moontlike toepassing van die nuwe kennis en vrae.
3. Nuwe metodes te kan ontwikkel, en/of bestaande metodes oorspronklike, kreatief en innoverend toe te kan pas op die navorsingsvraagstuk(ke) binne die gekose studieveld
4. Deur toepassing van spesialiskennis and advies, probleemoplossingsvaardighede in oorspronklike maniere te gebruik ter aanspreking van die navorsingsvraagstuk(ke).
5. Die toepaslike etiese vereistes na te kom soos voorgeskryf deur die toepaslike etiese komitees, prosedures, en regulasies.
6. Nuwe data, bevindings, en inligting te versamel, formuleer, prosesseer, analiseer, en te interpreteer binne die kader van bestaande kennis.
7. Nuwe data, bevindings, analises, en insigte as potesieel-publiseerbare en werk te produseer.
8. Vir wetenskaplike integriteit aanspreeklik gehou te kan word

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: DRRS871	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module-outcomes:
1. Specialist knowledge and understanding to engage with and critique disaster risk science multidiciplinary research and practices within the field of disaster risk studies; and to contribute to disciplined thinking about relevant matters with particular reference to their area(s) of specialisation.
2. The ability to evaluate current processes of knowledge production in the area of disaster risk studies and to choose appropriate processes of enquiry for the area of disaster risk studies.
3. The ability to use a wide range of specialised skills and relevant methods in identifying, conceptualising, designing and implementing methods of enquiry to address complex and challenfging disaster risk problems.
4. Demonstrate the ability to make autonomous ethical decisions which affect knowledge production, or complex organisational or professional issues, an ability to critically contribute to the development of ethical standards specifically in disaster risk studies.
5. Demonstrate the ability to access, process and manage resources of academic/ professional/ or occupational discourses to communicate and defend substantial ideas that are the products of their findings in academically appropriate ways in an area of specialisastion.
6. Demonstrate the ability to use a wide range of advanced and specialised skills and discources appropriate to disaster risk studies, to communicate to a multidisciplinary environment with different levels of knowledge or expertise.
7. Provide an understanding of the context of their research and associated consequences thereof to influence the field of Disaster Risk Studies.
8. Self-regulated learning and responsibility for academic and professional

development with cognisance of their ethical responsibility.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: ECOM871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:

1. Specialist knowledge and understanding to engage with and critique research and practices within the field of Agricultural Economics; and to contribute to disciplined thinking about relevant matters with particular reference to their area(s) of specialisation; increases knowledge of a specific field within the discipline concerned.
2. The ability to evaluate current processes of knowledge production in the field of Agricultural Economics and to choose appropriate processes of enquiry for the area of specialisation; The ability to evaluate, plan and execute a research programme in the field of Agricultural Economics.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in the field of Agricultural Economics; The ability to choose appropriate methods of analysis for the area of specialisation.
4. The ability to address complex and challenging problems in a specialised field of Agricultural Economics and to understand and contextualise their finding;
5. Demonstrate the ability to access, process and manage information and to communicate their findings in academically appropriate ways; To collect and interpret research results and writing of scientific papers; To conduct independent research and communicate research results effectively.
6. An understanding of the context of their research and associated consequences thereof to influence the field of Agricultural Economics
7. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

Module uitkomste:

1. Spesialis kennis en begrip om kritiese navorsing en praktykgerigte vraagstukke binne die veld van Landbou-ekonomie te kan oplos; By te dra tot gedissiplineerde denke oor relevante sake met spesifieke verwysing na hul omgewing van spesialisasie; Verhoogde kennis van 'n spesifieke gebied binne die betrokke dissipline .

2. Die vermoë om huidige metodes binne landbou-ekonomie te evalueer en om toepaslike metodes van ondersoek vir die spesialiseringsrigting te kies; 'n Navorsingsprogram binne die gebied van landbou-ekonomie te evalueer, beplan en uit te voer.

3. n Begrip van relevante metodes en prosedures wat nodig is om praktiese en teoretiese probleme binne die gebied van landbou-ekonomie op te los; Die vermoë om geskikte analistiese metodes vir die spesialiseringsrigting te kies .

4. Die vermoë om komplekse en uitdagende probleme in 'n gespesialiseerde veld van Landbou-ekonomie aan te spreek en om dit te verstaan ??en resultate te kan kontekstualiseer.

5. Die vermoë te demonstreer om resultate in akademiese toepaslike maniere te kan kommunikeer; Om navorsingsresultate te interpreteer deur die skryf van wetenskaplike artikels; Om selfstandig navorsing te doen en effektief te kommunikeer.

6. Om die konteks en verwante gevolge van hul navorsingsresultate te verstaan

binne die gebied van Landbou-ekonomie.
7. Selfgereguleerde leer en verantwoordelikheid vir akademiese en professionele ontwikkeling met inagneming van hul etiese verantwoordelikheid.

Method of delivering: Full-time or part-time

Module code:EXTM871	**Semester 1 & 2**	**NQF-Level: 9**

Title:Research project

Module-outcomes:
The student should be able to :
- Demonstrate advanced application of concepts, methods, ethics, theories and analytical processes in relation to a chosen focus area of Agricultural Extension
- Access, analyse, transform and critically evaluate existing knowledge.
- Show ability to access, process, produce and communicate information effectively to colleagues and other groups
- Engage in independent Agricultural Extension research and produce findings in the form of a research report selecting from a range of appropriate research designs, methods, techniques and technologies in the chosen focus area

Method of delivery:

Assessment methods:

Module code:FSKB874	**Semester 1 & 2**	**NQF-Level: 9**

Title: plasma Physics

Module-outcomes:
Upon completion of this course the student would:

• Have a detailed and integrated knowledge of the occurrence of plasmas, especially the specialized field of space plasmas, and the applications of plasma physics.
• Be able to describe the motion of singly charged particles in increasingly complex electric
and magnetic fields.
• Derive and understand the meaning of a complete set of fluid equations for a plasma.
• Demonstrate a detailed knowledge of plasma wave properties, specifically plasma oscillations, electron plasma waves, ion (acoustic) waves and electromagnetic waves in magnetic fields with different orientations.
• Understand diffusion and mobility in weakly-ionised gases and diffusion in fully-ionised
plasmas.
• Understand the meaning of distribution functions, and study the equations of kinetic
theory.
• Apply the above specialized skills and integrated knowledge to identify and creatively solve complex and unfamiliar problems at the forefront of the field in plasma physics by selecting and applying the correct problem solving techniques, and evaluating and critically reviewing the rigorous solutions acquired by referring to multiple sources in the scientific literature, taking full responsibility for the work done.

By voltooiing van hierdie kursus moet die student:
• 'n Gedetailleerde en geïntegreerde kennis van die voorkoms van plasmas, veral die gespesialiseerde veld van ruimte-plasmas, hê en die toepassings van plasmafisika.
• In staat wees om die beweging van enkel-gelaaide deeltjies in toenemend

komplekse elektriese en magnetiese velde, te beskryf.
• Die betekenis van 'n stel fluïde-vergelykings vir 'n plasma kan aflei en verstaan.
• 'n Gedetailleerde kennis van plasma golfeienskappe, spesifiek plasma-ossillasies, elektron-plasma golwe, ioon (akoestiese) golwe en elektromagnetiese golwe in magneetvelde, met verskillende oriëntasies, te demonstreer.
• Diffusie en die mobiliteit in swak-geïoniseerde gasse en in volledig- geïoniseerde plasmas te verstaan.
• Die betekenis van verdelingsfunksies en die studie van die kinetiese teorie vergelykings verstaan.
• Bogenoemde gespesialiseerde vaardighede en geïntegreerde kennis kan toepas ten einde komplekse en onbekende probleme op die voorpunt van die veld in plasmafisika te identifiseer en kreatief op te los, deur die korrekte probleemoplossingstegnieke te selekteer en toe te pas en die wiskundig goed-begronde oplossings, wat verkry word, te evalueer en krities te oorweeg deur te verwys na verskeie bronne in die wetenskaplike literatuur en volle verantwoordelikheid te aanvaar vir die werk wat gedoen is.

Method of delivery:

Assessment methods:

Module code: FSKB875	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Magnetohydrodynamics**

Module-outcomes: After completion of this module the student should have advanced knowledge of Magnetohydrodynamics relevant for Space Physics.
Module uitkomste:
Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor Magnetohidrodinmika relevant vir Ruimtefisika

Method of delivering: Contact

Assessment methods: Homework assignments, class participation, tests, final examination.

Module code: FSKB877	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Cataclysmic variables**

Module-outcomes: After completion of this module the student should have advanced knowledge of Cataclysmic Variable Stars, including the Novae.
Module uitkomste:
Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor Kataklismies Veranderlike Sterre, insluitende die Novas

Method of delivering: Contact

Assessment methods: Homework assignments, class participation, tests, final examination.

Module code: FSKB878	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Extragalactic astronomy**

Module-outcomes: After completion of this module the student should have advanced knowledge of Extragalactic Astronomy.
Module uitkomste:
Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor Ekstragalaktiese Astronomie

Method of delivering: Contact

Assessment methods: Homework assignments, class participation, tests, project.

Module code: FSKB879	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced General Relativity**

Module-outcomes: After completion of this module the student should have advanced knowledge of General Relativity. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor Algemene Relatiwiteit*		
Method of delivering: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB880	**Semester 1 & 2**	**NQF-Level: 9**
Title: **High Energy Astrophysics and Pulsars**		
Module-outcomes: After completion of this module the student should have advanced knowledge of high-energy Astrophysics, neutron stars and pulsars. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor hoë-energie Astrofisika, neutron sterre en pulsare*		
Method of delivering: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB882	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Stellar structure and -evolution**		
Module-outcomes: After completion of this module the student should have advanced knowledge of stellar structure and evolution. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor sterstruktuur en -evolusie*		
Method of delivering: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB885	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Geomagnetism and Aeronomy**		
Module-outcomes: After completion of this module the student should have advanced knowledge of Geomagnetism and aspects of the Earth's upper atmosphere. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor Geomagnetisme en aspekte van die Aarde se bo-atmosfeer*		
Method of delivering: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB886	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Computational Astrophysics**		
Module-outcomes: After completion of this module the student should have advanced knowledge of computational techniques in modern Astrophysics. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis te hê oor rekenaargebaseerde berekeningstegnieke in moderne Astrofisika*		
Method of delivering: Contact		
Assessment methods: Homework assignments, class participation, tests, projects.		

Module code: FSKB887	Semester 1 & 2	NQF-Level: 9
Title: **Radio Interferometry**		
Module-outcomes: After completion of this module the student should have advanced knowledge of radio interferometry.		
Method of delivering: Contact		
Module code: FSKB888	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Time Series and Data Analysis**		
Module outcomes: After completion of this module the student should have advanced knowledge of time series and data analysis.		
Method of delivery: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB889	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Space Weather**		
Module outcomes: After completion of this module the student should have advanced knowledge of the drivers of- and the effects on the space environment affecting mankind and its modern technological necessities.		
Method of delivery: Contact		
Assessment methods: Homework assignments, class participation, tests, final examination.		
Module code: FSKB890	**Semester 1 & 2**	**NQF-Level: 9**
Title**: Observational Cosmology**		
Module outcomes: After completion of this module the student should have advanced knowledge of Observational Cosmology and the testing of theoretical models of the early and late universe.		
Method of delivery: Contact		
Assessment methods: Homework assignments, class participation, tests, project.		
Module code: FSKB891	**Semester 1 & 2**	**NQF-Level: 9**
Title: Theoretical Cosmology		
Module outcomes: After completion of this module the student should have advanced knowledge of the theory of modern Cosmology.		
Method of delivery: Contact		
Assessment methods: Homework assignments, class participation, tests, project.		
Module code: FSKM811	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Astrophysics I**		
Module outcomes: After completion of this module the student should have advanced knowledge of different topics in High Energy Astrophysics *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente oor gevorderde kennis te beskik oor verskeie onderwerpe in Hoë Energie Astrofisika*		
Method of delivering: Contact (lectures)		
Assessment methods: Homework assignments, class participation, tests and final exam		

Module code: FSKM812	Semester 1 & 2	NQF-Level: 9
Title: **Transport Theory**		
Module-outcomes: After completion of this module the student should have advanced knowledge of neutral fluids relevant to astrophysical applications. *Module uitkomste:* *Na voltooiing van hierdie module behoort die studente oor gevorderde kennis te beskik oor neutrale vloeistowwe relevant tot astrofisika toepassings*.		
Method of delivering: Contact- lecturers		
Assessment methods: • Class tests, discussions, assignments, exam		
Module code: FSKM813	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Astrophysics II**		
Module-outcomes: Upon completion of this module the student should demonstrate advanced knowledge and understanding of the characteristics of and the physical processes which occur in the diffuse interstellar medium (ISM). *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis en begrip te demonstreer van die eienskappe van en die fisiese prosesse wat in die diffusse interstellêre medium (ISM) plaasvind.*		
Method of delivery: : Contact (lectures)		
Assessment methods: Assessment include a formal examination at the end of the module, plus homework assignments which include problem solving The student has to demonstrate that he/she understands the Physics of, and the physical processes which occur in, the ISM, and be able to independently do appropriate calculations in order to solve problems.		
Module code: FSKM814	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Heliospheric Physics**		
Module-outcomes: Upon completion of this module the student should demonstrate advanced knowledge and understanding of the characteristics of and the physical processes which occur in the Heliosphere. *Module uitkomste:* *Na voltooiing van hierdie module behoort die student gevorderde kennis en begrip te demonstreer van die eienskappe van en die fisiese prosesse in die Heliosfeer*		
Method of delivery: Semester module with five fixed assignments and three varying options from the topics listed above. Assignments are discussed every week followed up by submissions every second week		
Assessment methods: Eight assignments are handled as exam papers for which at least 50% each is required. If this is not done, an oral exam on all eight assignments is compulsory within the allocated period of semester examinations.		

Module code: FSKM815	Semester 1 & 2	NQF-Level: 9
Title: General Physics		
Module-outcomes: Upon completion of this module, the student should demonstrate in-depth knowledge and understanding, as well as be able to apply this knowledge when solving problems, regarding topics in the module. *Module uitkomste:* *a voltooiing van hierdie module behoort die student diepgaande kennis en begrip te demonstreer, asook hierdie kennis te kan toepas in die oplos van probleme, met die oog op temas in die module.*		
Method of delivering:Full-time or part-time		
Assessment methods: The examination in this module will consist of: A 3hour examination paper		
Module code: FSKM821	**Semester 1 & 2**	**NQF-Level: 9**
Title: **General Relativity**		
Module-outcomes: Upon completion of this module, the student should demonstrate in-depth knowledge and understanding, as well as be able to apply this knowledge when solving problems, regarding topics in General Modulke uitkomste: *Na voltooiing van hierdie module behoort die student diepgaande kennis en begrip te demonstreer, asook hierdie kennis te kan toepas in die oplos van probleme, met die oog op temas in Algemene Relatiwiteit*		
Method of delivering: Contact (lectures		
Assessment methods: The examination in this module will consist of: A 3 hour examination paper		
Module code: FSKS872	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Dissertation**		
Module-outcomes: The qualifiers in these curricula will be familiar with the general scientific methods of research, with emphasis on the special research methodologies which include: a) identification and formulation of a problem statement; b) thorough investigation of existing knowledge as reflected in appropriate scientific literature; c) appropriate research to solve the problem; d) scientific evaluation of the results in the context of the problem statement; • e) scientific communication of the results in the form of a dissertation. *Module uitkomste:* *Die kwalifiseerders in hierdie kurrikulums sal vertroud wees met die algemene wetenskaplike metode van navorsing, met toespitsing op die besondere navorsingsmetodologie wat insluit:* *a) die identifisering en wetenskaplike formulering van 'n probleemstelling;* *b) 'n deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike wetenskaplike literatuur;* *c) die uitvoer van toepaslike navorsing ter oplossing van die probleem;* *d) die wetenskaplike evaluering van die resultate in die konteks van die probleemstelling;* *e) die wetenskaplike kommunikering van die resultate in die vorm van 'n verhandeling.*		

Method of delivery: Full-time

Assessment methods:
This is a research module. Formative assessments are thus not relevant as the examination of the dissertation counts 100% towards the final module mark.

