NWU®

Fakulteit
**Natuur-en Landbouwetenskappe**

Faculty of
**Natural and Agricultural Sciences**

Postgraduate
*Nagraads*

# 2021 Yearbook *Jaarboek*

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**Focus Area: Human Metabolomics / *Fokusarea vir Menslike Metabolomika***
Potchefstroom: Prof DT (Du Toit) Loots, BSc (NWU - Biochemistry and Microbiology), BSc Hons (NWU - Biochemistry), MSc (NWU - Biochemistry), PhD (NWU - Biochemistry)

**Focus Area for Material Science Innovation and Modelling / *Fokusarea vir Materiaalwetenskap Innovasie en Modellering***
Vacant / *Vakant*

**Focus Area for Pure and Applied Analytics / *Fokusarea vir Suiwer- en Toegepaste Analitika***
Potchefstroom: Acting Director / *Waarnemende Direkteur*: Prof LE (Louis) Labuschagne, BSc (UPE), BA (Global Univ), BSc Hons (UPE), and MSc (UCT) PhD (University of Cape Town)

**Niche area for Food Security and Safety / *Nisarea vir Sekuriteit en Voedselveiligheid***
Mahikeng: Prof OO (Olubukola) Babalola, BSc Hons (Ogun), MSc (Univ of Ibadan), PhD (Univ of Ibadan), PGD Middle Management (NWU), MBA (NWU)

**School of Research and Postgraduate Studies/ *Skool vir Navorsing en Nagraadse Studie***
Mahikeng: Prof DA (David) Isabirye – BSc Hons (Makerere), PhD (Hong Kong)

**Unit for Business Mathematics and Informatics / *Eenheid vir Bedryfswiskunde en Informatika***
Potchefstroom: Prof HM (Magda) 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 CC (Carlos) Bezuidenhout, BSc Biology, BSc Hons (cum laude), MSc (cum laude), PhD (UOFS)

- **Africa Centre for Disaster Studies / *Afrika Sentrum vir Rampstudies***
    - Potchefstroom: **Head/*Hoof*:** Prof D (Dewald) van Niekerk, BA (RAU), Hons BA (RAU), MPM (UNISA), PhD (NWU).

**Centre for Applied Radiation Science and Technology / *Sentrum vir Toegepaste Stralingswetenskap en –tegnologie***
Mahikeng: Prof V (Victor) Tshivhase, BSc Hons Physics (UCT), MSc Physics (UCT), MBA (NWU), PhD Physics (UCT)

**Centre for Business Mathematics and Informatics / *Sentrum vir Bedryfswiskunde en Informatika***
Potchefstroom: Prof PJ (Riaan) de Jongh, BCom (US), MSc (UNISA), PhD (UCT)

**Centre for Human Metabolomics / *Sentrum vir Menslike Metabolomika***
Potchefstroom: Prof BC (Chris) Vorster, MMed (Chem Paths) (UP), FCPath (SA) College of Medicine, MBA (UP)

**Centre for Indigenous Knowledge Systems / *Sentrum vir Inheemse Kennissisteme***
Mahikeng: Acting Director: Dr M Koitsiwe, BA Soc Sc (UNW); MA IKS (UNW); PhD IKS (NWU)

**Centre for Space Research (Centre of Excellence) / *Sentrum vir Ruimtenavorsing (Sentrum van Uitnemendheid)***
Potchefstroom: Prof C (Christo) Venter, BSc, MSc, PhD (PU for CHE / NWU)

**Centre for Water Science and Management / *Sentrum vir Waterwetenskappe en -bestuur***
Potchefstroom: Prof I (Ingrid) Dennis; BSc (Mathematics and Applied Mathematics) - UFS, BSc Hons (Geohydrology and Hydrology) - UFS, MSc (Geohydrology and Hydrology) UFS, PhD (Geohydrology) UFS.

**SUBJECT GROUP LEADERS/ *VAKGROEPLEIERS***

**Agricultural Economics and Extension / *Landbou-ekonomie en Voorligting***

Mahikeng: Prof SS (Simon) Letsoalo, BSc (Agric.Education) UN, B Inst Agric.Extension (Hons) UP, M Agric. Extension UL, M Education TUT, MBA Regenesys, PhD (Agricultural Extension) NWU

**Agronomy and Horticulture / *Agronomie en Tuinbou***

Mahikeng: Ms M (Mercy) Motaung, BSc Hons (NWU), MSc (NWU)

**Animal Health / *Dieregesondheid***

Mahikeng: Prof M (Mulunda) Mwanza, DVM (University of Lubumbashi) MSc, (UJ) PhD (UJ)

**Animal Science / *Dierewetenskap***
Mahikeng: Prof HK (Hilda) Kwena Mokoboki BSc Agric, BSc Agric (Hons), (University of the North), MSc Agric, PhD Agric (UL)

**Biochemistry / *Biochemie***
Mahikeng: Dr M (Matsobane) G Tlou, BSc, Hons BSc (UNIVEN), MSc, PhD (UFS)
Potchefstroom: Deputy/*Adjunk*: Dr (Rencia) van der Sluis, Hons BSc (UP), MSc (UP), PhD (NWU)

**Botany / *Plantkunde***

Potchefstroom: Prof S (Sandra) Barnard, BSc (UOFS), BSc Hons (UOFS), MSc Botany (UOFS), PhD Botany (UKZN Pietermaritzburg)
Mahikeng: Deputy/*Adjunk*: Dr M (Madeleen) Struwig, BSc, MEnvSci, PhD (NWU)

**Centre for Business Mathematics and Informatics: Professional Programmes / *Sentrum vir***

***Bedryfswiskunde en Informatika: Professionele Programme***

Ms J (Janette) Larney, BSc, MCom, FASSA, FIA, CERA

- Actuarial Science / *Aktuariële Wetenskap*
- Quantitative Risk Management / *Kwantitatiewe Risikobestuur*
- Financial Mathematics / *Finansiële Wiskunde*
- Business Analytics / *Besigheidsanalise*

Vanderbijlpark: Dr Isaac Takaidza, (responsible for BMI programmes/*verantwoordelik vir BWI-programme*) BSc Honours Mathematics (University of Zimbabwe), MSc Mathematics (University of Zimbabwe), Advanced Diploma in Higher Education (University of Free State), DTech (Cape Peninsula University of Technology), Postgraduate Diploma in Management (North West University)

**MSc in Business Mathematics and Informatics with specialisation in above fields / *MSc in Bedryfswiskunde en Informatika met spesialisering in bogenoemde velde***
Prof H (Helgaard) Raubenheimer, BSc, MSc, PhD (NWU)

**Chemistry / *Chemie***

Potchefstroom: Dr J (Justus) Röscher, PhD (NWU), HED (PU for CHE)
Mahikeng: Deputy / *Adjunk*: Dr Z (Zimbili) Mkhize, BSc, BSc Hon, MSc (University of Natal), PhD (UKZN)

**Computer Science and Information Systems / *Rekenaarwetenskap en Inligtingstelsels***

Potchefstroom: Prof L (Lynette) Drevin, BSc (PU for CHE), HED (PU for CHE), Hons BSc (PU for CHE), MSc (PU for CHE), DTE (PU for CHE), PhD (Middlesex University, London, UK)

Mahikeng: Deputy / *Adjunk*: Dr F (Francis) Lugayizi, BSc Hons (NWU), MSc (NWU), PhD (NWU)

Vanderbijlpark: Deputy / *Adjunk*: Dr Suné van der Linde, BSc Hons, MSc, PhD (NWU)

**Geography and Environmental Management / *Geografie en Omgewingsbestuur***

Potchefstroom: Dr DP (Dirk) Cilliers, PhD (NWU)

Mahikeng: Deputy / *Adjunk*: Acting/*Waarnemend*: Mrs Nicole van Gessellen, Msc in Environmental Sciences (Ecotoxicology).

Vanderbijlpark: Deputy / *Adjunk*: Dr DFS (Delia) Ah Goo: BA Hons (Rhodes), HDE (PG) (UPE), MSc (NMMU), PhD (Wits).

**Geology / *Geologie***

Potchefstroom: Dr DM (Danél) van Tonder, BSc Honns (PU for CHE), MSc Geology (University of Pretoria), DTech (Tswhane University of Technology)

**Mathematics and Applied Mathematics / *Wiskunde en Toegepaste Wiskunde***

Mahikeng: Prof SC (Clovis) Oukouomi Noutchie, BSc Honours in Mathematics (University of Yaounde I), MSc in Applied Mathematics (UNISA), PhD in Applied Mathematics (UKZN)

Potchefstroom: Deputy / *Adjunk*: Dr DB (Dawie) Janse van Rensburg, Hons BSc (NWU), MSc (NWU), MTD (TU/eindhoven), PhD (NWU)

Vanderbijlpark: Deputy / Adjunk: Dr I (Isaac) Takaidza, BSc Hons (University of Zimbabwe), MSc (University of Zimbabwe), DTech (CPUT)

**Microbiology / *Mikrobiologie***

Potchefstroom: Dr LG (Lesego) Molale-Tom, BSc (NWU); BSc Hons (NWU); MSc (NWU); PhD (NWU)
Mahikeng: Deputy / *Adjunk*: Dr HT (Hazel) Mufhandu, BSc (UN), BSc Hons (MEDUNSA), MSc (WITS), PhD (WITS)

**Physics/ *Fisika***

Potchefstroom: Prof N E (Eugene) Engelbrecht, BSc (NWU), Hons BSc (NWU), MSc (NWU), PhD (NWU)
Mahikeng: Deputy / *Adjunk*: Dr R (Raphael) Mukaro, BSc (UZ), MPhil (UZ), PhD (UKZN)

**Statistics and Operational Research / *Statistiek en Operasionele Navorsing***

Potchefstroom: Dr C (Charl) Pretorius, B.Sc. in Business Mathematics and Informatics (NWU), HonsBSc in Financial Mathematics (NWU), MSc in Business Mathematics and Informatics: Financial Mathematics (NWU), PhD in Statistics (NWU)

Vanderbijlpark: Deputy / *Adjunk*: Mr MB (Modisane) Seitshiro, BSc (NWU), BCom Hons in Statistics (NWU), MSc in Statistics (NWU), PhD in Business Mathematics and Informatics (NWU)

**Urban and Regional Planning / *Stads- en Streekbeplanning***

Potchefstroom: Miss Karen Puren, Pr. Pln A/103/2009, B Arch (stud) (Free State University), MURP (Free State University)

**Zoology / *Dierkunde***

Prof R (Rialet) Pieters, BSc (PU for CHE), HED (PU for CHE), MSc (PU for CHE), PhD (NWU)

**PHILOSOPHY OF SCIENCE AND TECHNOLOGY/*FILOSOFIE VAN NATUURWETENSKAPPE EN TEGNOLOGIE***
Potchefstroom*:* Prof IJ (Kobus) van der Walt, BSc Geology & Geography, BSc Hons, MSc Earth Sciences; PhD Environmental Management; HED (Post Graduate), PU for CHE

**STATISTICAL CONSULTATION SERVICE/*STATISTIESE KONSULTASIE DIENS***
Potchefstroom: Programme Leader/Programleier: Dr M Cockeran, MSc (NWU)

**ACADEMIC SUPPORT SERVICES / *AKADEMIESE ONDERSTEUNINGSDIENSTE***
**Instrument making / *Instrumentmakery***
Potchefstroom: **Head/*Hoof*:** Mr Thys Taljaard

**Senior Faculty Administrator / *Senior Fakulteit Administrateur***
Heleen Swart

## NAS.1 FACULTY BOARD / FAKULTEITSRAAD

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

- The Executive Dean / *Uitvoerende Dekaan (*chairperson of the Faculty Board*/ voorsitter van die Fakulteitsraad)* (per appointment contract / *per kontrakaanstelling*).
- Deputy Deans / *Adjunk Dekane* (per appointment contract / *per kontrakaanstelling*).
- Directors (School/Centre and Research Entity Directors) / *Direkteure (Skool-/Sentrum- en Navorsings- Entiteitdirekteure* (per appointment contract / *per kontrakaanstelling*).
- 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).*
- Senior Faculty Administrator / Senior *Fakulteit Administrateur (*per appointment contract/ *per kontrakaanstelling*).
- Student representation by means of a representative of formally constituted substructures of the Student Representative Council (SRC) and designated annually by the SRC (one-year term)./
- *Studenteverteenwoordiging, deur middel van 'n verteenwoordiger van die formeel saamgestelde sub-strukture van die Verteenwoordigende Studenteraad (VSR) soos jaarliks deur die VSR aangewys word (eenjaar termyn).*
-

The Faculty Management Committee is a standing subcommittee of the Faculty Board and serves as Executive Committee of the Faculty Board. It handles Faculty matters between meetings of the Faculty Board and reports all activities to the next meeting of the Faculty Board. /

*Die Fakulteit Bestuurskomitee is ’n staande subkomitee van die Fakulteitsraad en dien as die Uitvoerende Komitee van die Fakulteitraad. Dit hanteer Fakulteitsaangeleenthede tussen die vergaderings van die Fakulteitsraad en rapporteer alle aktiwiteite aan die volgende Fakulteitsraadvergadering.*

**MEMBERSHIP / *LIDMAATSKAP***

The membership of the Faculty Management Committee is as follows / *Die lidmaatskap van die Fakulteit Bestuurskomitee is as volg:*

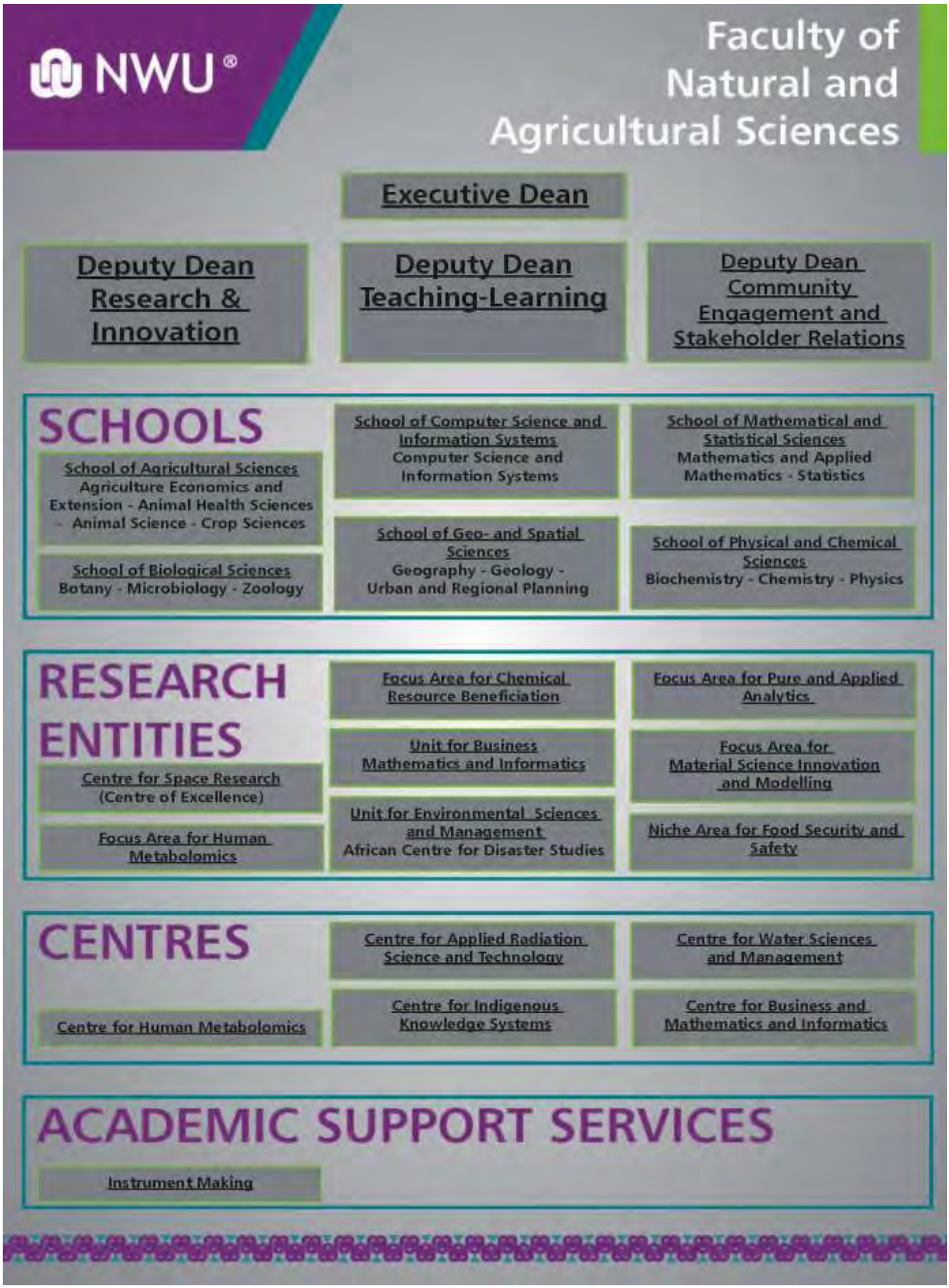
- The Executive Dean (Chair) / *Die Uitvoerende Dekaan (Voorsitter*).
- The Deputy Dean for Teaching and Learning / *Die Adjunk Dekaan vir Onderrig en Leer*.
- The Deputy Dean for Research and Innovation / *Die Adjunk Dekaan vir Navorsing en Innovasie.*
- The Deputy Dean for Community Engagement and Stakeholder Relations/ *Die Adjunk Dekaan vir Gemeenskapsbetrokkenheid en Belanghebbende Verhoudinge.*
- The directors of schools and research entities and directors of centres as determined by the Dean / *Die direkteure van skole en navorsingsentiteite en direkteure van sentrums soos deur die dekaan bepaal*.
- The Faculty Administrator (s) / *Die Fakulteit Administrateur (s)*.
- The Quality Coordinator / *Die Kwaliteitskoördineerder*.
- Representatives of the Academic Student Societies / *Verteenwoordigers van die Akademiese Studente Vereenigings*.

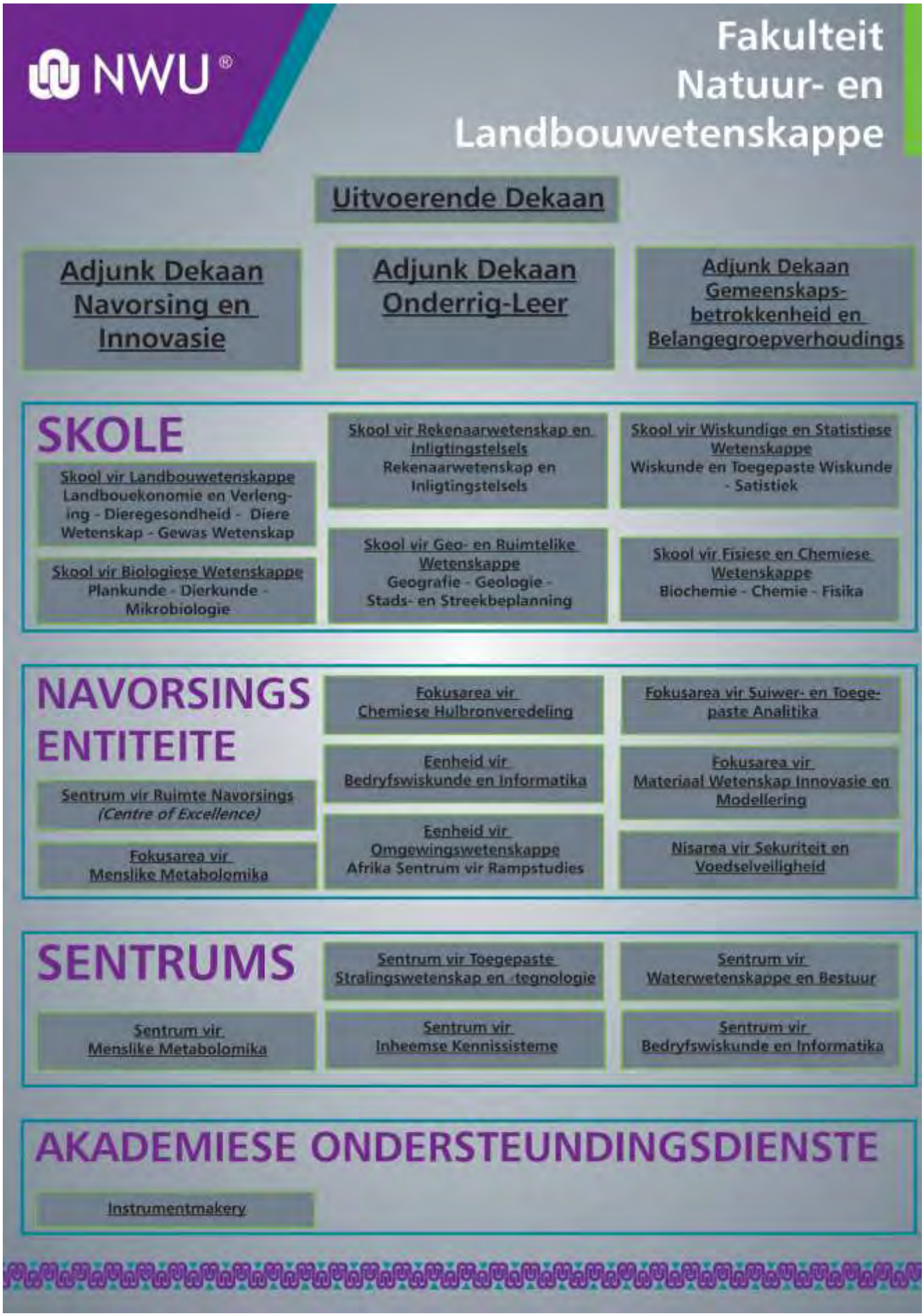
- Secretariat services are provided by Corporate Information and Governance Services / *Sekretariaatdienste soos voorsien deur die Korporatiewe Inligtingbestuursdienste*.

The Executive Dean and the deputy deans determine the final composition of the Faculty Management Committee / *Die Uitvoerende Dekaan en die adjunk dekane bepaal die finale samestelling van die Fakulteit Bestuurskomit*ee.

## NAS.1.1 POSITIONING AND STRUCTURE OF FACULTY / *POSISIONERING EN STRUKTUUR VAN FAKULTEIT*

### NAS.1.1.1 ORGANOGRAM INDICATING THE ORGANISATIONAL STRUCTURE / *ORGANOGRAM WAT DIE ORGANISATORIESE STRUKTUUR AANDUI*


NWU
Faculty of Natural and Agricultural Sciences
Executive Dean
Deputy Dean Research & Innovation
Deputy Dean Teaching-Learning
Deputy Dean Community Engagement and Stakeholder Relations
SCHOOLS
School of Agricultural Sciences
Agriculture Economics and Extension - Animal Health Sciences - Animal Science - Crop Sciences
School of Biological Sciences
Botany - Microbiology - Zoology
School of Computer Science and Information Systems
Computer Science and Information Systems
School of Geo- and Spatial Sciences
Geography - Geology - Urban and Regional Planning
School of Mathematical and Statistical Sciences
Mathematics and Applied Mathematics - Statistics
School of Physical and Chemical Sciences
Biochemistry - Chemistry - Physics
RESEARCH ENTITIES
Centre for Space Research (Centre of Excellence)
Focus Area for Human Metabolomics
Focus Area for Chemical Resource Beneficiation
Unit for Business Mathematics and Informatics
Unit for Environmental Sciences and Management
African Centre for Disaster Studies
Focus Area for Pure and Applied Analytics
Focus Area for Material Science Innovation and Modelling
Niche Area for Food Security and Safety
CENTRES
Centre for Human Metabolomics
Centre for Applied Radiation Science and Technology
Centre for Indigenous Knowledge Systems
Centre for Water Sciences and Management
Centre for Business and Mathematics and Informatics
ACADEMIC SUPPORT SERVICES
Instrument Making


NWU®
Fakulteit Natuur- en Landbouwetenskappe
Uitvoerende Dekaan
Adjunk Dekaan Navorsing en Innovasie
Adjunk Dekaan Onderrig-Leer
Adjunk Dekaan Gemeenskaps-betrokkenheid en Belangegroepverhoudings
SKOLE
Skool vir Landbouwetenskappe
Landbouekonomie en Verleng-ing - Dieregesondheid - Diere Wetenskap - Gewas Wetenskap
Skool vir Biologiese Wetenskappe
Plankunde - Dierkunde - Mikrobiologie
Skool vir Rekenaarwetenskap en Inligtingstelsels
Rekenaarwetenskap en Inligtingstelsels
Skool vir Geo- en Ruimtelike Wetenskappe
Geografie - Geologie - Stads- en Streekbeplanning
Skool vir Wiskundige en Statistiese Wetenskappe
Wiskunde en Toegepaste Wiskunde - Satistiek
Skool vir Fisiese en Chemiese Wetenskappe
Biochemie - Chemie - Fisika
NAVORSINGS ENTITEITE
Sentrum vir Ruimte Navorsings
(Centre of Excellence)
Fokusarea vir Menslike Metabolomika
Fokusarea vir Chemiese Hulbronveredeling
Eenheid vir Bedryfswiskunde en Informatika
Eenheid vir Omgewingswetenskappe
Afrika Sentrum vir Rampstudies
Fokusarea vir Suiwer- en Toege-paste Analitika
Fokusarea vir Materiaal Wetenskap Innovasie en Modellering
Nisarea vir Sekuriteit en Voedselveiligheid
SENTRUMS
Sentrum vir Menslike Metabolomika
Sentrum vir Toegepaste Stralingswetenskap en -tegnologie
Sentrum vir Inheemse Kennissisteme
Sentrum vir Waterwetenskappe en Bestuur
Sentrum vir Bedryfswiskunde en Informatika
AKADEMIESE ONDERSTEUNDINGSDIENSTE
Instrumentmakery

## NAS.2 FACULTY RULES / *FAKULTEITSREËLS*

### NAS.2.1 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://studies.nwu.ac.za/studies/yearbooks

*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*:

*http://studies.nwu.ac.za/af/studies/jaarboeke*

### NAS.2.2 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 FSKN111. 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.2.3 RECOGNITION OF PRIOR LEARNING (A-RULE 1.6) / *ERKENNING VAN VORIGE LEER (A REËL 1.6)*

The 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.*

The 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.2.4 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 Rules 1.10, 4.7, 5.7).

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 1.10, 4.7, 5.7).*

*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.***

### NAS.2.4.1 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 requested 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. Registrasie moet versoek word deur gebruik te maak van 'n studenteversoekvorm en is onderhewig aan goedkeuring deur die Uitvoerende Dekaan.*

## NAS.2.5 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.2.6 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*

### NAS.2.6.1 RELATION BETWEEN CREDITS AND EXAMINATION PAPERS / *VERHOUDING TUSSEN KREDIETPUNTE EN EKSAMEN-VRAESTELLE*

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.2.7 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 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.2.8 TERMINATION OF STUDIES / *BEËINDIGING VAN STUDIES*

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

*In terme van die Algemene Reël 1.18.1, geld die reëls in die Fakulteit Natuur- en Landbouwetenskappe.*

## NAS.2.9 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.2.10 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, namely Biology 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 the 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 Natuur en -Landbouwetenskappe wees, naamlik Biologie I (Plantkunde I en Dierkunde I), Chemie I, Wiskunde I, Fisika I, of ’n ander natuurwetenskapvak, soos Geologie I.*

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

*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 Natuur en - Landbouwetenskappe wees, naamlik Biologie I (Plantkunde I en Dierkunde I), Chemie I, Wiskunde I, Fisika I, of 'n ander natuurwetenskapvak, soos Geologie I.*

***Tweede- en derdejaar van studie:*** *80% van die modules wat geslaag word moet in die Natuur en - Landbouwetenskappe 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 Natuur en Landbouwetenskappe 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.*

*Studente wat vir die BSc in Stads en Streekbeplanning kwalifikasie geregistreer het, mag aansoek doen om registrasie as 'n Kandidaat Beplanner, in oorleg met die regulasies (Beplannings Professie Wet, 36 van 2002) van die Suid Afrikaanse Raad vir Beplanners (SACPLAN). Na 'n minimum van twee jaar in praktyk en die afhandeling van die instruksies om registrasie, sal so 'n student instaat wees om te registreer as 'n Professionele Beplanner [TRP (SA)/SS (SA)].*

### NAS.2.11 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.2.12 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. Due to capacity constraints and the oversupply of students in certain fields of study, students will be selected, based on their scholastic achievement for admission to these fields. /

*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.2.13 LANGUAGE MEDIUM / *TAALMEDIUM*

**Mahikeng and Vanderbijlpark:** The language of instruction in all undergraduate contact sessions is English.

***Mahikeng en Vanderbijlpark:*** *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.2.14 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. /

*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.2.14.1 QUALIFICATIONS, PROGRAMMES AND CURRICULA / *KWALIFIKASIES, PROGRAMME EN KURRIKULUMS*

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).

**NB: Lectures for lectured honours and master's modules are with one exception presented full-time only in the Faculty of Natural and Agricultural Sciences. The only exception is the lectured modules of 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.*

***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 graad Magister in Omgewingsbestuur. Lesings vir hierdie modules word slegs na-uurs aangebied.***

**Legend:**

**MOD/ *MVA*** - Method of Delivery / *Metode van Aflewering*
**C/*K*** - Campus / *Kampus*
**NQF/ *NKR*** - National Qualification Framework Level / *Nasionale Kwalifikasieraamwerkvlak*
**F/*P*** - Full-time or Part-time / *Voltyds of Deeltyds*
**PO** - Phasing out / *Uitfaseer*

| **DIPLOMAS** | | | | | |
|---|---|---|---|---|---|
| **Qualification / *Kwalifikasie*** | **Specialisation Field / *Spesialisasie*** | **Programkode/ *Programme Code*** | **MOD / *MVA*** | **Campus/ *Kampus*** | **NQF/ *NKR*** |
| **Postgraduate Diploma** | **Agricultural Economics** | **2FB D01 N501M** | F/P | MC | 8 |
| **Postgraduate Diploma** | **Agricultural Extension** | **2FC D01 N501M** | F/P | MC | 8 |
| **Postgraduate Diploma/ *Nagraadse Diploma*** | **Disaster Risk Management/ *Ramp Risikobestuur*** | **2GC D01 N501P** | F/P | PC | 8 |
| **BACHELOR OF SCIENCE HONOURS DEGREES / *BACCALAUREUS SCIENTIAE HONNEURSGRADE*** | | | | | |
| **Qualification / *Kwalifikasie*** | **Specialisation Field/ *Spesialisasie*** | **Programkode/ *Programme Code*** | **MOD / *MVA*** | **Campus/ *Kampus*** | **NQF/ *NKR*** |
| **BScHons in Applied Radiation Science/ *BScHons in Toegepaste Stralingswetenskap*** | | **2EK L01 N601M** | F/P | MC | 8 |
| **BScHons in Biology** | **Botany** | **2EL L01 N601M** | F/P | PC | 8 |
| **BScHons in Biochemistry/ *BScHons in Biochemie*** | | **2DW L01 N601P** | F/P | PC | 8 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **BScHons in Biochemistry** | **Molecular Biochemistry** | **2DW L02 N601M** | F/P | MC | 8 |
| **BScHons in Microbiology** | | **2ES L01 N601M** | F/P | MC | 8 |
| **BScHons in Chemistry/ *BScHons in Chemie*** | | **2GH L01 N601P**<br>**2GH L01 N601M** | F/P | MC<br>PC | 8 |
| **BScHons in Computer Science** | | **2EM L01 N601M** | F/P | MC | 8 |
| **BScHons in Computer Science and Information Technology /** ***BScHons in Rekenaarwetenskap en Inligtings-tegnologie*** | | **2EN L01 N601P**<br>**2EN L01 N601V** | PC= F<br>VC=<br>F/P | PC<br>VC | 8 |
| **BScHons in Physics** | **Electronics** | **2GJ L02 N601M** | F/P | MC | 8 |
| **BScHons in Physics/ *BScHons in Fisika*** | | **2GJ L01 N601P**<br>**2GJ L01 N601M** | F/P | PC<br>MC | 8 |
| **BScHons in Mathematical Statistics/** ***BScHons in Wiskundige Statistiek*** | | **2GD L01 N601P**<br>**2GD L01 N601V**<br>**Vanderbijlpark: pending approval from DHET** | F/P | PC<br>VC | 8 |
| **BScHons in Applied Mathematics /** ***BScHons in Toegepaste Wiskunde*** | | **2EJ L01 N601P**<br>**2EJ L01 N601M**<br>**2EJ L01 N601V**<br>**Vanderbijlpark: pending approval from DHET** | F/P | PC<br>MC<br>VC | 8 |
| **BScHons in Mathematics/** ***BScHons in Wiskunde*** | | **2ER L01 N601P**<br>**2ER L01 N601M**<br>**2ER L01 N601V**<br>**Vanderbijlpark: pending approval from DHET** | F/P | PC<br>MC<br>VC | 8 |
| **BScHons in Actuarial Sciences/** ***BScHons in Aktuariële Wetenskappe*** | | **2DR L01 N601P** | F/P | PC | 8 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **BScHons in Quantitative Risk Management/** ***BScHons in Kwantitatiewe Risikobestuur*** | | **2DP L01 N601P** | F/P | PC | 8 |
| **BScHons in Financial Mathematics/** ***BScHons in Finansiële Wiskunde*** | | **2DQ L01 N601P** | F/P | PC | 8 |
| **BScHons in Business Analytics/** ***BScHons in Besigheidsanalise*** | | **2FP L01 N601P** | F/P | PC | 8 |
| **BScHons in Geography** | | **2EP L01 N601M** **2EP L01 N601V** **Vanderbijlpark: pending approval from DHET** | F/P | MC | 8 |
| **BScHons in Environmental Sciences/** ***BScHons in Omgewings-wetenskappe*** | Geography and Environmental Management/ *Geografie en Omgewingsbestuur* | **2DM L07 N602P** | F/P | PC | 8 |
| **BScHons in Environmental Sciences/** ***BScHons in Omgewings-wetenskappe*** | Ecological Interactions and Ecosystem Resilience/ *Ekologiese Interaksies en Ekosisteem-veerkragtigheid* | **2DM L01 N601P** | F/P | PC | 8 |
| **BScHons in Environmental Sciences/** ***BScHons in Omgewings-wetenskappe*** | Biodiversity and Conservation Ecology/ *Biodiversiteit en Bewaringsekologie* | **2DM L02 N601P** | F/P | PC | 8 |
| **BScHons in Environmental Sciences/** ***BScHons in Omgewings-wetenskappe*** | Aquatic Ecosystem Health/ *Akwatiese Ekosisteemwelstand* | **2DM L03 N601P** | F/P | PC | 8 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **BScHons in Environmental Sciences/** **_BScHons in Omgewings-wetenskappe_** | Integrated Pest Management/ *Geïntegreerde Plaagbestuur* | **2DM L04 N601P** | F | PC | 8 |
| **BScHons in Environmental Sciences/** **_BScHons in Omgewings-wetenskappe_** | Environmental Geology/ *Omgewingsgeologie* | **2DM L05 N601P** | F | PC | 8 |
| **BScHons in Environmental Sciences/** **_BScHons in Omgewings-wetenskappe_** | Hydrology and Geohydrology/ *Hidrologie en Geohidrologie* | **2DM L06 N602P** | F | PC | 8 |
| **BACHELOR OF COMMERCE HONOURS / *BACCALAUREUS COMMERCII HONNEURS*** | | | | | |
| **Bachelor of Commerce Honours in Informatics/** **_Baccalaureus Commercii Honneurs in Inligtingstelsels_** | | **2GF L01 N601P** | F | PC | 8 |
| **MASTER OF SCIENCE DEGREES / *MAGISTER SCIENTIAE GRADE*** | | | | | |
| **MASTER OF SCIENCE IN AGRICULTURE/ *MAGISTER SCIENTIAE IN LANDBOU*** | | | | | |
| **MSc in Agricultural Economics/** **_MSc in Landbou-Ekonomie_** | | **2CG N01 N801P** **2CG N01 N801M** | F/P= MC F=PC | MC PC | 9 |
| **MSc in Agricultural Extension** | | **2CJ N01 N801M** | F/P | MC | 9 |
| **MSc in Animal Health** | | **2CE N01 N801M** | F/P | MC | 9 |
| **MSc in Animal Science** | | **2CK N01 N801M** | F/P | MC | 9 |
| **MSc in Crop Science/** **_MSc in Gewaskunde_** | | **2CF N01 N801M/P** | F/P= MC F=PC | MC PC | 9 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **MASTER OF SCIENCE IN COMPUTER SCIENCE/ *MAGISTER SCIENTIAE IN REKENAARWETENSKAP*** | | | | | |
| **MSc in Computer Science/ *MSc in Rekenaar-wetenskap*** | Coursework/ *Kursuswerk* | **2GK P01 N801P** | F | PC | 9 |
| **MSc in Computer Science/ *MSc in Rekenaar-wetenskap*** | Research/ *Navorsing* | **2DB N01 N801M 2DB N01 N801V 2DB N01 N801P** | F/P | MC VC PC | 9 |
| **MASTER OF SCIENCE IN MATHEMATICAL STATISTICS/ *MAGISTER SCIENTIAE IN WISKUNDIGE STATISTIEK*** | | | | | |
| **MSc in Mathematical Statistics/ *MSc in Wiskundige Statistiek*** | | **2CY P01 N802P** | F | PC | 9 |
| **MASTER OF SCIENCE IN APPLIED MATHEMATICS/ *MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE*** | | | | | |
| **MSc in Applied Mathematics/ *MSc in Toegepaste Wiskunde*** | Coursework/ *Kursuswerk* | **2FK P01 N802P** | F | PC | 9 |
| **MSc in Applied Mathematics** | Research | **2FL N01 N801M** | F | MC | 9 |
| **MASTER OF SCIENCE IN MATHEMATICS/ *MAGISTER SCIENTIAE IN WISKUNDE*** | | | | | |
| **MSc in Mathematics/ *MSc in Wiskunde*** | Coursework/ *Kursuswerk* | **2GA P01 N802P** | F | PC | 9 |
| **MSc in Mathematics** | Research | **2CV N01 N801M** | F | MC | 9 |
| **MASTER OF SCIENCE IN NATURAL SCIENCE TEACHING/ *MAGISTER SCIENTIAE IN NATUURWETENSKAP- ONDERWYS*** | | | | | |
| **MSc in Natural Science Teaching/ *MSc in Natuurwetenskap Onderwys*** | | **2CU N01 N801P** | F | PC | 9 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **MASTER OF SCIENCE IN RISK ANALYTICS/ *MAGISTER SCIENTIAE IN RISIKO-ANALISE*** | | | | | |
| **MSc in Risk Analytics/ *MSc in Risiko-Analise*** | | **2ED P01 N802P** | F | PC | 9 |
| **MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORMATICS/ *MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA*** | | | | | |
| **MSc in Business Mathematics and Informatics/ *MSc in Bedryfswiskunde en Informatika*** | | **2BP P04 N801P** | F | PC | 9 |
| **MASTER OF SCIENCE IN PHYSICS/ *MAGISTER SCIENTIAE IN FISIKA*** | | | | | |
| **MSc in Physics** | | **2CW N01 N801M** | F/P | MC | 9 |
| **MASTER OF SCIENCE IN ASTROPHYSICAL SCIENCES/ *MAGISTER SCIENTIAE IN ASTROFISIESE WETENSKAPPE*** | | | | | |
| **MSc in Astrophysical Sciences/ *MSc in Astrofisiese Wetenskappe*** | | **2CQ P01 N801P** | F | PC | 9 |
| **MASTER OF SCIENCE IN CHEMISTRY/ *MAGISTER SCIENTIAE IN CHEMIE*** | | | | | |
| **MSc in Chemistry/ *MSc in Chemie*** | | **2CM N01 N805M**<br>**2CM N01 N805P** | F/P | MC<br>PC | 9 |
| **MASTER OF SCIENCE IN APPLIED RADIATION SCIENCE/ *MAGISTER SCIENTIAE IN TOEGEPASTE STRALINGSWETENSKAP*** | | | | | |
| **MSc in Applied Radiation Science** | | **2HE P01 N801M** | F | MC | 9 |
| **MASTER OF SCIENCE IN BIOCHEMISTRY/ *MAGISTER SCIENTIAE IN BIOCHEMIE*** | | | | | |
| **MSc in Biochemistry/ *MSc in Biochemie*** | | **2EF P01 N801P**<br>**2EF P01 N801M** | F | MC<br>PC | 9 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES/ *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*** | | | | | |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | | **2CT N01 N801M 2CT N02 N801P** | F/P = MC F = PC | MC PC | 9 |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | Atmospheric Chemistry/ *Atmosferiese Chemie* | **2CT N03 N801P** | F/P | PC | 9 |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | Hydrology and Geohydrology/ *Hidrologie and Geohidrologie* | **2CT N04 N801P** | F | PC | 9 |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | Integrated Pest Management/ *Geïntegreerde Plaagbestuur* | **2CT N05 N801P** | F/P | PC | 9 |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | Mining Hydrology/ *Mynhidrologie* | **2CT N06 N801P** | F | PC | 9 |
| **MSc in Environmental Sciences/ *MSc in Omgewings-wetenskappe*** | Disaster Risk Science/ *Ramprisiko Wetenskappe* | **2CT N07 N801P** | F/P | PC | 9 |
| **MASTER OF SCIENCE IN ZOOLOGY/ *MAGISTER SCIENTIAE IN DIERKUNDE*** | | | | | |
| **MSc in Zoology/ *MSc in Dierkunde*** | | **2DD N01 N801P** | F | PC | 9 |
| **MASTER OF SCIENCE IN GEOGRAPHY/ *MAGISTER SCIENTIAE IN GEOGRAFIE*** | | | | | |
| **MSc in Geography** | | **2CP N01 N801M** | F/P | MC | 9 |
| **MASTER OF SCIENCE IN GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT/ *MAGISTER SCIENTIAE IN GEOGRAFIE EN OMGEWINGSBESTUUR*** | | | | | |
| **MSc in Geography and Environmental Management/ *MSc in Geografie en Omgewingsbestuur*** | | **2DG N01 N801P** | F | PC | 9 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **MASTER OF SCIENCE IN MICROBIOLOGY/ *MAGISTER SCIENTIAE IN MIKROBIOLOGIE*** | | | | | |
| **MSc in Microbiology/ *MSc in Mikrobiologie*** | | **2DE N01 N801P** | F | PC | 9 |
| **MASTER OF SCIENCE IN BIOLOGY/ *MAGISTER SCIENTIAE IN BIOLOGIE*** | | | | | |
| **MSc in Biology** | | **2CL N01 N801M** | F/P | MC | 9 |
| **MASTER OF SCIENCE IN BOTANY/ *MAGISTER SCIENTIAE IN PLANTKUNDE*** | | | | | |
| **MSc in Botany/ *MSc in Plantkunde*** | | **2DF N01 N801P** | F | PC | 9 |
| **MASTER OF ENVIRONMENTAL MANAGEMENT/ *MAGISTER IN OMGEWINGSBESTUUR*** | | | | | |
| **Master of Environmental Management/ *Magister in Omgewingsbestuur*** | | **2CD P01 N801P** | P | PC | 9 |
| **Master of Environmental Management/ *Magister in Omgewingsbestuur*** | Ecological Water Requirements/ *Ekologiese Watervereistes* | **2CD P02 N801P** | P | PC | 9 |
| **Master of Environmental Management/ *Magister in Omgewingsbestuur*** | Waste Management/ *Afvalbestuur* | **2CD P03 N801P** | P | PC | 9 |
| **Master of Environmental Management/ *Magister in Omgewingsbestuur*** | Conservation Leadership / *Bewaringsleierskap* | **2CD P04 N801P** | P | PC | 9 |
| **MASTER OF INDIGENOUS KNOWLEDGE SYSTEMS/ *MAGISTER IN INHEEMSE KENNISSTELSELS*** | | | | | |
| **Master of Indigenous Knowledge Systems** | | **2AA N01 N801M** | F/P | MC | 9 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **MASTER OF SCIENCE IN URBAN AND REGIONAL PLANNING / *MAGISTER SCIENTIAE IN STADS- EN STREEKBEPLANNING*** | | | | | |
| **MSc in Urban and Regional Planning/ *MSc in Stads- en Streekbeplanning*** | | **2DH N01 N801P** | F/P | PC | 9 |
| **DOCTOR OF PHILOSOPHY DEGREES / *DOCTOR PHILOSOPHIAE GRADE*** | | | | | |
| **Qualification / *Kwalifikasie*** | **Specialisation Field/ *Spesialisasie*** | ***Programkode/ Programme Code*** | **MOD / *MVA*** | **Campus/ *Kampus*** | **NQF/ *NKR*** |
| **DOCTOR OF PHILOSOPHY IN AGRICULTURE/ *DOCTOR PHILOSOPHIAE IN LANDBOU*** | | | | | |
| **PhD in Agriculture** | Animal Science | **2EA R01 N901M** | F/P | MC | 10 |
| **PhD in Agriculture** | Agronomy | **2EA R02 N901M** | F/P | MC | 10 |
| **PhD in Agriculture/ *PhD in Landbou*** | Agricultural Economics/ *Landbou-ekonomie* | **2EA R03 N901P** **2EA R03 N901M** | F/P | PC MC | 10 |
| **PhD in Agriculture** | Agriculture Extension | **2EA R04 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN ANIMAL HEALTH/ *DOCTOR PHILOSOPHIAE IN DIEREGESONDHEID*** | | | | | |
| **PhD in Animal Health** | | **2CA R01 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN COMPUTER AND INFORMATION SCIENCES / *DOCTOR PHILOSOPHIAE IN REKENAAR- EN INLIGTINGWETENSKAPPE*** | | | | | |
| **PhD in Computer and Information Sciences/ *PhD in Rekenaar- en Inligtingwetenskappe*** | Information Technology/ *Inligtingtegnologie* | **2CB R01 N901V** | F/P | VC | 10 |
| **PhD in Computer and Information Sciences/ *PhD in Rekenaar- en Inligtingwetenskappe*** | Computer Science and Informations Systems/ *Rekenaarwetenskap en Inligtingstelsels* | **2CB R02 N901P** **2CB R02 N901M** | F/P | PC MC | 10 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **DOCTOR OF PHILOSOPHY IN STATISTICS/** *DOCTOR PHILOSOPHIAE IN STATISTIEK* | | | | | |
| **PhD in Science with Statistics/** *PhD in Wetenskap met Statistiek* | | **2CC R20 N901P** | F | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN APPLIED MATHEMATICS/** *DOCTOR PHILOSOPHIAE IN TOEGEPASTE WISKUNDE* | | | | | |
| **PhD in Science with Applied Mathematics/** *PhD in Wetenskap met Toegepaste Wiskunde* | | **2CC R25 N901P** **2CC R25 N901M** | F = PC F/P = MC | PC MC | 10 |
| **DOCTOR OF PHILOSOPHY IN MATHEMATICS/** *DOCTOR PHILOSOPHIAE IN WISKUNDE* | | | | | |
| **PhD in Science with Mathematics/** *PhD in Wetenskap met Wiskunde* | | **2CC R24 N901P** **2CC R24 N901M** | F = PC F/P = MC | PC MC | 10 |
| **DOCTOR OF PHILOSOPHY IN NATURAL SCIENCE EDUCATION/** *DOCTOR PHILOSOPHIAE IN NATUURWETENSKAP-ONDERWYS* | | | | | |
| **PhD in Natural Science Education/** *PhD in Natuurwetenskap Onderwys* | | **2CC R09 N901P** | F | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH BUSINESS MATHEMATICS/** *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BEDRYFSWISKUNDE* | | | | | |
| **PhD of in Science with Business Mathematics/** *PhD in Wetenskap met Bedryfswiskunde* | | **2CC R01 N901P** | F | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH RISK ANALYSIS/** *DOCTOR PHILOSOPHIAE IN WETENSKAP MET RISIKO-ANALISE* | | | | | |
| **PhD in Science with Risk Analysis/** *PhD in Wetenskap met Risiko-analise* | | **2CC R15 N901P** | F | PC | 10 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH PHYSICS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET FISIKA*** | | | | | |
| **PhD in Science with Physics/ *PhD in Wetenskap met Fisika*** | | **2CC R23 N901P 2CC R23 N901M** | PC= F only MC=F/P | PC MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH CHEMISTRY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET CHEMIE*** | | | | | |
| **PhD in Science with Chemistry/ *PhD in Wetenskap met Chemie*** | | **2CC R11 N901P 2CC R11 N901M** | F/P | MC PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH ATMOSPHERIC CHEMISTRY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET ATMOSFERIESE CHEMIE*** | | | | | |
| **PhD in Science with Atmospheric Chemistry/ *PhD in Wetenskap met Atmosferiese Chemie*** | | **2CC R05 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIRONMENTAL SCIENCES/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OMGEWINGSWETENSKAPPE*** | | | | | |
| **PhD in Science with Environmental Sciences/ *PhD in Wetenskap met Omgewingswetenskappe*** | | **2CC R04 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIRONMENTAL SCIENCES AND MANAGEMENT/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OMGEWINGSWETENSKAPPE EN BESTUUR*** | | | | | |
| **PhD in Science with Environmental Sciences and Management** | | **2CC R26 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH DISASTER RISK SCIENCE/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET RAMPRISIKOWETENSKAP*** | | | | | |
| **PhD in Science with Disaster Risk Science/ *PhD in Wetenskap met Ramprisikowetenskap*** | | **2CC R14 N901P** | F/P | PC | 10 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH ZOOLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET DIERKUNDE*** | | | | | |
| **PhD in Science with Zoology/ *PhD in Wetenskap met Dierkunde*** | | **2CC R18 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH TRANSDISCIPLINARY ENVIRONMENTAL SCIENCES AND MANAGEMENT** | | | | | |
| **PhD in Science with Transdisciplinary Environmental Sciences and Management** | | **2CC R03 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH GEOGRAPHY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE*** | | | | | |
| **PhD in Science with Geography** | | **2CC R12 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE EN OMGEWINGSBESTUUR*** | | | | | |
| **PhD in Science with Geography and Environmental Management/ *PhD in Wetenskap met Geografie en Omgewingsbestuur*** | | **2CC R19 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH MICROBIOLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET MIKROBIOLOGIE*** | | | | | |
| **PhD in Science with Microbiology/ *PhD in Wetenskap met Mikrobiologie*** | | **2CC R17 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH BOTANY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET PLANTKUNDE*** | | | | | |
| **PhD in Science with Botany/ *PhD in Wetenskap met Plantkunde*** | | **2CC R16 N901P**<br>**2CC R16 N901M** | F/P | PC<br>MC | 10 |

| Qualification / *Kwalifikasie* | Specialisation Field/ *Spesialisasie* | Programkode/ *Programme Code* | MOD / *MVA* | Campus/ *Kampus* | NQF/ *NKR* |
|---|---|---|---|---|---|
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOCHEMISTRY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOCHEMIE*** | | | | | |
| **PhD in Science with Biochemistry/** ***PhD in Wetenskap met Biochemie*** | | **2CC R08 N901P** **2CC R08 N901M** | F/P | MC/PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOLOGIE*** | | | | | |
| **PhD in Science with Biology** | | **2CC R10 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH HIDROLOGY AND GEOHYDROLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET HIDROLOGIE EN GEOHIDROLOGIE*** | | | | | |
| **PhD in Science with Hydrology and Geohydrology/** ***PhD in Wetenskap met Hidrologie en Geohidrologie*** | | **2CC R06 N901P** | F/P | PC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH OPERATIONAL RESEARCH/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BEDRYFSNAVORSING*** | | | | | |
| **PhD in Science with Operational Research/** ***PhD in Wetenskap met Bedryfsnavorsing*** | | **2CC R21 N901V** | F/P | VC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH RADIATION SCIENCE/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STRALINGSWETENSKAP*** | | | | | |
| **PhD in Science with Radiation Science** | | **2CC R22 N901M** | F/P | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH INDIGENOUS KNOWLEDGE SYSTEMS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET INHEEMSE KENNISSTELSELS*** | | | | | |
| **PhD in Social Science with Indigenous Knowledge Systems** | | **1CC R13 N901M** | F | MC | 10 |
| **DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*** | | | | | |
| **PhD in Science with Urban and Regional Planning/** ***PhD in Wetenskap met met Stads- en Streekbeplanning*** | | **2CC R07 N901P** | F/P | PC | 10 |

## NAS.2.14.2 PROGRAMMES NOT IN 2021 YEARBOOK / *PROGRAMME NIE IN 2021 JAARBOEK*

**PHASING OUT WITH PIPELINE STUDENTS** (See Yearbook and Page for reference). All programmes listed below, are closed for applications. /