Module code: GGFN871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
1. Specialist knowledge and understanding to engage with and critique research and practices within the field of Geography and Environmental Management; and to contribute to disciplined thinking about relevant matters with particular reference to their area(s) of specialisation.
2. The ability to evaluate current processes of knowledge production in the field of Geography and Environmental Management and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in the field of Geography and Environmental Management.
4. The ability to address complex and challenging problems in a specialised field of Geography and Environmental Management and to understand and contextualise their findings.
5. The ability to make autonomous ethical decisions which affect knowledge production, or complex organisational or professional issues, an ability to critically contribute to the development of ethical standards specifically in Geography and Environmental Management.
6. The ability to access, process and manage information and to communicate their findings in academically appropriate ways
7. An ability to effectively present and communicate the results of research to specialist and non-specialist audiences using the resources of an academic-professional discourse.
8. An understanding of the context of their research and associated consequences thereof to influence the field of Geography and Environmental Management.
9. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

Module uitkomste:
1. Gespesialiseerde kennis en insig om interaksie met en kritiek van navorsing en praktyke in die veld van Geografie en Omgewingsbestuur te bewerkstellig; en om by te dra tot dissiplinêre denke oor toepaslike aangeleenthede t.o.v. die spesialiseringsterrein.
2. Die vermoë om heersende prosesse waardeur kennis gegenereer word in die veld van Geografie en Omgewingsbestuur te evalueer, en om gepaste prosesse van ondersoek in die spesialiseringsterrein te kies.
3. Beheersing van toepaslike metodes en prosedures om praktiese en toegpaste probleme op die terrein van Geografie en Omgewingsbestuur aan te spreek.
4. Die vermoë om komplekse en uitdagende probleme in ? spesialiseringsterrein binne Geografie en Omgewingsbestuur aan te spreek en om die bevindings te verstaan en te kontekstualiseer.
5. Die vermoë om selfstandige etiese besluite te neem wat verband hou met generering van kennis of komplekse organisatoriese of professionele kwessies; asook die vermoë om krities by te dra tot die ontwikkeling van etiese standaarde in Geografie en Omgewingsbestuur.
6. Die vermoë om inligting te ontsluit, verwerk en bestuur en die bevindinge op 'n

akademies aanvaarbare wyse te kommunikeer.
7. Die vermoë om die resultate van navorsing aan spesialiste en nie-spesialiste te kommunikeer .m.b.v die hulpbronne van ? akademies-professionele diskoers in Geografie en Omgewingsbestuur.
8. Die vermoë om die konteks van navorsing en die toepaslike gevolge daarvan in die veld van Geografie en Omgewingsbestuur te verstaan.
9. Die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese sowel as professionele ontwikkeling in stand sal hou; effektief interaktief binne ? leer- of professionele groep kan optree om daardeur leer te bevorder.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: GEOM871	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module outcomes:

1. Demonstrate specialist knowledge to enable engagement with and critique of current research and practices in the field of Geography.
2. Demonstrate an ability to evaluate current processes of knowledge production within the discipline of Geography and then to select an appropriate process of inquiry to address an appropriate problem therein
3. Demonstrate a command of, design, and select appropriate methods, techniques and processes in the research of Geography.
4. Exhibit the ability to design, select and apply appropriate and creative qualitative and/or quantitative geographical and/or management methods, techniques, processes, technologies to address complex and challenging problems within the field of Geography.
5. Access, process and manage information in order to conduct a review on the current research in the area of Geography.
6. Communicate and defend important ideas that are the products of research or development in the area of Geography.
7. Exhibit ability to place research findings in context within the prevailing understanding of the research problem within Geography and suggest solutions/intervention.
8. Demonstrate an ability to critically contribute to the development of ethical standards in Geography context; also demonstrate an ability to make autonomous ethical decisions which affect knowledge production or complex professional issues.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: HDGH871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:

1. To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of Hydrology and Geohydrology
2. The ability to conduct a relevant in-depth literature review and evaluate and critically manage current knowledge in the field of Hydrology and Geohydrology
3. The ability to select appropriate research methodologies and plan an appropriate research design in order to execute a research project with a view to solve

challenging and relevant research problems in the field of Hydrology and Geohydrology
4. The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers
5. The ability to make autonomous ethical decisions during the process of knowledge production, thereby making a critical contribution to the development of ethical standards in the context of research within the field of Hydrology and Geohydrology.
6. Demonstrate an ability to use the resources of academic and professional discourses to communicate and defend substantial ideas that are the products of research.
Module uitkomste:
1. Om gevorderde spesialis kennis te bekom en krities huidige navorsing of veld praktyke op die gebied van Hidrologie en Geohidrologie te evalueer.
2. Die vermoë om 'n relevante in-diepte literatuurstudie uit te voer en te evalueer op die gebied van Hidrologie en Geohidrologie asook om huidige kennis krities te bestuur.
3. Die vermoë om toepaslike navorsingsmetodes te identifiseer tesame met 'n gepaste navorsingsontwerp ten einde 'n navorsingsprojek uit te voer met die doel om relevante navorsing probleme op die gebied van Hidrologie en Geohidrologie aan te spreek.
4. Die vermoë om navorsingsresultate korrek te interpreteer asook om sulke resultate in die vorm van wetenskaplike artikels effektief te kommunikeer.
5. Die vermoë om outonome etiese besluite te neem tydens die proses van kennisproduksie, waardeur 'n kritieke bydrae gelewer word tot die ontwikkeling van etiese standaarde binne die veld van Hidrologie en Geohidrologie in die konteks van navorsing.
6. Vermoë te demonstreer om gebruik te maak van akademiese en professionele hulpbronne, om idees wat voorvloei uit navorsing te kommunikeer en verdedig.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: HDMG871	Semester 1 & 2	NQF-Level: 9
Title: Dissertation		
Module-outcomes: 1. To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of Mining Hydrology 2. The ability to conduct a relevant in-depth literature review and evaluate and critically manage current knowledge in the field of Mining Hydrology 3. The ability to select appropriate research methodologies and plan an appropriate research design in order to execute a research project with a view to solve challenging and relevant research problems in the field of Mining Hydrology 4. The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers 5. The ability to make autonomous ethical decisions during the process of knowledge production, thereby making a critical contribution to the development of ethical standards in the context of research within the field of Mining Hydrology 6. Demonstrate an ability to use the resources of academic and professional discourses to communicate and defend substantial ideas that are the products of research		
Method of delivering: Full-time or part-time		
Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.		
Module code: IPMM871	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Dissertation**		
Module-outcomes: 1. The ability to identify a relevant research problem in the field of pest and /or disease or weed management by integrating the above-mentioned skills and by thoroughly investigating existent knowledge as reflected in appropriate scientific literature. 2. Command of an applied competency in research methodology and in scientific penmanship. 3. The Ability to carry out the desired research in view of solving the problem 4. The Ability to evaluate the results scientifically in the context of the problem statement. 5. The Ability to communicate the results scientifically.		
Method of delivering: Full-time or part-time		
Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.		
Module code: ITRN872	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Dissertation**		
Module-outcomes: At the end of this module the learner is expected to: • Critically appraise available literature in order to justify a research question relating to research study. • Formulate a feasible systematic literature review relating to a research area. • Justify the selection of an appropriate research method in order to fulfill the research objectives. • Justify the selection of appropriate data analysis methods in order to fulfill the research objectives.		

- Write a research proposal
- Write a report on the studies and on the attainment of the objectives in an acceptable scientific format that is systematic, logical and persuasive.

Method of delivering: Dissertation

Assessment methods: Assessment regulations of the faculty for Master dissertations apply.

Module code: ITRV871	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		

Module code: ITWV874	**Semester 1 & 2**	**NQF-Level: 9**
Title: Data Mining I		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		

Module code: ITWV875	**Semester 1 & 2**	**NQF-Level: 9**
Title: Data Mining II		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		

Module code: ITRW876	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Databases**

Module-outcomes:

After completion of the module the student will be able to show that he/she:

- is conversant with the Oracle structures and processes involved in back-up and repair; is conversant with the various methods used for back-up and repair in an Oracle database; can prevent and identify certain database problems that may occur, and know possible solutions to such problems;
- can repair possible failures in Oracle databases;
- can describe the most important steps that are part of an adjustment methodology;
- can use Oracle aids for diagnosing problems with performance;
- can configure memory structures for optimising the operation of the cache;
- can configure file structures in order to improve performance;
- can identify and solve problems with importing/exporting, storage and database configuration;
- can identify and solve problems with competing at final usage;
- can configure memory and disc sources in order to optimise sorting;
- can do research in order to keep abreast of new developments and findings

Module uitkomste:

- *ie student sal na voltooiing van die module kan aantoon dat hy/sy:*

- *die Oracle-strukture en -prosesse wat betrokke is by rugsteun en herstel ken;*
- *die verskillende metodes ken wat gebruik word vir rugsteun en herstel in 'n Oracle-databasis;*
- *sekere databasisprobleme wat kan voorkom, kan identifiseer en moontlike oplossings daarvoor ken;*
- *Oracle-databasisse van moontlike probleme (failure) kan herstel;*
- *die belangrikste stappe wat deel uitmaak van ? verstelmetodologie kan beskryf;*
- *Oracle hulpmiddels kan gebruik om probleme met werkverrigting te diagnoseer;*
- *geheue-strukture kan konfigureer om die bewerkings van die cache te optimeer;*
- *lêerstrukture kan konfigureer om werkverrigting te verbeter;*
- *probleme met invoer/uitvoer, stoor en databasiskonfigurasie kan identifiseer en oplos;*
- *probleme met wedywering by slotgebruik kan identifiseer en oplos;*
- *geheue- en skyfbronne kan konfigureer om sortering te optimeer;*
- *navorsing kan doen om op hoogte te bly van nuwe verwikkelinge en bevindings.*

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRW877	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Decision Support Systems**

Module-outcomes:
After completing the module the student will be able to indicate that he/she:
has mastered the theory and practice of various modelling problems of especially mathematical models; has mastered the technical language so that communication with colleagues can take place with ease; can proceed in a problem-solving manner; display a love for the study field and show an understanding of the relationship between reality, abstraction, model and solution and master more specialised examples and problems if the module is taken as an M-module.
Module uitkomste:
Die student sal na voltooiing van die module kan aantoon dat hy/sy:
- Die teorie en praktyk van verskeie modelleringsprobleme, van veral wiskundige modelle, bemeester het;
- die vaktaal bemeester het sodat gemaklik met kollegas gekommunikeer kan word;
- probleemoplossend te werk kan gaan;
-'n Liefde vir die studieveld openbaar en begrip toon vir die verband tussen werklikheid, abstraksie, model en oplossing;
- meer gespesialiseerde voorbeelde en probleme kan bemeester indien die module as ? M-module geneem word.

Method of delivering: Full time / Part time

Assessment methods:
Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRW878	Semester 1 & 2	NQF-Level: 9

Title: **Artificial Intelligence**

Module-outcomes:

At the end of the module the student must be able to do the following:

•Define artificial Intelligence and critically evaluate a definition;
•describe the historical principles and history of the subject;
•discuss logical agents and the environments in which they operate;
•define the concept of rationality and apply it to intelligent agents;
•solve problems by making use of various informed and uninformed search methods;
•describe the history and applications of neural networks;
•explain the biological inspiration for neural networks;
•discuss and use various neural network models and architectures for solving practical problems;
•describe the principles of knowledge-based agents;
•define proposition logic (both syntax and semantics);
•make inferences in proposition logic;
•define predicate logic (both syntax and semantics);
•make inferences in predicate logic;
•translate problem descriptions in predicate logic;
•construct proof of resolution;
•build a simple furnisher of proof for predicate logic;
•work together in groups;
•communicate effectively, orally as well as in writing, by making use of appropriate technology;
•integrate and apply information from various modules in the solving of practical problems (the outcomes will be achieved with the aid of one or more integrated evaluations);
act in an ethical manner with regard to all aspects of artificial intelligence.

Module uitkomste:

Aan die einde van die module sal die student in staat wees om die volgende te kan doen:

• Kunsmatige Intelligensie te kan definieer en ? definisie krities te kan evalueer;
• die historiese grondslae en geskiedenis van die vak te kan beskryf;
• logiese agente en die omgewings waarin hulle opereer te kan bespreek;
• die begrip rasionaliteit te kan definieer en toe te pas op intelligente agente;
• probleme te kan oplos deur van verskeie ingeligte en oningeligte soekmetodes gebruik te maak;
• die geskiedenis en toepassings van neurale netwerke te kan beskryf;
• die biologiese inspirasie vir neurale netwerke te kan verduidelik;
• verskeie neurale netwerkmodelle en argitekture te kan bespreek en te kan gebruik om praktiese probleme mee op te los;
• die beginsels van kennisgebaseerde agente te kan beskryf;
• proposisielogika te kan definieer (beide sintaksis en semantiek);
• gevolgtrekkings ("inferences") te kan maak in proposisielogika;
• predikaatlogika te kan definieer (beide sintaksis en semantiek);
• gevolgtrekkings ("inferences") in predikaatlogika te kan maak;
• probleembeskrywings in predikaatlogika te kan vertaal;
• resolusiebewyse te kan konstrueer;
• ? eenvoudige bewysvoerder vir predikaatlogika te kan bou;
• in groepe saam te werk;

• effektief te kan kommunikeer, mondelings sowel as skriftelik, deur van toepaslike tegnologie gebruik te maak;
• inligting uit verskeie modules te kan integreer en te kan aanwend in die oplos van praktiese probleme (die uitkoms sal bereik word met behulp van een of meer geïntegreerde evaluerings);
• eties op te tree ten opsigte van alle aspekte rakende kunsmatige intelligensie.

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRW883	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Image Processing**

Module-outcomes:
Context:
On theoretical level, the student should have insight and a basic knowledge of concepts and mathematical background of image processing. From a practical perspective students should demonstrate the ability to apply this knowledge to solve image processing problems.
Module-outcomes:
Upon successful completion of the module the students will be able to:

- Discuss basic concepts of image processing with reference to examples of the use of image processing, different imaging modalities, human visual perception, image acquisition, sampling and quantization, representation of digital images and relationships between pixels;
- Discuss and practically implement image enhancement in the spatial domain with reference to grey level transforms as well as spatial filters for smoothing and sharpening of images;
- Discuss and practically implement image enhancement in the frequency domain with reference to the Fourier transform and its properties as well as smoothing, sharpening and homomorphic filters;
- Discuss and practically implement colour image processing with reference to the different colour models and both pseudo-colour and full-colour processing;
- Discuss and practically implement different image compression algorithms.
- Discuss the use of mathematical morphology in image processing.
- Discuss different image segmentation techniques with reference to edge detection and linking as well as thresholding of images.
- Discuss the representation and description of images with reference to the description of boundaries and regions as well as the use of principal component analysis.
- Discuss the practical use of image processing.
- Discuss the application of the basic image processing techniques listed above in the fields of document image processing and video processing.

Module uitkomste:
an die einde van die module, sal die student kan bewys lewer dat hy/sy oor voldoende kennis en insig beskik oor die volgende onderafdelings van beeldverwerking:

- *Basiese beginsels van beeldverwerking; beeldverbetering in die ruimtelike en frekwensie domeine; verwerking van kleur beelde: beeldkompressie; morfologiese beeldverwerking; beeldsegmentasie; voorstelling en*

beskrywing van objekte in beelde;

- *Die gebruik van wiskundige morfologie in beeldverwerking kan bespreek;*
- *Verskillende beeldsegmentasie tegnieke, met verwysing na randwaarneming en – verbinding asook beelddrempelling, kan bespreek;*
- *Die voorstelling en beskrywing van beelde, met verwysing na die beskrywing van rande en gebiede asook die gebruik van hoofkomponentanalise, kan bespreek;*
- *Die praktiese gebruik van beeldverwerking kan bespreek.*
- *Basiese konsepte van beeldverwerking kan bespreek met verwysing na voorbeelde van die gebruik van beeldverwerking, verskillende beeldingsmodaliteite, visuele persepsie by die mens, beeldvaslegging, monstering en kwantisering;*
- *Beeldverbetering in die ruimtelike domein, met verwysing na grysvlaktransforms asook ruimtelike filters vir die gladmaak en skerpmaak van beelde, kan bespreek en prakties implementeer;*
- *Beeldverbetering in die frekwensie domein, met verwysing na die Fouriertransform en sy eienskappe asook gladmaak, skerpmaak en homomorfiese filters, kan bespreek en prakties implementeer.*
- *Die verwerking van kleurbeelde, met verwysing na die verskillende kleurmodelle asook beide pseudo-kleur en vol-kleur verwerking, kan bespreek en prakties implementeer.*
- *Verskillende beeldkompressie algoritmes kan bespreek en implementeer.*

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRW884	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Information Systems Engineering**

Module-outcomes:

After the completion of this module students should be able to: understand and apply project management in the IT context; understand and manage project management process groups; understand and apply project integration management; understand and apply scope management; understand and apply time management; understand and apply cost management; understand and apply quality management; understand and apply human resource management; understand and apply communication management; understand and apply risk management; understand and apply purchasing management. At the end of the study the students will have a sound knowledge of different system development methodologies. These include system development methods, underlying approaches upon which system development methods are based, development process models followed in system development methods, development techniques and aids used in system development methods. After the completion of this module students should be able to: define and explain information system engineering; define and explain system development methodology; explain acceptance of system development methodology in practice; understand and apply STRADIS (Structured analysis, design, and implementation of information systems); understand and apply IE (Information Engineering);
understand and apply RUP (Rational Unified Process); understand and apply XP (Extreme Programming); understand and apply SSM (Soft Systems Methodology); understand and apply ETHICS (Effective technical and human implementation of computer-based systems); understand and apply MULTIVIEW 1

en 2; do a critical evaluation and comparison of system development methodologies. Students will be able to critically evaluate system development methodologies, and be able to recommend a suitable methodology for a specific project. Students will be able to apply system development methodologies and develop a large project by means of it

Module uitkomste:

Studente behoort na die voltooiing van hierdie module: projekbestuur in die IT-konteks te verstaan en te kan toepas; projekbestuurprosesgroepe te verstaan en te kan bestuur; projekintegrasiebestuur te verstaan en te kan toepas; omvangbestuur te verstaan en te kan toepas; tydbestuur te verstaan en te kan toepas; kostebestuur te verstaan en te kan toepas; kwaliteitbestuur te verstaan en te kan toepas; menslikehulpbronnebestuur te verstaan en te

kan toepas; kommunikasiebestuur te verstaan en te kan toepas; risikobestuur te verstaan en te kan toepas; aankopebestuur te verstaan en te kan toepas.

- Aan die einde van die studie sal die studente goeie kennis dra van verskillende stelselontwikkelingsmetodologieë. Dit sluit in stelselontwikkelingsmetodes, onderliggende benaderings waarop stelselontwikkelingsmetodes gebaseer is, ontwikkelingsprosesmodelle wat gevolg word in stelselontwikkelingsmetodes, ontwikkelingstegnieke en hulpmiddels wat gebruik word instelselontwikkelingsmetodes.

- Studente behoort na die voltooiing van hierdie module: inligtingstelsel-ingenieurswese te kan definieer en verduidelik; ? stelselontwikkelingsmetodologie te kan definieer en verduidelik; die aanvaarding van stelselontwikkelingsmetodologie in praktyk te kan verduidelik; STRADIS (Structured analysis, design, and implementation of information systems) te verstaan en te kan toepas; IE (Information engineering) te verstaan en te kan toepas; RUP (Rational Unified Process)

te verstaan en te kan toepas; XP (Extreme Programming) te verstaan en te kan toepas; SSM (Soft Systems Methodology) te verstaan en te kan toepas; ETHICS (Effective technical and human implementation of computer-based systems) te verstaan en te kan toepas; MULTIVIEW 1 en 2 te verstaan en te kan toepas; ? kritiese beoordeling en vergelyking van stelselontwikkelingsmetodologieë te kan doen.