***FASEER UIT MET PYPLYN STUDENTE*** *(Sien Jaarboek en Bladsy vir verwysing). Alle programme hieronder gelys, is gesluit vir aansoeke.*

| **Qualification/** ***Kwalifikasie*** | **Program Code/** ***Programkode*** | **Yearbook/** ***Jaarboek*** | **Page/** ***Bladsy*** | **Closing date of programme/** ***Program sluitingsdatum*** |
|---|---|---|---|---|
| MSc in Geography | 203 124 N806M | 2016 Mafikeng | 28 | Dec 2020 |
| MSc in Physics | 203 136 N807M | 2016 Mafikeng | 29 | Dec 2020 |
| MSc in Statistics | 2EB N01 N801M | 2017 Mafikeng | 31 | Dec 2020 |
| MArt et Scien in Urban and Regional Planning | 119 102 N825P | 2016 Potchefstroom | 71 | Dec 2020 |
| MSc in Space Physics | 203 128 N867P | 2016 Potchefstroom | 50 | Dec 2020 |
| MSc in Microbiology | 203 191 N827P | 2016 Potchefstroom | 55 | Dec 2021 Phasing out |
| **Qualification/** ***Kwalifikasie*** | **Program Code/** ***Programkode*** | **Yearbook/** ***Jaarboek*** | **Page/** ***Bladsy*** | **Closing date of programme/** ***Program sluitingsdatum*** |
| MSc in Geography and Environmental Management | 203 193 N829P | 2016 Potchefstroom | 55 | Dec 2021 Phasing out |
| MSc in Environmental Sciences | 203 194 N830P | 2016 Potchefstroom | 53 | Dec 2021 Phasing out |
| MSc in Environmental Sciences | 203 194 N831P | 2016 Potchefstroom | 54 | Dec 2021 Phasing out |
| MSc in Environmental Sciences | 203 194 N832P | 2016 Potchefstroom | 54 | Dec 2021 Phasing out |
| | | | | |
| PhD in Environmental Science | 204 114 N914M | 2016 Mafikeng | 31 | Dec 2021 Phasing out |
| PhD in Geography | 204 121 N932M | 2016 Mafikeng | 31 | Dec 2020 |
| PhD in Agriculture Crop Science | 204 127 N903M | 2016 Mafikeng | 30 | Dec 2020 |
| PhD in Agricultural Economics | 204 128 N904M | 2016 Mafikeng | 30 | Dec 2020 |
| PhD in Agricultural Extension | 204 129 N905M | 2016 Mafikeng | 30 | Dec 2020 |
| PhD in Computer Sciences | 204 132 N936M | 2016 Mafikeng | 31 | Dec 2020 |

| | | | | |
|---|---|---|---|---|
| PhD in Environmental Sciences | 204 114 N916P | 2016 Potchefstroom | 83 | Dec 2021 Phasing out |
| PhD in Urban and Regional Planning | 204 115 N912P | 2016 Potchefstroom | 85 | Dec 2021 Phasing out |
| PhD in Biochemistry | 204 116 N913P | 2016 Potchefstroom | 87 | Dec 2020 |
| PhD in Chemistry | 204 120 N907P | 2016 Potchefstroom | 82 | Dec 2021 Phasing out |
| PhD in Agriculture, Economics | 204 128 N922P | 2016 Potchefstroom | 86 | Dec 2020 |
| PhD in Computer Science | 204 132 N901P | 2016 Potchefstroom | 80 | Dec 2020 |
| PhD in Microbiology | 204 135 N910P | 2016 Potchefstroom | 85 | Dec 2021 Phasing out |
| PhD in Zoology | 204 136 N908P | 2016 Potchefstroom | 84 | Dec 2021 Phasing out |
| PhD in Geography and Environmental Management | 204 137 N909P | 2016 Potchefstroom | 84 | Dec 2021 Phasing out |
| PhD in Statistics | 204 138 N902P | 2016 Potchefstroom | 80 | Dec 2020 |

| 2018-2020 | | | | |
|---|---|---|---|---|
| **Qualification/ *Kwalifikasie*** | **Program Code/ *Programkode*** | **Yearbook/ *Jaarboek*** | **Page/ *Bladsy*** | **Closing date of programme/ *Program sluitingsdatum*** |
| Postgraduate Diploma in Agricultural in Economics and Mangement | 272 100 N501M | 2018 | 95/96 | Closed |
| Postgraduate Diploma in Agricultural Extension | 272 101 N502M | 2018 | 99/100 | Closed |
| | | | | |
| Hons BSc in Agriculture in Agricultural Economics | 276 103 N602M | 2020 | 84 | Closed |
| Hons BSc in Applied Radiation Science | 202 145 N609M | 2018 | 145 | Closed |
| Hons BSc in Biology/ *Hons BSc in Biologie* | 202 141 N664M and N610M | 2018 | 147 | Closed |
| Hons BSc in Microbiology | 202 143 N640M | 2018 | 155 | Closed |
| Hons BSc in Chemistry / *BSc Hons in Chemie* | 202 117 N651P | 2018 | 159/160 | Closed |
| Hons BSc in Chemistry/ *Hons BSc in Chemie* | 202 117 N623M | 2018 | 157 | Closed |
| Hons BSc in Computer Science and Information Systems | 202 134 N653P & N653V | 2020 | 93 & 94 | Closed |
| Hons BSc in Computer Science | 202 142 N612M | 2018 | 165/166 | Closed |
| Hons BSc in Physics | 202 121 N652P<br>202 144 N616M | 2020<br>2018 | 98<br>180 | Closed<br>Closed |
| Hons BSc in Physics and Electronics | 202 146 N613M | 2018 | 176 | Closed |
| Hons BSc in Mathematical Statistics | 202 135 N654P | 2018 | 186/187 | Closed |
| Hons BSc in Applied Mathematics | 202 140 N609M<br>202 136 N601P | 2018 | 192/193<br>194/195 | Closed<br>Closed |
| Hons BSc in Mathematics | 202 119 N628M<br>202 137 N601P | 2018 | 202/203<br>204/205 | Closed<br>Closed |
| Hons BSc in Data Mining | 202 129 N612P | 2020 | 115 | Closed |
| Hons BSc in Actuarial Sciences | 202 126 N609P | 2018 | 211/212 | Closed |
| Hons BSc in Geography | 202 118 N614M | 2020 | 117 | Closed |

| **Qualification/** ***Kwalifikasie*** | **Program Code/** ***Programkode*** | **Yearbook/** ***Jaarboek*** | **Page/** ***Bladsy*** | **Closing date of programme/** ***Program sluitingsdatum*** |
|---|---|---|---|---|
| BSc Honours in Environmental Sciences with Geography and Environmental Management | 2DM L07 N601P | 2020 | 120 | Dec 2020 |
| BSc Hons in Environmental Sciences with Hydrology and Geohydrology | 202 124 N674P<br>2DM L06 N601P | 2017<br>2020 | 73/74<br>132 | Dec 2021<br>Phasing out |
| BSc Hons in Environmental Sciences with Waste Management | 2DM L08 N601P | 2020 | 133 | Dec 2020 |
| Bachelor of Commerce Hons | 504 143 N658P | 2018 | 260-262 | Closed |
| | | | | |
| MSc in Computer Science | 203 180 N808M & N802V<br>**203 155 N861P** | 2020 | 154 & 155 | Closed<br>**Phasing out Dec 2021** |
| MSc in Business Statistics | 203 180 N801V<br>2GB P01 N801V | 2020 | 158 | Closed<br>Dec 2020 |
| MSc in Statistics | 203 138 N810M | | | Closed |
| MSc in Applied Mathematics | 203 121 N804M | 2020 | 160 | Closed |
| MSc in Applied Mathematics | 203 157 N863P | 2020 | 161 | Closed |
| MSc in Mathematics (Research) | 203 135 N830M | 2020 | 163 | Closed |
| MSc in Mathematics (Coursework) | 203 135 N806M | 2020 | 164 | Closed |
| MSc in Mathematics (Coursework) | 203 158 N864P | 2020 | 165 | Closed |
| MSc in Risk Analysis | 203 127 N865P | 2020 | 168 | Closed |
| MSc in Business Mathematics and Informatics | 2BP P01 N801P | 2020 | 172 | Dec 2020 |
| MSc in Business Mathematics and Informatics with Financial Mathematics | 2BP P02 N801P | 2020 | 173 | Dec 2020 |
| MSc in Business Mathematics and Informatics with Business Analytics | 2BP P03 N801P | 2020 | 174 | Dec 2020 |

| **Qualification/** ***Kwalifikasie*** | **Program Code/** ***Programkode*** | **Yearbook/** ***Jaarboek*** | **Page/** ***Bladsy*** | **Closing date of programme/** ***Program sluitingsdatum*** |
|---|---|---|---|---|
| MSc in Chemistry | 2CN P01 N801P | 2020 | 181 | Phasing out. Dec 2021 |
| MSc in Biochemistry | 203 132 N869P | 2020 | 183 | Phasing out. Dec 2021 |
| MSc in Environmental Sciences | 203 133 N830M | 2020 | 185 | Closed |
| MSc in Astrophysics and Space Science | 2CR P01 N801P | 2020 | 179 | Closed Dec 2020 Awaiting final approval. |
| MSc in Computer Science and Information Systems | 505 138 N870P | 2020 | 207 | Closed |
| | | | | |
| PhD in Science with Statistics | 2CC R20 N901M | 2020 | 219 | Dec 2020 |
| PhD in Applied Mathematics | 204 139 N902P | 2020 | 220 | Dec 2020 |
| PhD in Mathematics | 204 122 N933M | 2020 | 221 | Dec 2020 |
| PhD in Mathematics | 204 140 N904P | 2020 | 221 | Dec 2021 Phasing out |
| PhD in Space Physics | 204 112 N906P | 2020 | 223 | Dec 2021 Phasing out |
| PhD in Physics | 204 124 N935M | 2020 | 224 | Dec 2020 |

## NAS.3 LIST OF MODULES/ *MODULELYS*

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF-level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **POSTGRADUATE DIPLOMAS/ *NAGRAADSE DIPLOMAS*** | | | | |
| **DRRS511** | Disaster Risk Studies and Climate Change Adaptation / *Ramp Risiko Studies en Klimaatsverandering* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS512** | Socio-Ecological Resilience / *Sosiale Ekologiese Veerkragtigheid* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS513** | Hazards | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS514** | Disaster Risk Assessment | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS515** | Research Methodology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS521** | Urban Disaster Risk | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS522** | Preparedness and Response/ *Voorbereiding en Reaksie* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS523** | Planning and Project Management | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **DRRS524** | Research Project | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ECOM515** | Agriculture and Economic Development | 16 | 8 | Faculty of Economic & Management Sciences |
| **ECOM516** | Agricultural Statistics Research I | 16 | 8 | Faculty of Economic & Management Sciences |
| **ECOM517** | Quantitative Methods in Agricultural Economics | 8 | 8 | Faculty of Economic & Management Sciences |
| **ECOM518** | Agricultural Micro-Economics | 12 | 8 | Faculty of Economic & Management Sciences |
| **ECOM520** | Agricultural Marketing | 12 | 8 | Faculty of Economic & Management Sciences |
| **ECOM526** | Agricultural Project Appraisal | 16 | 8 | Faculty of Economic & Management Sciences |
| **ECOM527** | Agricultural Macro Economics | 12 | 8 | Faculty of Economic & Management Sciences |
| **ECOM529** | Research methods and Project | 16 | 8 | Faculty of Economic & Management Sciences |
| | | | | |
| **EXTM514** | Rural Community Development | 16 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **EXTM515** | Essentials of Agricultural Extension | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **EXTM516** | Elements of Communication in Extension | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **EXTM525** | Research Methods and Projects | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **EXTM526** | Change in Agriculture | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **EXTM527** | Leadership Development in Extension | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **HONOURS / *HONNEURS*** | | | | |
| **APMA621** | Introductory Harmonic Analysis / *Inleidende HarmonieseAnalise* | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM611** | Symmetries of Differential Equations I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM612** | Numerical Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM613** | Theory of Partial Differential Equations | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM614** | Financial Modelling I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM615** | Theory of Ordinary Differential Equations | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM616** | Calculus of Variations | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM617** | Fluid Dynamics I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM618** | Biomathematics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM619** | Applied Matrix Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM621** | Symmetries of Differential Equations II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM622** | Advanced Numerical Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM623** | Numerical Methods for Partial Differential Equations | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM624** | Financial Modelling II | 12 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **APPM625** | Financial Modelling III | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM626** | Control Theory | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM627** | Fluid Dynamics II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM628** | Industrial Mathematics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM629** | Dynamical Systems & PDEs / *Dinamiese Stelsels en PDVs* | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **APPM671** | Research Report / *Navorsingsverslag* | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ARSM611** | Nuclear Physics | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **ARSM612** | Nuclear Chemistry | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **ARSM673** | Research Report / *Navorsingsverslag* | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BCHN611** | Analytical Biochemistry | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN612** | Advanced Metabolism | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN613** | Advanced Analytical Biochemistry | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN614** | Advanced Metabolism of Diseases | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN621** | Advanced Molecular Biology | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN622** | Bio-energetics | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN623** | Advanced Drug Discovery | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN624** | Advanced Cellular and Molecular Biology | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BCHN671** | Research Report / *Navorsingsverslag* | 32 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **BMCM613** | Bacteriology | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BMCM614** | Virology And Immunology | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **BMCM621** | Mycology | 24 | 2 | Faculty of Natural and Agricultural Sciences |
| **BMCM622** | Environmental And Industrial Microbiology | 24 | 2 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIA671** | Actuarial Risk Management (A301/CA1) | 80 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIB611** | Statistical Learning I | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIB621** | Statistical Learning II | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIB623** | Forecasting for Business | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIN611** | Quantitative Risk Analysis I | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN613** | Financial Engineering I | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN614** | Investment Theory I | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN615** | Financial Modelling I / *Finansiële Modellering I* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN621** | Quantitative Risk Analysis II | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN622** | Pricing of Derivatives A | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIN625** | Financial Modelling Optimisation / *Finansiële Modellering Optimalisering* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIR622** | Research Report: Financial Engineering and Pricing of Derivatives | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIR671** | Research Report Financial Engineering and Financial Modelling (Full Time / Part Time) | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| **BWIR672** | Research Report: Financial Modelling and Optimisation | 32 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| | | | | |
| **CISM614** | Algorithms and Data structures | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM615** | Programming Languages and Objects | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM616** | Operating Systems | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM621** | Networks | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM622** | Databases | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM623** | Machine Learning | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **CISM670** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **EKRP623** | Risk Management | 16 | 8 | Faculty of Economic & Management Sciences |
| | | | | |
| **ELEM611** | Embedded Systems | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM612** | Analogue Communication Systems | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM613** | Electronic Instrumentation | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM614** | Opto-electronics and Optical Communications Systems | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM625** | Control Systems | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM626** | Engineering Electromagnetics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM627** | Digital Communications Systems | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM628** | Power Electronics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ELEM671** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ESFP616** | African Fish Parasitology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
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| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **GEOG611** | Research Methods | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG612** | Selected Fields In Human Geography | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG613** | Geographic Information Systems Techniques (GIS) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG614** | Environmental Problems & Management in Africa | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG616** | Selected Fields in Geomorphology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG621** | Remote Sensing | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG622** | Selected Fields In Climatology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG623** | Applications In Geographic Information System (GIS) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG624** | Rural Geography | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG672 Year Module** | Urban Geography | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GEOG671** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **GGFS673 Year module** | Introduction to Earth Observation/ *Inleiding tot Aardwaarneming* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **GGFS674 Year module** | Air Pollution/ *Lugbesoedeling* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **HDGH611** | Geohydrology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **HDGH612** | Environmental Hydrology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **HDGH613** | Spatial Analysis | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **HDGH621** | Hydrochemistry | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **ITRI611** | Data Warehouses I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI612** | Linear Programming I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI613** | Databases I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI614** | Information Systems Engineering I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI615** | Computer Security I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI616** | Artificial Intelligence I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI617** | Image Processing I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI618** | Decision Support Systems I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI621** | Data Warehouses II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI622** | Linear Programming II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI623** | Databases II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI624** | Information Systems Engineering II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI625** | Computer Security II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI626** | Artificial Intelligence II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI627** | Image Processing II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI628** | Decision Support Systems II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **ITRI671** | Research Report / *Navorsingsverslag* | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MARS621** | Radiation and Environment | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **MARS622** | Radioactive Waste Minimisation and Management | 24 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| | | | | |
| **MTHS611** | Fundamentals of Mathematics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS612** | Abstract Algebra I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS613** | Matrix Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS614** | Measure and Integration Theory I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS615** | Functional Analysis I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS619** | Real & Complex Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS621** | Topology | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS622** | Abstract Algebra II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS623** | Complex Function Theory | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS624** | Measure and Integration Theory II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS625** | Functional Analysis II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS626** | Evolution of Mathematical Ideas | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **MTHS671** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **NCHE611** | Advanced Organic Chemistry | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE612** | Advanced Physical Chemistry | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE613** | Advanced Inorganic Chemistry | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE614** | Advanced Analytical Chemistry | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE621** | Molecule Modelling (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE622** | Polymer Chemistry (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE623** | Advanced Structural Elucidation (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ NKR-vlak | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **NCHE624** | Environmental Chemistry (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE625** | Techniques for Organic Synthesis (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE626** | Electrochemistry (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE627** | Homogeneous Catalysis (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE628** | Coal Chemistry (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE629** | Membrane Science and Technology (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE671** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE672** | Electronic Structure Methods and Solvation Models (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE673** | Thermodynamics of Solution (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE674** | Applied Materials Chemistry (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE675** | Introduction to Nanomedicine (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE676** | Natural products in Drug Discovery (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| **NCHE677** | Electrochemical Sensors (Elective) | 8 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **NPHY611** | Classical Mechanics/ *Klassieke Meganika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY612** | Quantum Mechanics I/ *Kwantummeganika I* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY613** | Electrodynamics/ *Elektrodinamika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY614** | Computational Physics/ *Rekenaarfisika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |

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|---|---|---|---|---|
| **NPHY615** | Astrophysical Fluids/ *Astrofisiese Fluïedes* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY616** | Observational Techniques/ *Waarnemingstegnieke* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY617** | Introduction to General Relativity/ *Inleiding tot Algemene Relatiwiteit* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY621** | Statistical Mechanics/ *Statistiese Meganika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY623** | Plasma Physics / *Plasmafisika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY625** | Introduction to Stellar Astrophysics / *Inleidende Sterre Astrofisika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY626** | Nuclear Physics / *Kernfisika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY627** | Solid State Physics/ *Vastetoestandfisika* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY628** | Quantum Mechanics II/ *Kwantummeganika II* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY629** | Introduction to Cosmology / *Inleiding tot Kosmologie* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **NPHY671** | Research Report / *Navorsingsverslag* | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **NRCM611** | Conservation of Natural Resources | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **NRCM621** | Further Conservation of Natural Resources | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMBE622** | Applied Hydrology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBE623** | Groundwater Geology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBE675 Year module** | Introduction to Hydrology and Integrated Water Resources Management (Full Time Only) / *Inleiding tot Hidrologie en Geïntegreerde Waterhulpbronbestuur (Slegs Voltyds Aangebied)* | 16 | 8 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **OMBE674** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMBO611** | Introduction to Environmental Management | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBO613** | Introduction to Geographic Information System [GIS] (Full Time Only)/ *Inleiding tot GIS (Slegs Voltyds)* Applicable To All Programmes | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBO684 Year module** | Geographic Information System Applications (Full-time Only)/ *GIS Toepassings (Slegs Voltyds)* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBO682** | Environmental Management I | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMBO683** | Environmental Analysis I / *Omgewingsevaluering I* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| OMBW614 **Change to OMBW624 from 2021 Year module** | Fundamentals of Waste Management / *Grondbeginsels van Afvalbestuur* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMSB611** | Conservation Ecology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSB613** | Biodiversity Planning | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSB614** | Biomonitoring and Risk Assessment | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSB627** | Herpetology in Practise (Full-time Only) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSB628** | Coral Reef Ecology (Full-time Only) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSB629** | Genome Analysis and Bio-informatics | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMSE611** | Environmental Soil Science (Full Time Only) **GDKN 122, GDKN 211 & GDKN 221 are prerequisites)** | 16 | 8 | Faculty of Natural and Agricultural Sciences |

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|---|---|---|---|---|
| **OMSE613** | Resilience Thinking in Ecology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE621** | Restoration of Degraded Ecosystems | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE622** | Urban Ecology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE623** | Plant Ecophysiology and Stress Physiology **PLKS314 or equivalent as a prerequisite** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE625** | Advanced Ecotoxicology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE626** | Microbial Ecology **MKBS325 or equivalent as a prerequisite** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSE674** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMSG611** | Environmental Geochemistry (Full Time Only) **GLGN 122 & GLGN311 are prerequisites** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSG621** | Environmental Mineralogy **GLGN 122 & GLGN211 are prerequisites** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSG622** | Applied Environmental Geology **GLGN 112, GLGN221 & GLGN321 are prerequisites** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMSP611** | Principles of Integrated Pest Management (Full-time Only) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSP622** | GM Crops and Integrated Pest Management | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSP623** | Nematodes and Crops | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSP624** | Arthropod/Plant Interactions | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMSW611** | Aquatic Ecosystems: Pollution and Ecotoxicology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSW622** | Phycology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSW624** | Environmental Hydrology | 16 | 8 | Faculty of Natural and Agricultural Sciences |

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|---|---|---|---|---|
| **OMSW625** | Limnology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMSW626** | Animal Ecology | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMWE611** | Rehabilitation of Disturbed Areas (Full Time Only) **GDKN 121, GDKN 211 and GDKN 221 are prerequisites for this Module** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMWF621** | Advanced Waste Water Treatment / *Gevorderde Afvalwaterbehandeling* | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMWP611** | Pest Phenology and Damage Symptoms (Full-time Only) | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMWP613** | Economic Damage and Threshold Values | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMWW611** | Physical, Chemical and Biological Properties of Inland Water | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMWW616** | Estuarine and Near Shore Marine Ecology (Full-time Only) **DRKS311 or equivalent as a prerequisite** | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **OMWW617** | Zoonoses | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **PTSM618 Phasing out 2020-2021** | Higher Plant Taxonomy And Systematics | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **PTSM619** | Plant Taxonomy | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **PTSM628 Phasing out 2020-2021** | Further Higher Plant Taxonomy And Systematics | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| **PTSM629** | Herbarium Management | 24 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **RESM672** | Research Report | 32 | 8 | Faculty of Natural and Agricultural Sciences |

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| | | | | |
| **SGSS614** | Research Methods | 16 | 16 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **STAT612** | Financial Time Series | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STAT622** | Linear Statistical Models and Experimental Design | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **STTN612 Replaced by STAT622** | Statistical Data-Analysis I: Models **Closes the end of 2020, students who fail STTN612 will need to register for STAT622.** | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN613** | Resampling | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN614** | Statistical Inference | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN615** | Stochastic Processes I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN617** | Mathematical and Computer-Intensive Methods I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN618** | Financial-driven Statistics I | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN619** | Nonparametric Methods | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN622 Replaced by STAT612** | Statistical Data-Analysis II: Time Series **Closes the end of 2020, students who fail STTN622 will need to register for STAT612.** | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN623** | Multivariate Statistics | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN624** | Discrete Data-Analysis | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN625** | Stochastic Processes II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN626** | Probability Theory | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN627** | Mathematical and Computer-Intensive Methods II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN628** | Financial-Driven Statistics II | 12 | 8 | Faculty of Natural and Agricultural Sciences |
| **STTN671** | Research Report | 32 | | Faculty of Natural and Agricultural Sciences |

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|---|---|---|---|---|
| | | | | |
| **WISK615** | Differential Equations | 16 | 8 | Faculty of Natural and Agricultural Sciences |
| **MASTERS / MAGISTER** | | | | |
| **AECM871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **AEXM871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **AGRM871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **AHMM871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **APPM871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM872** | Dissertation / *Verhandeling* | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM874** | Applicable Analysis / *Toepasbare Analise I* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM875** | Applicable Analysis II/ *Toepasbare Analise II* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM876** | Modelling I / *Modellering I* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM877** | Modelling II/ *Modellering II* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **APPM878** | Principles and Paradigms:Applied Mathematics/ *Beginsels en Paradigmas: Toegepaste Wiskunde* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BCHN872** | Dissertation / *Verhandeling* | 135 | 9 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **BCHN877** | Advanced Biochemistry | 45 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BIOM871** | Dissertaion | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIA812** | Enterprise-Wide Risk Management I | 24 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIA821** | Enterprise-wide Risk Management II | 12 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIB817** | Optimisation for Decision Making | 12 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIB818** | Business Intelligence | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIB821** | Data Mining Techniques | 12 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIB822** | Contemporary Issues in Business Analytics | 12 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIM815** | Industry Integration Methodology/ *Bedryfsintegrasie Metodologie* | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIN811** | Practical Risk Management SAS RD | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIN812** | Pricing of Derivatives B | 24 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIN816** | Modern Portfolio Theory | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIN817** | Retail Credit Risk | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIN818** | Topical Research Issues in Risk Analysis | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **BWIR828** | Industry Directed Research Project | 96 | 9 | Faculty of Natural and Agricultural Sciences |
| **BWIN872** | Dissertation | 132 | 9 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| | | | | |
| **CHEM871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **CHEN874** | Advanced Chemistry | 48 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **DRKN871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **DRRS871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **FSKM811** | Astrophysics I | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM812** | Transport Theory | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM813** | Astrophysics II | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM814** | Heliospheric Physics | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM815** | General Physics | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM816** | Advanced Plasma Physics/ *Gevorderde Plasmafisika* | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKM817** | General Relativity/ *Algemene Relatiwiteit* | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **FSKS872** | Dissertation | 132 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MPHY871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **GGFN871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **HDGH871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **HDMG871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **IPMM871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ITRN872** | Dissertation | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ITRW876** | Databases / *Databasisse* | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW877** | Decision Support Systems | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW878** | Artificial Intelligence | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW883** | Image Processing | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW884** | Information Systems Engineering | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW885** | Computer Security | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| **ITRW886** | Data Warehouses | 32 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **ITWV871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MARR811** | Radioanalytical Applications | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **MARR812** | Environmental Applications | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **MARR813** | Radioactive Waste Management | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **MARR814** | Industrial Applications | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| **MARR815** | Technology Management | 16 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MARR873** | Mini - Dissertation | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **MENV871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MGEO871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MIKS871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MKBN871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **MTHS871** | Dissertation / *Verhandeling* | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS872** | Dissertation / *Verhandeling* | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS874** | Abstract Analysis I / *Abstrakte Analise I* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS875** | Abstract Analysis II / *Abstrakte Analise II* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS876** | Algebra I / *Algebra I* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS877** | Algebra II / *Algebra II* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS878** | Discrete Structures I / *Diskrete Strukture I* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS879** | Discrete Structures II / *Diskrete Strukture II* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **MTHS888** | Principles and Paradigms:Pure Mathematics/ *Beginsels en Paradigmas: Suiwer Wiskunde* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **NWON871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **OMBO873** | Dissertation | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO878** | Environmental Management II | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO879** | Environmental Assessment II | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO880** | Management of Ecological Drivers in Aquatic Systems | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO881** | Management of Ecological Responders in Equatic Systems | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO882** | Integrated Waste Management | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO883** | Waste Management Law And Governance | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO884** | Conservation Leadership / *Bewaringsleierskap* | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| **OMBO885** | Futures Thinking / *Toekomsbeplanning* | 40 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **OMWN871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **PLKN871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **RSWW811** | Research Methodology / *Navorsingsmetodologie* | 8 | 9 | Faculty of Natural and Agricultural Sciences |
| **RSWW813** | Research Methods in Mathematical Sciences / *Navorsingsmetodes in Wiskundige Wetenskappe* | 8 | 9 | Faculty of Natural and Agricultural Sciences |
| **RSWW821** | Research Communication | 8 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **SBEL871** | Dissertation | 180 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **STTK884** | Advanced Resampling Methods / *Hersteekproefnemingsmetodes* | 36 | 9 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **STTK885** | Advanced Statistical Models / *Gevorderde Statistiese Modelle* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **STTK886** | Advanced Multivariate Statistics / *Gevorderde Meerveranderlike Statistiek* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **STTK887** | Advanced Probability Theory / *Gevorderde Waarskynlikheidsleer* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **STTK888** | Advanced Time Series Models / *Gevorderde Tydsreeksmodelle* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **STTK889** | Advanced Stochastic Processes / *Gevorderde Stogastiese Prosesse* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| | | | | |
| **STTN872** | Dissertation / *Verhandeling* | 100 | 9 | Faculty of Natural and Agricultural Sciences |
| **STTN884** | Advanced Survival Models / *Gevorderde Oorlewingsteorie* | 36 | 9 | Faculty of Natural and Agricultural Sciences |
| **DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*** | | | | |
| **AECM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **AEXM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **AGRM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **AHAM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **APPM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ARST971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ASCM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **BCHN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **BIYM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **BWIN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **BWIR971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |

| Module Code 2021 / *Modulekode 2021* | Descriptive Name / *Beskrywende Naam* | Cr/ *Kr* | NQF level/ *NKR-vlak* | Faculty/ *Fakulteit* |
|---|---|---|---|---|
| **CHEN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **CHEM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **DRKN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **DRRS971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ENVM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **FSKN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **GEOM971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **GGFN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **HDGH971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **HIKS971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ITRW971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ITWV971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **MKBN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **MTHS971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **NWON971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **OMWN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **ONAV972** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **PLKN971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **SBEL971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **STTK971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **TGWS971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |
| **WISK971** | Thesis | 360 | 10 | Faculty of Natural and Agricultural Sciences |

## NAS.4 POSTGRADUATE DIPLOMA / *NAGRAADSE 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 A.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.

*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 A.3). 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.*

#### NAS.4.1.1 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.*

#### NAS.4.1.2 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 N1.14.1. 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 N1.14.1. Sien A-Reêls 3.*

*As die getal aansoeke vir 'n program die kapasiteit van die skool oorskrei, word slegs die studente, op grond van die skooldirekteur 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.*

### NAS.4.1.3 FACULTY-SPECIFIC REQUIREMENTS / *FAKULTEITSPESIFIEKE 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 lead to learning.

*Die student het reeds 'n toepaslike baccalaureusgraad met ten minste 60 krediet modules op 'n NKR-vlak 7 in die hoofvak 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 Fakulteitsraad, 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.4.2 POSTGRADUATE DIPLOMA IN AGRICULTURAL ECONOMICS / *NAGRAADSE DIPLOMA IN LANDBOU-EKONOMIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2FB D01 N501M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ECOM515 | Agriculture and Economic Development | 16 |
| ECOM516 | Agricultural Statistics Research I | 16 |
| ECOM517 | Quantitative Methods in Agricultural Economics | 8 |
| ECOM518 | Agricultural Micro-Economics | 12 |
| ECON519 | Agricultural Production Economics | 16 |
| EXTM514 | Rural Community Development | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **84** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ECOM520 | Agricultural Marketing | 12 |
| ECOM526 | Agricultural Project Appraisal | 16 |
| ECOM527 | Agricultural Macro-Economics | 12 |
| ECOM529 | Research Methods And Project | 16 |
| **Total 2nd/ *Totaal 2e Semester*** | | **56** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **140** |

## NAS.4.3 POSTGRADUATE DIPLOMA IN AGRICULTURAL EXTENSION/ *NAGRAADSE DIPLOMA IN LANDBOUVOORLIGTING*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2FC D01 N501M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ECOM515 | Agriculture and Economic Development | 16 |
| EXTM514 | Rural Community Development | 16 |
| EXTM515 | Essentials of Agricultural Extension | 16 |
| EXTM516 | Elements of Communication in Agricultural Extension | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **64** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ECOM526 | Agricultural Project Appraisal | 16 |
| EXTM526 | Change in Agriculture | 16 |
| EXTM527 | Leadership Development in Agricultural Extension | 16 |
| EXTM525 | Research Methods and Project | 24 |
| **Total 2nd/ *Totaal 2e Semester*** | | **72** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **136** |

## NAS.4.4 POSTGRADUATE DIPLOMA IN DISASTER RISK MANAGEMENT / *NAGRAADSE DIPLOMA IN RAMPRISIKOBESTUUR*

### NAS.4.4.1 PROGRAMME OUTCOMES / *PROGRAMUITKOMSTE*

After successful completion of the Postgraduate diploma in Disaster Risk Management, the candidate will demonstrate the following:

*Na suksesvolle voltooiing van die Nagraadse Diploma in Ramprisikobestuur, sal die kandidate die volgende demonstreer:*

- Integrated knowledge and understanding of, as well as involvement in, different theories and principles relating to disaster risk management and climate change adaptation, leadership and management within the field of disaster risk management, as well as the ability to apply such knowledge and understanding with a view to critically analyze and evaluate global and local studies within this context; /

  *Geïntegreerde kennis en begrip van, asook betrokkenheid by, verskillende teorieë en beginsels wat betrekking het op ramprisikobestuur en klimaatsveranderingaanpassing, 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 submit multiple knowledge sources to critical questioning, especially published journal articles on studies in the field of disaster risk management and climate change, and to judge and evaluate critical research methods as well as the results and recommendations produced by such research; /

  '*n Vermoë om veelvuldige kennisbronne aan kritiese vraagstelling te onderwerp, veral gepubliseerde 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 and apply a variety of different but appropriate management skills and scientific research methods, to reflect on it and to address complex and abstract problems, contributing to positive change in the practice of disaster risk management and for the benefit of all members of the community;/

  '*n Vermoë om 'n 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, ramprisikobestuur se openbare bestuurspraktyke en die gemeenskap en dit aan te spreek, ten einde waar nodig verandering in gedrag en aanpassing teweeg te bring;*

- The ability to deliver accurate, coherent, appropriate and creative presentation and communication of innovative and new professional ideas, methods and research findings to

policy makers, practitioners, other role players and academics in the field of disaster risk reduction, with understanding 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 navorsingsbevindings 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 the future use of appropriate resources; and /

  *Die vermoë om effektief te 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 appropriate learning strategies in a self-critical manner in order to address a professional lifelong learning process while developing accountability for resource utilization. /

  *Die vermoë om op 'n selfkritiese wyse, toepaslike leerstrategieë toe te pas ten einde 'n professionele lewenslange leerproses aan te spreek terwyl toerekenbaarheid vir die benutting van hulpbronne ontwikkel word.*

### NAS.4.4.2 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 Bachelors degree or an equivalent Qualification obtained with an average mark of 65%. /

   *Om in aanmerking te kom vir die Nagraadse Diploma in Ramprisikobestuur, moet kandidate 'n B-graad of 'n Gevorderde Diploma ekwivalent met 'n gemiddeld van 65% voltooi het.*

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 Skooldirekteur aansoek doen om 'n onderhoud deur 'n keuringspaneel. Die paneel word saamgestel deur die Skooldirekteur 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, afhangend 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. /

*Alle kandidate wat toegelaat word, moet op 'n datum wat deur die Skooldirekteur vasgestel word, 'n inleidende en oriënterende byeenkoms op die Potchefstroomkampus bywoon.*

e. Each applicant is obliged to supply the following documentation together with the application: **/**

*Elke aansoeker moet die volgende dokumentasie saam met die aansoekvorm indien:*

- A curriculum vitae / *a Curriculum vitae*
- A photocopy of the certificate of undergraduate degree / *'n Kopie van die sertifikaat van voorgraadse kwalifikasie*
- Academic record / *Akademiese rekord*
- At least two letters of recommendation / *Ten minste twee aanbevelingsbriewe*

## NAS.4.4.3 POSTGRADUATE DIPLOMA IN DISASTER RISK MANAGEMENT / *NAGRAADSE DIPLOMA IN RAMPRISIKOBESTUUR*

### NAS.4.4.3.1 FULL TIME PROGRAMME / *VOLTYDSE PROGRAM*

| **Qualification Code/** ***Kwalifikasiekode*** | **2GC D01 N501P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS, ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time */ Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Full-time (1 Year) / *Voltyds (1 Jaar)*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 / *Navorsingsmetodologie* | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **80** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 |
| **Total 2nd/ *Totaal 2e Semester*** | | **64** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **144** |

## NAS.4.4.3.2 PART TIME PROGRAMME / *DEELTYDSE PROGRAM*

| | |
|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GC D01 N501P** |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS, ENGLISH) |
| **Delivery Mode/** ***Metode van Aflewering*** | Part Time */ Deeltyds* |

| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
|---|---|---|
| **Part-time ( 2 Years) / *Deeltyds (2 jaar)*** | | |
| **First/ *Eerste Semester* - Year 1/ *Jaar 1*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester* - Year 1/ *Jaar 1*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| DRRS521 | Urban Disaster Risk / *Streeks Ramp Risiko* | 16 |
| DRRS522 | Preparedness and Response / *Voorbereiding en Reaksie* | 16 |
| **Total 2nd/ *Totaal 2e Semester*** | | **32** |
| **First/ *Eerste Semester* - Year 2/ *Jaar 2*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/ Beskrywende naam** | **Credits/** ***Krediete*** |
| DRRS514 | Disaster Risk Assessment / Ramp Risiko Assesserings | 16 |
| DRRS515 | Research Methodology / Navorsingsmetodologie | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **32** |
| **Second/ *Tweede Semester* - Year 2/ *Jaar 2*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/ Beskrywende naam** | **Credits/** ***Krediete*** |
| DRRS523 | Planning and Project Management / Beplanning en Projekbestuur | 16 |
| DRRS524 | Research Project / Navorsingsprojek | 16 |
| **Total 2nd/ Totaal 2e Semester** | | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **144** |

## NAS.5 BACHELOR OF SCIENCE HONOURS / BACCALAUREUS SCIENTIAE HONNEURS

### NAS.5.1 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 formal admission to the intended programme in the following year (see General Rules 1.5). 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.

*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 1.5). 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 vakgroep beskikbaar is*.

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

#### NAS.5.1.1 DURATION (MINIMUM AND MAXIMUM DURATION) / *DUUR VAN DIE STUDIE (MIMIMUM EN MAKSIMUM DUUR)*

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.*

#### NAS.5.1.2 ADMISSION REQUIREMENTS FOR THE QUALIFICATION / *TOELATINGVEREISTES 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 N1.14.1.

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

*Die studie kan onderneem word in 'n studieprogram wat deur die Fakulteitsraad goedgekeur is. Hierdie studieprogramme word in N1.14.1. 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.*

### NAS.5.1.3 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 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 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.*

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:

*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:*

| **Honours Programmes/**<br>***Honneurs Programme*** | **Undergraduate Codes/**<br>***Voorgraadse kodes*** |
|---|---|
| **2DP L01 N601P (N610P)**<br>Bachelor of Science Honours in Quantitative Risk Management/<br>*Baccalareus Scientiae Honneurs in Kwantitatiewe Risikobestuur* | 2FT H01 N301P (N134P)<br>2FQ H01 N301P (N137P) |
| **2DQ L01 N601P (N611P)**<br>Bachelor of Science Honours in Financial Mathematics/<br>*Baccalareus Scientiae Honneurs in Finansiële-wiskunde* | 2FS H01 N301P (N135P) |
| **N2FP L01 N601P (N612P)**<br>Bachelor of Science Honours in Business Analytics/<br>*Baccalaureus Scientiae Honneurs in Besigheidsanalise* | 2FT H01 N301P (N134P)<br>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.

*'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. 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.

*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 program 2DR L01, N601P (N609P) toegelaat word.*

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.

*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.*

### NAS.5.1.4 ATTAINMENT OF THE DEGREE/ *VERWERWING VAN DIE GRAAD QUALIFICATION WITH DISTINCTION/ KWALIFIKASIE MET ONDERSKEIDING*

Referring to General Rule 3.6.2 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.

*Met verwysing na Algemene Reël 3.6.2 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.*

### NAS.5.1.5 EXIT LEVEL OUTCOMES / *UITTREEVLAKUITKOMSTE*

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.

*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.*

### NAS.5.1.6 NATURAL SCIENCE (INCLUDING MATHEMATICAL AND COMPUTER) AND TECHNOLOGY 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 solve certain convergent and divergent problems in relevant disciplines from the health sciences and technology in a creative and innovative way.

*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.*

### NAS.5.1.7 APPLYING FUNDAMENTAL AND EXPERT KNOWLEDGE/ *TOEPASSING VAN FUNDAMENTELE EN SPESIALISKENNIS*

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.

*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.*

### NAS.5.1.8 INVESTIGATIONS, EXPERIMENTING AND DATA ANALYSIS/ *ONDERSOEKE, EKSPERIMENTERING EN DATA-ANALISE*

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.

*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 navorsingsmetodologie van die besondere dissipline.*

### NAS.5.1.9 SCIENTIFIC METHODS, SKILLS AND INFORMATION TECHNOLOGY/ *WETENSKAPLIKE METODES, VAARDIGHEDE EN INLIGTINGSTEGNOLOGIE*

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.

*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.*

### NAS.5.1.10 PROFESSIONAL AND GENERAL COMMUNICATION / *PROFESSIONELE EN ALGEMENE KOMMUNIKASIE*

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;
b. 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).

*Aan die einde van die studie is die student in staat om:*

*a. 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. 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.*

### NAS.5.1.11 IMPACT OF NATURAL SCIENCE ACTIVITIES ON THE COMMUNITY AND ENVIRONMENT / *IMPAK VAN NATUURWETENSKAPLIKE AKTIWITEIT OP DIE GEMEENSKAP EN DIE OMGEWING*

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
c. the impact of technology on the community and
d. the personal, social and cultural values and expectancies of those people on whom scientific activities have an influence.

*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*
*c. die impak van tegnologie op die gemeenskap, en*
*d. die persoonlike, sosiale, en kulturele waardes en verwagtinge van diegene wat deur wetenskaplike aktiwiteite geraak word, in ag te neem.*

### NAS.5.1.12 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.*

### NAS.5.1.13 LIFELONG LEARNING / *LEWENSLANGE LEER*

The student understands 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.*

### NAS.5.1.14 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 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. Programme 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.

*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.5.1.15 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.*

### NAS.5.1.15.1 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.*

### NAS.5.1.15.2 Module Mark / *Modulepunt*

The module mark (General Rule 1.13.1) 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 1.13.1) word bereken in die verhouding waarin evalueringsmetodes van toepassing vir 'n spesifieke module gekombineer word, soos in die studiegids vir die module uiteengesit.*

### NAS.5.1.15.3 Pass Requirements / *Slaagvereistes*

a) The stipulations of General Rule 1.13 applies. /

   *Die bepalings van Algemene Reël 1.13 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%.* (ARule 1.13.2)

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*.

### NAS.5.1.15.4 Number of Examination 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 1.13.

*'n Eenmalige herhaling van modules wat nie geslaag is nie, en ook verdere eksamengeleenthede, vind slegs plaas in oorleg met die bepalings van Algemene Reël 1.13.*

## NAS.5.2 BACHELOR OF SCIENCE HONOURS IN APPLIED RADIATION SCIENCE/ BACCALAUREUS *SCIENTIAE HONNEURS IN TOEGEPASTE STRALINGSWETENSKAP*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EK L01 N601M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ARSM611 | Nuclear Physics | 24 |
| ARSM612 | Nuclear Chemistry | 24 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **48** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MARS621 | Radiation and Environment | 24 |
| MARS622 | Radioactive Waste Minimisation and Management | 24 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **48** |
| **Year Module/** ***Jaarmodule*** | | |
| ARSM673 | Research Report | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.3 BACHELOR OF SCIENCE HONOURS IN BIOLOGY WITH BOTANY / *BACCALAUREUS SCIENTIAE HONNEURS IN BIOLOGIE MET PLANTKUNDE*

### NAS.5.3.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR PROGRAM*

Students may be admitted to the Honours qualification in Biology with Botany given that they are in possession of a BSc degree with Botany 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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2EL L01 N601M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| NRCM611 | Conservation of Natural Resources | 24 |
| PTSM619 | Plant Taxonomy | 24 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **48** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| NRCM621 | Further Conservation of Natural Resources | 24 |
| PTSM629 | Herbarium Management | 24 |
| RESM672 | Research Report | 32 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **80** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.4 BACHELOR OF SCIENCE HONOURS IN BIOCHEMISTRY / *BACCALAUREUS SCIENTIAE HONNEURS IN BIOCHEMIE*

### NAS.5.4.1 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 Honneurs-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.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DW L01 N601P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/ Beskrywende naam** | **Credits/** ***Krediete*** |
| BCHN611 | Analytical Biochemistry / *Analitiese Biochemie* | 24 |
| BCHN612 | Advanced Metabolism / *Gevorderde Metabolisme* | 24 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **48** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/ Beskrywende naam** | **Credits/** ***Krediete*** |
| BCHN621 | Advanced Molecular Biology / *Gevorderde Molekulêre Biologie* | 24 |
| BCHN622 | Bioenergetics / *Bio-energetika* | 24 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **48** |
| **Year Module/ Jaarmodule** | | |
| BCHN671 | Research Report / *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.5 BACHELOR OF SCIENCE HONOURS IN BIOCHEMISTRY WITH MOLECULAR BIOCHEMISTRY/ *BACCALAUREUS SCIENTIAE HONNEURS IN BIOCHEMIE MET MOLUKULÊRE BIOCHEMIE*

### NAS.5.5.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME

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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2DW L02 N601M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BCHN613 | Advanced Analytical Biochemistry | 24 |
| BCHN614 | Advanced Metabolism of Diseases | 24 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **48** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BCHN623 | Advanced Drug Discovery | 24 |
| BCHN624 | Advanced Cellular and Molecular Biology | 24 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **48** |
| **Year Module/ Jaarmodule** | | |
| BCHN671 | Research Report | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.6 BACHELOR OF SCIENCE HONOURS IN MICROBIOLOGY / *BACCALAUREUS SCIENTIAE HONNEURS IN MIKROBIOLOGIE*

### NAS.5.6.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR PROGRAM*

Students may be admitted to the Honours qualification in Microbiology given that they are in possession of a BSc degree with Microbiology 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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2ES L01 N601M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BMCM613 | Bacteriology | 24 |
| BMCM614 | Virology And Immunology | 24 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **48** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RESM672 | Research Report | 32 |
| BMCM621 | Mycology | 24 |
| BMCM622 | Environmental And Industrial Microbiology | 24 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **80** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.7 BACHELOR OF SCIENCE HONOURS IN CHEMISTRY / *BACCALAUREUS SCIENTIAE HONNEURS IN CHEMIE*

### NAS.5.7.1 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 Natuurwetenskaplikes*.

### NAS.5.7.2 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 suksesvol te voltooi.*

### NAS.5.7.3 PROGRAMME OUTCOMES / *PROGRAMUITKOMSTE*

The BScHons in Chemistry programme, is designed to train chemists as natural scientists. /

*Die BSc Hons in Chemie program, is vir die opleiding van chemici as natuurwetenskaplikes, ontwerp.*

## NAS.5.7.4 BACHELOR OF SCIENCE HONOURS IN CHEMISTRY / *BACCALAUREUS SCIENTIAE HONNEURS IN CHEMIE*

| | |
|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GH L01 N601P**<br>**2GH L01 N601M** |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng<br>(AFRIKAANS / ENGLISH) |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time /<br>*Voltyds* |

**COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM***

**First/ *Eerste Semester***

| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
|---|---|---|
| NCHE611 | Advanced Organic Chemistry /<br>*Gevorderde Organiese Chemie* | 16 |
| NCHE612 | Advanced Physical Chemistry /<br>*Gevorderde Fisiese Chemie* | 16 |
| NCHE613 | Advanced Inorganic Chemistry /<br>*Gevorderde Anorganiese Chemie* | 16 |
| NCHE614 | Advanced Analytical Chemistry /<br>*Gevorderde Analitiese Chemie* | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **64** |

**Second/ *Tweede Semester***

**Select FOUR of the following modules in consultation with the subject chairperson / *Kies VIER van die modules in konsultasie met die vakvoorsitter:***

| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
|---|---|---|
| NCHE621 | Molecular Modelling /<br>*Molekuulmodellering* | 8 |
| NCHE622 | Polymer Chemistry /<br>*Polimeerchemie* | 8 |
| NCHE623 | Advanced Structural Elucidation /<br>*Gevorderde strukstuuropklaring* | 8 |
| NCHE624 | Environmental Chemistry /<br>*Omgewingschemie* | 8 |
| NCHE625 | Techniques for Organic Synthesis /<br>*Tegnieke vir Organiese Sintese* | 8 |
| NCHE626 | Electrochemistry /<br>*Elektrochemie* | 8 |

| Module Code/ *Modulekode* | Descriptive name/ *Beskrywende naam* | Credits/ *Krediete* |
|---|---|---|
| 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 |
| **Total 2nd/ *Totaal 2de Semester*** | | **32** |
| **Year Module/ Jaarmodule** | | |
| NCHE671 | Research Report / *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **128** |

## NAS.5.8 BACHELOR OF SCIENCE HONOURS IN COMPUTER SCIENCE/ *BACCALAUREUS SCIENTIAE HONNEURS IN REKENAARWETENSKAP*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EM L01 N601M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| CISM614 | Algorithms and Data Structures | 16 |
| CISM615 | Programming Languages and Objects | 16 |
| CISM616 | Operating Systems | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| CISM621 | Networks | 16 |
| CISM622 | Databases | 16 |
| CISM623 | Machine Learning | 16 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| **Research Module/ *Navorsingsmodule*** | | |
| CISM670 | Research Report | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.9 BACHELOR OF SCIENCE HONOURS IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY/ *BACCALAUREUS SCIENTIAE HONNEURS IN REKENAARWETENSKAP EN INLIGTINGSTEGNOLOGIE*

### NAS.5.9.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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.*

### NAS.5.9.2 CURRICULUM REQUIREMENTS / *KURRIKULUMVEREISTES*

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 more than 60%. Selection is furthermore based on a student's academic record and other proven appropriate prior learning, taking into account the student's background knowledge and potential. Selection also depends on capacity. If the students who pass the selection are more than the relevant school can handle, the group of students who, in the opinion of the selection committee in consultation with school director, has the greatest chance of success, will be selected for the relevant qualification.

*Studente kan tot die Honneurs-kwalifikasie in Rekenaarwetenskap en Inligtingstegnologie toegelaat word indien hulle 'n BSc graad met Rekenaarwetenskap en Inligtingstegnologie op NQF-vlak 7, wat 'n slaagpunt van meer as 60% behaal het. Keuring vind plaas op grond van die student se akademiese rekord, vorige leer asook die student se agtergrondskennis en potensiaal. Keuring hang ook af van kapasiteit. As die studente wat die keuring slaag, meer is as wat die betrokke skool kan hanteer, kan die groep studente wat volgens die oordeel van die keuringskomitee, in oorleg met die skooldirekteur, die grootste kans op sukses het, gekies word vir die betrokke kwalifikasie.*

## NAS.5.9.3 BACHELOR OF SCIENCE HONOURS IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY/ *BACCALAUREUS SCIENTIAE HONNEURS IN REKENAARWETENSKAP EN INLIGTINGSTEGNOLOGIE*

| | |
|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EN L01 N601P**<br>**2EN L01 N601V** |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Vanderbijlpark<br>(AFRIKAANS / ENGLISH) |
| **Delivery Mode/** ***Metode van Aflewering*** | PC= Full Time only; VC= Full Time & Part Time /<br>PK= *Voltyds*; VK= *Voltyds & Deeltyds* |

| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
|---|---|---|
| **First/ *Eerste Semester*** | | |
| **Select FOUR of the following modules in consultation with the subject chairperson /** ***Kies VIER van die modules in konsultasie met die vakvoorsitter*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ITRI611 | Data Warehouses I /<br>*Datapakhuise I* | 12 |
| ITRI612* | Linear Programming I /<br>*Lineêre Programmering I* | 12 |
| ITRI613 | Databases I /<br>*Databasisse I* | 12 |
| ITRI614 | Information Systems Engineering I /<br>*Inligtingstelselingenieurswese I* | 12 |
| ITRI615 | Computer Security I /<br>*Rekenaarsekuriteit I* | 12 |
| ITRI616 | Artificial Intelligence I /<br>*Kunsmatige Intelligensie I* | 12 |
| ITRI617* | Image Processing I /<br>*Beeldverwerking I* | 12 |
| ITRI618 | Decision Support Systems I /<br>*Besluitsteunstelsels* I | 12 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |

**Please note:** An asterisk (*) indicates that the module won't be offered at the VC campus.

| Second/ *Tweede Semester* | | |
|---|---|---|
| **Select FOUR of the following modules in consultation with the subject chairperson / *Kies VIER van die modules in konsultasie met die vakvoorsitter:*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| 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 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| **Year Module/ *Jaarmodule*** | | |
| ITRI671 | Research Report / *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **128** |

**Please note:** An asterisk (*) indicates that the module won't be offered at the VC campus.

## NAS.5.10 BACHELOR OF SCIENCE HONOURS IN PHYSICS WITH ELECTRONICS / *BACCALAUREUS SCIENTIAE HONNEURS IN FISIKA MET ELEKTRONIKA*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GJ L02 N601M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ELEM611 | Embedded Systems | 12 |
| ELEM612 | Analogue Communication Systems | 12 |
| ELEM613 | Electronic Instrumentation | 12 |
| ELEM614 | Optoelectronics and Optical Communications Systems | 12 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ELEM625 | Control Systems | 12 |
| ELEM626 | Engineering Electromagnetics | 12 |
| ELEM627 | Digital Communications Systems | 12 |
| ELEM628 | Power Electronics | 12 |
| ELEM671 | Research Report | 32 |
| **Total 2nd/ *Totaal 2de Semester*** | | **80** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.11 BACHELOR OF SCIENCE HONOURS IN PHYSICS / *BACCALAUREUS SCIENTIAE HONNEURS IN FISIKA*