- Studente sal stelselontwikkelingsmetodologieë krities kan beoordeel, en ? geskikte metodologie vir ? bepaalde projek kan aanbeveel.

- Studente sal stelsel-ontwikkelingsmetodologieë kan toepas en ? groot projek daarmee kan ontwikkel.

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams practical evaluation).

Module code: ITRW885	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Computer Security**

Module-outcomes:

Upon successful completion of the module the learners will be able to:

• Discuss concepts of computer and information security and weaknesses in computerised environments and understand how the threats can be controlled.

• Know basic encryption and decryption schemes as well as the most important encryption systems generally used.

• Understand operating system controls, and reliable operating systems.

• Identify security problems in computer systems, programs and information in businesses and recommend measures to address these.

• Discuss database concepts regarding information security and understand how threats can be controlled.
• Discuss network security threats and possible countermeasures.
• Discuss administrative security within an IT environment and its economic aspects.
• Identify and discuss privacy and legal issues within computer security.
• Understand that security systems should be completed meticulously and in the agreed manner and that confidential information should be handled as such.
• Understand that computer resources should be used ethically and responsibly. The students should know social and ethical issues within computer and information security.
• Study and discuss other relevant computer and information security
Module uitkomste:
Na suksesvolle voltooiing van die module behoort die leerders in staat te wees om:
• *Konsepte van rekenaar- en inligtingsekuriteit en swakplekke in gerekenariseerde omgewings te beskryf en te verstaan hoe sulke bedreigings gekontroleer kan word.*
• *Basiese enkripsie- en dekripsie-skemas asook die belangrikste enkripsie-stelsels wat algemeen gebruik word te ken.*
• *Bedryfstelkontroles en betroubare bedryfstelsels te verstaan.*
• *Sekuriteitsprobleme rakende rekenaarstelsels en programme en inligting in ondernemings te identifiseer en maatreëls daarvoor aan te beveel.*
• *Databasiskonsepte rondom inligtingsekuriteit te kan bespreek en te verstaan hoe hierdie bedreigings gekontroleer kan word.*
• *Netwerksekuriteitbedreigings te beskryf en te weet watter maatreëls daarteen ingestel kan word.*
• *Administratiewe sekuriteit in die IT-omgewing te bespreek en die ekonomiese aspekte daarvan te verstaan.*
• *Privaatheid en regsimplikasies binne rekenaarsekuriteit te identifiseer en te bespreek.*
• *Te verstaan dat sekuriteitsmaatreëls met noukeurigheid en op ooreengekome wyse voltooi moet word en dat inligting rakende die kliënt met die nodige vertroulikheid hanteer moet word.*
• *Te verstaan dat rekenaarhulpbronne eties en verantwoordelik gebruik moet word. Die leerders moet kennis dra van sosiale en etiese kwessies in rekenaar en inligtingsekuriteit.*
• *Ander relevante rekenaar- en inligtingsekuriteit onderwerpe te bestudeer en te bespreek*

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: ITRW886	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Data Warehouses**

Module-outcomes:
At the end of the module the student will be able to:
- understand and discuss the basic principles of data warehouses, and must write down explanations and elucidate these explanations by means of own examples;
- understand the life cycle of a data warehouse and discuss and apply each of the phases in detail;
- set up a dimensional model for a case study;
- discuss different software aids for data warehouses.
Module uitkomste:

aan die einde van die module sal die student in staat wees om:
- die basiese beginsels van datapakhuise te verstaan en te bespreek. Die student sal verduidelikings kan neerskryf en hierdie verduidelikings met eie voorbeelde toelig;
- die lewensiklus van ? datapakhuis verstaan en elkeen van die fases in besonderhede kan bespreek; ? dimensionele model vir ? gevallestudie kan opstel;
- verskillende programmatuurhulpmiddele vir datapakhuise kan bespreek.

Method of delivering: Full time / Part time

Assessment methods: Formative and summative assessment (Tests, exams, practical evaluation).

Module code: MARS811	**Semester 1 & 2**	**NQF-Level: 9**

Title Radioanalytical Applications

Module outcomes:

Module outcomes:

Radiopharmacy

i. Students will able to demonstrate be how radiopharmaceuticals are produced, what the requirements are for radionuclidic and radiochemical purity as well as the radioanalytical techniques that are used to determine their purity.

Neutron Radiography & Diffraction

Students will able to demonstrate

ii. full understanding of Reactors and Accelerators operation and explain different types of Neutron sources

iii. fully the advancement of neutron diffraction in residual stress analysis as well as

iv. to gain expertise in instrument control software and data acquisition.

NORM & Dose Calculation

Students will understand fully to which mining and mineral processing industries NORMs (Natural Occurring Radioactive Materials) are associated with, the radioanalytical techniques used to analyse for the individual radionuclides as well as how the radiological impact on humans and the environmental is determined.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MARS812	**Semester 1 & 2**	**NQF-Level: 9**

Title

Module outcomes:

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MARS813	**Semester 1 & 2**	**NQF-Level: 9**

Title

Module outcomes:

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MARS814	**Semester 1 & 2**	**NQF-Level: 9**

Title		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: MARS815	**Semester 1 & 2**	**NQF-Level: 9**
Title		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: MARS873	**Semester 1 & 2**	**NQF-Level: 9**
Title		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module codeMENV871	**Semester 1 & 2**	**NQF-Level: 9**
Title : Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module codeMGEO871	**Semester 1 & 2**	**NQF-Level: 9**
Title : Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module codeMIKS871	**Semester 1 & 2**	**NQF-Level: 9**
Title : Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: MIKS 871	**Semester 1 & 2**	**NQF-Level: 9**
Title: Master in Indigenous Knowledge Systems		
Module outcomes: The student should be able to **:** • Demonstrate advanced application of concepts, methods, ethics, theories and analytical processes in relation to a chosen focus area of IKS • Access, analyse, transform and critically evaluate existing knowledge • Show ability to access, process, produce and communicate information effectively to colleagues and other groups • Engage in independent IKS research and produce findings in the form of a research report selecting from a range of appropriate research designs, methods, techniques and technologies in the chosen focus area		

Demonstrate advanced understanding of IKS values, principles of human rights and social justice and competency in their application in the chosen focus field.
Method of delivery: Research
Assessment methods: The student shall submit a dissertation on a suitable research topic.

Module code: MKBN871	Semester 1 & 2	NQF-Level: 9
Title: **Dissertation**		
Module-outcomes: 1. Demonstrate specialist knowledge and understanding to engage with and critique research and practices within the field of Microbiology. 2. Demonstrate a command of relevant methods and procedures required to solve practical and theoretical problems in the field of Microbiology. 3. Demonstrate the ability to address complex and challenging problems in a specialised field of Microbiology and to understand and contextualise their findings. 4. Demonstrate the ability to access, process and manage information and to communicate their own findings in academically appropriate ways. 5. Demonstrate an understanding of the context of their research and associated consequences thereof to influence the field of Microbiology. 6. Demonstrate self-regulated learning and responsibility for academic and professional development; knowledge of the ethics of research and practice in Microbiology. *Module uitkomste:* *1. Gespesialiseerde kennis en begrip te toon om interaksie met en kritiek van navorsing en praktyke in Mikrobiologie te bewerkstellig.* *2. Bemeestering te toon van relevante metodes en prosedures wat vereis word om praktiese en teoretiese probleme van Mikrobiologie op te los.* *3. Te toon dat komplekse en uitdagende probleme in 'n gespesialiseerde Mikrobiologiese veld aangespreek kan word en om eie bevindinge te verstaan en te kontekstualiseer.* *4. Die vermoë te demonstreer om inligting in te samel, te verwerk en te bestuur en om eie bevindinge te kommunikeer op akademies gepaste wyse.* *5. Begrip te demonstreer van die konteks van eie navorsing en die geassosieerde gevolge daarvan om die Mikrobiologiese veld te beïnvloed.* *6. Self-gereguleerde leer en verantwoordelikheid vir akademiese en professionele ontwikkeling te toon; kennis demonstreer van die etiek van navorsing en praktyk binne Mikrobiologie.*		
Method of delivering: Full-time/part-time		
Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.		

Module code: MTHS871	Semester 1 & 2	NQF-Level: 9
Title: Dissertation		
Module outcomes: Knowledge: The student is equipped to master and apply Mathematics research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution theories, formulate and prove theorems if necessary, and furnish practical proof of the meaningfulness, implementability and accuracy of the new solution theory. Methods for committing the above process to paper in a scientific manner are acquired. The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in the dissertation. Skills: After the successful completion of the module the student will have mastered the Mathematics way of thinking. He or she will be able to master subject-matter and		

methods on his/her own, as well as to control modern techniques, apparatus and software. He or she will be able to function efficiently and independently in doing research in his/her subject and/or to solve practical problems of a standard magnitude. The student will therefore be able to act as a self-reliant scientist and take charge in dealing with not only standard problems and projects, but also problems and projects of an advanced nature, and also to undertake research projects in actual practice.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MTHS872	**Semester 1 & 2**	**NQF-Level: 9**

Title: Dissertation

Module outcomes:
Knowledge: The student is equipped to master and apply Applied Mathematics and Mathematics research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution theories, formulate and prove theorems if necessary, and furnish practical proof of the meaningfulness,implementability and accuracy of the new solution theory. Methods for committing the above process to paper in a scientific manner are acquired. The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in thedissertation.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MTHS881	**Semester 1 & 2**	**NQF-Level: 9**

Title: Abstract Analysis I

Module outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Regular Borel- and Radon measures, Fourier and Harmonic analysis, Banach function spaces, Hilbert spaces, Operator theory, Locally Convex spaces, C*- and von Neumann algebras.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MTHS882	**Semester 1 & 2**	**NQF-Level: 9**

Title: Abstract Analysis II

Module outcomes:
This module complements and extends the material covered in MTHS881 (Abstract Analysis I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,

* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Regular Borel- and Radon measures, Fourier and Harmonic analysis, Banach function spaces, Hilbert spaces, Operator theory, Locally Convex spaces, C*- and von Neumann algebras.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MTHS883	**Semester 1 & 2**	**NQF-Level: 9**

Title: Algebra I

Module outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

- structures described by one or two binary operations on one set (for example groups, rings and lattices), and/or
- Structures described by one or two binary operations on a set, together with an action of a second set on the first (for example vector spaces, modules, algebras and co-algebras).
- The interface of algebraic structures with non-algebraic structures (Lie groups, ordered rings, ordered groups, ordered fields, etc.).

The interface of algebraic structures with other study fields, including, but not limited to algebraic topology, algebraic homology, algebraic graph theory or matrix theory.

Method of delivering:

Assessment methods:
Dissertation (100%)

Module code: MTHS884	**Semester 1 & 2**	**NQF-Level: 9**

Title: Algebra II

Module outcomes:
This module complements and extends the material covered in MTHS883 (Algebra I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

- structures described by one or two binary operations on one set (for example groups, rings and lattices), and/or

- Structures described by one or two binary operations on a set, together with an action of a second set on the first (for example vector spaces, modules, algebras and co-algebras).
- The interface of algebraic structures with non-algebraic structures (Lie groups, ordered rings, ordered groups, ordered fields, etc.).

The interface of algebraic structures with other study fields, including, but not limited to algebraic topology, algebraic homology, algebraic graph theory or matrix theory

Method of delivering:

Assessment methods:

Dissertation (100%)

Module code: MTHS885	**Semester 1 & 2**	**NQF-Level: 9**

Title: Discrete Structures I

Module outcomes:

Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Theoretical Computer Science, Logic and Set Theory, Combinatorics, Graph Theory, Discrete Probability, Number Theory, Geometry, Game Theory, Complexity Theory

Method of delivering:

Assessment methods:

Dissertation (100%)

Module code: MTHS886	**Semester 1 & 2**	**NQF-Level: 9**

Title: Discrete Structures II

Module outcomes:

This module complements and extends the material covered in MTHS885 (Discrete Structures II). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Theoretical Computer Science, Logic and Set Theory, Combinatorics, Graph Theory, Discrete Probability, Number Theory, Geometry, Game Theory, Complexity Theory

Method of delivering:

Assessment methods:

Dissertation (100%)

Module code: MTHS887	Semester 1 & 2	NQF-Level: 9

Title: Principles and Paradigms: Pure Mathematics

Module outcomes:

Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected topics in Advanced Mathematics not covered by the other Masters level module modules. Such topics shall be jointly determined by the supervisor of the affected student, and the chairperson of the subject group Mathematics, and shall be directly related to the chosen research topic of the student.

Method of delivering:

Assessment methods:

Dissertation (100%)

Module code: NWON871	Semester 1 & 2	NQF-Level: 9

Title: **Dissertation**

Module-outcomes:
At the end of this module the learner is expected to:
- Critically appraise available literature in order to justify a research question relating to research study.
- Formulate a feasible systematic literature review relating to a research area.
- Justify the selection of an appropriate research method in order to fulfill the research objectives.
- Justify the selection of appropriate data gathering en data analysis methods in order to fulfill the research objectives.
- Write a research proposal.
- Write a report on the studies and on the attainment of the objectives in an acceptable scientific format that is systematic, logical and persuasive.

Module uitkomste:
Aan die einde van die module word van die leerder verwag om:
- *Bestaande literatuur krities te kan evalueer om sodoende 'n navorsingsvraag te regverdig verwant aan die navorsing.*
- *'n Stelselmatige literatuuroorsig te kan formuleer, verwant aan die navorsingsarea.*
- *Die keuse van 'n gepaste navorsingsmetode te kan regverdig, om sodoende die navorsingsdoelwitte te kan nakom.*
- *Die keuse van gepaste metodes vir datainsameling en ontleding te kan*

regverdig, om sodoende die navorsingsdoelwitte te kan nakom.

- *'n Navorsingsvoorstel te kan skryf.*
- *'n Stelselmatige, logiese en oorredende verslag oor die studies en doelwitte te skryf, in 'n aanvaarbare, wetenskaplike formaat.*

Method of delivering:

Assessment methods: The student shall submit a mini-dissertation on a suitable topic.

Module code: OMBO873	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Mini dissertation**

Module-outcomes:

1. Specialist knowledge and understanding to engage with and critique research and practices within the field of environmental management; and to contribute to disciplined thinking about relevant matters with particular reference to their area(s) of specialisation.
2. The ability to evaluate current processes of knowledge production in the field of environmental management and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in the field of environmental management.
4. The ability to address complex and challenging problems in a specialised field of environmental management and to understand and contextualise their findings.
5. Demonstrate the ability to make autonomous ethical decisions which affect knowledge production, or complex organisational or professional issues, an ability to critically contribute to the development of ethical standards specifically in environmental management.
6. Demonstrate the ability to access, process and manage information and to communicate their findings in academically appropriate ways (f and g)
7. An ability to effectively present and communicate the results of research to specialist and non-specialist audiences using the resources of an academic-professional discourse.
8. An understanding of the context of their research and associated consequences thereof to influence the field of environmental management.
9. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

Module uitkomste:

1. Demonstreer gespesialiseerde kennis en begrip om interaksie met, en kritiek van, heersende navorsing of praktyke binne die veld van omgerwingsbestuurveld te bewerkstellig; en om by te dra tot denke oor relevante sake wat betref hul spesifieke rigting van spesialisasie.

2. Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om ? gepaste proses van ondersoek te selekteer vir die spesialiseringsrigting of praktyk in omgewingsbestuur.

3. Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in omgewingsbestuur.

4. Demonstreer die vermoë om komplekse en uitdagende probleme binne 'n spesialiseringsrigting van omgewingsbestuur aan te spreek asook die begrip en kontekstualisering van enige daaruitspruitende oplossings.

5. Demonstreer die vermoë om selfstandige etiese besluite wat kennisproduksie, of komplekse organisatoriese of professionele aangeleenthede raak, te neem en 'n vermoë om krities by te dra tot die ontwikkeling van etiese standaarde in

omgewingsbestuur.
6. Demonstreer die vermoë om inligting (akademiese, profes-sionele of beroepsgerigte diskoerse as bronne) verwant aan omgewingsbestuur te ontgin, te prosesseer en te bestuur asook om die betekenisvolle insigte daarvan op 'n akademiese wyse te kan kommunikeer (f en g).
7. Die vermoë om navorsingsresultate effektief aan spesialis en nie-spesialis gehore aan te bied en te kommunikeer met behulp van 'n akademies-professionele diskoers.
8. n Begrip van die konteks van hul navorsing en hpe die verwante gevolge daarvan die veld van omgewingsbestuur te beïnvloed.
Demonstreer die vermoë om eie leerstrategieë te ontwerp en te gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand hou, met inagneming van hul etiese verantwoordelikheid.

Method of delivering: Part-time

Assessment methods: Assessment mark after examination and moderation of dissertation : 100 % of the final mark.

Module code: OMBO878	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Environmental Management 2**

Module-outcomes:
1. Demonstrate specialist knowledge and understanding to engage with and critique research and practices relating to global and national perspectives on environmental and sustainability challenges; including all relevant environmental management and governance instruments.
2. The ability to evaluate current processes of knowledge production in the field of environmental management and governance and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in environmental management and governance instruments and approaches.
4. The ability to address complex and challenging problems in a specialised field of environmental management and governance and to understand and contextualise their findings.
5. Demonstrate the ability to operate within the ethical requirements of environmental management and governance.
6. Demonstrate the ability to access, process and manage information related environmental management and governance and to communicate their findings in academically appropriate ways.
7. Candidates exhibit the potential to act as leaders and experts in the field of environmental management and governance.
8. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.
Module uitkomste:
1. Demonstreer gespesialiseerde kennis om interaksie met, en kritiek van, heersende navorsing of praktyke te bewerkstellig met betrekking tot internasionale en nasionale perspektiewe op uitdagings in volhoubaarheid, die omgewing asook alle relevante omgewingsbestuurs-instrumente.
2. Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om 'n gepaste proses van ondersoek te selekteer vir die spesialiseringsarea of praktyk in omgewingsbestuur.
3. Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes

en prosedures te selekteer en toe te pas in omgewingsbestuur.
4. Demonstreer die vermoë om komplekse en uitdagende probleme binne die veld van omgewingsbestuur aan te spreek deur die gebruik van 'n wye verskeidenheid gespesialiseerde vaardighede asook begrip vir die gevolge van enige daaruitspruitende oplossings of insigte te verstaan.
"5. Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met omgewingsbestuur.
"
6. Demonstreer die vermoë om inligting (akademiese, profes-sionele of beroepsgerigte diskoerse as bronne) verwant aan omgewingsbestuur te ontgin, te prosesseer en te bestuur asook om die betekenisvolle insigte daarvan op 'n akademiese wyse te kan kommunikeer.
7. Demonstreer die leierskapsvermoë tot ingryping op 'n toepaslike vlak binne 'n sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.
8. Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.

Method of delivering: Part-time

Assessment methods: Assignments, practical reports, presentations and examination

Module code: OMBO879	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Environmental Assessment 2**

Module-outcomes:
1. Demonstrate specialist knowledge and understanding to engage with and critique research and practices relating to global and national perspectives on environmental and sustainability challenges; including all relevant environmental assessment and governance instruments.
2. The ability to evaluate current processes of knowledge production in the field of environmental assessment and governance and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems in environmental assessment and governance instruments and approaches.
4. The ability to address complex and challenging problems in a specialised field of environmental assessment and governance and to understand and contextualise their findings.
5. Demonstrate the ability to operate within the ethical requirements of environmental assessment and governance.
6. Demonstrate the ability to access, process and manage information related environmental assessment and governance and to communicate their findings in academically appropriate ways.
7. Candidates exhibit the potential to act as leaders and experts in the field of environmental assessment and governance.
8. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.
Module uitkomste:
1. Demonstreer gespesialiseerde kennis om interaksie met, en kritiek van, heersende navorsing of praktyke met betrekking tot internasionale en nasionale perspektiewe op uitdagings in volhoubaarheid, die omgewing asook alle relevante

omgewingsassesering-instrumente te bewerkstellig.
2. Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om ? gepaste proses van ondersoek te selekteer vir die spesialiseringsrigting of praktyk in omgewingsassesering en -bestuur.
3. Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in omgewingsassesering en -bestuur.
4. Demonstreer die vermoë om komplekse en uitdagende probleme binne die rigting van omgewingsassesering en -bestuur aan te spreek asook die begrip en kontekstualisering van enige daaruitspruitende oplossings.
5. Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met omgewingsassesring en -bestuur.
6. Demonstreer die vermoë om inligting (akademiese, profes-sionele of beroepsgerigte diskoerse as bronne) verwant aan omgewingsassesering te ontgin, te prosesseer en te bestuur asook om die betekenisvolle insigte daarvan op 'n akademiese wyse te kan kommunikeer.
7. Demonstreer die leierskapsvermoë tot ingryping op ? toepaslike vlak binne ? sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.
8. Demonstreer die vermoë om eie leerstrategieë te ontwerp en te gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.

Method of delivering: Part-time

Assessment methods: Assignments, practical reports, presentations and examination

Module code: OMBO880	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Management of Ecological Drivers in Aquatic Systems**

Module-outcomes:
1. Demonstrate specialist knowledge and understanding to engage with and critique research and practices relating to global and national perspectives on environmental and sustainability challenges; including all relevant environmental management and governance instruments.
2. The ability to evaluate current processes of knowledge production in relation to ecological water requirements and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems related to ecological water requirements and specifically ecological drivers in aquatic systems.
4. The ability to address complex and challenging problems in relation to ecological water requirements and ecological drivers in equatic systems, and to understand and contextualise their findings.
5. Demonstrate the ability to operate within the ethical requirements of water management and governance.
6. Demonstrate the ability to access, process and manage information related to ecological water requirements and to communicate their findings in academically appropriate ways.
7. Candidates exhibit the potential to act as leaders and experts in the field of water management and governance.
8. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.
Module uitkomste:
1. Demonstreer gespesialiseerde kennis om interaksie met, en kritiek van,

heersende navorsing of praktyke te bewerkstellig met betrekking tot internasionale en nasionale perspektiewe op uitdagings in volhoubaarheid, die omgewing asook alle relevante omgewingsbestuurs-instrumente.
2. Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om ? gepaste proses van ondersoek te selekteer vir die spesialiseringsarea of praktyk in water bestuur.
3. Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in water bestuur en spesifiek ekologiese drywers in akwatiese sisteme.
4. Demonstreer die vermoë om komplekse en uitdagende probleme binne die veld van water bestuur aan te spreek deur die gebruik van ? wye verskeidenheid gespesialiseerde vaardighede asook begrip vir die gevolge van enige daaruitspruitende oplossings of insigte te verstaan.
5. Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met water bestuur.
6. Demonstreer die vermoë om inligting (akademiese, profes-sionele of beroepsgerigte diskoerse as bronne) verwant aan water bestuur te ontgin, te prosesseer en te bestuur asook om die betekenisvolle insigte daarvan op 'n akademiese wyse te kan kommunikeer.
7. Demonstreer die leierskapsvermoë tot ingryping op ? toepaslike vlak binne ? sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.
8. Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.

Method of delivering: Part Time

Assessment methods: Assignments, practical reports, presentations and examination

Unit/Centre/Focus Area: Environmental Sciences and Management

Module code: OMBO881	**Semester 1 & 2**	**NQF-Level: 9**

Title**: Management of Ecological Responders in Equatic Systems**

Module-outcomes:
1. Demonstrate specialist knowledge and understanding to engage with and critique research and practices relating to global and national perspectives on environmental and sustainability challenges; including all relevant environmental management and governance instruments.
2. The ability to evaluate current processes of knowledge production in relation to ecological water requirements and to choose appropriate processes of enquiry for the area of specialisation.
3. A command of relevant methods and procedures required to solve practical and theoretical problems related to ecological water requirements and specifically ecological responders in aquatic systems.
4. The ability to address complex and challenging problems in relation to ecological water requirements and ecological responders in equatic systems, and to understand and contextualise their findings.
5. Demonstrate the ability to operate within the ethical requirements of water management and governance.
6. Demonstrate the ability to access, process and manage information related to ecological water requirements and to communicate their findings in academically appropriate ways.
7. Candidates exhibit the potential to act as leaders and experts in the field of water

management and governance.
8. Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.
Module uitkomste:
1. Demonstreer gespesialiseerde kennis om interaksie met, en kritiek van, heersende navorsing of praktyke te bewerkstellig met betrekking tot internasionale en nasionale perspektiewe op uitdagings in volhoubaarheid, die omgewing asook alle relevante omgewingsbestuurs-instrumente.
2. Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om ? gepaste proses van ondersoek te selekteer vir die spesialiseringsarea of praktyk in water bestuur.
3. Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in water bestuur en spesifiek ekologiese reageerders in akwatiese sisteme.
4. Demonstreer die vermoë om komplekse en uitdagende probleme binne die veld van water bestuur aan te spreek deur die gebruik van ? wye verskeidenheid gespesialiseerde vaardighede asook begrip vir die gevolge van enige 5. daaruitspruitende oplossings of insigte te verstaan.
5. Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met water bestuur.
6. Demonstreer die vermoë om inligting (akademiese, profes-sionele of beroepsgerigte diskoerse as bronne) verwant aan water bestuur te ontgin, te prosesseer en te bestuur asook om die betekenisvolle insigte daarvan op 'n akademiese wyse te kan kommunikeer.
7. Demonstreer die leierskapsvermoë tot ingryping op ? toepaslike vlak binne ? sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.
8. Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.

Method of delivering: Part Time

Assessment methods: Assignments, practical reports, presentations and examination

Module code: OMBO882	**Semester 1 & 2**	**NQF-Level: 9**

Title**: Integrated Waste Management**

Module-outcomes:
1. An integrated knowledge of and engagement in integrated waste management and of theories, techniques and requirements relevant to waste management as well as the ability to critically evaluate and apply these concepts.
2. The ability to gather multiple sources of knowledge and information within the field of integrated waste management, and critically evaluate, review and apply this knowledge.
3. Contextualize and critically comment on the complex nature of integrated waste management and how it relates to unfamiliar contexts and other fields of environmental management.
4. The ability to select, critically evaluate and apply a range of different but appropriate tools, techniques, requirements and best practices related to integrated waste management, and to reflect on and propose suggestions to effectively manage waste throughout the entire waste management life cycle.
Module uitkomste:
1. Geïntegreerde kennis van en betrokkenheid by geïntegreerde afvalbestuur, en

van teorieë, tegnieke en vereistes ten opsigte van afvalbestuur sowel as die vermoë om hierdie konsepte krities te evalueer en toe te pas.
2. Die vermoë om kennis en inligting oor geïntegreerde afvalbestuur in te samel en krities te evalueer, te hersien, en toe te pas.
3. Kontekstualiseer die komplekse aard van geïntegreerde afvalbestuur en lewer ingeligte kommentaar oor hoe dit met onbekende kontekste en ander dissiplines in omgewingsbestuur verband hou.
4. Die vermoë om 'n reeks verskillende, maar toepaslike hulpmiddels, tegnieke, vereistes en beste praktyke wat op geïntegreerde afvalbestuur betrekking het, te selekteer, krities te evalueer en toe te pas, en om na te dink en voorstelle te maak vir doeltreffende afvalbestuur oor die hele afvalbestuurlewensiklus heen.

Method of delivering: Full time or part time

Assessment methods: Assignments, practical reports, presentations and examination

Module code: OMBO883	**Semester 1 & 2**	**NQF-Level: 9**

Title**: Waste Management Law And Governance**

Module-outcomes:
1. An integrated knowledge of and engagement in integrated waste management legislation and governance (including international obligations, policies, laws, regulations, norms and standards, etc.) relevant to waste management as well as the ability to critically evaluate and apply these concepts.
2. The ability to gather multiple sources of knowledge and information applicable to waste management legislation and governance, and evaluate, review and apply this knowledge;
3. Contextualize and critically comment on the complex nature of waste management legislation and governance, and how it relates to unfamiliar contexts and other fields of environmental management.
4. The ability to select, review, evaluate and apply a range of different but appropriate legislative requirements related to integrated waste management, and to reflect on and propose suggestions to effectively manage waste within the South African legal framework.
Module uitkomste:
1. Geïntegreerde kennis van en betrokkenheid by wetgewing en korporatiewe bestuur (insluitende internasionale verpligtinge, beleide, wette, regulasies, norme en standaarde, ens.) van geïntegreerde afvalbestuur sowel as die vermoë om die konsepte krities te evalueer en toe te pas.
2. Die vermoë om kennis en inligting oor die wetgewing en korporatiewe bestuur van geïntegreerde afvalbestuur in te samel en krities te evalueer, te hersien, en toe te pas.
3. Kontekstualiseer die komplekse aard van die wetgewing en korporatiewe bestuur van geïntegreerde afvalbestuur, en lewer ingeligte kommentaar oor hoe dit met onbekende kontekste en ander dissiplines in omgewingsbestuur verband hou.
4. Die vermoë om 'n reeks verskillende, maar toepaslike wetlike vereistes wat op geïntegreerde afvalbestuur betrekking het, te selekteer, krities te evalueer en toe te pas, en om na te dink en voorstelle te maak vir doeltreffende afvalbestuur binne die Suid-Afrikaanse regsraamwerk.

Method of delivering: Part Time

Assessment methods: Assignments, practical reports, presentations and examination

Module code: OMWN871	Semester 1 & 2	NQF-Level: 9
Title: **Dissertation**		
Module-outcomes: 1. Demonstrate specialist knowledge and knowledge literacy regarding the field of environmental sciences. 2. Demonstrate a command of, design, and select appropriate methods, techniques and processes in the research of environmental sciences. 3. Use wide range of specialised skills in identifying, and conceptualising methods of enquiry to address complex and challenging problems within the field of environmental sciences. 4. Access, process and manage information in order to conduct a review on the current research in the area of environmental sciences. 5. Produce and communicate information regarding his/her research in the field of environmental sciences. 6. Place his/her research findings in context within the prevailing understanding of the research problem within environmental sciences and suggest solutions/intervention. 7. Make autonomous ethical decisions, to operate independently and take full responsibility for his/her own work. *Module uitkomste:* *1. Gespesialiseerde kennis en kennisgeletterdheid met betrekking tot die veld van omgewingswetenskappe te demonstreer.* *2. Bemeestering, ontwerp en keuse van toepaslike metodes, tegnieke en prosesse in die navorsing van omgewingswetenskappe te demonstreer.* *3. n Wye reeks gespesialiseerde vaardighede te implimenteer in die identifisering en konseptualisering van ondersoekmetodes om komplekse en uitdagende probleme in die veld van omgewingswetenskappe aan te spreek.* *4. Inligting in te samel, te prosesseer en te bestuur sodat 'n omvattende oorsig van die leidende navorsing in die area van omgewingswetenskappe verskaf kan word.* *5. Inligting rakende sy/haar navorsingsveld in omgewingswetenskappe te produseer en te kommunikeer* *6. Sy/haar navorsingsbevindings in konteks met die heersende begrip van die navorsingsprobleem binne omgewingswetenskappe te stel en om oplossings/intervensies voor te stel.* *7. Outonomies etiese besluite te neem, onafhanklik te funksioneer en toerekenbaar te wees vir sy/haar eie werk*		
Method of delivering: Full-time or part-time		
Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners		
Module code: ONAV872	**Semester 1 & 2**	**NQF-Level: 9**
Title: Dissertation		
Module outcomes:		
Method of delivering:		
Assessment methods: Dissertation (100%)		

Module Code: ORMS873	Year module	NQF-Level: 9
Title: Mini-Dissertation		
Module Outcomes: Candidates have mastered the outcomes the outcomes if they are able to: • display specialist knowledge and understanding to engage and critique mathematical, statistical and/or systemic models of an application area and practices within the field of Operational Research and to contribute disciplined thinking to operational research matters and issues, with particular reference to their area(s) of specialisation. • apply and develop intellectual independence and advanced research skills, sophisticated knowledge and research methodologies to the solution of complex, unfamiliar problems in the field of Operational Research, for example probability and statistical modelling, • analyse and apply specialised problem solving skills in identifying, conceptualising, designing and implementing methods of enquiry to address complex and challenging problems within a specialist field of Operational Research, and to report their findings in appropriate ways for academic and/or practical purposes, • plan, manage and optimise all aspects of research processes within complex and unpredictable contexts in the area of specialisation as academic leaders and experts in the field of Operational Research, • high levels of responsibility, self-reflexitivity and adaptability, with respect to the ethical implications of the research, the determination of relevant issues and research needs in South Africa.		
Method of delivery:		
Assessment Methods:	The mini-dissertation will be examined by 1 examiner	
Module Code: ORMS874	**Year module**	**NQF-Level: 9**
Title: Operational Research Methodologies		
Module Outcomes: After the successful completion of this module, the student must be able to demonstrate: specialist knowledge and understanding to engage and critique operational research methodologies within the field of operational research and to contribute to disciplined thinking about operational research matters and issues, an ability to evaluate current processes of knowledge production in the field of operational research and to choose appropriate processes of inquiry for the area of spesialisation, for example incorporating behavioural research in operational research. an ability to conduct independent inquiry in a specialised field of operational research, and to report their findings in academically appropriate ways, the potential to act as academic leaders and experts in the field of operational research methodologies, high levels of responsibility, self-reflexitivity and adaptability, with respect to the ethical implications of research, the determination of relevant issues and research needs in South Africa.		
Method of delivery:		
Assessment Methods:		
Module Code: ORMS875	**Year module**	**NQF-Level: 9**
Title: Business Devlopment And Implementation		

Module Outcomes:
After the successful completion of this module, the student must be able to demonstrate:

- specialist knowledge and understanding to engage and critique business development and implementation within the field of Operational Research and to contribute to disciplined thinking about operational research matters and issues,
- an ability to evaluate current processes of knowledge production in the field of operational research and to choose appropriate processes of inquiry in business development and implementation,
- an ability to conduct independent inquiry in a specialised field of business development and implementaion, and to report their findings in academically appropriate ways,
- the potential to act as academic leaders and experts in the field of business development and implementation,
- high levels of responsibility, self-reflexitivityand adaptability, with respect to the ethical implications of research, the determination of relevant issues and research needs in South Africa.

Method of delivery:

Assessment Methods:

Module Code ORMS876	**Year module**	**NQF-Level: 9**

Title: Operational Research: Business Analysis

Module Outcomes:
After the successful completion of this module, the student must be able to demonstrate:
specialist knowledge and understanding to engage and critique business analysis within the field of Operational Research and to contribute to disciplined thinking about operational research matters and issues,
an ability to evaluate current processes of knowledge production in the field of operational research and to choose appropriate processes of inquiry in business analysis,
an ability to conduct independent inquiry in a specialised field of business analysis, and to report their findings in academically appropriate ways,
the potential to act as academic leaders and experts in the field of business analysis,
high levels of responsibility, self-reflexitivity and adaptability, with respect to the ethical implications of research, the determination of relevant issues and research needs in South Africa.