### NAS.5.11.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

Admission to this Honours qualification is open to students who have been awarded a BSc degree with at least 65% 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 65% 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.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GJ L01 N601P**<br>**2GJ L01 N601M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng<br>(AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time /<br>*Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| NPHY612 | Quantum Mechanics I /<br>*Kwantummeganika I* | 16 |
| NPHY613 | Electrodynamics /<br>*Elektrodinamika* | 16 |
| NPHY614 | Computational Physics /<br>*Rekenaarfisika* | 16 |
| **Choose ONE of the following /** ***Kies EEN van die volgende*** | | |
| NPHY611 | Classical Mechanics /<br>*Klassieke Meganika* | 16 |
| NPHY615 | Astrophysical Fluids /<br>*Astrofisiese fluïedes* | 16 |
| NPHY616 | Observational Techniques /<br>*Waarnemingstegnieke* | 16 |
| NPHY617 | Introduction to General Relativity /<br>*Inleiding tot Algemene Relatiwiteit* | 16 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **64** |

| **Second/ *Tweede Semester*** | | |
|---|---|---|
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| NPHY621 | Statistical Mechanics / *Statistiese Meganika* | 16 |
| **Choose ONE of the following / *Kies EEN van die volgende*** | | |
| NPHY623 | Plasma Physics / *Plasmafisika* | 16 |
| NPHY625 | Introduction to Stellar Astrophysics / *Inleidende Sterre Astrofisika* | 16 |
| NPHY626 | Nuclear Physics / *Kernfisika* | 16 |
| NPHY627 | Solid State Physics / *Vastetoestandfisika* | 16 |
| NPHY628 | Quantum Mechanics II / *Kwantummeganika II* | 16 |
| NPHY629 | Introduction to Cosmology / *Inleiding tot Kosmologie* | 16 |
| **Total 2nd/ *Totaal 2de Semester*** | | **32** |
| **Year Module/ *Jaarmodule*** | | |
| NPHY671 | Research Report/ *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **128** |

## NAS.5.12 BACHELOR OF SCIENCE HONOURS IN MATHEMATICAL STATISTICS / *BACCALAUREUS SCIENTIAE HONNEURS IN WISKUNDIGE STATISTIEK*

### NAS.5.12.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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*

### NAS.5.12.2 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 an appropriate advanced diploma (level 7), 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 and a reading programme. /

*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 toepaslike gevorderde diploma (vlak 7), 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 en leesprogram te voltooi.*

## NAS.5.12.3 BACHELOR OF SCIENCE HONOURS IN MATHEMATICAL STATISTICS / *BACCALAUREUS SCIENTIAE HONNEURS IN WISKUNDIGE STATISTIEK*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GD L01 N601P/ 2GD L01 N601V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom/ Vanderbijlpark (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| STAT612 | Financial Time Series | 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 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| STAT622 | Linear Statistical Models and Experimental Design | 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 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| **Year Module/ *Jaarmodule*** | | |
| STTN671 | Research Report | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.13 PREREQUISITES FOR MATHS AND APPLIED MATHS HONOURS MODULES / *VOORVEREISTES VIR WISKUNDE EN TOEGEPASTE WISKUNDE HONNEURS MODULES*

| **Module Code/** *Modulekode* | **Description/** *Beskrywing* | **Prerequisite as stated in the study guide (SG) or yearbook/** *Voorvereiste soos in studiegids (SG) uiteengesit of jaarboek* |
|---|---|---|
| **APPLIED MATHEMATICS / *TOEGEPASTE WISKUNDE*** **Semester 1** | | |
| **APMA621** | Introductory Harmonic Analysis | Credit for MTHS311 or the successful completion of MTHS619. |
| **APPM611** | Lie-symmetries I (ODE's) | |
| **APPM612** | Numerical Analysis | |
| **APPM613** | Theory of PDE's | |
| **APPM614** | Financial Modelling I | |
| **APPM615** | Theory of ODE's | |
| **APPM616** | Calculus of Variations | |
| **APPM617** | Fluid Dynamics I | Vector Calculus (stated in SG). Contained in for example **MTHS211/ WISN211 & MTHS221/ WISN224.** |
| **APPM618** | Biomathematics | |
| **APPM619** | Applied Matrix Analysis | **WISN212/ MTHS212** and one of either **WISN226/ MTHS222** or **WISN227/ MTHS224** or equivalent (stated in SG) |
| **APPM629** | Dynamical systems & PDEs | APPM311, APPM312 & APPM613 |
| **APPLIED MATHEMATICS / *TOEGEPASTE WISKUNDE*** **Semester 2** | | |
| **APPM621** | Lie-symmetries II (PDE's) | |
| **APPM622** | Advanced Numerical Analysis | **APPM612** Numerical Analysis (stated in SG) |
| **APPM623** | Numerical Methods for PDE's | **APPM613** and **MTHS312 (APPM312**) or equivalent (stated in SG) |
| **APPM624** | Financial Modelling II | **APPM614** Financial Modelling I (stated in SG), **STTN115 or equivalent** (stated in yearbook). |
| **APPM625** | Financial Modelling III | **STTN115** or equivalent (stated in yearbook). |
| **APPM626** | Control Theory | **APPM619 Applied Matrix Analysis or MTHS613 Matrix Analysis (assumed)** |
| **APPM627** | Fluid Dynamics II | **APPM617** Fluid Dynamics I (stated in SG) |
| **APPM628** | Industrial Mathematics | |

| MATHEMATICS / *WISKUNDE*<br>**Semester 1** | | |
|---|---|---|
| **MTHS611** | Fundamentals of Mathematics | |
| **MTHS612** | Abstract Algebra I | **MTHS222/ WISN226** & **MTHS322/ WISN322** (stated in SG) |
| **MTHS613** | Matrix Analysis | **WISN212/ MTHS212 & WISN226/ MTHS222** or equivalent (stated in SG) |
| **MTHS614** | Measure Theory I | **WISN323/ MTHS311** or equivalent (stated in SG) |
| **MTHS615** | Functional Analysis I | **WISN323/ MTHS311 and WISN323/ MTHS311 or equivalent** (stated in SG) |
| **MTHS619** | Real and Complex Analysis | **MTHS222/ WISN226** & **MTHS322/ WISN322** (stated in SG) |
| **MATHEMATICS / *WISKUNDE***<br>**Semester 1** | | |
| **MTHS621** | Topology | **WISN323/ MTHS311** or equivalent (stated in SG) |
| **MTHS622** | Abstract Algebra II | **MTHS612** Abstract Algebra I (stated in SG) |
| **MTHS623** | Complex Function Theory | **WISN313/ MTHS321** or equivalent (stated in SG) |
| **MTHS624** | Measure Theory II | **MTHS614** Measure Theory I (stated in SG) |
| **MTHS625** | Functional Analysis II | **MTHS615 Functional Analysis I** (stated in SG) |
| **MTHS626** | Evolution of Mathematical Ideas | |

## NAS.5.14 BACHELOR OF SCIENCE HONOURS IN APPLIED MATHEMATICS / *BACCALAUREUS SCIENTIAE HONNEURS IN TOEGEPASTE WISKUNDE*

### NAS.5.14.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE REËLS 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*.

### NAS.5.14.2 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

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. In addition, a prospective student must comply with all other requirements as prescribed in the rules of the Faculty of Natural and Agricultural Sciences, and as contained in the faculty yearbook.

Prerequisites for Maths modules in the programme, see NAS.4.16.1 /

*Studente kan tot die Honneurs kwalifikasie in Toegepaste Wiskunde toegelaat word, indien hulle in besit is van 'n BSc-graad met Wiskunde wat met minstens 60%, op NKR-vlak 7 geslaag is. Keuring is verder gegrond op 'n student se akademiese rekord en ander bewese toepaslike vorige leer, met inagneming van die student se agtergrond en potensiaal. Daarbenewens moet 'n voornemende student voldoen aan alle ander vereistes soos voorgeskryf in die reëls van die Fakulteit Natuur- en Landbouwetenskappe, en soos vervat in die fakulteit se jaarboek*.

*Voorvereistes vir Wiskunde modules in die program sien NAS.4.16.1.*

## NAS.5.14.3 BACHELOR OF SCIENCE HONOURS IN APPLIED MATHEMATICS / *BACCALAREUS SCIENTIAE HONNEURS IN TOEGEPASTE WISKUNDE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EJ L01 N601P/ 2EJ L01 N601M/ 2EJ L01 N601V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom/ Mahikeng / Vanderbijlpark (AFRIKAANS/ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| APPM612 | Numerical Analysis / *Numeriese Analise* | 12 |
| **And ONE module selected in consultation with the School Director and the subject chairperson of Mathematics and Applied Mathematics, from the following list /** ***En EEN module, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, gekies uit die volgende lys:*** | | |
| APPM613 | Theory of Partial Differential Equations / *Teorie van Parsiële Differensiaal-vergelykings* | 12 |
| APPM615 | Theory of Ordinary Differential Equations / *Teorie van* Gewone *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 / | 12 |

| | | |
|---|---|---|
| | *Vloeidinamika I* | |
| APPM618 | Biomathematics /<br>*Biowiskunde* | 12 |
| APPM619 | Applied Matrix Analysis /<br>*Toegepaste Matriksanalise* | 12 |
| MTHS614 | Measure and Integration theory I /<br>*Maat- en Integrasieteorie I* | 12 |
| MTHS615 | Functional Analysis I /<br>*Funksionaalanalise I* | 12 |
| MTHS619 | Real & Complex Analysis /<br>*Reële en Komplekse Analise* | 12 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester*** | | |
| **One module, selected in consultation with the School Director and the subject chairperson of Mathematics and Applied Mathematics, from the following list /**<br>***EEN module, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, gekies uit die volgende lys:*** | | |
| **Module Code/**<br>***Modulekode*** | **Descriptive name/**<br>***Beskrywende naam*** | **Credits/**<br>***Krediete*** |
| APPM621 | Symmetries of Differential Equations II /<br>*Simmetrieë van Differensiaalvergelykings II* | 12 |
| APPM622 | Advanced Numerical Analysis /<br>*Gevorderde Numeriese Analise* | 12 |
| APPM623 | Numerical Methods for Partial Differential Equations /<br>*Numeriese Metodes vir Parsiële Differensiaalvergelykings* | 12 |
| APPM628 | Industrial Mathematics /<br>*Industriële Wiskunde* | 12 |
| **And THREE modules, in consultation with the School Director and the head of the subject group Mathematics and Applied Mathematics, from the following list: /**<br>***En DRIE modules, in oorleg met die skooldirekteur en die vakvoorsitter by Wiskunde en Toegepaste Wiskunde, uit die volgende lys:*** | | |
| APMA621 | Introductory Harmonic Analysis /<br>*Inleidende Harmoniese Analise* | 12 |
| APPM621 | Symmetries of Differential Equations II (if not already selected) /<br>*Simmetrieë van Differensiaalvergelykings II (indien nie reeds gekies nie)* | 12 |
| APPM622 | Advanced Numerical Analysis (if not already selected)/<br>*Gevorderde Numeriese Analise (indien nie reeds gekies nie)* | 12 |
| APPM623 | Numerical Methods for Partial Differential Equations (if | 12 |

| | | |
|---|---|---|
| | not already selected) /<br>*Numeriese metodes*<br>*vir Parsiële Differensiaalvergelykings*<br>*(indien nie reeds gekies nie)* | |
| APPM624* | Financial Modelling II /<br>*Finansiële Modellering II* | 12 |
| APPM625* | Financial Modelling III /<br>*Finansiële Modellering III* | 12 |
| APPM626 | Control Theory /<br>*Beheerteorie* | 12 |
| APPM627 | Fluid Dynamics II /<br>*Vloeidinamika II* | 12 |
| APPM628 | Industrial Mathematics (if not already selected) / *Industriële Wiskunde (indien nie reeds gekies nie)* | 12 |
| APPM629 | Dynamical systems & PDEs /<br>*Dinamiese stelsels en PDVs* | 12 |
| MTHS623 | Complex Function Theory /<br>*Komplekse Funksie Teorie* | 12 |
| MTHS624 | Measure and Integration theory II /<br>*Maat- en Integrasieteorie II* | 12 |
| MTHS625 | Functional Analysis II /<br>*Funksionaalanalise II* | 12 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| **Year Module/ *Jaarmodule*** | | |
| APPM671 | Research Report /<br>*Navorsingsverslag* | **32** |
| **Total Credits for the Programme/<br>*Totale Krediete vir die Program*** | | **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.5.15 BACHELOR OF SCIENCE HONOURS IN MATHEMATICS / *BACCALAUREUS SCIENTIAE HONNEURS IN WISKUNDE*

### NAS.5.15.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

A student who has completed BSc in 2FF H22 N301P (N152P), 2FF H23 N301P (N154P), 2FF H09 N301P (N157P), 2FG H02 N301P (N158P), 2FG H01 N301P (N159P), 2FF H29 N301P (N176P), 2FS H01 N301P (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 MTHS611/626 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 H09 N301P (N157P), 2FG H02 N301P (N158P), 2FG H01 N301P (N159P), 2FF H29 N301P (N176P), 2FS H01 N301P (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 MTHS611/626 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.*

### NAS.5.15.2 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. In addition, a prospective student must comply with all other requirements as prescribed in the rules of the Faculty of Natural and Agricultural Sciences, and as contained in the faculty yearbook. /

*Studente kan tot die Honneurs kwalifikasie in Wiskunde toegelaat word, indien hulle in besit is van 'n BSc-graad met Wiskunde wat met minstens 60%, op NKR-vlak 7 geslaag is. Keuring is verder gegrond op 'n student se akademiese rekord en ander bewese toepaslike vorige leer, met inagneming van die student se agtergrond en potensiaal. Daarbenewens moet 'n voornemende student voldoen aan alle ander vereistes soos voorgeskryf in die reëls van die Fakulteit Natuur- en Landbouwetenskappe, en soos vervat in die fakulteit se jaarboek*.

## NAS.5.15.3 BACHELOR OF SCIENCE HONOURS IN MATHEMATICS / *BACCALAUREUS SCIENTIAE HONNEURS IN WISKUNDE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2ER L01 N601P/ 2ER L01 N601M / 2ER L01 N601V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom/ Mahikeng / Vanderbijlpark (AFRIKAANS/ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 module, 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 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |

| Second/ *Tweede Semester* | | |
|---|---|---|
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MTHS621 | Topology *I* *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:** | | |
| APMA621 | Introductory Harmonic Analysis / *Inleidende Harmoniese Analise* | 12 |
| 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 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| **Year Module/ *Jaarmodule*** | | |
| MTHS671 | Research Report/ *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **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.5.16 BACHELOR OF SCIENCE HONOURS IN ACTUARIAL SCIENCES/ *BACCALAUREUS SCIENTIAE HONNEURS IN AKTUARIËLE WETENSKAPPE*

### NAS.5.16.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS*

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 BWIR671. /
*Die geïntegreerde assessering van hierdie program vind tydens die assessering van die module BWIR671.*

### NAS.5.16.2 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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2DR L01 N601P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Year Module / *Jaarmodule*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BWIA671 | Actuarial Risk Management (A301/CA1) / *Aktuariële Risikobestuur (A301/CA1)* | **80** |
| BWIR671 | Research Report: Financial Engineering and Financial Modelling / *Navorsingsverslag: Finansiële Ingenieurswese en Finansiële Modellering* | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **160** |

## NAS.5.17 BACHELOR OF SCIENCE HONOURS IN QUANTITATIVE RISK MANAGEMENT / *BACCALAUREUS SCIENTIAE HONNEURS IN KWANTITATIEWE RISIKOBESTUUR*

### NAS.5.17.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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 curriculum takes place during the assessment of the module BWIR671. /

*Die geïntegreerde assessering vind tydens die assessering van die module BWIR671.*

### NAS.5.17.2 ADMISSION REQUIREMENTS FOR THE PROGRAMME

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.

## NAS.5.17.3 BACHELOR OF SCIENCE HONOURS IN QUANTITATIVE RISK MANAGEMENT/ *BACCALAREUS SCIENTIAE HONNEURS IN KWANTITATIEWE RISIKOBESTUUR*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DP L01 N601P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| 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 |
| STAT612 | Financial Time Series | 12 |
| **Total 1st/ *Totaal 1ste Semester*** | | **60** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BWIN621 | Quantitative Risk Analysis II / *Kwantitatiewe Risiko-analise II* | 16 |
| EKRP623 | Risk Management / *Risikobestuur* | 16 |
| STAT622 | Linear Statistical Models and Experimental Design | 12 |
| STTN623 | Multivariate Statistics / *Meerveranderlike Statistiek* | 12 |
| **Total 2nd/ *Totaal 2de Semester*** | | **56** |
| **Year Module/ *Jaarmodule*** | | |
| BWIR671 | Research Report: Financial Engineering and Financial Modelling / *Navorsingsverslag: Finansiële Ingenieurswese en Finansiële Modellering* | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **148** |

## NAS.5.18 BACHELOR OF SCIENCE HONOURS IN FINANCIAL MATHEMATICS / *BACCALAUREUS SCIENTIAE HONNEURS IN FINANSIëLE WISKUNDE*

### NAS.5.18.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS 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*

### NAS.5.18.2 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 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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2DQ L01 N601P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BWIN613 | Financial Engineering I | 16 |
| STAT612 | Financial Time Series | 12 |
| STTN615 | Stochastic Processes I | 12 |
| MTHS614 | Measure Theory I | 12 |
| WISK615 | Differential Equations | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **68** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BWIR622 | Research Report: Financial Engineering and Pricing of Derivatives | 32 |
| STAT622 | Linear Statistical Models and Experimental Design | 12 |
| STTN625 | Stochastic Processes II | 12 |
| MTHS621 | Topology | 12 |
| MTHS624 | Measure and IntegrationTheory II | 12 |
| **Total 2nd/ *Totaal 2de Semester*** | | **80** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **148** |

## NAS.5.19 BACHELOR OF SCIENCE HONOURS IN BUSINESS ANALYTICS / *BACCALAUREUS SCIENTIAE HONNEURS IN BESIGHEIDSANALISE*

### NAS.5.19.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

Please note that all BMI post graduate programmes are presented in English. /
*Neem asseblief kennis dat BWI se nagraadse programme in Engels aangebied word.*
The integrated assessment of this programme takes place during the assessment of the module **BWIR672**. / *Die geïntegreerde assessering vind plaas tydens die assessering van die module* **BWIR672**.

### NAS.5.19.2 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.

| **Qualification Code/** ***Kwalifikasiekode*** | **2FP L01 N601P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full time / *Voltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| STAT612 | Financial Time Series | 12 |
| BWIB611 | Statistical Learning I | 16 |
| STTN619 | Nonparametric Methods | 12 |
| STTN618 | Financial Driven Statistics | 12 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **52** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| STTN623 | Multivariate Statistics | 12 |
| BWIB621 | Statistical Learning II | 16 |
| BWIB623 / STAT622 | Forecasting for Business / Linear Statistical Models and Experimental Design | 12 |
| STTN624 | Discrete Data-analysis | 12 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **52** |
| **Year Module /** ***Jaarmodule*** | | |
| BWIR672 | Research Report: Financial Modelling and Optimisation | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **136** |

## NAS.5.20 BACHELOR OF SCIENCE HONOURS IN GEOGRAPHY / *BACCALAUREUS SCIENTIAE HONNEURS IN GEOGRAFIE*

### NAS.5.20.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME

To qualify for admission to the Bachelor of Science Honours in Geography, a prospective student needs to have an appropriate bachelor's degree (NQF level 7) in the field of Geography or an appropriate advanced diploma (level 7), with at least 60%; or the equivalent of these as approved by Senate. 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. In addition, a prospective student must comply with all other requirements as prescribed in the rules of the Faculty of Natural and Agricultural Sciences, and as contained in this yearbook.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EP L01 N601M**<br>**2EP L01 N601V**<br>**Vanderbijlpark:pending approval from DHET** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng<br>(ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| GEOG671 | Research Report | 32 |
| GEOG611 | Research Methods | 16 |
| **And select 2 Elective Modules** | | |
| GEOG612 | Selected Fields In Human Geography (MC only) | 16 |
| GEOG613 | Geographic Information Systems Techniques | 16 |
| GEOG614 | Environmental Problems & Management in Africa (MC only) | 16 |
| *GEOG616 | Selected fields in Geomorphology (MC only) | 16 |
| OMBO611 | Introduction to Environmental Management (VC only) | 16 |
| **GGFS673 : Year module** | Introduction to Earth Observation (VC only) : | 16 |
| **GGFS674 : Year module** | Air Pollution (VC only) : | 16 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **80** |
| **Second/** ***Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| **Select 3 Elective Modules** | | |
| GEOG621 | Remote Sensing (MC only) | 16 |
| GEOG622 | Selected Fields In Climatology (MC only) | 16 |
| GEOG623 | Applications In GIS | 16 |
| GEOG624 | Rural Geography | 16 |
| **OMBE675: Year module** | Introduction to Hydrology and Integrated Water Resources Management (VC only) | 16 |
| **GEOG672: Year module** | Urban Geography (VC only): | 16 |
| **Total 2nd/** ***Totaal 2de Semester*** | | **48** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |
| * **GEOG616** will not be presented in 2021 | | |

## NAS.5.21 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES/ *BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE*

### NAS.5.21.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS*

Students have to take elective modules that complement the compulsory modules and research project so that the total value of modules is 128 credits for the programme. Please refer to individual compilations for the number and availability of elective modules per programme. /

*Studente moet keusemodules neem wat die verpligte modules en die navorsingsprojek komplementeer sodat die totale waarde van modules 128 krediete is vir die program. Verwys asseblief na die individuele samestellings vir die aantal en beskikbaarheid van keusemodules per program.*

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 EERSTE semester toegeken, maar die kredietlading sal gelykmatig oor die jaar versprei word.*

### NAS.5.21.2 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM:*

Students may be admitted to the Honours qualification in Environmental Sciences given that they are in possession of a BSc degree with subjects appropriate to the chosen programme, 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 Honneurs kwalifikasie in Omgewingswetenskappe toegelaat word, indien hulle in besit is van 'n BSc-graad met vakke toepaslik tot die gekose program, geslaag op NKR-vlak 7 met minstens 60%. Keuring is verder gegrond op 'n student se akademiese rekord en ander bewese toepaslike vorige leer, met inagneming van die student se agtergrond en potensiaal.*

If the applications for a programme received are more than what the specific group in the 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. /

*As die getal aansoeke vir 'n program die kapasiteit van die spesifieke groep in die Skool oorskrei, word slegs die studente, op grond van die Skooldirekteur 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.*

## NAS.5.21.3 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT/

### *BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET GEOGRAFIE EN OMGEWINGSBESTUUR*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L07 N602P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| OMBO611 | Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur* | 1 | 16 |
| SGSS614 | Research Methods | 1 | 16 |
| OMBE674 | Research Report/ *Navorsingsverslag* | Year Module | 32 |
| **Total compulsory modules/ *Totaal verpligte modules*** | | | **64** |
| **Elective modules: Select FOUR of the following modules / *Student kies VIER van die onderstaande modules:*** | | | |
| DRRS511 | Disaster Risk Studies and Climate Change Adaptation / *Ramp Risiko studies en Klimaatsverandering* | 1 | 16 |
| DRRS512 | Socio-Ecological Resilience / *Sosiale Ekologiese Veerkragtigheid* | 1 | 16 |
| DRRS522 | Preparedness and Response / *Voorbereiding en Reaksie* | 2 | 16 |
| GGFS673 | Introduction to Earth Observation / *Inleiding tot Aardwaarneming* | Year Module | 16 |
| GGFS674 | Air pollution / *Lugbesoedeling* | Year Module | 16 |
| OMBE675 | Introduction to Hydrology and Integrated Water Resources Management / *Inleiding tot Hidrologie en Geïntegreerde Waterhulpbronbestuur (Slegs Voltyds)* | Year Module | 16 |
| OMBO613 | Introduction to GIS (Full-time only) / *GIS Toepassings (Slegs Voltyds)* | 1 | 16 |
| OMBO682 | Environmental Management I / *Omgewingsbestuur I* | Year Module | 16 |
| OMBO683 | Environmental Analysis I/ *Omgewingsevaluering I* | Year Module | 16 |
| OMBO684 | GIS Applications (Full-time only) / *GIS Toepassings (Slegs Voltyds)* | Year Module | 16 |
| OMBW684 (OMBW614 old code) | Fundamentals of Waste Management / *Grondbeginsels van Afvalbestuur* | Year Module | 16 |
| OMSB613 | Biodiversity Planning / *Biodiversiteitsbeplanning* | 1 | 16 |
| **Total elective modules / *Totale keusemodules*** | | | **64** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | | **128** |

## NAS.5.21.4 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH ECOLOGICAL INTERACTIONS AND ECOSYSTEM RESILIENCE/ *BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET EKOLOGIESE INTERAKSIES EN EKOSISTEEMVEERKRAGTIGHEID*

### NAS.5.21.4.1 Faculty-specific rules for the programme / *Fakulteitspesifieke 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 programme manager. /

*Studente word nie toegelaat om vir meer as vier (4) modules in die eerste semester te registreer nie (uitgesluit die navorsingsprojek). Keusemodules word gekies volgens die vereiste kennis en vaardighede van die navorsingsprojek. Seleksie van keusemodules moet daarom goedgekeur word deur die navorsingsprojek-mentor, sowel as die programbestuurder.*

**Take note** of prerequisites for certain modules as indicated in the table below. /

***Neem kennis*** *van voorvereistes vir sekere modules soos aangedui in die tabel hier onder.*

## NAS.5.21.4.2 Bachelor of Science Honours in Environmental Sciences with Ecological Interactions and Ecosystem Resilience/ *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Ekologiese Interaksies en Ekosisteemveerkragtigheid*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L01 N601P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| OMBO611 | Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur* | 1 | 16 |
| OMSE613 | Resilience Thinking in Ecology / *Ekologiese Veerkragtigheidsdenke* | 1 | 16 |
| OMSE674 | Research Report / *Navorsingsverslag* | Year Module | 32 |
| **Total compulsory modules/ *Totaal verpligte 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*** | | | |
| OMBO684 | GIS Applications (Full Time Only) / *GIS Toepassings (Slegs Voltyds)* | Year Module | 16 |
| OMSB611 | Conservation Ecology / *Bewaringsekologie* | 1 | 16 |
| OMSE611 | Environmental Soil Science (Full Time Only) **GDKN 121, GDKN 211 and GDKN 221 are prerequisites**/ *Omgewingsgrondwetenskap (Slegs Voltyds)* ***GDKN121, GDKN211 en GDKN221 is voorvereistes*** | 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 **(PLKS314 or equivalent on NQF 7 is a prerequisite)** / *Plantekofisiologie en Stresfisiologie* ***(PLKS314 of ekwivalent op NKR 7 is 'n voorvereiste)*** | 2 | 16 |
| OMSE625 | Advanced Ecotoxicology / *Gevorderde Ekotoksikologie* | 2 | 16 |
| OMSE626 | Microbial Ecology (MKBS325 or equivalent on NQF 7 is a prerequisite)/ *Mikrobiese Ekologie (MKBS325 of ekwivalent op NKR 7 is 'n voorvereiste)* | 2 | 16 |
| OMWE611 | Rehabilitation of Disturbed Areas (Full Time Only) **GDKN 121, GDKN 211 and GDKN 221 are prerequisites**/ *Rehabilitasie van Versteurde Gebiede (Slegs Voltyds)* ***GDKN121, GDKN211 en GDKN221 is voorvereistes*** | 1 | 16 |
| **Total elective modules / *Totale keusemodules*** | | | **64** |
| **Total Credits for the Programme/*Totale Krediete vir die Program*** | | | **128** |
| *** See 5.21.4.1.** | | | |