Method of delivery:

Assessment Methods:

Module Code: ORMS877	**Year module**	**NQF-Level: 9**

Title: Business Statistics

Module Outcomes:
After the successful completion of this module, the student must be able to demonstrate:
specialist knowledge and understanding to engage and critique business statistics within the field of Operational Research and to contribute to disciplined thinking

about operational research matters and issues,
an ability to evaluate current processes of knowledge production in the field of operational research and to choose appropriate processes of inquiry in business statistics,
an ability to conduct independent inquiry in a specialised field of business statistics, and to report their findings in academically appropriate ways,
the potential to act as academic leaders and experts in the field of business statistics,
high levels of responsibility, self-reflexitivity and adaptability, with respect to the ethical implications of research, the determination of relevant issues and research needs in South Africa

Method of delivery:

Assessment Methods:

Module code: PLKN871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
1. Knowledge of the botanical field of specialisation (ecology, molecular biology, physiology or taxonomy) of terrestrial or aquatic environments.
2. Ability to evaluate relevant literature in the field of specialisation.
3. Ability to address complex problems within the field of specialisation by applying skills to identify, conceptualise and design relevant research questions.
4. Application of appropriate and creative methods, techniques, processes or technologies to address practical or theoretical problems in the field of specialisation.
5. Adoption of appropriate, responsible and approved ethical decisions for knowledge production in the field of specialisation.
6. Ability to implement appropriate procedures to collect, process and analyse data in the field of specialisation, and the initiation and implementation of good management practices to meet the goals of the study.
7. Independent thought and responsibility for the research in the field of specialisation, and to communicate and defend findings in academically appropriate ways.
Module uitkomste:
Aan die einde van die module moet die student die volgende kan demonstreer:

1. Kennis van die plantkundige spesialiseringsrigting (ekologie, molekulêre biologie, fisiologie of taksonomie) van terrestriële of akwatiese omgewings.
2. Vermoë om toepaslike literatuur in die spesialiseringsrigting te evalueer.
3. Vermoë om ingewikkelde probleme binne die spesialiseringsrigting aan te spreek deur die toepassing van vaardighede om vraagstukke te identifiseer, konseptualiseer en te ontwerp.
4. Aanwending van toepaslike en kreatiewe metodes, tegnieke, prosesse of tegnologieë om praktiese of teoretiese probleme in die spesialiseringsrigting aan te spreek.
5. Inkorporering van toepaslike, verantwoordelike en goedgekeurde etiese besluite vir kennisproduksie binne die spesialiseringsrigting.
6. Vermoë om geskikte prosedures te volg om data in te samel, te bestuur, te verwerk en te analiseer in die spesialiseringsrigting, asook die inisiëring en implementering van goeie bestuurspraktyke om die doelstellings van die studie te

bereik.
7. Onafhanklike denke en verantwoordelikheid vir navorsing in die spesialiseringsrigting, asook om bevindinge te kommunikeer en te verdedig op akademies verantwoordbare maniere.

Method of delivering: Full-time or part-time

Assessment methods: Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: RSWW811	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Research Method**

Module-outcomes:
On completing this module the student will be able to demonstrate that he/she is ready for undertaking the literature study with a view to a dissertation in his/her subject field (which may include that the student should be able to present the literature study in the form of an article); that he/she knows how to consult and correctly quote sources without committing plagiarism. The student will demonstrate that he/she is conversant with the contents of the "guide to postgraduate study", and that he/she is able to choose and apply an appropriate research method, for example that he/she (where applicable) is able to prepare suitable questionnaires and can do suitable statistic processing of data; that he/she is able to work with questionnaires and results in an ethically correct manner. On completing this module the student will be able to write a research proposal.
Module uitkomste:
Die student sal by voltooiing van hierdie module kan aantoon dat hy/sy gereed is om die
literatuurstudie met die oog op 'n verhandeling in sy/haar vakgebied te kan doen (wat kan
inhou dat die student die literatuurstudie in artikelvorm moet aanbied), en weet hoe om
bronne te raadpleeg en korrek aan te haal, sonder om plagiaat te pleeg. Die student sal kan
aantoon dat hy/sy vertroud is met die inhoud van die "handleiding vir nagraadse studie", en
sal in staat wees om 'n geskikte navorsingsmetode te kies en toe te pas, bv. hoe om (waar
van toepassing) geskikte vraelyste op te stel en gepaste statistiese verwerking van data te
kan doen, en eties korrek met vraelyste en resultate om te gaan. Die student sal by voltooiing van hierdie module in staat wees om 'n navorsingsvoorstel te skryf.

Method of delivering: Full time / Part time (Scheduled lectures)

Assessment methods: Formative and summative assessment: Assignments and exam.

Module code: RSWW821	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Research Communication**

Module-outcomes:
On completion of this module the student would have shown that he/she is capable of communicating research results in writing and verbally according to the standard practices in the subject field. The student will be able to present a lecture on research results that will include the necessary skills in making use of modern aids (such as the data projector), and he/she must submit a typed article from the work in his/her dissertation for examination. The student must have the skills to use the

generally accepted word processing package of his/her subject field and prepare the article by means of that.

Module uitkomste:

Die student sal by die voltooiing van hierdie module aangetoon het dat hy/sy in staat is om navorsingsresultate skriftelik en mondeling volgens die standaard praktyke in die vakgebied te kommunikeer. Die student sal 'n voordrag oor navorsingsresultate kan aanbied, wat insluit die vaardigheid om van moderne hulpmiddels (soos die data-projektor) gebruik te maak en hy/sy sal 'n getikte artikel uit die werk van sy/haar verhandeling vir eksaminering aanbied. Die student sal oor die vaardigheid beskik om die algemeen aanvaarde woordverwerkingspakket van sy vakgebied te gebruik en die artikel met behulp hiervan voor te berei.

Method of delivering: Full time / Part time (Scheduled lectures)

Assessment methods: Summative assessment: Assignments.

Module code: SBEL871	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:

1. Illustrate the ability to independently conduct research under guidance, and collect, process, analyse, evaluate and interpret data and to document these findings meaningfully in a dissertation.
2. Illustrate the ability to apply advanced subject-specific and integrated planning knowledge and skills in addressing planning issues and in identifying, analysing and solving complex and abstract problems.
3. Illustrate sufficient knowledge of related literature, mastery of appropriate techniques and analytical methods, and the ability to remain at the forefront of the latest policy and practices in planning;
4. Illustrate the ability to apply the knowledge and skills acquired in these studies meaningfully in order to reflect significant insight.
5. Demonstrate advanced and specialised skills, appropriate to the Urban and Regional Planning discipline, to communicate research findings to a range of audiences with different levels of knowledge or expertise.

Module uitkomste:

a) Illustreer die vermoë om selfstandig navorsing uit te voer onder toesig, data te versamel, te verwerk, te analiseer, te evalueer en te interpreteer en dit sinvol in ? verhandeling op te skryf.

b) Illustreer die vermoë om gevorderde vakspesifieke en geïntegreerde beplanningskennis en -vaardighede toe te pas om beplanningsvraagstukke aan te pak en probleme te identifiseer, analiseer en op te los.

c) Illustreer voldoende bekendheid met verbandhoudende literatuur, bemeestering van toepaslike en analitiese metodes en die vermoë om op die voorpunt te bly van die nuutste wetgewing en praktyke in beplanning.

d) Illustreer die vermoë om die kennis en vaardighede opgedoen in hierdie studie sin-vol toe te pas ten einde betekenisvolle insig te reflekteer.

e) Demonstreer gevorderde en gespesialiseerde vaardighede toepaslik vir Stads-en-Streeksbeplannings dissipline, ten einde navorsingsbevindings te kommunikeer met verskillende gehore uit verskillende vlakke van kennis en kundigheid.

Method of delivering: : Full time or part-time

Assessment methods:

Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: STTK871	Semester 1 & 2	NQF-Level: 9
Title:		
Module outcomes: Students will have to demonstrate the ability to make a definite contribution towards the development of new knowledge and skills in Statistics by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically and ethically acceptable format.		
Method of delivering:Full time		
Assessment methods: Class tests, assignments, exam		
Module code: STTK874	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Advanced Resampling Methods**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Advanced knowledge of resampling methods and advance critical understanding and application of these methods. Advanced research skills by assimilating information from various sources within the field of resampling methods and critically evaluate and review this information. The ability to identify, analyse, and effectively solve problems with the help of resampling methods where traditional methods are not tractable. Advance problem solving skills by implementing resampling methods to solve advanced real-world problems *Module uitkomste:* *Na voltooiing van die module behoort die student die volgende te kan demonstreer:* *Gevorderde kennis van hersteekproefnemingsmetodes en 'n gevorderde kritiese begrip en toepassing van hierdie metodes.* *Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van hersteekproefneming en hierdie inligting krities te evalueer en te hersien.* *Die vermoë om probleme raak te sien wat te gekompliseerd is om met tradisionele metodes op te los, en dan hierdie probleme te kan oplos met behulp van hersteekproefnemingsmetodes.* *Gevorderde probleemoplossingsvaardigheid deur van hersteekproefnemingsmetodes gebruik te maak om werklike probleme op te los.*		
Method of delivering:Full time		
Assessment methods: Class tests, assignments, exam		

Module code: STTK875	Semester 1 & 2	NQF-Level: 9
Title: **Advanced Statistical Models**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Advanced knowledge of non-parametric regression and advance critical understanding and application of this type of regression. Advanced research skills by assimilating information from various sources within the field of non-parametric statistics and critically evaluate and review this information. The ability to identify, analyse, and effectively solve problems with the help of non-parametric regression, especially in the cases where traditional regression does not provide adequate answers. Advance problem solving skills by implementing non-parametric regression methods to solve advanced real-world problems. *Module uitkomste:* *Na voltooiing van die module behoort die student die volgende te kan demonstreer:* *Gevorderde kennis van nie-parametriese regressie en 'n gevorderde kritiese begrip en toepassing van hierdie regressie.* *Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van nie-parametriese regressie en hierdie inligting krities te evalueer en te hersien.* *Die vermoë om probleme te identifiseer, te analiseer en op te los met behulp van nie-parametriese regressie, veral in die gevalle waar tradisionele regressie metodes nie voldoende antwoorde gee nie.* *Gevorderde probleemoplossingsvaardigheid deur van nie-parametriese regressie metodes gebruik te maak om werklike probleme op te los.*		
Method of delivering:Full time		
Assessment methods: Class tests, assignments, exam		
Module code: STTK876	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Advanced Multivariate Statistics**		
Module-outcomes: On completion of the module, the student should be able to demonstrate: Advanced knowledge of a variety of Multivariate Statistical methods and advance critical understanding and application of these methods. Advanced research skills by assimilating information from various sources within the field of Multivariate Statistics and critically evaluate and review this information. The ability to identify, analyse, and effectively solve problems with the help of Multivariate Statistical methods, especially in the so-called big-data environment.		

Advance problem solving skills by implementing Multivariate Statistical methods to solve advanced real-world problems.

Advanced ethical behaviour by making autonomous ethical decisions with regards to the analysis of big-data.

Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Gevorderde kennis van 'n verskeidenheid Meerveranderlike Statistiese metodes en 'n gevorderde kritiese begrip en toepassing van hierdie metodes.

Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van Meerveranderlike Statistiek en hierdie inligting krities te evalueer en te hersien.

Die vermoë om probleme te identifiseer, te analiseer en op te los met behulp van Meerveranderlike Statistiese tegnieke, veral in die sogenaamde "big-data" omgewing.

Gevorderde probleemoplossingsvaardigheid deur van Meerveranderlike Statistiese tegnieke gebruik te maak om werklike probleme op te los.

Gevorderde etiese gedrag deur selfstandige etiese besluite te neem met betrekking tot die analise van "big-data".

Method of delivering: Full time

Assessment methods:
Class tests, assignments, exam

Module code: STTK877	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Probability Theory**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Advanced knowledge of measure theoretical probability theory and advance critical understanding and application of these methods.

Advanced research skills by assimilating information from various sources within the field of probability theory and critically evaluate and review this information.

Advance problem solving skills by implementing results from probability theory to analyse and address complex or abstract problems.

Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Gevorderde kennis van maat-teoretiese waarskynlikheidsleer en 'n gevorderde kritiese begrip en toepassing van hierdie veld.

Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk

binne die veld van waarskynlikheidsleer en hierdie inligting krities te evalueer en te hersien.

Gevorderde probleemoplossingsvaardighede deur van waarskynlikheidsleer resultate gebruik te maak om komplekse en abstrakte probleme te analiseer en op te los.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, exam

Module code: STTK878	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Time Series Models**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Advanced knowledge of Time Series methods and advance critical understanding and application of these methods.

Advanced research skills by assimilating information from various sources within the field of Time Series and critically evaluate and review this information.

The ability to identify, analyse, and effectively solve problems with the help of Time Series methods.

Advance problem solving skills by implementing Time Series to address advanced real-world problems.

Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Gevorderde kennis van tydreeksmetodes en 'n gevorderde kritiese begrip en toepassing van hierdie metodes.

Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van tydreekse en hierdie inligting krities te evalueer en te hersien.

Die vermoë om probleme te identifiseer, te analiseer en op te los met behulp van tydreeks analise.

Gevorderde probleemoplossingsvaardigheid deur van tydreekse gebruik te maak om gevorderde werklike probleme aan te spreek.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, exam

Module code: STTK879	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Stochastic Processes**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Advanced knowledge of Stochastic Processes and advance critical understanding

and application of these processes.

Advanced research skills by assimilating information from various sources within the field of Stochastic Processes and critically evaluate and review this information.

The ability to identify, analyse, and effectively solve problems with the help of the appropriate Stochastic Process.

Advance problem solving skills by implementing results from the theory of Stochastic Processes to analyse and address complex, abstract, or real-world problems.

Module uitkomste:
Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Gevorderde kennis van Stogastiese Prosesse en 'n gevorderde kritiese begrip en toepassing van hierdie prosesse.

Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van Stogastiese Prosesse en hierdie inligting krities te evalueer en te hersien.

Die vermoë om probleme te identifiseer, te analiseer en op te los met behulp van 'n toepaslike Stogastiese Proses.

Gevorderde probleemoplossingsvaardighede deur teoretiese resultate van Stogastiese Prosesse te gebruik om komplekse, abstrakte, of werklike probleme te analiseer en op te los.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, exam

Module code: STTN872	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module-outcomes:
Knowledge: The student is equipped to master and apply Mathematical Statistics research methodologies and techniques, which implies that they acquire the necessary expertise to identify within their subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution theories, formulate and prove theorems if necessary, and furnish practical proof of the meaningfulness, usefulness, and accuracy of the new solution theory. Methods for committing the above process to paper in a scientific manner are acquired. The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in the dissertation.

Skills: After the successful completion of the module the student will have mastered a statistical way of thinking and will be able to master subject-matter and methods on their own, as well as to employ modern techniques and software. The student will be able to function efficiently and independently in solving research problems in their subject. The student will therefore be able to act as a self-reliant scientist and oversee and manage not only standard problems and projects, but also problems and projects of an advanced nature. In addition, the student will also be able to

undertake research projects in actual practice. The student should also demonstrate that they have the skill to report findings and results in an ethically responsible manner.

Module uitkomste:
***Kennis**: Die student word toegerus om Wiskundige Statistiek navorsingsmetodologieë en –tegnieke te bemeester en toe te pas, wat impliseer dat die student die nodige kundigheid verwerf om in hulle vakgebied 'n geskikte navorsingsonderwerp te identifiseer, teoretiese agtergrondskennis in te win, toepaslike oplossingsteorieë voor te lê, stellings te formuleer en te bewys indien nodig, en praktiese bewys te lewer van die sinvolheid, implementeerbaarheid en korrektheid van die nuwe oplossingsstrategieë. Metodes om die bostaande proses wetenskaplik op te skryf, word aangeleer. Die student se vooraf diepgaande, fundamentele opleiding in geselekteerde, gevorderde vakteoretiese onderwerpe word in die verhandeling vergestalt.*

***Vaardighede**: Na suksesvolle voltooiing van die module sal die student 'n statistiese denkwyse bemeester het. Die student sal in staat wees om selfstandig leerstof en metodes te bemeester, asook moderne tegnieke en sagteware te gebruik. Die student sal doeltreffend en selfstandig kan funksioneer om navorsingsprobleme van standaard omvang in sy vak op te los. Die student sal dus as selfstandige wetenskaplike kan optree en leiding neem om standaard tot gevorderde probleme en projekte af te handel, sowel as om navorsingsprojekte te kan onderneem in die praktyk. Die student moet kan demonstreer dat hulle die vermoë het om resultate en bevindinge op 'n etiese verantwoordbare manier te kan weergee.*

Method of delivering: Full time

Assessment methods:
According to the faculty's given rules for the examination of dissertations. Ultimately, the dissertation will count 100/180 of the final mark.

Module code: STTN874	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Advanced Survival Models**

Module-outcomes:
On completion of the module, the student should be able to demonstrate:

Advanced knowledge of a variety of Survival Analysis methods and advance critical understanding and application of these methods.

Advanced research skills by assimilating information from various sources within the field of Survival Analysis and critically evaluate and review this information.

The ability to identify, analyse, and effectively solve problems with the help of Survival Analysis.

Advance problem solving skills by implementing methods in Survival Analysis to solve advanced real-world problems.

Advanced ethical behaviour by making autonomous ethical decisions with regards to the analysis of survival data.

Module uitkomste:

Na voltooiing van die module behoort die student die volgende te kan demonstreer:

Gevorderde kennis van 'n verskeidenheid oorlewingsteorie metodes en 'n gevorderde kritiese begrip en toepassing van hierdie metodes.

Gevorderde navorsingsvaardighede deur inligting uit verskillende bronne te verwerk binne die veld van oorlewingsteorie en hierdie inligting krities te evalueer en te hersien.

Die vermoë om probleme te identifiseer, te analiseer en op te los met behulp van tegnieke in oorlewingsteorie.

Gevorderde probleemoplossingsvaardigheid deur van oorlewingsteorie tegnieke gebruik te maak om werklike probleme op te los.

Gevorderde etiese gedrag deur selfstandige etiese besluite te neem met betrekking tot die analise van oorlewingsdata.

Method of delivering: Full time

Assessment methods:
Class tests, assignments, exam

Module code: TGWN872	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Dissertation**

Module outcomes:

Knowledge: The student is equipped to master and apply research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution
theories, formulate and prove theorems if necessary, and furnish practical proof of the
meaningfulness, implementability and accuracy of the new solution theory. Methods for
committing the above process to paper in a scientific manner are acquired. The student's
thorough fundamental training acquired beforehand in selected, advanced theoretical subjects
is embodied in the dissertation.

Skills*:* After the successful completion of the module the student will
have mastered the mathematical way of thinking. He/she will be able to master learning matter
and methods independently. He/she will be able to function efficiently and independently in
doing research in his/her subject and/or to solve research problems of a standard magnitude.
The student will therefore be able to act as a self-reliant scientist and take charge in dealing
with not only standard problems and projects, but also problems and projects of an advanced
nature

Module uitkomste:

***Kennis**: Die student word toegerus om wiskundige navorsingsmetodologië en -tegnieke te bemeester en toe te pas, wat impliseer dat die student die nodige kundigheid verwerf om in sy vakgebied 'n geskikte navorsingsonderwerp te identifiseer, teoretiese agtergrondskennis in te win, toepaslike oplossingsteorieë voor te lê, stellings te formuleer en te bewys indien nodig, en praktiese bewys lewer van die sinvolheid, inplementeerbaarheid en juistheid van die nuwe oplossingsstrategie. Metodes om bostaande proses wetenskaplik te boekstaaf, word aangeleer. Die student se vooraf diepgaande fundamentele opleiding in geselekteerde, gevorderde vakteoretiese onderwerpe word in die verhandeling vergestalt.*

***Vaardighede:** Na suksesvolle voltooiing van die module sal die student die wiskundige denkwyse bemeester het. Hy/Sy sal in staat wees om selfstandig leerstof en metodes te bemeester. Hy/Sy sal doeltreffend en selfstandig kan funksioneer om navorsingsprobleme van standaard omvang in sy vak te doen en/of op te los. Die student sal dus as selfstandige wetenskaplike kan optree en leiding neem om standaard tot gevorderde probleme en projekte af te handel.*

Method of delivery: Not applicable – research project:

Assessment methods: The candidate submits a dissertation on a suitable research topic

Module code: TGWN881	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Applicable Analysis I**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected aspects of the one or more of the following topics:

Solvability of finite dimensional integral-, differential- and operator equations; the contraction mapping principle; applications of the theory of integration, applications of complete spaces with Hilbertian and Normed structures; the Calculus of Variations

Module uitkomste:
Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe:

Oplosbaarheid van eindig-dimensionele integraal-, differensiaal- en operator vergelykings; die kontraksie afbeeldingsbeginsel; toepassings van die intehrasieteorie; toepassings van volledige ruimtes met Hilbert en en Norm strukture; Variasierekening

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: TGWN882	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Applicable Analysis II**

Module-outcomes:
This module complements and extends the material covered in TGWN881 (Applicable Analysis I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Advanced aspects of the solvability of finite dimensional integral-, differential- and operator equations; the contraction mapping principle; applications of the theory of integration, applications of complete spaces with Hilbertian and Normed structures; the Calculus of Variations.
Module uitkomste:
Hierdie module komplementeer en vul die materiaal van APPM881 (Toepasbare Analise I) aan. Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe: Oplosbaarheid van eindig-dimensionele integraal-, differensiaal- en operator vergelykings; die kontraksie afbeeldingsbeginsel; toepassings van die intehrasieteorie; toepassings van volledige ruimtes met Hilbert en en Norm strukture; Variasierekening

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: TGWN883	**Semester 1& 2**	**NQF-Level: 9**

Title: **Modelling I**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,

* the application of the theory
regarding selected aspects of one or more of the following topics:
The study of the various ways in which phenomena may be modelled by means of mathematics, namely linear vs nonlinear models, static vs dynamic models, explicit vs implicit models, discrete vs continuous models, deterministic vs stochastic models, deductive, inductive or floating models.

Module uitkomste:

Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe:
Die verskillende maniere waarop verskynsels met wiskunde modelleer kan word, naamlik lineêr vs nie-lineêre modelle, statiese vs dinamiese modelle, explisiete vs implisiete modelle, diskrete vs kontinue modelle, deterministiese vs stochastiese modelle, deduktiewe, induktiewe modelle.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: TGWN884	**Semester & 2**	**NQF-Level: 9**

Title: **Modelling 2**

Module-outcomes:
This module complements and extends the material covered in TGWN883 (Modelling I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of one or more of the following topics:

The study of the various ways in which phenomena may be modelled by means of mathematics, namely linear vs nonlinear models, static vs dynamic models, explicit vs implicit models, discrete vs continuous models, deterministic vs stochastic models, deductive, inductive or floating models.

Module uitkomste:

* *Hierdie module komplementeer en vul die module APPM883 (Modellering I) aan. Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in*
* *die dieper beginsels,*

** die metodes,*
** en die toepassings van die teorie*
rakende geselekteerde gevorderde aspekte van een of meer van die volgende onderwerpe:
Die verskillende maniere waarop verskynsels met wiskunde modelleer kan word, naamlik lineêr vs nie-lineêre modelle, statiese vs dinamiese modelle, explisiete vs implisiete modelle, diskrete vs kontinue modelle, deterministiese vs stochastiese modelle, deduktiewe, induktiewe modelle.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

School: Computer, Statistical and Mathematical Sciences	**Subject Group: Mathematics and Applied Mathematics**	
Module code: TGWN887	**Semester 1& 2**	**NQF-Level:9**

Title: **Principles and Paradigms:Applied Mathematics**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
of selected topics in Advanced Applied Mathematics not covered by the other Masters level module modules. Such topics shall be jointly determined by the supervisor of the affected student, and the chairperson of the subject group Applied Mathematics, and shall be directly related to the chosen research topic of the student.
Module uitkomste:
Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde onderwerpe in Gevorderde Toegepaste Wiskunde wat nie reeds deur ander Meestersmodules gedek word nie. Sodanige onderwerpe sal gesamentlik deur die studieleier van die betrokke student in konsultasie met die voorsitter van die vakgroep Toegepaste Wiskunde bepaal word, en sal direk verband hou met die gekose navorsingsonderwerp van die student.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISK872	Semester 1 & 2	NQF-Level: 9
Title: **Dissertation**		
Module-outcomes: The student is equipped to master and apply research methodologies and techniques, which implies that he or she acquires the necessary expertise to identify within his or her subject field a suitable research topic, acquire theoretical background knowledge, submit relevant solution theories, formulate and prove theorems if necessary, and furnish practical proof of the meaningfulness, implementability and accuracy of the new solution theory. Methods for committing the above process to paper in a scientific manner are acquired. The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in the dissertation. After the successful completion of the module the student will have mastered the mathematical way of thinking. He/she will be able to master learning matter and methods independently. He/she will be able to function efficiently and independently in doing research in his/her subject and/or to solve research problems of a standard magnitude. The student will therefore be able to act as a self-reliant scientist and take charge in dealing with not only standard problems and projects, but also problems and projects of an advanced nature.		
Method of delivering: Dissertation		
Assessment methods: Assessment methods: According to the faculty rules for the examination of dissertations. The dissertation will contribute 100/180 of the final mark for the M-programme.		
Module code: WISN881	**Semester 1 & 2**	**NQF-Level: 9**
Title: **Abstract Analysis I**		
Module-outcomes: Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in * the deeper principles, * the methods, * the application of the theory regarding selected aspects of the one or more of the following topics: Regular Borel- and Radon measures, Fourier and Harmonic analysis, Banach function spaces, Hilbert spaces, Operator theory, Locally Convex spaces, C*- and von Neumann algebras. Module uitkomste: Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in * die dieper beginsels, * die metodes * en die toepassings van die teorie van geselekteerde aspekte van een of meer van die volgende onderwerpe: Reguliere Borel- en Radon mate, Fourier en Harmoniese analise, Banach funksie ruimtes, Hilbert ruimtes, Operator teorie, Lokaal Konvekse ruimtes, C*- en von Neumann algebras		
Method of delivering: Full Time/Part Time (scheduled classes)		
Assessment methods: Formative assessment in the form of practical assignments / homework and/or		

projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN882	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Abstract Analysis II**

Module-outcomes:
This module complements and extends the material covered in WISN881 (Abstract Analysis I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics: Regular Borel- and Radon measures, Fourier and Harmonic analysis, Banach function spaces, Hilbert spaces, Operator theory, Locally Convex spaces, C*- and von Neumann algebras.

Module uitkomste:

Hierdie module komplementeer en brei die materiaal van die module MTHS881 (Abstrakte Analise I) uit. Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis, en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe: Reguliere Borel- en Radon mate, Fourier en Harmoniese analise, Banach funksie ruimtes, Hilbert ruimtes, Operator teorie, Lokaal Konvekse ruimtes, C*- en von Neumann algebras.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN883	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Algebra I**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:
- Structures described by one or two binary operations on one set (for example

groups, rings and lattices), and/or

- Structures described by one or two binary operations on a set, together with an action of a second set on the first (for example vector spaces, modules, algebras and co-algebras).

- The interface of algebraic structures with non-algebraic structures (Lie groups, ordered rings, ordered groups, ordered fields, etc.).

- The interface of algebraic structures with other study fields, including, but not limited to algebraic topology, algebraic homology, algebraic graph theory or matrix theory.

Module uitkomste:
Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe:

- Strukture wat beskryf word deur een or twee binêre operasies op 'n versameling (byvoorbeeld groepe, ringe en tralies), en/of
- Strukture wat beskryf word deur een of twee binêre operasies op 'n versameling, tesame met 'n aksie van 'n tweede versameling op die eerste (byvoorbeeld vektorruimtes, modules, algebras, en ko-algebras).
- Die raakpunt van algebraïese strukture met nie-algebraïese strukture (Lie groepe, geordende ringe, geordende groepe, geordende liggame, ens.).
- Die raakpunt van algebraïese strukture met ander studievelde, insluitend, maar nie beperk tot algebraïese topologie, algebraïese homologie, algebraïese grafiekteorie of matriksteorie.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN884	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Algebra II**

Module-outcomes:
This module complements and extends the material covered in WISN883 (Algebra I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

• structures described by one or two binary operations on one set (for example groups, rings and lattices), and/or
• Structures described by one or two binary operations on a set, together with an action of a second set on the first (for example vector spaces, modules, algebras and co-algebras).
• The interface of algebraic structures with non-algebraic structures (Lie groups, ordered rings, ordered groups, ordered fields, etc.).
• The interface of algebraic structures with other study fields, including, but not limited to algebraic topology, algebraic homology, algebraic graph theory or matrix theory

Module uitkomste:
Hierdie module komplementeer en brei die materiaal van die module MTHS883 (Algebra I) uit. Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde aspekte van een of meer van die volgende onderwerpe:
• Strukture wat beskryf word deur een or twee binêre operasies op 'n versameling (byvoorbeeld groepe, ringe en tralies), en/of
• Strukture wat beskryf word deur een of twee binêre operasies op 'n versameling, tesame met 'n aksie van 'n tweede versameling op die eerste (byvoorbeeld vektorruimtes, modules, algebras, en ko-algebras).
• Die raakpunt van algebraïese strukture met nie-algebraïese strukture (Lie groepe, geordende ringe, geordende groepe, geordende liggame, ens.).
• Die raakpunt van algebraïese strukture met ander studievelde, insluitend, maar nie beperk tot algebraïese topologie, algebraïese homologie, algebraïese grafiekteorie of matriksteorie.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN885	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Discrete Structures 1**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected aspects of the one or more of the following topics:

Theoretical Computer Science, Logic and Set Theory, Combinatorics, Graph Theory, Discrete Probability, Number Theory, Geometry, Game Theory, Complexity Theory.

Module uitkomste:
Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in

- * die dieper beginsels,
- * die metodes,
- * en die toepassings van die teorie
- rakende geselekteerde aspekte van een of meer van die volgende onderwerpe:

Teoretiese Rekenaarwetenskap, Logika en Versamelingsleer, Kombinatorika, Grafiekteorie, Diskrete Waarksynlikheidsleer, Getalle Teorie, Meetkunde, Spelteorie, Kompleksiteitsteorie.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN886	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Discrete Structures 2**

Module-outcomes:
This module complements and extends the material covered in WISN885 (Discrete Structures I). Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in
* the deeper principles,
* the methods,
* the application of the theory
regarding selected advanced aspects of the one or more of the following topics:

Theoretical Computer Science, Logic and Set Theory, Combinatorics, Graph Theory, Discrete Probability, Number Theory, Geometry, Game Theory, Complexity Theory.

Module uitkomste:
Hierdie module komplementeer en vul die module MTHS885 (Diskrete Strukture I) aan. Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in
* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie
rakende geselekteerde gevorderde aspekte van een of meer van die volgende onderwerpe:
Teoretiese Rekenaarwetenskap, Logika en Versamelingsleer, Kombinatorika, Grafiekteorie, Diskrete Waarksynlikheidsleer, Getalle Teorie, Meetkunde, Spelteorie, Kompleksiteitsteorie.

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Formative assessment in the form of practical assignments / homework and/or projects that integrate the various outcomes of the module, and summative

assesment in the form of either a written examination or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

Module code: WISN887	**Semester 1 & 2**	**NQF-Level: 9**

Title: **Principles and Paradigms: Pure Mathematics**

Module-outcomes:
Building on prior knowledge, the student should upon completion of this module demonstrate a thorough and advanced knowledge of, and skill in

* the deeper principles,
* the methods,
* the application of the theory

regarding selected topics in Advanced Mathematics not covered by the other Masters level module modules. Such topics shall be jointly determined by the supervisor of the affected student, and the chairperson of the subject group Mathematics, and shall be directly related to the chosen research topic of the student.

Module uitkomste:
Deur voort te bou op vorige kennis, behoort die student na die afhandeling van die module 'n deeglike en gevorderde kennis en vaardigheid kan demonstreer in

* die dieper beginsels,
* die metodes,
* en die toepassings van die teorie

rakende geselekteerde onderwerpe in Gevorderde Wiskunde wat nie reeds deur ander Meestersmodules gedek word nie. Sodanige onderwerpe sal gesamentlik deur die studieleier van die betrokke student in konsultasie met die voorsitter van die vakgroep Wiskunde bepaal word, en sal direk verband hou met die gekose navorsingsonderwerp van die student

Method of delivering: Full Time/Part Time (scheduled classes)

Assessment methods:
Either a written examination of at least 3 hours or an in-depth essay about a selected topic wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

NAS.13.4 DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*

Module code: AECM971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: The learner in this programme will attain the following specific outcomes: The candidate will write a thesis of high technical quality (with reference to language usage, illustrations, tables, graphic representations, etc.) that will demonstrate: His/her command of an applied competency in an applicable quantitative and qualitative research methodology and in scientific penmanship; The ability to identify a relevant research problem in a natural science or agricultural science discipline by integrating the above-mentioned skills and by thoroughly investigating existent knowledge as reflected in appropriate scientific literature; The ability to carry out the desired research in view of solving the problem; The ability to evaluate the results scientifically in the context of the problem statement; The ability to communicate the results scientifically. The learner will demonstrate by means of a literature investigation that he/she has a thorough and in-depth knowledge of related scientific literature; has the ability to interpret and debate different viewpoints and theories on a scientific basis; has looked up a large enough quantity of recent and appropriate historic primary and secondary sources in the speciality area. The learner will provide proof by means of problem identification that he/she has a sound insight into the nature and aim of the research; has the ability to circumscribe the research topic properly at the level of a doctorate. Apart from the literature investigation the student will demonstrate that the research method is appropriate to the speciality area in view of handling the problem identified and that the research method has been selected in a reflexive and responsible manner. By scientific evaluation and communication of the results the student will demonstrate the following: scientific processing of the thesis, with reference to the handling of appropriate quantitative or qualitative research methods and/or techniques, such as modeling, mathematical techniques of proof, experiments, observations, systematisation, founding of scientific statements, etc., as may be relevant to the problem investigated; the ability to formulate clearly; the ability to present a logical structure; a critical attitude and personal insight; the ability to formulate scientifically justified recommendations.		
Method of delivering: Distance		
Assessment methods: Internal and external evaluation/examination of thesis		

Module code: BCHN971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: Upon completion of this module, the student should demonstrate: - critical and advanced knowledge of the relevant scientific literature and be able to plan and conduct advanced empirical scientific research, to such a level that he/she		

is considered an expert in the field of study

- depth of critical knowledge and high levels of theoretical understanding in a complex and specialised area within the field of Biochemistry and /or across specialised or applied areas and expand or redefine existing knowledge in the field of Biochemistry.

- intellectual independence and advanced research skills through the ability to apply sophisticated knowledge and research methodologies to the solution of complex, unfamiliar problems in the field of Biochemistry and the competence to integrate and apply theoretical knowledge and research findings within local and global contexts

- advanced problem solving skill through the ability to question existing knowledge boundaries and practices in the field of Biochemistry and existing knowledge. Deal with complexity, lacunae and contradictions in the knowledge base of the field of Biochemistry.

- accessing, processing and managing information skills through autonomous independent judgements about information and concepts at highly abstract levels and make evaluations on the basis of independently generated criteria.

- the ability to produce and communicate information: show mastery of the literature and state of research in a specific area by publishing novel findings in internationally relevant journals

- research leadership within a field or across disciplines to optimise all aspects of research processes within complex and unpredictable contexts.

- management of learning, accountability and ethical behaviour through demonstrate high levels of responsibility, self-reflexivity and adaptability, with respect to the ethical implications of research, the determination of socially relevant issues and research needs in South Africa, and the ability to relate these issues to international contexts.
Module uitkomste:
Omvang van kennis: in diepte begrip van kritiese kennis en hoë vlakke van teoretiese begrip in ‘n kompleks en gespesialiseerde area binne die gebied van Biochemie en/of oor gespesialiseerde of toegepaste areas en die uitbreiding of herdefinieering van bestaande kennis binne die gebied van Biochemie.
Kennis geletterdheid en metodes: intellektuele onafhanklikheid en gevorderde navorsingsvaardighede deur die vermoë om gesofistikeerde kennis en navorsingsmetodologieë tot die oplossing van kompleks, onbekende probleme binne die gebied Biochemie toe te pas en die bevoegdheid om teoretiese kennis en navorsingsbevindinge te integreer en toe te pas binne plaaslike en globale kontekste.
Probleemoplossing: Bevraagteken bestaande kennis grense en praktyke binne die gebied Biochemie en huidige kennis. Hanteer kompleksiteit, leemtes en teenstrydighede in die kennis basis binne die gebied Biochemie.
Toegang, verwerking en bestuur van inligting: outonome uitsprake oor inligting en konsepte teen hoogs abstrakte vlakke en moet evaluerings op die basis van onfhanklike gegenereerde kriteria kan maak.
Vervaardiging en kommunikasie van inligting: Toon meesterskap van die literatuur en stand van navorsing in ‘n spesifieke area deur die publikasie van nuwe bevindings in internasionale relevante tydskrifte.