## NAS.5.21.5 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH BIODIVERSITY AND CONSERVATION ECOLOGY /

***BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET BIODIVERSITEIT EN BEWARINGSEKOLOGIE***

### NAS.5.21.5.1 Faculty-specific rules for the programme / *Fakulteitspesifieke reëls vir 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 programme manager. /

*Studente word nie toegelaat om vir meer as vier (4) modules in die eerste semester te registreer nie (uitgesluit die navorsingsprojek). Keusemodules word gekies volgens die vereiste kennis en vaardighede van die navorsingsprojek. Seleksie van keusemodules moet daarom goedgekeur word deur die navorsingsprojek-mentor, sowel as die programbestuurder.*

**OMSB614 & OMSB629:**

These modules each include a week long practical session in Potchefstroom. Part time students can only register for these modules if they are willing to travel to Potchefstroom for the practical sessions. /

*Hierdie modules sluit elkeen ’n weeklange praktiese opleidingsessie in Potchefstroom in wat verpligtend is. Afstandstudente kan slegs vir hierdie modules registreer indien hul bereid is om na Potchefstroom te reis vir praktiese sessies.*

**Take note of prerequisites** for certain modules as indicated in the table below. /

***Neem kennis van voorvereistes*** *vir sekere modules soos aangedui in die tabel hier onder.*

## NAS.5.21.5.2 Bachelor of Science Honours in Environmental Sciences with Biodiversity and Conservation Ecology/ *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Biodiversiteit en Bewaringsekologie*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L02 N601P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| 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 Report / *Navorsingsverslag* | Year Module | 32 |
| **Total compulsory modules/ *Totaal verpligte modules*** | | | **80** |
| **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*** | | | |
| ESFP616 | African Fish Parasitology | 1 | 16 |
| OMBO611 | Introduction to Environmental Management/ *Inleiding tot Omgewingsbestuur* | 1 | 16 |
| OMBO613 | Introduction to GIS (Full Time Only) / *Inleiding tot GIS (Slegs Voltyds)* | 1 | 16 |
| OMSB627 | Herpetology in Practise (Full Time Only / *Herpetologie in Praktyk (Slegs Voltyds)* | 2 | 16 |
| OMSB628 | Coral Reef Ecology (Full Time Only) / *Koraalrifekologie (Slegs Voltyds)* | 2 | 16 |
| OMSB629* | Genome Analysis and Bio-informatics* / *Genoomanalise en Bio-informatika** | 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 / *Arthropod/ Plantinteraksies* | 2 | 16 |
| **Total elective modules / *Totale keusemodules*** | | | **48** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | | **128** |
| *** See 5.21.5.1.** | | | |

## NAS.5.21.6 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH AQUATIC ECOSYSTEM HEALTH /

***BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET AKWATIESE EKOSISTEEMWELSTAND***

### NAS.5.21.6.1 Faculty-specific rules for the programme / *Fakulteitspesifieke 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 programme manager. /

*Studente word nie toegelaat om vir meer as vier (4) modules in die eerste semester te registreer nie (uitgesluit die navorsingsprojek). Keusemodules word gekies volgens die vereiste kennis en vaardighede van die navorsingsprojek. Seleksie van keusemodules moet daarom goedgekeur word deur die navorsingsprojek-mentor, sowel as die programbestuurder.*

**OMWW616:**

FULL-TIME ONLY. This module includes a one week compulsory excursion. /

*SLEGS VOLTYDS. Hierdie module sluit 'n weeklange verpligte ekskursie in.*

**OMWW617 & OMSB629:**

These modules each include a week long practical session in Potchefstroom. Part time students can only register for these modules if they are willing to travel to Potchefstroom for the practical sessions. /

*Hierdie modules sluit elkeen 'n weeklange praktiese opleidingsessie in Potchefstroom in wat verpligtend is. Afstandstudente kan slegs vir hierdie modules registreer indien hul bereid is om na Potchefstroom te reis vir praktiese sessies.*

**OMSW625 & OMSW626:**

FULL-TIME ONLY. Only students involved in the Arkansas State University exchange programme may register for these modules. /

*SLEGS VOLTYDS. Slegs student wat betrokke is by die Arkansas State University uitruilprogram mag vir hierdie modules registreer.*

**Take note of prerequisites** for certain modules as indicated in the table below. /

***Neem kennis van voorvereistes*** *vir sekere modules soos aangedui in die tabel hier onder.*

## NAS.5.21.6.2 Bachelor of Science Honours in Environmental Sciences with Aquatic Ecosystem Health / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Akwatiese Ekosisteemwelstand*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L03 N601P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| 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 Report/ *Navorsingverslag* | Year | 32 |
| **Total compulsory modules/ *Totaal verpligte 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*** | | | |
| ESFP616 | African Fish Parasitology | 1 | 16 |
| OMSB629* | Genome Analysis And Bio-Informatics / *Genoomanalise en Bio-informatika** | 2 | 16 |
| OMSE625 | Advanced Ecotoxicology / *Gevorderde ekotoksikologie* | 2 | 16 |
| OMSE626 | Microbial Ecology **(MKBS325 or equivalent on NQF 7 is a prerequisite for this module)**/ *Mikrobiese Ekologie* ***(MKBS325 of ekwivalent op NKR 7 is 'n voorvereiste vir hierdie module)*** | 2 | 16 |
| OMSW622 | Phycology / *Fikologie* | 2 | 16 |
| OMSW624 | Environmental Hydrology (Full Time Only) / *Omgewingshidrologie (Slegs Voltyds)* | 2 | 16 |
| OMSW625* | Limnology* / *Limnologie** | 2 | 16 |
| OMSW626* | Animal Ecology*/ *Dierekologie** | 2 | 16 |
| OMWF621 | Advanced Waste Water Treatment / *Gevorderde Afvalwaterbehandeling* | 2 | 16 |
| OMWW616* | Estuarine and Near Shore Marine Ecology **(DRKS311 or equivalent on NQF 7 is a prerequisite)** / *Estuariene en Naby-Kuslyn Mariene-Ekologie* ***(DRKS311 of ekwivalent op NKR 7 is 'n voorvereiste)*** | 1 | 16 |
| OMWW617* | Zoonoses / *Soönoses** | 1 | 16 |
| **Total elective modules / *Totale keusemodules*** | | | **64** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | | **128** |
| *** See 5.21.6.1.** | | | |

## NAS.5.21.7 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH INTEGRATED PEST MANAGEMENT /

## *BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET GEÏNTEGREERDE PLAAGBESTUUR*

### NAS.5.21.7.1 Faculty-specific rules for the Programme / *Fakulteitspesifieke reëls vir 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 programme manager. /

*Studente word nie toegelaat om vir meer as vier (4) modules in die eerste semester te registreer nie (uitgesluit die navorsingsprojek). Keusemodules word gekies volgens die vereiste kennis en vaardighede van die navorsingsprojek. Seleksie van keusemodules moet daarom goedgekeur word deur die navorsingsprojek-mentor, sowel as die programbestuurder.*

**OMWW617, OMSB629 & OMSP623:**

These modules each include compulsory practical sessions in Potchefstroom. Part time students can only register for these modules if they are willing to travel to Potchefstroom for the practical sessions. /

*Hierdie modules sluit elkeen praktiese opleidingsessies in Potchefstroom in wat verpligtend is. Afstandstudente kan slegs vir hierdie modules registreer indien hul bereid is om na Potchefstroom te reis vir praktiese sessies.*

**Take note** of prerequisites for certain modules as indicated in the table below. /

***Neem kennis*** *van voorvereistes vir sekere modules soos aangedui in die tabel hier onder.*

## NAS.5.21.7.2 Bachelor of Science Honours in Environmental Sciences with Integrated Pest Management / *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Geïntegreerde Plaagbestuur*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L04 N601P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time ONLY / *SLEGS Voltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| OMSP611 | Principles Of Integrated Pest Management (Full Time Only)/ *Beginsels Van Geïntegreerde Plaagbestuur (Slegs Voltyds)* | 1 | 16 |
| OMWP611 | Pest Phenology And Damage Symptoms / *Plaagfenologie En Skadesimptome* | 1 | 16 |
| OMSE674 | Research Report / *Navorsingsverslag* | Year Module | 32 |
| **Total compulsory modules/ *Totaal verpligte 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*** | | | |
| OMBO611 | Introduction to Environmental Management / *Inleiding tot Omgewingsbestuur* | 1 | 16 |
| OMSB629* | Genome Analysis And Bio-Informatics* / *Genoomanalise en Bio-informatika** | 2 | 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 | Arthropod/Plant Interactions / *Arthropod/ Plant-Interaksies* | 2 | 16 |
| OMWP613 | Economic Damage And Threshold Values / *Ekonomiese Skade En Drempelwaardes* | 1 | 16 |
| OMWW617* | Zoonoses* / *Soönoses** | 1 | 16 |
| **Total elective modules / *Totale keusemodules*** | | | **64** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | | **128** |
| *** See 5.21.7.1.** | | | |

## NAS.5.21.8 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH ENVIRONMENTAL GEOLOGY/

***BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET OMGEWINGSGEOLOGIE***

### NAS.5.21.8.1 Faculty-specific rules for the programme / *Fakulteitspesifieke 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.*

### NAS.5.21.8.2 Bachelor of Science Honours in Environmental Sciences with Environmental Geology/ *Baccalaureus Scientiae Honneurs in Omgewingswetenskappe met Omgewingsgeologie*

| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L05 N601P** | | |
|---|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS/ ENGLISH) | | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Semester** | **Credits/** ***Krediete*** |
| OMSG611 | Environmental Geochemistry (Full Time Only) **GLGN112 and GLGN311 are pre-requisites for this module** / *Omgewingsgeochemie (Slegs Voltyds)* ***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 (Slegs Voltyds)* ***GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module)*** | 1 | 16 |
| OMSE674 | Research Report / *Navorsingsverslag* | Year Module | 32 |
| **Total compulsory modules/ *Totaal verpligte modules*** | | | **64** |

| **Student selects FOUR of the following modules in consultation with programme manager, research mentor and School Director /**<br>***Student kies VIER van die onderstaande modules in oorleg met programbestuurder, projekleier en Skooldirekteur*** | | | |
|---|---|---|---|
| OMBO611 | Introduction to Environmental Management /<br>*Inleiding tot Omgewingsbestuur* | 1 | 16 |
| OMBO613 | Introduction to GIS (Full Time Only) /<br>*Inleiding tot GIS (Slegs Voltyds)* | 1 | 16 |
| OMBO684 | GIS Applications (Full Time Only) /<br>*GIS Toepassings (Slegs Voltyds)* | Year Module | 16 |
| OMSE611 | Environmental Soil Science<br>(Full Time Only)<br>**GDKN 121, GDKN 211 and GDKN 221 are pre-requisites for this module** /<br>*Omgewingsgrondwetenskap*<br>*(Slegs Voltyds)*<br>***GDKN121, GDKN211 en GDKN221 is voorvereistes vir hierdie module*** | 1 | 16 |
| OMSE621 | Restoration Of Degraded Ecosystems /<br>*Restourasie Van Gedegradeerde Ekostelsels* | 2 | 16 |
| OMSG621 | Environmental Mineralogy<br>**GLGN 112 and GLGN 211 are pre-requisites for this module** /<br>*Omgewingsmineralogie*<br>***GLGN122 en GLGN211 is voorvereistes vir hierdie module*** | 2 | 16 |
| OMSG622 | Applied Environmental Geology<br>**GLGN 112 and GLGN211 are pre-requisites for this module** /<br>*Toegepaste Omgewingsgeologie*<br>***GLGN112, GLGN221 en GLGN321 is voorvereistes vir hierdie module*** | 2 | 16 |
| OMWW611 | Physical, Chemical And Biological Properties Of Inland Water /<br>*Fisies-Chemies En Biologiese Eienskappe van Binnelandse Waters* | 1 | 16 |
| **Total elective modules /** ***Totale keusemodules*** | | | **64** |
| **Total Credits for the Programme/**<br>***Totale Krediete vir die Program*** | | | **128** |

## NAS.5.21.9 BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCES WITH HYDROLOGY AND GEOHYDROLOGY /

***BACCALAUREUS SCIENTIAE HONNEURS IN OMGEWINGSWETENSKAPPE MET HIDROLOGIE EN GEOHIDROLOGIE***

### NAS.5.21.9.1 Faculty-specific rules for the programme / *Fakulteitspesifieke reels vir die program*

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.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DM L06 N602P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HDGH611 | Geohydrology / *Geohidrologie* | 16 |
| HDGH612 | Environmental Hydrology / *Omgewingshidrologie* | 16 |
| HDGH613 | Spatial Analysis / *Ruimtelike Analise* | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HDGH621 | Hydrochemistry / *Hidrochemie* | 16 |
| OMBE622 | Applied Hydrology* / *Toegepaste Hidrologie** | 16 |
| OMBE623 | Groundwater Geology / *Grondwater Geologie* | 16 |
| **Total 2nd/ *Totaal 2de Semester*** | | **48** |
| ***Year Module/ Jaarmodule*** | | |
| OMSE674 | Research Report / *Navorsingsverslag* | **32** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **128** |

## NAS.5.22 BACHELOR OF COMMERCE HONOURS/ *BACCALAUREUS COMMERCII HONNEURS*

### NAS.5.22.1 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*.

#### NAS.5.22.1.1 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.*

### NAS.5.22.2 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.1.14.1. Apart from the provisions in General Rule 3.2, the specific requirements stated in the description of the relevant curricula in N.5.8.1 must additionally be complied with. /

*Die honneursstudie kan onderneem word in 'n studieprogram wat deur die Fakulteitsraad goedgekeur is en in NAS.1.14.1. 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.5.8.1 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.*

### NAS.5.22.3 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 NAS.5.3 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.*

### NAS.5.22.4 STUDY PROGRAMMES / *STUDIEPROGRAMME*

This honours degree may be taken in Computer Science Information Systems. /

*Hierdie honneursgraad word in die studieprogram Rekenaarwetenskap-Inligtingstelsels verwerf.*

### NAS.5.22.5 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.5.22.6 BACHELOR OF COMMERCE HONOURS IN INFORMATICS / *BACCALAUREUS COMMERCII HONNEURS IN INFORMATIKA*

### NAS.5.22.6.1 Admission Requirements for the Programme

Students may be admitted to the Honours qualification in Informatics given that they are in possession of any applicable B-degree with Informatics, passed at NQF level 7, with more than 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. Selection is also determined by capacity. /

*Studente kan tot die honneursgraad in Informatika toegelaat word, indien hulle oor 'n toepaslike B-graad met Informatika beskik, wat op NQF-vlak 7 met meer as 60% geslaag is. Keuring is verder gebaseer op die student se akademiese rekord en ander bewese toepaslike voorafleer, met inagneming van die student se agtergrond en potensiaal. Keuring word ook deur kapasiteit bepaal*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GF L01 N601P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **First/** ***Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ITRI671 | Research Project / *Navorsingsprojek* | 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 Systems Engineering 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 |
| **Total 1st/** ***Totaal 1ste Semester*** | | **80** |

| Second/ *Tweede Semester* | | |
|---|---|---|
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| **FOUR of the following modules in consultation with the school director / 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 2nd/ *Totaal 2de Semester*** | | **48** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **128** |

## NAS.6 MASTER OF SCIENCE / *MAGISTER SCIENTIAE*

### NAS.6.1 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 bachelor's 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.*

#### NAS.6.1.1 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.*

### NAS.6.1.2 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.*

### NAS.6.1.3 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.*

### NAS.6.1.4 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.*

### NAS.6.1.5 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.*

### NAS.6.1.6 ARTICULATION POSSIBILITIES / *ARTIKULASIE MOONTLIKHEDE*

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.*

### NAS.6.1.7 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.*

### NAS.6.1.8 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.*

### NAS.6.1.9 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.*

### NAS.6.1.10 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*

### NAS.6.1.10.1 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 discipline.*

### NAS.6.1.10.2 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.*

### NAS.6.1.11 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.*

### NAS.6.1.12 IMPACT OF NATURAL SCIENCE ACTIVITIES ON THE COMMUNITY AND ENVIRONMENT / *IMPAK VAN NATUURWETENSKAPLIKE AKTIWITEITE 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.*

### NAS.6.1.13 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.*

### NAS.6.1.14 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.*

### NAS.6.1.15 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.*

### NAS.6.1.16 EXTENSION OF THE STUDY PERIOD / *VERLENGING VAN STUDIETYDPERK*

See A Rules 4.14. / *Sien A Reëls 4.14*

### NAS.6.1.17 EXAMINATION */ EKSAMINERING*

#### NAS.6.1.17.1 Exams / *Eksamens*

The examination opportunities and relevant related rules apply in congruence with General Rule 3.5 & 4.11. /

*Die eksamengeleenthede en verbandhoudende reëls geskied in ooreenstemming met Algemene Reël 3.5 & 4.11.*

#### NAS.6.1.17.2 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*

#### NAS.6.1.17.3 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.

### NAS.6.1.17.4 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.*

### NAS.6.1.17.5 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.4.7.5 & 4.11.3. /

*Eenmalige herhaling van modules wat nie geslaag is nie, geskied volgens die bepalings van Algemene Reël 4.7.5 & 4.11.3.*

## NAS.6.2 MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS/ *MAGISTER SCIENTIAE IN LANDBOU-EKONOMIE*

### NAS.6.2.1 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.*

#### NAS.6.2.1.1 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.*

#### NAS.6.2.1.2 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.*

### NAS.6.2.1.3 Assumed prior learning / *Aannames oor vorige leer*

To be admitted to this qualification the candidate should be in possession of the four year BSc Agric degree (including subjects relevant to agricultural economics) 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). /

*Vir toelating tot die kwalifikasie moet die kandidaat oor ’n vier jaar BSc (Agric) beskik (wat vakke wat relevant is tot Landbou-ekonomie, insluit) of ‘n ekwivalente kwalifiksie soos deur die Senaat goedgekeur. Toelating tot die studie is ook onderhewig aan die goedkeuring van die Skooldirekteur (MC) of die Direkteur van die Navorsingseenheid (PC) en 'n nagraadse keuringskomitee, wat gebaseer is op 'n bevredigende studierekord en 'n toepaslike kwalifikasie wat reeds verwerf is. Die Skooldirekteur (MC) of die Navorsingsdirekteur (PC) kan vereis dat addisionele vakke / modules voltooi moet word, voor toelating tot die MSc (Agric).*

### NAS.6.2.1.4 Admission and registration / *Toelating en registrasie*

To gain admission to this Degree, a student must have obtained a four year BSc Agric degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

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. /

*Vir toelating tot die kwalifikasie moet die kandidaat oor ’n vier jaar BSc (Agric) beskik (wat vakke wat relevant is tot Landbou-ekonomie insluit), of ’n gelykwaardige kwalifikasie soos goedgekeur deur die Senaat. Alternatiewelik moet aansoekers die status hê van so 'n kwalifikasie wat toegestaan is deur die Senaat, deur 'n vlak van bevoegdheid te bereik, wat na die mening van die Senaat, op aanbeveling van die Fakulteit, voldoende is vir toelating tot die graad. 'n Aansoeker moet bewys lewer van sy / haar prestasies en opleiding asook die nodige voor-af werk voltooi wat die Senaat mag vereis, en moet aan die Senaat se vereistes voldoen ten opsige van sy / haar vak. 'n Evalueringsertifikaat soos uitgereik deur die Suid-Afrikaanse Kwalifikasie-owerheid (SAQA) moet ingedien word, indien 'n vorige kwalifikasie in 'n vreemde land verwerf is.*

*Die toelatingsvereistes en die voorgeskrewe datums vir registrasie word in die Algemene reëls uiteengesit. Die betrokke navorsingsdirekteur kan in oorleg met die skooldirekteur toelating tot 'n program weier, indien die standaard van bevoegdheid wat die voornemende student voorheen behaal het in die vak (ke) waarin hy / sy wil voortgaan met sy / haar studies, nie ooreenstem met die betrokke programvereistes nie. Indien die aansoeke wat ontvang word vir 'n program meer is as wat die betrokke navorsingsentiteit in die program kan hanteer, word die groep studente wat na die mening van die navorsingsdirekteur in oorleg met die skooldirekteur die grootste kans op sukses het, gekies vir die betrokke program. Die agtergrond en potensiaal van studente word ook in ag geneem in hierdie keuringsproses.*

#### NAS.6.2.1.5 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 Reëls en die tersaaklike bepalings in die Handleiding vir Nagraadse Studie. Voornemende studente moet hierdie handleiding baie deeglik raadpleeg***.**

#### NAS.6.2.1.6 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. /

*Na verwerwing van hierdie graad kan die student toegelaat word tot verdere leer vir die PhD-graad in "n kernmodule waarin voldoende krediete verwerf is.*

#### NAS.6.2.1.7 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*

#### NAS.6.2.1.8 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:*

a. Demonstrate a comprehensive and systematic knowledge base in a specific relevant field to Agricultural Economics.
    - *'n Omvattende en sistematiese kennisbasis te demonstreer in 'n spesifieke relevante gebied tot Landbou-ekonomie.*

b. 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 relevant tot 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.*
    -
c. Identify, analyze 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 werklike globale probleme 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.*

### NAS.6.2.1.9 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 NQF-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. /

D*ie 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.6.2.2 MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS / *MAGISTER SCIENTIAE IN LANDBOU-EKONOMIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CG N01 N801P**<br>**2CG N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng<br>(AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | PC: Full Time */ Voltyds*;<br>MC: Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AECM871 | Dissertation/<br>*Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.3 MASTER OF SCIENCE IN AGRICULTURAL EXTENSION / *MAGISTER SCIENTIAE IN LANDBOUVOORLIGTING*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CJ N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng<br>(ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AEXM871 | Dissertation/<br>*Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.4 MASTER OF SCIENCE IN ANIMAL HEALTH / *MAGISTER SCIENTIAE IN DIEREGESONDHEID*

| **Qualification Code/** ***Kwalifikasiekode*** | **2CE N01 N801M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AHMM871 | Dissertation/ *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.5 MASTER OF SCIENCE IN ANIMAL SCIENCE / *MAGISTER SCIENTIAE IN VEEKUNDE*

| **Qualification Code/** ***Kwalifikasiekode*** | **2CK N01 N801M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ASDM871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.6 MASTER OF SCIENCE IN CROP SCIENCE / *MAGISTER SCIENTIAE IN GEWASKUNDE*

### NAS.6.6.1 ADMISSION REQUIREMENTS

To qualify for admission to this master's programme, a student must be in possession of a 4 year BSc in Agriculture Hons degree, (including subjects relevant to crop science, soil science, horticulture, plant breeding, plant protection) or a relevant postgraduate diploma at level 8 in an appropriate field, or the equivalent of these as approved by Senate. A prospective student must comply with all other requirements as prescribed in the rules of the faculty offering the qualification, and as contained in the faculty yearbook.

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).

An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CF N01 N801P** **2CF N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | PC: Full Time MC: Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AGRM871 | Dissertation/ *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7 MASTER OF SCIENCE IN THE UNIT FOR BUSINESS MATHEMATICS AND INFORMATICS / *MAGISTER SCIENTIAE IN DIE EENHEID VIR BEDRYFSWISKUNDE EN INFORMATIKA*

### NAS.6.7.1 RULES FOR THE DEGREE / *REËLS VIR DIE GRAAD*

#### NAS.6.7.1.1 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 programmes 2BP P01, 2BP P02 and 2BP P03 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 BScHons qualification in Business Mathematics and Informatics, subject to the following specific prerequisites: /

*Vir toelating tot die programme* 2BP P01, 2BP P02 en 2BP P03 *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 BScHons -kwalifikasie in Bedryfswiskunde en Informatika verwerf het, en wel onderhewig aan die volgende spesifieke voorvereistes:*

| Masters' Programme/ *Magister Program* | Programme Code/ *Program Kode* | Honours program *Honneurs program* |
|---|---|---|
| MSc in Business Mathematics and Informatics | 2BP P01 | 2DR L01 N601P ; 2DP L01 N601P |
| MSc in Business Mathematics and Informatics with Financial Mathematics | 2BP P02 | 2DQ L01 N601P |
| MSc in Business Mathematics and Informatics with Business Analytics | 2BP P03 | 2FP L01 N601P **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 van BWI geskied.*

Apart from the prerequisites specified for admission in NAS.7.1.1 students may be refused to be admitted to the postgraduate BMI qualifications 2BP P01, 2BP P02 and 2BP P02 if the Centre should have insufficient capacity to handle the accompanying projects (BWIR828). 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 NAS.7.1.1 gespesifiseer, kan studente toegang tot die nagraadse BWI-programme 2BP P01, 2BP P02 en 2BP P02 geweier word, mits die Sentrum onvoldoende kapasiteit het om die gepaardgaande projekte (BWIR828) 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.*

### NAS.6.7.1.2 PROGRAMME-SPECIFIC ARTICULATION POSSIBILITIES / *PROGRAMSPESIFIEKE ARTIKULASIE MOONTLIKHEDE*

**MSc programmes in Computer Science, Statistics 2CY P01 N802P, Applied Mathematics 2FK P01 N802P and Mathematics 2GA P01 N802P /**

***MSc programme in Rekenaarwetenskap, Statistiek 2CY P01 N802P, Toegepaste Wiskunde 2FK P01 N802P en Wiskunde 2GA P01 N802P***

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 /
  M*et 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 programme 2BP P01, 2BP P02 and 2BP P02 in Business Mathematics and Informatics and 2ED P01 N802P in Risk Analytics /**

***MSc-programme 2BP P01, 2BP P02 and 2BP P02 in Bedryfswiskunde en Informatika en* 2ED P01, (N802P) *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 navorsingsprojekte, voltooi moet wees voor die einde van die akademiese jaar. Studente wat nie hieraan voldoen nie, druip hul graad.*

## NAS.6.7.2 MASTER OF SCIENCE IN COMPUTER SCIENCE (COURSEWORK) / *MAGISTER SCIENTIAE IN REKENAARWETENSKAP (KURSUSWERK)*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GK P01 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RSWW811 | Research Methodology / *Navorsingsmetodologie* | 8 |
| **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 1st/ *Totaal 1ste Semester*** | | **72** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RSWW821 | Research Communication / *Navorsingskommunikasie* | 8 |
| **Total 2nd/ *Totaal 2de Semester*** | | **8** |
| **Research Module/ *Navorsingsmodule*** | | |
| ITRN872 | Dissertation / *Verhandeling* | **100** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.3 MASTER OF SCIENCE IN COMPUTER SCIENCE (RESEARCH) / *MAGISTER SCIENTIAE IN REKENAARWETENSKAP (NAVORSING)*