Konteks en stelsels: navorsing leierskap binne 'n gebied of oor dissiplines om alle aspekte van die navorsingsprosesse te optimaliseer binne kompleks en onvoorspelbare kontekste.
Kontrole leer, aanspreeklikheid en etiek: Demonstreer hoë vlakke van verantwoordelikheid, self-refleksiwiteit en aanpasbaarheid, met betrekking tot etiese implikasies van navorsing, die bepaling van sosiaal relevante kwessies en navorsingsbehoeftes in Suid Afrika en die vermoë om hierdie kwessies aan internasionale kontekste te verbind.

Method of delivering: Full-time or part-time

Assessment methods:
Thesis examination: 100% of marking allocation

Module codeBIYM 971	Semester 1 & 2	NQF-Level: 9

Title : Dissertation

Module outcomes:
A doctoral candidate must demonstrate a depth of knowledge and high levels of theoretical understanding in a complex and specialised area of Biology. • Demonstrate intellectual independence and advanced research skills through the ability to apply sophisticated knowledge and research Biology. • Autonomously generate, synthesize and evaluate information and concepts at highly abstract levels and make sound evaluations on the basis of independently generated criteria. • Question existing knowledge boundaries and practices in Biology and create responses to problems that expand or redefine existing knowledge. • Show mastery of the literature and state of research in a specific area. • Demonstrate research leadership within a field or across disciplines, including the ability to plan, resource, manage and optimise all aspects of research processes engaged in, within complex and unpredictable contexts. • Demonstrate high levels of responsibility, self-reflexivity and adaptability, with respect to the ethical implications of research, the determination of socially relevant issues and research needs in South Africa, and the ability to relate these issues to international contexts. Critical cross-field outcomes: Critical cross-field outcomes for this qualification include but are not limited to the following competencies: • identifying and solving problems in which responses display that responsible decisions using critical and creative thinking have been made; • working in a disciplinary and/or inter-disciplinary manner as a member of a team, group, organisation or community in both the public and private sectors; • demonstrating an understanding of the interaction between systems from an ecological perspective by understanding social needs, problems and resource capacity within an international, national and local context; • demonstrating the effective utilisation of technology for strategies aimed at the development of the Natural Sciences as well as Science in general; • effectively managing and planning a learning programme that provides for a schedule of activities including reading scientific journals in the field, becoming a member of scholarly societies and professional bodies, attending seminars and conferences, doing research and rendering voluntary services to facilitate professional growth and development; • developing a comprehensive and systematic report on a research project in the format of a doctoral thesis, and the competence to write research articles suitable for publication in refereed journals and/or other scientific reports. • communicating effectively with people of all target groups, using visual, language and mathematical skills, in the modes of oral and/or written persuasion.

Method of delivering:		
Assessment methods: Dissertation (100%)		
Module code: BWIN971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: Students will have to demonstrate their ability to make a definite contribution towards the development of new knowledge and skills in Business Mathematics and Informatics by proving mastered knowledge of the theory and principles of the field; the integration of theory and practice in the field; critical analysis of existing knowledge in the field; the undertaking of research according to the accepted methodology in the field; the analysis and interpretation of research data and results; and the reporting of their research results in a scientifically acceptable format.		
Method of delivering:		
Assessment methods: The student shall submit a thesis on a suitable research topic.		
Module code: BWIR971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: Students will have to demonstrate their ability to make a definite contribution towards the development of new knowledge and skills in Risk Analysis by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically acceptable format.		
Method of delivering:		
Assessment methods: The student shall submit a thesis on a suitable research topic.		
Module code: CHEN971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: Upon completion of this module the student should make a determined contribution to the development of new knowledge and skills in a research field in Chemistry, and to be acquainted with the specific research methodology of this field(s), that include: • the identification and scientific formulation of a problem statement; • a thorough investigation of existing knowledge as reflected by the applicable literature; • a critical analysis of existing knowledge in the field; • the execution of applicable research to solve the problem; • the scientific evaluation of the results in context with the problem statement; • the scientific communication of the results in the form of a thesis. Module uitkomste: Na voltooiing van hierdie module behoort die student 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in 'n navorsingsveld in Chemie, en vertroud te wees met die besondere navorsingsmetodologie van hierdie veld(e),		

wat insluit:
• die identifisering en wetenskaplike formulering van 'n probleemstelling;
• 'n deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike wetenskaplike literatuur;
• 'n kritiese analise van bestaande kennis in die veld;
• die uitvoer van toepaslike navorsing ter oplossing van die probleem;
• die wetenskaplike evaluering van die resultate in die konteks van die probleemstelling;
• die wetenskaplike kommunikasie van die resultate in die vorm van 'n proefskrif.

Method of delivering: Full-time or part-time

Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: CHEM971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:

1. Demonstrate expertise and critical knowledge of a specialised area in Atmospheric Chemistry and/or across specialised or applied areas.
2. Demonstrate an ability to develop new methods, techniques or approaches in original, creative and innovative ways appropriate to specialised and complex contexts.
3. Demonstrate the ability to apply specialist knowledge and theory in critically reflexive, creative and novel ways to address complex and unfamiliar problems in a specialised field of Atmospheric Chemistry and/or across applied areas.
4. Demonstrate the ability to make independent judgements about managing incomplete or inconsistent information or data in an iterative process of analysis and synthesis.
5. Demonstrate the ability to produce and communicate the findings of their research in academically appropriate ways.
6. Demonstrate the ability to identify, address and manage emerging ethical issues and advance processes of ethical decision-making; take full responsibility for own work and operate independently.

Module uitkomste:

1. Kundigheid en kritiese kennis te demonstreer in 'n gespesialiseerde area in Atmosferiese Chemie en/of oor gespesialiseerde of toegepaste areas.
2. Die vermoë te demonstreer om nuwe metodes, tegnieke of benaderings te ontwikkel op oorspronklike, kreatiewe en innoverende wyses wat gepas is vir gespesialiseerde en komplekse kontekste.
3. Die vermoë te demonstreer om gespesialiseerde kennis en teorie toe te pas op refleksiewe, kreatiewe en nuwe maniere om komplekse en onbekende probleme op te los in 'n gespesialiseerde veld in Atmosferiese Chemie en/of oor toegepaste areas.
4. Die vermoë te demonstreer om onafhanklik te kan oordeel hoe onvolledige of teenstrydige inligting of data hanteer moet word deur 'n herhalende proses van analise en sintese.
5. Die vermoë te demonstreer om die bevindinge van sy/haar navorsing te kan genereer en op akademies-toepaslike wyses te kan kommunikeer.
6. Die vermoë demonstreer om ontluikende etiese kwessies te identifiseer, aan te spreek en te bestuur en om prosesse betrokke by etiese besluitneming te bevorder; volle verantwoordelikheid te neem vir eie werk en onafhanklike te kan

funksioneer.		
Method of delivering: Full-time or part-time		
Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.		
Module code: DRKN971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-uitkomste: 1. Conceptualise, plan, and execute new research initiatives, and to create and present new knowledge and questions, based on demonstrated, integrated, and contextualised knowledge of the relevant scientific literature and theory. 2. Contribute towards the scholarly debate concerning the theory, practice and possible implementation of the new knowledge generated. 3. Develop new methods and/or apply existing methods towards new research questions in original, creative and innovative ways to address the chosen research topic. 4. Apply and/or develop problem solving skills by using specialist knowledge and theory in critically reflexive, creative, and novel ways to address any practical, interpretive, and/or theoretical situations foreseen or that may arise during the study. 5. Apply all relevant ethical requirements as set out by the relevant ethical committees, procedures, and regulations 6. Collect, process, analyse, judge, and interpret new data, findings, information, and theory in the context of existing knowledge, discourse, and theory 7. Produce, communicate, and defend new data, findings, analyses, insights, and theoretical and practical discourse as presentable and publishable work 8. Be held accountable for scientific integrity. Module uitkomste: 1. Te kan konseptualiseer, beplanning te kan doen, en uitvoering te kan gee van nuwe navorsingsinisiatiewe, asook die generering en voordra van nuwe kennis en vrae, gegrond op bewese, geïntegreerde, en gekontekstualiseerde kennis van die spesifieke navorsingsveld. 2. Bydraes te kan lewer tot die vakkundige debat betreffende die teorie, praktyk, en moontlike toepassing van die nuwe kennis en vrae. 3. Nuwe metodes te kan ontwikkel, en/of bestaande metodes oorspronklike, kreatief en innoverend toe te kan pas op die navorsingsvraagstuk(ke) binne die gekose studieveld. 4. Deur toepassing van spesialiskennis en -teorie, probleemoplossingsvaardighede te gebruik in 'n oorspronklike, kritiese, en innoverende manier ter aanspreking van die navorsingsvraagstuk(ke). 5. Die toepaslike etiese vereistes na te kom soos voorgeskryf deur die toepaslike etiese komitees, prosedures, en regulasies. 6. Nuwe data, bevindings, inligting, en teorie te versamel, formuleer, prosesseer, analiseer, beoordeel, en te interpreteer binne die kader van bestaande kennis, diskoers, en teorie. 7. Nuwe data, bevindings, analises, insigte, as teoretiese en/of praktiese diskoers as publiseerbare en werk wat voorgedra kan word aan portuurgehore, te produseer, kommunikeer, en te verdedig. 8. Vir wetenskaplike integriteit aanspreeklik gehou te kan word.		
Method of delivering: Full-time or part-time		
Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.		

Module code: DRRS971	Semester 1 & 2	NQF-Level: 10
Title: **Thesis**		
Module-uitkomste: Module-outcomes: 1. Demonstrate advanced and integrated knowledge with regard to disaster risk studies to specifically enable engagement with and critique of multidisciplinary research practices and the ability to evaluate current processes of knowledge production in disaster risk studies and then to select appropriate processes of enquiry into disaster risk in various sectors. 2. Demonstrate the ability to use a wide range of specialised skills in identifying, conceptualising, designing and implementing methods of enquiry to address complex and challenging problems within disaster risk studies and the ability to make autonomous ethical decisions which affect knowledge production, or complex organisational or professional issues, an ability to critically contribute to the development of ethical standards specifically in disaster risk studies. 3. Demonstrate the ability to use the resources of academic/ professional/or occupational discourses to communicate and defend substantial ideas that are the products of research or development in disaster risk studies; and use a range of advanced and specialised skills and discourses appropriate to disaster risk studies, to communicate to a multidisciplinary environment with different levels of knowledge or expertise. 4. Demonstrate the ability to make strategic interventions at an appropriate level within a system, based on an understanding of hierarchical relations within the system, and the ability to address the intended and unintended consequences of interventions. 5. Demonstrate an ability to operate independently and take full responsibility for own work, and, where appropriate, to account for leading and initiating processes and implementing systems, ensuring good resource management and governance practices.		
Method of delivering: Full-time or part-time		
Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.		
Module code: FSKN971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: On completion of the module, students should be able to demonstrate: i) Depth of critical knowledge and high levels of theoretical understanding in a complex and specialized area within the field of Physics and or across specialized applied areas and expand or redefine existing knowledge in the fields within the curriculum topic. There is only one curriculum and a topic for a thesis may be selected from one of the focus research areas which are thermal energy, material characterization, electronic instrumentation, stellar astrophysics, radio astronomy, TeV-gamma ray astronomy, cosmic ray physics, heliospheric physics and other relevant emerging research entities. ii) Ability to make a specific contribution to the development of new knowledge and skills in the field of specialization by providing proof that they have mastered knowledge of the theory and principles in the field; they are capable of integrating theory and practice in the field; of critical analysis of existing methodologies in the		

field; of analysis and interpretation of research data and results; of reporting research results in a scientifically acceptable format; of relating science to international standard.

iii) The ability to make autonomous, independent judgements about information and concepts at highly abstract levels and make evaluations on the basis of independently generated criteria; show mastery of the literature and state of research in the selected topic in the field of physics.

Module uitkomste:

Na voltooing van die module sal die student in staat wees om te demonstreer:

i)Diepte van kritiese kennis en 'n hoë vlak van teoretiese begrip in 'n komplekse en gespesialiseerde toegepase gebied binne die veld van Fisika. Bestaande kennis uit te brei of te herdefinieer binne die kurrikulum onderwerp.Daar is net een kurrikulum en 'n onderwerp vir 'n proefskrif kan uit een van die navorsings areas gekies word wat insluit : Hitte-energie, Materiaal karakterisering, Elektroniese toerusting, Astrofisika, Radio-astronomie, TEV-gammastraalastronomie, Fisika van Kosmiese Strale, Heliosferiese Fisika en ander relevante onderwerpe van toekomstige navorsingsentiteite.

ii) Die vermoë om 'n spesifieke bydrae tot die ontwikkeling van nuwe kennis en vaardighede in die veld van spesialisasie te maak deur te bewys dat hulle die nodige teoretiese kennis en beginsels in die veld onder die knie het; die integrering van teorie en praktyk in die veld; kritiese analise van bestaande kennis in die veld; die uitvoering van navorsing volgens die aanvaarde metodologie in die veld; die ontleding en interpretasie van navorsingsdata en resultate; die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.

iii) Die vermoë om onafhanklike besluite oor inligting asook konsepte te maak op hoë abstrakte vlakke en evaluerings te maak op grond van onafhanklike en eie kriteria; die bemeestering van die literatuur en stand van navorsing in die gekose onderwerp in Fisika.

Method of delivering:Full-time or part-time

Assessment methods:

Assessment mark received after examination of the thesis : 100% of final module mark

Module code: GGFN971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:

1. Depth of critical knowledge and high levels of theoretical understanding in a complex and specialised area within the field of Geography and Environmental Management and /or across specialised or applied areas and expand or redefine existing knowledge in the field of Geography and Environmental Management.
2. Intellectual independence and advanced research skills through the ability to apply sophisticated knowledge and research methodologies to the solution of complex, unfamiliar problems in the field of Geography and Environmental Management and the competence to integrate and apply theoretical knowledge and research findings within local and global contexts.
3. The ability to question existing knowledge boundaries and practices in the field of Geography and Environmental Management; and to deal with complexity, and

contradictions in the knowledge base of the field of Geography and Environmental Management.
4. The ability to make autonomous, independent judgements about information and concepts at highly abstract levels and make evaluations on the basis of independently generated criteria. Show mastery of the literature and state of research in Geography and Environmental Management, with specific reference to their chosen are of specialisation; and to defend and communicate the findings of their own research.
5. Research leadership within the field of Geography and Environmental Management or across disciplines to optimise all aspects of research processes within complex and unpredictable contexts.
6. High levels of responsibility, self-reflexivity and adaptability, with respect to the ethical implications of research, the determination of socially relevant l issues and research needs in South Africa, and the ability to relate these issues to international contexts.
Modules uitkomste:
1. Diepgang van kritiese kennis en hoë vlakke van teoretiese begrip in ? kompleske en gespesialiseerde terrein binne Geografie en Omgewingsbestuur en/of oor gespesialiseerde of toegaste terreine en brei uit of herdefinieër bestaande kennis in Geografie en Omgewingsbestuur .
2. Intellektuele onafhanklikheid en gevorderde navorsingsvaardighede deur die vermoë om gesofistikeerde kennis en navorsingsmetodes toe te pas ten einde komplekse, onbekende probleme in Geografie en Omgewingsbestuur op te los, en die bevoegdheid om teoretiese kennis en navorsing binne plaaslike en globale kontekste te integreer en toe te pas.
3. Die vermoë om bestaande kennisgrense en -praktyke te bevraagteken, en met kompleksiteit en teenstrydighede in die kennisveld van Geografie en Omgewingsbestuur om te gaan.
4. Die vermoë om outonome, selfstandige besluite te neem oor inligting en konsepte op hoogs abstrakte vlak en evaluasies uit te voer aan die hand van kriteria wat onafhanklik verwek is. Beheersing van literatuur en stand van navorsing in Geografie en Omgewingsbestuur, met besondere verwysing na die gekose spesialiteitsterrein. Die vermoë om bevindings van eie navorsing te verdedig en te kommunikeer.
5. Navorsingsleierskap in Geografie en Omgewingsbestuur en oor dissiplinêre grense heen om alle aspekte van navorsingsprosesse in komplekse en onvoorspelbare kontekste te optimaliseer.
6. Hoë vlakke van verantwoordelikheid, selfondersoek en aanpasbaarheid t.o.v. die etiese implikasies van navorsing, bepaling van aangeleenthede en navorsingsbehoeftes wat sosiaal relevant is in Suid-Afrika, en die vermoë om hierdie aangeleenthede met die internasionale konteks te skakel.

Metode van aflewering: Full-time or part-time

Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners

Module code: HDGH971	Semester 1 & 2	NQF-Level: 10

Title: **Thesis**

Module-outcomes:

1. To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of hydrology and geohydrology
2. To develop new methods/techniques/processes/systems in original, creative and innovative ways appropriate to the complex context of hydrology and geohydrology
3. The ability to select appropriate research methodologies and plan an appropriate research design in order to execute a complex research project with a view to obtaining novel solutions to challenging and relevant research problems in the field of hydrology and geohydrology
4. The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers
5. The ability to produce substantial publishable work that meets international standards because it is considered to be new/innovative
6. The ability to make autonomous ethical decisions during the process of knowledge production, thereby making a critical contribution to the development of ethical standards in the context of research within the field of hydrology and geohydrology.

Modules uitkomste:

1. Gevorderde spesialis kennis te gebruik, om met huidige navorsing of praktyke in die studieveld van hidrologie en geohidrologieskakeling te skakel en krities te evalueer.
2. Metodes, tegnieke, prosesse of stelsels the ontwikkel deur gebruik te maak van oorspronklike, kreatiewe en innoverende metodes wat toepaslik is in die konteks van hidrologie en geohidrologie.
3. Toepaslike navorsingsmetodes te identifiseer met die beplanning van 'n gepaste navorsingsontwerp ten einde 'n komplekse navorsingsprojek uit te voer met die oog op die verkryging van nuwe oplossings vir uitdagende en relevante navorsing probleme in die studieveld van hidrologie en geohidrologie.
4. Navorsingsresultate korrek te interpreteer en om sulke resultate effektief the kommunikeer in die vorm van wetenskaplike artikels.
5. Om nuwe en innoverende navorsing te publiseer wat aan internasionale standaarde voldoen.
6. Etiese besluite te neem tydens die proses van kennisproduksie, waardeur 'n kritieke bydrae gelewer word tot die ontwikkeling van etiese standaarde binne die veld van Hidrologie en Geohidrologie in die konteks van navorsing.

Method of delivering: Full-time or part-time

Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: HIKS 971	Semester 1 & 2	NQF-Level: 10

Title:Thesis

Module outcomes:

The student should be able to:
-Demonstrate a detailed knowledge of the research process;
-Make analysis of literature on a chosen topic in IKS;
-To make a sysnthesis of literature culminating in a research proposal;

-To make a sysnthesis of literature culminating in a presentation of an oral seminar;
-To make analysis and interpretation of research data on a chosen tipic in IKS using appropriate techniques and software;
-To make a synthesis of literature and analysed data culmitating into a thesis;
-To make a synthesis of literature and analysed datata culmitating into a manuscript for publication;

Method of delivery;

Assessment methods:

Module code:IKSM971	**Semester 1 & 2**	**NQF-Level: 10**

Title: Doctor of Philosophy in Indigenous Knowledge Systems

Module outcomes: Students will demonstrate their ability to
1) make a contribution towards the development of new knowledge and skills in Indigenous Knowledge Systems by proving mastered knowledge of the theory and principles of the field,
2) demonstrating the ability to integrate theory and principles of IKS;
3) A critical analysis of existing knowledge in the field;
4) Undertaking of research according to the accepted methodology in the field of IKS;
5) Ability to analyse and interpretef research data and results in IKS,;and
6) Production of a report of the research results in an acceptable format.

Method of delivery: Research

Assessment methods: The student shall submit a thesis on a suitable research topic.

Module code: ITRW971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:
Students will demonstrate their ability to make a definite contribution towards the development of new knowledge and skills in Computer Science and Information Systems by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically acceptable format.
Module uitkomste:
Studente sal hul vermoë demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in Rekenaarwetenskap en Inligtingstelsels deur bewys te lewer van beheersde kennis van die teorie en beginsels van die navorsingsgebied, die integrasie van teorie en praktyk in die navorsingsgebied, kritiese analise van bestaande kennis in die navorsingsgebied, die uitvoering van navorsing volgens die aanvaarde metodologie in die navorsingsgebied, die ontleding en interpretasie van navorsingsdata en resultate, die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.

Method of delivering: : Full-time/part-time

Assessment methods:
The student shall submit a thesis on a suitable research topic.
Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in.

Module code: MKBN971	Semester 1 & 2	NQF-Level: 10
Title: **Thesis**		
Module-outcomes: 1. Demonstrate expertise and critical knowledge of a specialised area in Microbiology and/or across specialised or applied areas. 2. Demonstrate an ability to develop new methods, techniques or approaches in original, creative and innovative ways appropriate to specialised and complex contexts. 3. Demonstrate the ability to apply specialist knowledge and theory in critically reflexive, creative and novel ways to address complex and unfamiliar problems in a specialised field of Microbiology and/or across applied areas. 4. Demonstrate the ability to make independent judgements about managing incomplete or inconsistent information or data in an iterative process of analysis and synthesis. 5. Demonstrate the ability to produce and communicate the findings of their research in academically appropriate ways. 6. Demonstrate the ability to identify, address and manage emerging ethical issues and advance processes of ethical decision-making; take full responsibility for own work and operate independently. Modules uitkomste: 1. Kundigheid en kritiese kennis te demonstreer in 'n gespesialiseerde area in Mikrobiologie en/of oor gespesialiseerde of toegepaste areas. 2. Die vermoë te demonstreer om nuwe metodes, tegnieke of benaderings te ontwikkel op oorspronklike, kreatiewe en innoverende wyses wat gepas is vir gespesialiseerde en komplekse kontekste. 3. Die vermoë te demonstreer om gespesialiseerde kennis en teorie toe te pas op refleksiewe, kreatiewe en nuwe maniere om komplekse en onbekende probleme op te los in 'n gespesialiseerde veld in Mikrobiologie en/of oor toegepaste areas. 4. Die vermoë te demonstreer om onafhanklik te kan oordeel hoe onvolledige of teenstrydige inligting of data hanteer moet word deur 'n herhalende proses van analise en sintese. 5. Die vermoë te demonstreer om die bevindinge van sy/haar navorsing te kan genereer en op akademies-toepaslike wyses te kan kommunikeer. 6. Die vermoë demonstreer om ontluikende etiese kwessies te identifiseer, aan te spreek en te bestuur en om prosesse betrokke by etiese besluitneming te bevorder; volle verantwoordelikheid te neem vir eie werk en onafhanklike te kan funksioneer.		
Method of delivering: Full-time/part-time		
Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.		
Module code: NWON971	**Semester 1 & 2**	**NQF-Level: 10**
Title: **Thesis**		
Module-outcomes: Students will have to demonstrate the ability to make a definite contribution towards the development of new knowledge and skills in Natural Science Education by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically and ethically acceptable format.		

Module uitkomste:
Studente sal hul vermoë demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in Natuurwetenskaponderwys deur bewys te lewer van beheersde kennis van die teorie en beginsels van die navorsingsgebied, die integrering van teorie en praktyk in die navorsingsgebied, kritiese analise van bestaande kennis in die navorsingsgebied, die uitvoering van navorsing volgens die aanvaarde metodologie in die navorsingsgebied, die ontleding en interpretasie van navorsingsdata en resultate, die rapportering van hul navorsingsresultate in 'n wetenskaplik en etiese aanvaarde formaat.

Method of delivering: Full-time or part-time

Assessment methods: The student shall submit a thesis on a suitable research topic.
Assesserings methode: ie student dien 'n proefskrif in oor 'n geskikte navorsingsonderwerp

Module code: OMWN971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:
1. Demonstrate expertise and critical knowledge in an area at the forefront of environmental sciences and to contribute to scholarly debates around theories and processes of knowledge production in environmental sciences.
2. Demonstrate an ability to develop new methods/techniques/processes/systems to specialised and complex areas of environmental science.
3. Demonstrate an ability to apply specialist knowledge and theory to address complex problems in environmental science.
4. Demonstrate an ability to make independent judgements about managing incomplete/inconsistent information/data in the field of environmental science in an iterative process of analysis and synthesis.
5. Demonstrate an ability to produce substantial, independent, in-depth and publishable work in environmental science.
6. Demonstrate an understanding of theoretical underpinnings in the management of complex environmental scientific systems.
7. Demonstrate an ability to identify, and address emerging ethical issues, to advance processes of ethical decision-making, and to operate independently and responsibly within the context of research in environmental science.

Module uitkomste:
1. Kundigheid en kritiese kennis in 'n area aan die voorpunt van omgewingswetenskappe te demonstreer en om 'n bydra te lewer tot vakkundige debatte rakende teorieë en prosesses waardeur kennis gegenereer kan word in omgewingswetenskappe.
2. Nuwe metodes/tegnieke/prosesse/stelsels te ontwikkel vir gespesialiseerde en komplekse areas van omgewingswetenskappe.
3. Gespesialiseerde kennis en teorie toe te pas om komplekse probleme in omgewingswetenskappe aan te spreek.
4. Onafhanklike beoordelings te maak rakende onvolledige/teenstrydige inligting/data in die veld van omgewingswetenskappe deur van herhalende analise en sintese gebruik te maak.
5. Beduidende, selfstandige, in-diepte en publiseerbare werk in die veld van omgewingswetenskappe te produseer.
6. Diepgaande onderbou in die bestuur van kompekse omgewingswetenskaplike stelsels te demonstreer.

7. Ontluikende etiese kwessies te identifiseer en aan te spreek, prosesse rakende etiese besluitneming te bevorder, en om selfstandig en vertantwoorbaar binne die konteks van omgewingswetenskapper op te tree.

Method of delivering: Full-time or part-time

Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: ONAV971	**Semester 1 & 2**	**NQF-Level: 10**

Title:Thesis / Skrpsie

Module outcomes:
Students will have to demonstrate their ability to make a specific contribution to the development of new knowledge and skills in the field of specialization by providing proof they have mastered knowledge of the theory and principles in the field; they are capable of integrating theory and practice in the field; of critical analysis of existing methodologies in the field; of analysis and interpretation of research data and results; of reporting research results in a scientifically acceptable format.
Module uitkomste:
Studente sal hul vermoë moet demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in die veld van spesialisasie deur bewys te lewer van beheersde kennis van die teorie en beginsels van die veld; die integrering van teorie en praktyk in die veld; kritiese analise van bestaande kennis in die veld; die uitvoering van navorsing volgens die aanvaarde metodologie in die veld; die ontleding en interpretasie van navorsingsdata en resultate; die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.

Method of delivering: Full-time or part-time

Assessment methods: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

Module code: PLKN971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:
1. Display expertise and broad knowledge of the botanical field of specialisation (ecology, molecular biology, physiology or taxonomy) in terrestrial or aquatic environments to formulate conduct fundamental research of significance in the primary area of study.
2. Exhibit a critical and advanced understanding of the theoretical underpinnings of research in the field of specialisation to identify, demarcate and critically analyse complex research problems, and to conceptualise and formulate appropriate research questions.
3. Initiate, develop and implement appropriate procedures to collect, process, analyse and manage data to independently address the goals of the study through the application of creative skills (techniques, processes or technologies) and suitable analytical methods to test a research hypothesis.
4. Adopt appropriate, responsible and approved processes of ethical decision-making for knowledge production in the field of specialisation and to monitor and evaluate the consequences of these decisions where appropriate.
5. Produce substantial, in-depth and publishable research that meets international standards, which is considered to be new or innovative by peers, and makes a significant contribution to the discipline and field of specialisation.

6. Demonstrate intellectual independence, research leadership and management of research development in the field of specialisation, and to initiate communication strategies to defend and promote the value of the research.

Module uitkomste:

1. Kundigheid en wye kennis te vertoon van die plantkundige spesialiseringsrigting (ekologie, molekulêre biologie, fisiologie of taksonomie) in terrestriële of akwatiese omgewings, om sodoende fundamentele navorsing te doen wat betekenisvol is in die primêre studiegebied.
2. 'n Kritiese en gevorderde begrip te toon van die teoretiese onderbou van navorsing in die spesialiseringsrigting, om sodoende komplekse navorsingsprobleme te identifiseer, af te baken en krities te analiseer, en om toepaslike navorsingsvrae te konseptualiseer en te formuleer.
3. Toepaslike prosedures te inisieer, ontwikkel en implementeer om data in te samel, te verwerk, te analiseer en te bestuur.
4. Onafhanklik die doelstellings van die studie aan te spreek deur die aanwending van kreatiewe vaardighede (metodes, tegnieke, prosesse of tegnologie) en geskikte analitiese metodes om 'n navorsingshipotese te toets.
5. Toepaslike, verantwoordelike en goedgekeurde prosesse van etiese besluitneming te bewerkstellig vir kennisproduksie binne die spesialiseringsrigting en om die gevolge van hierdie besluite, waar van toepassing, te moniteer en te evalueer.
6. Voldoende, in-diepte en publiseerbare navorsing te lewer wat aan internasionale standaarde voldoen, wat deur eweknieë beskou sal word as nuut of innoverend en wat 'n betekenisvolle bydrae tot die dissipline en spesialiseringsrigting sal maak.
7. Intellektuele onafhanklikheid, navorsingsleierskap en bestuur van navorsingsontwikkeling te demonstreer in die spesialiseringsrigting, en kommunikasiestrategieë inisieer wat die waarde van die navorsing kan verdedig en bevorder.

Method of delivering: Full-time or part-time

Assessment methods: The achievement of module outcomes will be tested in the following way: Research thesis will be examined by a minimum of three examiners, of which only one can be an internal examiner and at least two should be external examiners (including one international external examiner).

Module code: SBEL971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:

a) Illustrate an original contribution to knowledge creation within the field of Urban and Regional Planning, by applying advanced subject-specific and integrated planning knowledge and skills in addressing planning issues and in identifying, analysing and solving relevant problems.

b) Illustrate expertise and insight into the nature and objectives of the study, as well as the theoretical and scientific principles that form the basis of the study, in order to conceptualise new research initiatives, and create new knowledge.

c) Illustrate the ability to contribute to scholarly debates around theories and knowledge production within the field of Urban and Regional Planning

d) Illustrate the ability to develop new techniques and analytical methods appropriate to complex planning problems, and the ability to retrieve new knowledge appropriate to specialised and complex Urban and Regional Planning contexts.

e) Illustrate thorough, logical and coherent assessment of the significance of the

research findings, including the ability to produce significant insights, apply specialist knowledge and skills acquired in these studies, meaningfully.
f) Illustrate critical and independent thought, demonstrating insight into the challenges and multi-dimensional considerations within the field of Urban and Regional Planning, which makes a significant, publishable contribution to the Urban and Regional Planning discipline.
Module uitkomste:
a) Illustreer 'n oorspronklike bydrae tot kennis ontwikkeling in die vakgebied Stads-en-Streekbeplanning, deur gevorderde vakspesifieke en geïntegreerde beplanningskennis en -vaardighede toe te pas om beplanningsvraagstukke aan te pak en relevante probleme te identifiseer, analiseer en op te los.
b) Illustreer kundigheid en insig met betrekking tot die aard en doelstellings van die studie, asook die teoretiese en wetenskaplike beginsels wat die studie onderbou, ten einde nuwe navorsingsinisiatiewe te konseptualiseer en nuwe kennis te genereer of praktyke te vestig
c) Illustreer die vermoë om 'n bydrae te lewer tot vakkundige debat rakende teorieë en prosesse waardeur kennis gegenereer word binne Stads-en-Streekbeplanning
d) Illustreer die vermoë om nuwe tegnieke en analitiese metodes te ontwikkel wat toepaslik is vir komplekse beplanningsprobleme, en die vermoë om nuwe kennis te ontsluit toepaslik vir gespesialiseerde en komplekse Stads-en-Streekbeplanningkontekste
e) Illustreer deeglike, logiese en samehangende beoordeling van die betekenisvolheid van die navorsingsbevindings, insluitend die vermoë om gespesialiseerde kennis en vaardighede opgedoen in hierdie studie sinvol toe te pas en betekenisvolle insigte te genereer.
f) Illustreer kritiese en onafhanklike denke wat van insig getuig in die uitdagings en unieke, multi-dimensionele oorwegings binne die veld van Stads-en-Streekbeplanning, wat publiseerbaar is en 'n betekenisvolle bydrae lewer tot die Stads-en-Streekbeplanning dissipline.

Method of delivering: Full-time or part-time

Assessment methods: Not applicable as this is a research module. Formative assessments are thus not relevant as the examination of the dissertation counts 100% towards the final module mark
Assesseringsmetode: Nie van toepassing omdat hierdie n navorsings module is.

Module code: STTK971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module-outcomes:
Students will have to demonstrate the ability to make a definite contribution towards the development of new knowledge and skills in Statistics by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically and ethically acceptable format.
Module uitkomste:
Studente sal hul vermoë demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in Statistiek deur bewys te lewer van

beheersde kennis van die teorie en beginsels van die navorsingsgebied, die integrering van teorie en praktyk in die navorsingsgebied, kritiese analise van bestaande kennis in die navorsingsgebied, die uitvoering van navorsing volgens die aanvaarde metodologie in die navorsingsgebied, die ontleding en interpretasie van navorsingsdata en resultate, die rapportering van hul navorsingsresultate in 'n wetenskaplik en etiese aanvaarde formaat.

Method of delivering: Not applicable – research project
Metode van aflewering: Nie van toepassing – navorsingsprojek

Assessment methods: The student shall submit a thesis on a suitable research topic.
Assesserings method: Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in

Module code: TGWS971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module outcomes: Students will demonstrate their ability to make a definite contribution towards the development of new knowledge and skills in Applied Mathematics by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field; the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically acceptable format.
Module uitkomste:
Studente sal hul vermoë demonstreer om 'n bepaalde bydrae te maak tot die ontwikkeling van nuwe kennis en vaardighede in Toegepaste Wiskunde deur bewys te lewer van beheersde kennis van die teorie en beginsels van die navorsingsgebied, die integrasie van teorie en praktyk in die navorsingsgebied, kritiese analise van bestaande kennis in die navorsingsgebied, die uitvoering van navorsing volgens die aanvaarde metodologie in die navorsingsgebied, die ontleding en interpretasie van navorsingsdata en resultate, die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.

Method of delivering: Not applicable – research project
Metode van aflewering: Nie van toepassing – navorsingsprojek

Assessment methods: The student shall submit a thesis on a suitable research topic.
Assesserings method: Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in

Module code: WISK971	**Semester 1 & 2**	**NQF-Level: 10**

Title: **Thesis**

Module Outcomes: Students will demonstrate their ability to make a definite contribution towards the development of new knowledge and skills in Mathematics by proving mastered knowledge of the theory and principles of the field, the integration of theory and practice in the field, critical analysis of existing knowledge in the field, the undertaking of research according to the accepted methodology in the field, the analysis and interpretation of research data and results, and the reporting of their research results in a scientifically acceptable format.
Module uitkomste:
Studente sal hul vermoë demonstreer om 'n bepaalde bydrae te maak tot die

ontwikkeling van nuwe kennis en vaardighede in Wiskunde deur bewys te lewer van beheersde kennis van die teorie en beginsels van die navorsingsgebied, die integrasie van teorie en praktyk in die navorsingsgebied, kritiese analise van bestaande kennis in die navorsingsgebied, die uitvoering van navorsing volgens die aanvaarde metodologie in die navorsingsgebied, die ontleding en interpretasie van navorsingsdata en resultate, die rapportering van hul navorsingsresultate in 'n wetenskaplik aanvaarde formaat.
Method of delivering: Not applicable – research project Metode van aflewering: Nie van toepassing – navorsingsprojek.
Assessment methods: The student shall submit a thesis on a suitable research topic. Assesserings method: Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in