### NAS.6.7.3.1 Admission Requirements

The student has already obtained an appropriate honours baccalaureus degree. For an MSc in a specific subject (Computer Science, Statistics, Applied Mathematics or Mathematics) the BScHons in the same subject is normally required.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DB N01 N801P**<br>**2DB N01 N801M**<br>**2DB N01 N801V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng / Vanderbijlpark (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time/*Voltyds* &<br>Part Time/*Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ITWV871 | Dissertation/<br>*Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.4 MASTER OF SCIENCE IN MATHEMATICAL STATISTICS / *MAGISTER SCIENTIAE IN WISKUNDIGE STATISTIEK*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CY P01 N802P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RSWW813 | Research Methods in the Mathematical Sciences / *Navorsingsmetodes in Wiskundige Wetenskappe* | 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:*** | | |
| STTK884 | Advanced Resampling Methods / *Gevorderde Hersteekproefnemingsmetodes* | 36 |
| STTK885 | Advanced Statistical Models / *Gevorderde Statistiese Modelle* | 36 |
| STTK886 | Advanced Multivariate Statistics / *Gevorderde Meerveranderlike Statistiek* | 36 |
| STTK887 | Advanced Probability Theory / *Gevorderde Waarskynlikheidsleer* | 36 |
| STTK888 | Advanced Time Series Models / *Gevorderde Tydsreeksmodelle* | 36 |
| STTK889 | Advanced Stochastic Processes / *Gevorderde Stogastiese Prosesse* | 36 |
| STTN884 | Advanced Survival Models / *Gevorderde Oorlewingsteorie* | 36 |
| **Total / *Totaal*** | | **72** |
| **Research Module/ *Navorsingsmodule*** | | |
| STTN872 | Dissertation / *Verhandeling* | 100 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.5 MASTER OF SCIENCE IN APPLIED MATHEMATICS (COURSEWORK) / *MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE (KURSUSWERK)*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2FK P01 N802P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RSWW813 | Research Methods in the Mathematical Sciences / *Navorsingsmetodes in Wiskundige Wetenskappe* | 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:** | | |
| APPM874 | Applicable Analysis I/ *Toepasbare Analise I* | 36 |
| APPM875 | Applicable Analysis II / *Toepasbare Analise II* | 36 |
| APPM876 | Modelling I / *Modellering I* | 36 |
| APPM877 | Modelling II / *Modellering II* | 36 |
| APPM878 | Principles and Paradigms:Applied Mathematics / *Beginsels en Paradigmas: Toegepaste Wiskunde* | 36 |
| MTHS878 | Discrete Structures I / *Diskrete Strukture I* | 36 |
| MTHS888 | Principles and Paradigms: Pure Mathematics | 36 |
| **Total / *Totaal*** | | **72** |
| **Research Module/ *Navorsingsmodule*** | | |
| APPM872 | Dissertation / *Verhandeling* | **100** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.6 MASTER OF SCIENCE IN APPLIED MATHEMATICS (RESEARCH) / *MAGISTER SCIENTIAE IN TOEGEPASTE WISKUNDE (NAVORSING)*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2FL N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| APPM871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.7 MASTER OF SCIENCE IN MATHEMATICS (COURSEWORK) / *MAGISTER SCIENTIAE IN WISKUNDE (KURSUSWERK)*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2GA P01 N802P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| RSWW813 | Research Methods in the Mathematical Sciences / *Navorsingsmetodes in Wiskundige Wetenskappe* | 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 direkteur TWEE van die volgende modules:*** | | |
| MTHS874 | Abstract Analysis I / *Abstrakte Analise I* | 36 |
| MTHS875 | Abstract Analysis II / *Abstrakte Analise II* | 36 |
| MTHS876 | Algebra I / *Algebra I* | 36 |
| MTHS877 | Algebra II / *Algebra II* | 36 |
| MTHS878 | Discrete Structures I / *Diskrete Strukture I* | 36 |
| MTHS879 | Discrete Structures II / *Diskrete Strukture II* | 36 |
| MTHS888 | Principles and Paradigms: Pure Mathematics / *Beginsels en Paradigmas: Suiwer Wiskunde* | 36 |
| **Total / *Totaal*** | | **72** |
| **Research Module/ *Navorsingsmodule*** | | |
| MTHS872 | Dissertation / *Verhandeling* | **100** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.8 MASTER OF SCIENCE IN MATHEMATICS (RESEARCH) / *MAGISTER SCIENTIAE IN WISKUNDE (NAVORSING)*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CV N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MTHS871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.9 MASTER OF SCIENCE IN NATURAL SCIENCE TEACHING/ *MAGISTER SCIENTIAE IN NATUURWETENSKAPONDERWYS*

### NAS.6.7.9.1 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.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CU N01 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| NWON871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.10 MASTER OF SCIENCE IN RISK ANALYTICS / *MAGISTER SCIENTIAE IN RISIKO-ANALISE*

### NAS.6.7.10.1 Admission requirements / *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:*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2ED P01 N802P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| **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 :*** | | |
| BWIA812 | Enterprise-wide Risk Management I / *Ondernemingwye Risikobestuur I* | 16 |
| 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 |
| BWIN615 | Financial Modelling I / *Finansiële Modellering I* | 16 |
| BWIN817 | Practical Credit Risk / *Kleinhandel Kredietrisiko* | 16 |
| BWIN818 | Topical Research Issues in Risk Analysiss / *Voorpunt Risikovraagstukke* | 16 |
| **Total / *Totaal*** | | **32** |

| Module Code/ *Modulekode* | Descriptive name/ *Beskrywende naam* | Credits/ *Krediete* |
|---|---|---|
| **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 / *Finansiële Modellering Optimalisering* | 16 |
| **Total / *Totaal*** | | **16** |
| **Year Module/ *Jaarmodule*** | | |
| BWIN872 | Dissertation / *Verhandeling* | **132** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.6.7.11 MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORMATICS / *MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA*

### NAS.6.7.11.1 Admission Requirements / *Toelatingsvereistes*

The MSc degree is a qualification that may follow on an NQF level 8 qualification four year Bachelors degree, a Honours BSc or another recognised degree approved by the Dean.
For admission to the programme 2BP P04, MSc Business Mathematics and Informatics (BMI) a student is required to have taken any of the below Hons BSc qualifications, but the following pre-requisites with regards to the elective modules apply:

| MSc Module | Pre-requisite Hons programme(s)/ Voorvereiste Hons Program(me) |
|---|---|
| **BWIA812** | 2DR L01 N601P **or** 2DP L01 N601P **or** 2DQ L01 N601P |
| **BWIA821** | 2DR L01 N601P |
| **BWIN812** | 2DQ L01 N601P |
| **BWIB822** | 2DR L01 N601P **or** 2DP L01 N601P **or** 2DQ L01 N601P or 2FP L01 N601P |
| **BWIB817** | 2DR L01 N601P **or** 2DP L01 N601P **or** 2DQ L01 N601P or 2FP L01 N601P |
| **BWIB821** | 2DR L01 N601P **or** 2DP L01 N601P **or** 2DQ L01 N601P or 2FP L01 N601P |

## NAS.6.7.12 MASTER OF SCIENCE IN BUSINESS MATHEMATICS AND INFORMATICS / *MAGISTER SCIENTIAE IN BEDRYFSWISKUNDE EN INFORMATIKA*

| | | |
|---|---|---|
| **Qualification Code/ *Kwalifikasiekode*** | **2BP P04 N801P** | |
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| BWIB818 | Business Intelligence / *Bedryfsintelligensie* | 16 |
| BWIM815 | Industry Integration Methodology / *Bedryfsintegrasiemetodologie* | 16 |
| BWIN817 | Retail Credit Risk / *Kleinhandel Kredietrisiko* | 16 |
| **Students must select BWIA812 or BWIN812 or (BWIB822 and BWIB817) totalling 24 credits** | | |
| BWIA812 | Enterprise-wide Risk Management I | 24 |
| BWIB817 | Optimisation for Decision Making / *Optimering vir Besluitneming* | 12 |
| BWIN812 | Pricing of Derivatives B | 24 |
| BWIB822* | Contemporary Issues in Business Analytics | 12 |
| **Total 1st/ *Totaal 1ste Semester*** | | **72** |
| **Second/ *Tweede Semester*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| BWIR828 | Industry Directed Research Project / *Industriegerigte Navorsingsprojek* | **96** |
| **Students must select ONE MODULE below. BWIA821 may only be taken by students who completed BWIA812 in the first semester and completed 2DR L01 N601P as honours qualification or the equivalent professional exam (ASSA A311)** | | |
| BWIB821 | Data Mining Techniques / *Data-ontginningstegnieke* | 12 |
| BWIA821** | Enterprise-wide Risk Management II | 12 |
| **Total 2nd/ *Totaal 2de Semester*** | | **12** |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

*__BWIB822__ is presented in the first semester

**__BWIA821__ may only be taken by students who completed 2DR L01 N601P as honours qualification or the equivalent professional exam (ASSA A311

## NAS.7 MASTER OF SCIENCE / *MAGISTER SCIENTIAE*

### NAS.7.1 MASTER OF SCIENCE IN PHYSICS / *MAGISTER SCIENTIAE IN FISIKA*

#### NAS.7.1.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

Physics or equivalent degree is required for entry into the master's programme. Admission will only be granted upon reviewing the candidate's academic record and background.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CW N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MPHY871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

### NAS.7.2 MASTER OF SCIENCE IN ASTROPHYSICAL SCIENCES / *MAGISTER SCIENTIAE IN ASTROFISIESE WETENSKAPPE*

#### NAS.7.2.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE 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 lecturers 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*

#### NAS.7.2.2 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

BScHons in Physics or equivalent degree, is required for entry into the master's programme. Admission will only be granted upon reviewing the candidate's academic record and background./

*'n BScHons in Fisika of 'n ekwivalente graad, is 'n voorvereiste vir toelating tot die Meestersprogram. 'n Aansoeker sal slegs toegelaat word na insae in die kandidaat se akademiese rekord en agtergrond.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CQ P01 N801P** **Astrophysical Sciences/*Astrofisiese Wetenskappe*** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| **A student chooses THREE of the following in consultation with the Research Director / *Student kies in oorleg met die Navorsingsdirekteur*** ***DRIE 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 |
| FSKM816 | Advanced Plasma Physics/ *Gevorderde Plasmafisika* | 16 |
| FSKM817 | General Relativity / *Algemene Relatiwiteit* | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **48** |
| **Year Module/ *Jaarmodule*** | | |
| FSKS872 | Dissertation/ *Verhandeling* | **132** |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

*Select in consultation with the Research Director a topic in General Physics/

**Kies in oorleg met die Navorsingsdirekteur 'n onderwerp in Algemene Fisika*.

## NAS.7.3 MASTER OF SCIENCE IN ASTROPHYSICS AND SPACE SCIENCE: PHASING OUT/ *MAGISTER SCIENTIAE IN ASTROFISIKA EN RUIMTEWETENSKAP: Faseer uit*

**Not available for registration.**

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CR P01 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **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 Pulsars/ *Hoë-energie Astrofisika en Pulsare* | 12 |
| 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:* Total 1st/ *Totaal 1ste Semester*** | | **60** |
| **Compulsory Module/ *Verpligte Module*** | | |
| FSKS872 | Dissertation/ *Verhandeling* | 132 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **192** |

## NAS.7.4 MASTER OF SCIENCE IN APPLIED RADIATION SCIENCE/ *MAGISTER SCIENTIAE IN TOEGEPASTE STRALINGSWETENSKAP*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2HE P01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **First/ *Eerste Semester*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MARR811 | Radioanalytical Applications | 16 |
| MARR812 | Environmental Applications | 16 |
| MARR813 | Radioactive Waste Management | 16 |
| MARR814 | Industrial Applications | 16 |
| MARR815 | Technology Management | 16 |
| **Total 1st/ *Totaal 1ste Semester*** | | **80** |
| **Research Module/ *Navorsingsmodule*** | | |
| MARR873 | Mini - Dissertation | 100 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

## NAS.7.5 MASTER OF SCIENCE IN CHEMISTRY / *MAGISTER SCIENTIAE IN CHEMIE*

### NAS.7.5.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

**To gain admission to the qualification a student must have obtained an Honours degree in Chemistry. / Om toelating tot die kwalifikasie te verkry, moet 'n student 'n Honneursgraad in Chemie verwerf het.**

| | | |
|---|---|---|
| **Qualification Code/ *Kwalifikasiekode*** | **2CM N01 N801P<br>2CM N01 N801M** | |
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng<br>(AFRIKAANS / ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Full Time & Part Time /<br>*Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| CHEM871 | Dissertation /<br>*Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.7.6 MASTER OF SCIENCE IN BIOCHEMISTRY / *MAGISTER SCIENTIAE IN BIOCHEMIE*

### NAS.7.6.1 ADMISSION REQUIREMENTS FOR THE PROGRAMME / *TOELATINGSVEREISTES VIR DIE PROGRAM*

*Presentation and oral examination of the dissertation and relevant field of HDMG871. /

**Voordrag en mondelinge eksaminering van die verhandeling en toepaslike studieveld van* HDMG871.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2EF P01 N801P** **2EF P01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BCHN872 | Dissertation / *Verhandeling* | 135 |
| BCHN877* | Advanced Biochemistry* / *Gevorderde Biochemie* | 45 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*

### NAS.8.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Environmental Sciences, or equivalent degree (subject to approval by the Director). Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

#### NAS.8.1.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME AND ADMISSION REQUIREMENTS FOR THE FOLLOWING MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES PROGRAMMES/ *FAKULTEITSPESIFIEKE REËLS EN TOELATINGSVEREISTES VIR DIE PROGRAMME MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*

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/ *Omgewingsgeologie en grondkunde*

## NAS.8.2 PROGRAMME: MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES / *PROGRAM: MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MENV871 | Dissertation | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N02 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| OMWN871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8.3 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH ATMOSPHERIC CHEMISTRY / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET ATMOSFERIESE CHEMIE*

### NAS.8.3.1 ADMISSION REQUIREMENTS/ *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N03 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| CHEM871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8.4 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH DISASTER RISK SCIENCES / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET RAMP-RISIKOWETENSKAPPE*

### NAS.8.4.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N07 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| DRRS871 | Dissertation/ *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8.5 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH INTEGRATED PEST MANAGEMENT / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET GEÏNTEGREERDE PLAAGBESTUUR*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N05 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| IPMM871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8.6 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH MINING HYDROLOGY / *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET MYNHIDROLOGIE*

### NAS.8.6.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE 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.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N06 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HDMG871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.8.7 MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES WITH HYDROLOGY AND GEOHYDROLOGY/ *MAGISTER SCIENTIAE IN OMGEWINGSWETENSKAPPE MET HIDROLOGIE EN GEOHIDROLOGIE*

### NAS.8.7.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE 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*

### NAS.8.7.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CT N04 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HDGH871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.9 MASTER OF SCIENCE IN ZOOLOGY / *MAGISTER SCIENTIAE IN DIERKUNDE*

### NAS.9.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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.*

### NAS.9.2 ADMISSON REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Zoology, or equivalent degree (subject to approval by the Director). Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2DD N01 N601P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| DRKN871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.10 MASTER OF SCIENCE IN GEOGRAPHY / *MAGISTER SCIENTIAE IN GEOGRAFIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CP N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MGEO871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## *NAS.11* MASTER OF SCIENCE IN GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT/ *MAGISTER SCIENTIAE IN GEOGRAFIE EN OMGEWINGSBESTUUR*

### NAS.11.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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

### NAS.11.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

A candidate should, unless otherwise determined by the Faculty Board, be in possession of an Honours qualification in Geography or Environmental Sciences or its equivalent as approved by Senate, as well as comply with any other requirements prescribed in the rules of the Faculty offering this Master's degree, to be permitted to register for a Master's qualification in Geography and Environmental Management.

| **Qualification Code/** ***Kwalifikasiekode*** | **2DG N01 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| GGFN871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.12 MASTER OF SCIENCE IN MICROBIOLOGY / *MAGISTER SCIENTIAE IN MIKROBIOLOGIE*

### NAS.12.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

In this programme research can be conducted on any subject in Microbiology, although the School/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 Skool/Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

### NAS.12.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To qualify for admission to a master's programme, a student must be in possession of a relevant honours degree or postgraduate diploma at level 8 in an appropriate field (subject to approval by the Director), or the equivalent of these as approved by Senate. In addition, a prospective student must comply with all other requirements as prescribed in the rules of the faculty offering the qualification, and as contained in the faculty yearbook.

Under circumstances as explained in the faculty yearbook after approval by Senate, a prospective student with a four-year undergraduate degree at exit level 8 may be considered for admission to a cognate Master's Degree.

An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country

| **Qualification Code/** ***Kwalifikasiekode*** | **2DE N01 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MKBN871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.13 MASTER OF SCIENCE IN BIOLOGY / MAGISTER SCIENTIAE IN BIOLOGIE

### NAS.13.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

In this programme research can be conducted on any subject in Microbiology, although the School/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 Skool/Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

### NAS.13.2 ADMISSION REQUIREMENTS

To qualify for admission to a master's programme, a student must be in possession of a relevant honours degree (in Microbiology/Biology) or postgraduate diploma at level 8 in an appropriate field (subject to approval by the Director), or the equivalent of these as approved by Senate. In addition, a prospective student must comply with all other requirements as prescribed in the rules of the faculty offering the qualification, and as contained in the faculty yearbook.

Under circumstances as explained in the faculty yearbook after approval by Senate, a prospective student with a four-year undergraduate degree at exit level 8 may be considered for admission to a cognate Master's Degree.

In this programme, research will be conducted on any subject in the field of Biology, depending on the availability of the requisite expertise to supervise. An applicant for registration must give evidence of attainments and education and complete such preliminary work.

An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CL N01 N801M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BIOM871 | Dissertation | 180 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **180** |

## NAS.14 MASTER OF SCIENCE IN BOTANY / MAGISTER SCIENTIAE IN PLANTKUNDE

### NAS.14.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE 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*

### NAS.14.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Botany, or equivalent degree (subject to approval by the Director). Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DF N01 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| PLKN871 | Dissertation/*Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.15 MASTER OF ENVIRONMENTAL MANAGEMENT / *MAGISTER IN OMGEWINGSBESTUUR*

### NAS.15.1 RULES FOR THE DEGREE / *REËLS VIR DIE GRAAD*

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 /

***NB:** Lesings vir die gedoseerde modules van hierdie graad word slegs na-uurs en in Engels aangebied.*

#### NAS.15.1.1 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.*

#### NAS.15.1.2 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*.

### NAS.15.1.3 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.*

### NAS.15.1.4 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.*

### NAS.15.1.5 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*

### NAS.15.1.6 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.*

### NAS.15.1.7 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.*

### NAS.15.1.8 SPECIFIC EXIT LEVEL OUTCOMES / *SPESIFIEKE UITTREEVLAK-UITKOMSTE*

#### NAS.15.1.8.1 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 implementer.*
- 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*

#### NAS.15.1.8.2 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*

### NAS.15.1.8.3 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.15.2 MASTER OF ENVIRONMENTAL MANAGEMENT/ *MAGISTER IN OMGEWINGSBESTUUR*

### NAS.15.2.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

a. This programme is presented **part-time only** 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.*

### NAS.15.2.2 ADMISSION REQUIREMENTS/ TOELATINGSVEREISTES

To gain admission to the qualification a student must have obtained an Honours degree in Geography/Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/ *Kwalifikasiekode*** | **2CD P01 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom (ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Part Time / *Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| OMBO878 | Environmental Management II/ *Omgewingsbestuur II* | 40 |
| OMBO879 | Environmental Assessment II / *Omgewingsevaluering II* | 40 |
| **Mini dissertation/ *Skripsie*** | | |
| OMBO873 | Dissertation/ *Verhandeling* | 100 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.15.3 MASTER OF ENVIRONMENTAL MANAGEMENT WITH ECOLOGICAL WATER REQUIREMENTS / *MAGISTER IN OMGEWINGSBESTUUR MET EKOLOGIESE WATERVEREISTES*

### NAS.15.3.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEIT SPESIFIEKE REËLS VIR DIE PROGRAM*

a. This programme is presented **part-time only** 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.*

### NAS.15.3.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Geography/Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CD P02 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Part Time / *Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **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 | Dissertation/ *Verhandeling* | 100 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.15.4 MASTER OF ENVIRONMENTAL MANAGEMENT WITH WASTE MANAGEMENT/ *MAGISTER IN OMGEWINGSBESTUUR MET AFVALBESTUUR*

### NAS.15.4.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE REËLS VIR DIE PROGRAM*

a. This programme is presented **part-time only** 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.*

### NAS.15.4.2 ADMISSION REQUIREMENTS/ *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Geography/Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/ *Kwalifikasiekode*** | **2CD P03 N801P** | |
|---|---|---|
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom (ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Part Time / *Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **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 | Dissertation/ *Verhandeling* | 100 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.15.5 MASTER OF ENVIRONMENTAL MANAGEMENT WITH CONSERVATION LEADERSHIP / *MAGISTER IN OMGEWINGSBESTUUR MET BEWARINGSLEIERSKAP*

### NAS.15.5.1 ADMISSION REQUIREMENTS/ *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Geography/Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CD P04 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Part Time (Contact)/ *Deeltyds (Kontak)* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| OMBO884 | Conservation Leadership / *Bewaringsleierskap* | 40 |
| OMBO885 | Futures Thinking / *Toekomsbeplanning* | 40 |
| **Mini dissertation/ *Skripsie*** | | |
| OMBO873 | Dissertation/ *Verhandeling* | 100 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.16 MASTER OF INDIGENOUS KNOWLEDGE SYSTEMS / *MAGISTER IN INHEEMSE KENNISSTELSELS*

### NAS.16.1 ADMISSION REQUIREMENTS

Should be in possession of the BIKS degree or any equivalent honours degree. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2AA N01 N801M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MIKS871 | Dissertation | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.17 MASTER OF SCIENCE IN URBAN AND REGIONAL PLANNING / *MAGISTER SCIENTIAE IN STADS- EN STREEKBEPLANNING*

### NAS.17.1 RULES FOR THE DEGREE / *REËLS VIR DIE GRAAD*

#### NAS.17.1.1 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 sinvol 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.*

#### NAS.17.1.2 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.*

### NAS.17.1.3 ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

#### Admission requirements / *Toelatingsvereistes*

All candidates must be in possession of a BSc in Urban and Regional Planning. The research director in consultation with the school director, will select those candidates who, in their opinion has the greatest chance of success for succeeding in the relevant qualification. The background and potential of students will also be taken into account in this selection process. Candidates may be refused admission if the standard of competence previously attained by the prospective student does not conform to the relevant qualification requirements. If the students who pass the selection are more than the relevant research entity can handle 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 qualification. /

*Alle kandidate moet in besit wees van 'n BSc in Stads- en Streekbeplanning. Die navorsingsdirekteur sal in oorleg met die skooldirekteur die kandidate kies wat na hul mening die grootste kans op sukses het om in die betrokke kwalifikasie te slaag. Die agtergrond en potensiaal van studente word ook in ag geneem in hierdie keuringsproses. Kandidate kan toelating geweier word indien die bevoegdheidstandaard wat die voornemende student voorheen behaal het, nie aan die toepaslike kwalifikasievereistes voldoen nie. As die studente wat die keuring slaag, meer is as wat die betrokke navorsingsentiteit kan hanteer, kan die groep studente wat volgens die oordeel van die navorsingsdirekteur in oorleg met die skooldirekteur die grootste kans op sukses het, gekies word vir die betrokke kwalifikasie.*

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.*

### NAS.17.1.4 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*

### NAS.17.1.5 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.*

### NAS.17.1.6 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.*

### NAS.17.1.7 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.*

### NAS.17.1.8 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.*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2DH N01 N801P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| SBEL871 | Dissertation / *Verhandeling* | 180 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **180** |

## NAS.18 DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*

### NAS.18.1 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.*

#### NAS.18.1.1 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.*

### NAS.18.1.2 DURATION OF THE STUDIES / *DUUR VAN STUDIES*

The minimum duration of the studies is two years and the maximum duration four years (General Rule 1.14), taken from the date of first registration for the specific programme. In terms of the procedure explained in the General Rule 5.13, 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), bereken vanaf die datum van eerste registrasie vir die betrokke program. Daar kan volgens die prosedure uiteengesit in die Algemene Reël 5.13, aansoek gedoen word om 'n verlenging van die studietermyn.*

### NAS.18.1.3 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.*

### NAS.18.1.4 ADMISSION AND REGISTRATION / *TOELATING EN REGISTRASIE*

The admission requirements and the prescribed dates for registration are set out in the General Rules 5.7. /

*Die toelatingsvereistes en vereiste datums van registrasie word uiteengesit in die Algemene Reël 5.7.*

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 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.*

### NAS.18.1.5 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.***

### NAS.18.1.6 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*

### NAS.18.1.7 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.*

### NAS.18.1.8 SUMMARISED / *SAMEVATTEND*

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.18.1.9 EXAMINATIONS/ EKSAMINERING

Examinations for the doctorate are taken in terms of the provisions of the General Rule 5.11. 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 5.11.*

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 5.11.4. /

*Die slaag van modules en 'n kurrikulum geskied in ooreenstemming met die Algemene Reël 5.11.4.*

## NAS.18.2 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRICULTURAL ECONOMICS / *DOCTOR PHILOSOPHIAE IN LANDBOU MET LANDBOU-EKONOMIE*

### NAS.18.2.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

Candidates must apply at the Research Unit Director on the prescribed form for admission to PhD studies. A student must have the following minimum qualifiifcations before applying: (i) a MSc or Mcom degree in Agricultural Economics (ii) convince the research Unit director concernde beforehand that he/she has sufficient knowledge of the subject to warrant admission./

*Kandidate moet aansoek doen by die navorsingseenheid direkteur op die voorgeskrewe aansoekvorm vir toelating tot PhD-studie. Die student moet in besit wees van 'n MSc of MCom graad en die betrokke navorsingsdirekteur oortuig dat hy/sy oor voldoende kennis van die onderwerp beskik om toelating tot die PhD te reverdig.*

| **Qualification Code/** ***Kwalifikasiekode*** | **2EA R03 N901P** **2EA R03 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time / *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AECM971 | Dissertation / *Verhandeling* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.3 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRICULTURAL EXTENSION/ *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET LANDBOUVOORLIGTING*

| **Qualification Code/** ***Kwalifikasiekode*** | **2EA R04 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AEXM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.4 DOCTOR OF PHILOSOHPY IN AGRICULTURE WITH ANIMAL SCIENCE / *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET DIEREWETENSKAP*

### NAS.18.4.1 ADMISSION REQUIREMENTS

A student must have the following minimum qualifications before applying:

- An MSc degree in a relevant field such as animal production, animal nutrition, animal breeding, animal physiology, meat science and pasture science.
- Convince the research Unit director concerned, beforehand that he/she has sufficient knowledge of the subject to warrant admission.

| **Qualification Code/** ***Kwalifikasiekode*** | **2EA R01 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ASCM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.5 DOCTOR OF PHILOSOPHY IN AGRICULTURE WITH AGRONOMY/ *DOCTOR PHILOSOPHIAE IN LANDBOUKUNDE MET AGRONOMIE*

### NAS.18.5.1 ADMISSION REQUIREMENTS

A student must have the following minimum qualifications before applying:

- An MSc in a relevant discipline such as crop science, soil science, horticulture, plant breeding, plant protection.
- Convince the research Unit director concerned beforehand that he/she has sufficient knowledge of the subject to warrant admission.

| **Qualification Code/** ***Kwalifikasiekode*** | **2EA R02 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AGRM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.6 DOCTOR OF PHILOSOPHY IN ANIMAL HEALTH / *DOCTOR PHILOSOPHIAE IN DIEREGESONDHEID*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CA R01 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| AHAM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.7 DOCTOR OF PHILOSOPHY IN COMPUTER AND INFORMATION SCIENCES/ *DOCTOR PHILOSOPHIAE IN REKENAAR- EN INLIGTINGSWETENSKAPPE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CB R02 N901P**<br>**2CB R02 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time: Potchefstroom<br>Full Time & Part Time: Mahikeng | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ITRW971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.8 DOCTOR OF PHILOSOPHY IN COMPUTER AND INFORMATION SCIENCES WITH INFORMATION TECHNOLOGY / *DOCTOR PHILOSOPHIAE IN REKENAAR- EN INLIGTINGWETENSKAPPE MET INLIGTINGTEGNOLOGIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CB R01 N901V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Vanderbijlpark (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ITWV971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.9 DOCTOR OF PHILOSOPHY IN SCIENCE WITH STATISTICS / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STATISTIEK*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R20 N901P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| STTK971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.10 DOCTOR OF PHILOSOPHY IN SCIENCE WITH APPLIED MATHEMATICS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET TOEGEPASTE WISKUNDE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R25 N901P** **2CC R25 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | PC=Full Time only / *Slegs Voltyds;* MC=Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| APPM971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.11 DOCTOR OF PHILOSOPHY IN SCIENCE WITH MATHEMATICS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET WISKUNDE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R24 N901 P** **2CC R24 N901 M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | PC=Full Time only / *Slegs Voltyds;* MC=Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MTHS971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.12 DOCTOR OF PHILOSOPHY IN SCIENCE WITH NATURAL SCIENCES EDUCATION / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET NATUURWETENSKAPONDERWYS*

### NAS.18.12.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME/ *FAKULTEITSPESIFIEKE 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.*

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|---|---|---|
| **Qualification Code/ *Kwalifikasiekode*** | **2CC R09 N901P** | |
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| NWON971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.13 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BUSINESS MATHEMATICS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BEDRYFSWISKUNDE*

| | | |
|---|---|---|
| **Qualification Code/ *Kwalifikasiekode*** | **2CC R01 N901P** | |
| **Campus & Language of Instruction/ *Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/ *Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/ *Modulekode*** | **Descriptive name/ *Beskrywende naam*** | **Credits/ *Krediete*** |
| BWIN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.14 DOCTOR OF PHILOSOPHY IN SCIENCE WITH RISK ANALYSIS/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET RISIKO-ANALISE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R15 N901P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / *Voltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BWIR971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.15 DOCTOR OF PHILOSOPHY IN SCIENCE WITH PHYSICS / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET FISIKA*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R23 N901 P**<br>**2CC R23 N901 M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | PC=Full Time only / Slegs Voltyds;<br>MC=Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| FSKN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.16 DOCTOR OF PHILOSOPHY IN SCIENCE WITH CHEMISTRY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET CHEMIE*

### NAS.18.16.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

**To gain admission to the qualification a student must have obtained a Master of Science degree in Chemistry. / *Om toelating tot die kwalifikasie te verwerf, moet 'n student 'n magistergraad in Chemie verwerf het.***

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R11 N901P** **2CC R11 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part-Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| CHEN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.17 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ATMOSPHERIC CHEMISTRY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET ATMOSFERIESE CHEMIE*

### NAS.18.17.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R05 N901P** **PhD in Science with Atmospheric Chemistry** ***/ PhD in Wetenskap met Atmosferiese Chemie*** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part-Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| CHEM971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **360** |

## NAS.18.18 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIROMENTAL SCIENCES/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OMGEWINGSWETENSKAPPE*

### NAS.18.18.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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 / *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*

### NAS.18.18.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her

subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R04 N901P**<br>**PhD in Science with Environmental Sciences** ***/ PhD in Wetenskap met Omgewingswetenskappe*** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom<br>(AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part-Time<br>*Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| OMWN971 | Thesis /<br>*Proefskrif* | 360 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **360** |

## NAS.18.19 DOCTOR OF PHILOSOPHY IN SCIENCE WITH TRANSDICIPLINARY ENVIRONMENTAL SCIENCES AND MANAGEMENT/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET TRANSDISSIPLINÊRE OMGEWINGSWETENSKAPPE EN BESTUUR*

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R03 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng<br>(ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / Part Time | |
| **COMPILATION OF PROGRAMME /** ***SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ENVM971 | Thesis | 360 |
| **Total Credits for the Programme/** ***Totale Krediete vir die Program*** | | **360** |

## NAS.18.20 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ENVIRONMENTAL SCIENCES AND MANAGEMENT/ *DOCTOR PHILIOSOPHAIE IN WETENSKAP MET OMGEWINGSWETENSKAPPE EN BESTUUR*

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R26 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ENVM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.21 DOCTOR OF PHILOSOPHY IN SCIENCE WITH DISASTER RISK SCIENCE/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET RAMP-RISIKOWETENSKAP*

### NAS.18.21.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R14 N901P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| DRRS971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.22 DOCTOR OF PHILOSOPHY IN SCIENCE WITH ZOOLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET DIERKUNDE*

### NAS.18.22.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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*

### NAS.18.22.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R18 N901P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| DRKN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.23 DOCTOR PHILOSOPHY IN SCIENCE WITH GEOGRAPHY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE*

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|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R12 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time / Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| GEOM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.24 DOCTOR OF PHILOSOPHY IN SCIENCE WITH GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET GEOGRAFIE EN OMGEWINGSBESTUUR*

### NAS.18.24.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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.

*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.*

Specialist fields include (but are not limited to):

*Spesialisvelde sluit in (maar is nie eksklusief nie):*

a. Spatial studies / *Ruimtelike studies*
b. Environmental impact analysis and all aspects thereof / *Omgewingsinvloedanalise en alle aspekte daarvan*
c. Environmental management and all aspects thereof / *Omgewingsbestuur en alle aspekte daarvan*
d. Physical and human Geography / *Fisiese en menslike Geografie*

## NAS.18.24.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R19 N901P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| GGFN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.25 DOCTOR OF PHILOSOPHY IN SCIENCE WITH MICROBIOLOGY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET MIKROBIOLOGIE*

### NAS.18.25.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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.*

### NAS.18.25.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To qualify for admission to a Doctoral degree, a prospective student must be in possession of an appropriate Master's degree or its equivalent as approved by Senate, and as contained in the faculty yearbook.

Admission to all doctoral degrees offered by the University shall be subject to approval by the relevant faculty structure on the recommendation of the concerned research director in consultation with the concerned school director. In light hereof, it is expected of prospective doctoral students to consult with the concerned research director on their intended research proposals and the nature of their supervision prior to admission being sought to a doctoral qualification (see the NWU Manual for Master's and Doctoral Studies). In addition, a prospective student must comply with all other requirements as prescribed in the rules of the faculty offering the qualification, and as contained in the faculty yearbook.

An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R17 N901P** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| MKBN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.26 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BOTANY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET PLANTKUNDE*

### NAS.18.26.1 FACULTY-SPECIFIC RULES FOR THE PROGRAMME / *FAKULTEITSPESIFIEKE 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 Botany, although the School/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 Plantkunde, alhoewel die Skool/Eenheid die reg voorbehou om 'n kandidaat nie te aanvaar, in gevalle waar daar nie voldoende kapasiteit bestaan nie.*

### NAS.18.26.2 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R16 N901P** **2CC R16 N901M** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| PLKN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.27 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOCHEMISTRY/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOCHEMIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R08 N901P** **2CC R08 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom / Mahikeng (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BCHN971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.28 DOCTOR OF PHILOSOPHY IN SCIENCE WITH BIOLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET BIOLOGIE*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R10 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| BIYM971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.29 DOCTOR OF PHILOSOPHY IN SCIENCE WITH HYDROLOGY AND GEOHYDROLOGY / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET HIDROLOGIE EN GEOHIDROLOGIE*

### NAS.18.29.1 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the qualification a student must have obtained an Honours degree in Environmental Sciences, or equivalent degree. Alternatively, applicants must have the status of such a qualification granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country.

| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R06 N901P** | |
|---|---|---|
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HDGH971 | Thesis / *Proefskrif* | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.30 DOCTOR OF PHILOSOPHY IN SCIENCE WITH OPERATIONAL RESEARCH/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET OPERASIONELE NAVORSING*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R21 N901V** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Vanderbijlpark (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time/ Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ONAV972 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.31 DOCTOR OF PHILOSOPHY IN SCIENCE WITH RADIATION SCIENCE / *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STRALINGSWETENSKAP*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **2CC R22 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time/ Part Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| ARST971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.32 DOCTOR OF PHILOSOPHY IN SOCIAL SCIENCE WITH INDIGENOUS KNOWLEDGE SYSTEMS / *DOCTOR PHILOSOPHIAE IN SOSIALEWETENSKAP MET INHEEMSE KENNISSTELSELS*

| | | |
|---|---|---|
| **Qualification Code/** ***Kwalifikasiekode*** | **1CC R13 N901M** | |
| **Campus & Language of Instruction/** ***Kampus & Onderrigtaal*** | Mahikeng (ENGLISH) | |
| **Delivery Mode/** ***Metode van Aflewering*** | Full Time | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** ***Modulekode*** | **Descriptive name/** ***Beskrywende naam*** | **Credits/** ***Krediete*** |
| HIKS971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.18.33 DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING/ *DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*

### NAS.18.33.1 RULES FOR THE DEGREE / *REËLS VIR DIE PROGRAM*

#### NAS.18.33.1.1 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.*

### NAS.18.33.2 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.*

### NAS.18.33.3 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 5.13, 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 5.13, aansoek gedoen word om 'n verlenging van die studietermyn.*

### NAS.18.33.4 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.*

### NAS.18.33.5 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.18.33.6 ADMISSION REQUIREMENTS / *TOELATINGSVEREISTES*

To gain admission to the PhD in Science, a student must have obtained an appropriate Master's degree in the discipline in which the student wishes to study. Alternatively, applicants must have the status of such a Master's degree granted on request by the Senate, by attaining a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree. An applicant for registration must give evidence of his/her attainments and education and complete such preliminary work as Senate may require, and must satisfy Senate as to the suitability of his/her subject. An evaluation certificate as issued by the South African Qualifications Authority (SAQA) must be submitted if a previous qualification was obtained in a foreign country. Admission to the PhD in Science with specialization in Dietetics or with specialization in Nutrition, is subject to attaining 60% at completion of the Master's degree.

### NAS.18.33.7 PROGRAMME: DOCTOR OF PHILOSOPHY IN SCIENCE WITH URBAN AND REGIONAL PLANNING/ *PROGRAM: DOCTOR PHILOSOPHIAE IN WETENSKAP MET STADS- EN STREEKBEPLANNING*

| **Qualification Code/** *Kwalifikasiekode* | **2CC R07 N901P** | |
|---|---|---|
| **Campus & Language of Instruction/** *Kampus & Onderrigtaal* | Potchefstroom (AFRIKAANS / ENGLISH) | |
| **Delivery Mode/** *Metode van Aflewering* | Full Time & Part Time *Voltyds & Deeltyds* | |
| **COMPILATION OF PROGRAMME / *SAMESTELLING VAN PROGRAM*** | | |
| **Module Code/** *Modulekode* | **Descriptive name/** *Beskrywende naam* | **Credits/** *Krediete* |
| SBEL971 | Thesis | 360 |
| **Total Credits for the Programme/ *Totale Krediete vir die Program*** | | **360** |

## NAS.19 MODULE OUTCOMES / *MODULE UITKOMSTE*

### NAS.19.1 POSTGRADUATE DIPLOMA / *NAGRAADSE DIPLOMA*

| **DRRS511** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **Disaster Risk Studies and Climate Change Adaptation** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Define and explain the interaction between the basic concepts (i.e risk, hazards, vulnerability, resilience) that form the basis of disaster risk.<br>• Explain the influence of disaster risk on poor communities.<br>• Critique various disaster myths.<br>• Understand the difference between disaster risk management, disaster risk reduction and climate change adaptation.<br>• Explain the application of disaster risk management and climate change adaptation within the South African context.<br>• Place climate change and adaptation within disaster risk reduction theory.<br>• Display a basic understanding of current processes of climate change and adaptive practices to enhance societal resilience.<br>• Analyse the link between climate change affects the risk profile of southern Africa.<br>• Understand the concepts “adaptation” and “resilience” and how it relates to disaster risk reduction. | | |
| **Method of delivery:** Full-time and Part-time | | |
| **Assessment methods:**<br>**Formative:**<br>Class tests<br>Quizzes<br>Written assignments<br>**Summative:**<br>Closed book examination | | |
| **DRRS512** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Socio-Ecological Resilience** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Critically judge the vulnerability of a community or group by applying different models of vulnerability, resilience and exposure analysis.<br>• Accurately, appropriately monitor and communicate the nature of vulnerability and exposure to disaster risk reduction professionals, community members and critical role players.<br>• Understand the complexity of vulnerability and resilience that extends its roots into social, economic, physical, environmental and political origins.<br>• 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 of delivery:** Full-time and Part-time

**Assessment methods:**

**Formative:**

Class tests

Quizzes

Written assignments

**Summative:**

Closed book examination

| DRRS513 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 of delivery:** Full-time and Part-time

**Assessment methods:**

**Formative:**

Written assignment

Project

Test

**Summative:**

Closed book examination

| DRRS514 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 of delivery:** Full-time and Part-time

**Assessment methods:**

**Formative:**

Class tests

Quizzes

Written assignments

**Summative:**

Closed book examination

| **DRRS515** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 of delivery:** Full-time and Part-time

**Assessment methods:**

**Formative Assessment:**

Research Proposal (Individual Assessment)

Oral presentation (Individual Assessment)

Class participation (Individual Assessment)

Written Assignment (Individual Assessment)

Semester Test (Individual Assessment)

**Summative Assessment:**

Closed book examination (Individual Assessment)

| DRRS521 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Urban Disaster Risk** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Explain the role of urbanisation in increasing disaster risk.<br>• Investigate environmental hazards (through climate change) and their dynamic within an urban setting.<br>• Compare urban risk variables in order to choose the correct course of action.<br>• Assess technological and human-made hazards within the urban setting.<br>• Promote community disaster risk assessment in urban settings.<br>• Explain rural-urban linkages which leads to heightened disaster risk.<br>• Investigate urban risk reduction priorities. | | |
| **Method of delivery:** Full-time and Part-time | | |
| **Assessment methods:**<br>**Formative:**<br>Class tests<br>Written assignments<br>**Summative:**<br>Closed book examination | | |
| **DRRS522** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Preparedness and Response** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Conduct disaster preparedness planning.<br>• Apply the various phases associated with disaster response and recovery.<br>• Show knowledge of and be able to explain the types of disaster assessments.<br>• Demonstrate knowledge and discuss disaster assessment process in full.<br>• Show knowledge of and critically explain the importance of logistical preparedness in disaster relief.<br>• Critically discuss the practical considerations for various sectors of relief.<br>• Demonstrate a critical understanding of the Incident Command System, its role and how it functions.<br>• Demonstrate the ability to ensure a transition from disaster recovery to development. | | |
| **Method of delivery:** Full-time and Part-time | | |
| **Assessment methods:**<br>**Formative:**<br>Class tests<br>Quizzes<br>Written assignments<br>**Summative:**<br>Closed book examination | | |

| DRRS523 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Planning and Project Management** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Demonstrate competence in designing systems, strategies and programmes for public policy implementation.<br>• Apply appropriate project management competencies in programme development and delivery.<br>• Apply relevant performance management systems in programme monitoring and evaluation. | | |
| **Method of delivery:** Full-time and Part-time | | |
| **Assessment methods:**<br>**Formative:**<br>Class tests<br>Quizzes<br>Written assignments<br>**Summative:**<br>Closed book examination | | |
| **DRRS524** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Research Project** | | |
| **Module outcomes:**<br>After the completion of this module the learners should be able to:<br>• Understand the code of conduct, values and ethics of post-graduate study.<br>• Have a basic orientation on the nature of scientific knowledge and the epistemology of the humanities.<br>• 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.<br>• Think critically and proceed with scientific reasoning whenever necessary through the collection, analysis, synthesis and assessment of data. | | |
| **Method of delivery:** Full-time and Part-time | | |
| **Assessment methods:**<br>**Formative Assessment:**<br>a. Oral presentations (Individual Assessment)<br>b. Literature Review (Individual Assessment)<br>c. Draft Research Paper (Individual Assessment)<br>**Summative Assessment:**<br>Research Project in the form a research paper/article (Individual Assessment) | | |

| ECOM515 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Agriculture and Economic Development** | | |
| **Module outcomes:**<br>• To foster more rapid economic development.<br>• Demonstrate integrated knowledge and understanding of principles of technical, allocative, scale and economic efficiencies.<br>• Have the ability to analyse agriculture's role in the development of underdeveloped communities/countries.<br>• Be able to identify barriers to agricultural development and to examine critically remedial agricultural policies and well-known tools of economic analysis. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| ECOM516 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Agricultural Statistics Research I** | | |
| **Module outcomes:**<br>• Demonstrate knowledge and understanding of applications of linear regression and the general linear model to agricultural economic data.<br>• Be able to and use and interpret at least two econometric software for data analysis to be able to analyse data.<br>• Demonstrate the ability to discuss the problems of estimation when classical assumptions of linear regression are violated.<br>• Be able to use application of Chi-square analysis in the estimation of Index numbers and time series analysis in the agricultural sector. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| ECOM517 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Quantitative Methods in Agricultural Economics** | | |
| **Module outcomes:**<br>• Demonstrate knowledge and engagement in this area of study to be able to use basic mathematical methods to identify pressing agricultural problems;<br>• Translate identified problem into a simple mathematical model to allow easier understanding and to aid agricultural problem solving;<br>• Demonstrate commendable competency in numeric skills;<br>• Derive outcomes, analyse and interpret output from mathematical and statistical models; Implement the analysis and evaluation of numerical solutions to business problems;<br>• Communicate the results of quantitative analyses in the contexts of agricultural problems to policy makers; and<br>• Demonstrate the ability to access, process and manage current economic literature in this area of study. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| ECOM518 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Agricultural Micro-Economics** | | |
| **Module outcomes:**<br>Upon completion of this module, students are expected:<br>• To have knowledge and demonstration of understanding of relevant terms, rules, concepts, principles and theories to describe microeconomics.<br>• To be able to apply this knowledge and these principles in the real world situations.<br>• To conduct economic analysis in agricultural and related enterprises.<br>• To advise agricultural stakeholders on micro-economics matters. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>**Formative:**<br>Quizzes<br>Written assignments<br>Class tests<br>**Summative:**<br>End of semester examination | | |
| **ECOM520** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Agricultural Marketing** | | |
| **Module outcomes:**<br>Upon completion of this module, learners are expected to have acquired:<br>• 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;<br>• Knowledge and understanding of the complexities and uncertainties of the different components of agricultural risk management in the context of South African agriculture;<br>• 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;<br>• 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 of delivery:** Full Time | | |
| **Assessment methods:**<br>**Formative:**<br>Class tests<br>Assignments<br>**Summative:**<br>Closed book written exam | | |

| ECOM526 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Agricultural Project Appraisal** | | |
| **Module outcomes:**<br>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 of delivery:** Full Time | | |
| **Assessment methods:** | | |

| ECOM527 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Agricultural Macro Economics** | | |
| **Module outcomes:**<br>• 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.<br>• Conduct economic analysis in agricultural and related enterprises.<br>• Advise agricultural stakeholders on micro-economics matters. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| ECOM529 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Research Methods and Project** | | |
| **Module outcomes:**<br>• Demonstrate knowledge of and understanding of agricultural economics research methods,<br>• Engage in this field to be able to identify a research proposal and formulate a proposal in the agricultural economics environment,<br>• Demonstrate the ability to critically review information gathering, synthesise data, evaluate and manage information,<br>• 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 of delivery:** Full Time | | |
| **Assessment methods:** | | |

| **APMA621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|
| **Introductory Harmonic Analysis /**<br>***Inleidende Harmoniese Analise*** | | |

**Module outcomes:**

After the successful completion of this module, the student must be able to demonstrate:

- Integrated knowledge of and engagement in harmonic analysis and critical understanding and application of Fourier series & transforms, Hilbert space techniques, and the theory of (tempered) distributions relevant to harmonic analysis,
- The ability to identify, demarcate, analyse, critically reflect on and effectively solve complex problems related to Fourier series & transforms and the theory of distributions and apply proven solution algorithms with theory-driven arguments,
- Ability to solve complex and unfamiliar problems within the field of harmonic analysis by gaining a deep understanding of the problem and employing novel solution techniques if required,
- Comprehensive knowledge and understanding of harmonic analysis, Fourier methods, Hilbert space techniques and (tempered) distributions in accordance with the level of the qualification achieved,
- The ability to communicate the solutions and their accompanying theoretical justification, verbally or in writing and via appropriate technologies and media (like latex and Beamer), in an accurate and coherent manner, with understanding of copyright principles and adherence to the rules on plagiarism.

**Method of delivery:** Full Time

**Assessment methods:**

Students have achieved these outcomes if they can furnish proof that they are able to do the following

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 40% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in an unseen context.
- 35% Know and understand the theorems and principles of the subject.
- 10% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 5% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **APPM611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery**: Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM613 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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.

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 finansiële 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;*
- *Die vermoë om probleme met geskikte numeriese metodes en rekenaarprogramme op te los.*

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM615 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM616 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM617 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM618 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM619 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment:**

Class tests and assignments that integrate the module outcomes.

**Summative assessment:**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| APPM621 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM622** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM623** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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.

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM624** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 finansiële 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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM625** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM626** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM627** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Fluid Dynamics II /**
***Vloeidinamika 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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM628** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **APPM629** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Dynamical Systems & PDEs /**
***Dinamiese Stelsels en PDVs***

**Module outcomes:**

After the successful completion of this module, the student must be able to demonstrate:

- Integrated knowledge of and engagement in dynamical systems & PDE and critical understanding and application of nonlinear dynamics (infinitely and countably many

dimensions), dissipative dynamics and models, modulation theory (including dynamics of pattern and introductory material on centre manifold reduction and diffusive stability) relevant to harmonic analysis,

- The ability to identify, demarcate, analyse, critically reflect on and effectively solve complex problems related to nonlinear dynamics, dissipative dynamics and various aspects of modulation theory (including dynamics of pattern and introductory material on centre manifold reduction and diffusive stability) and apply proven solution algorithms with theory-driven arguments,
- Ability to solve complex and unfamiliar problems within the field of harmonic analysis by gaining a deep understanding of the problem and employing novel solution techniques if required,
- Comprehensive knowledge and understanding of dynamical systems & PDE and critical understanding and application of nonlinear dynamics, dissipative dynamics and models, and
- Modulation theory in accordance with the level of the qualification achieved,
- The ability to communicate the solutions and their accompanying theoretical justification, verbally or in writing and via appropriate technologies and media (like latex and Beamer), in an accurate and coherent manner, with understanding of copyright principles and adherence to the rules on plagiarism.

**Method of delivery:** Full Time

**Assessment methods:**

Students have achieved these outcomes if they can furnish proof that they are able to do the following

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 40% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in an unseen context.
- 35% Know and understand the theorems and principles of the subject.
- 10% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 5% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **APPM671** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report /**
***Navorsingsverslag***

**Module outcomes:**

After completion of this module, the student should, taking in account previous studies, be able to do the following:

- Demonstrate mastery of introductory research methods in the subject;
- Be able to read and interpret and analyse 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 skills 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 conduct and report research on a mathematical problem under the guidance of a supervisor
- Be able to work together in a team on a topic.

**Method of delivery:** Full Time

**Assessment methods:**

**Formative:**

Initial presentation of project proposal in the second quarter.

**Summative:**

Present the chosen topic verbally using standard resources of the field of study (Beamer/Powerpoint).

| **ARSM611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

| **ARSM612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

| **ARSM673** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report**

**Module outcomes:**

After completion of module ARSM673, the student will demonstrate:

- Ability to articulate a research proposal and carry out literature review
- Understanding of how to design a research strategy, carry out experiments specific to a research problem
- Competency in analytically interpreting results of a research or experiment and in producing a research report under supervision.

**Method of delivery:** Full Time

**Assessment methods/criteria:**

- The student will prove that he/she has attained the outcomes of the ARSM673 module when he/she can articulate a research proposal and carry out literature review.
- When he/she can design a research strategy, carry out experiments specific to a research problem.
- When he/she can analytically interpret results of a research or experiment and produce a research report.

| **BCHN611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formal Formative**

The formative assessments include individual assignments and discussions.

**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 :**

The module mark is calculated by taking the average of all the formal tests and/or assignments.

| **BCHN612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative**

Assessments consist of in-class presentations, in-class assignments and take-home assignments.

**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.

| **BCHN613** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Advanced Analytical Biochemistry**

**Module outcomes:**

After completion of the module BCHN613, 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.
- Specialised 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.

**Method of delivery:** Full Time

**Assessment methods:** The formative assessments include individual assignments and discussions.

| **BCHN614** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Advanced Metabolism of Diseases**

**Module outcomes:**

After completion of the module BCHN614, the student should demonstrate:

- Integrated knowledge and understanding of the theory of human metabolism, and analytical techniques for metabolic profiling;
- The ability to evaluate the f human metabolism critically and to trace abnormalities back to a possible enzyme defect, co-factor 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.

**Method of delivery:** Full Time

**Assessment methods:** Formative assessments consist of in-class presentations, in-class assignments and take-home assignments.

| **BCHN622** | **SEMESTER 2** | **NQF8LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative**

The formative assessments include individual in-class presentations and discussions.

**Summative**

The summative assessment consists of an examination paper that will be written at an appointed time by every student.

**Assessment plan:**

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.

| **BCHN623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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:**

**Formative**

Assessments consist of in-class presentations, in-class assignments and take-home assignments.

**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.

| **BCHN621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 cellular and molecular biology;
- An ability to assimilate multiple sources of knowledge such as books, journals and the internet on particular topics within the field of cell and 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 cell and 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

**Assessment methods:** The formative assessments include individual in-class presentations and discussions.

| **BCHN624** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Advanced Cellular and Molecular Biology**

**Module outcomes:**

After completion of the module BCHN624, 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 online sources 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 advanced 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

**Assessment methods:**

**Formative**

The formative assessments include individual assignments and presentations (40%).

**Summative**

The summative assessment consists of formal examination on each of the subsections of the course at appointed times by every student (60%).

**Assessment Plan**

A written examination follows at the end of the module. The participation mark and examination mark will contribute 40% and 60%, respectively, to the module mark.

| BCHN671 | SEMESTER 1 & 2 | NQF-LEVEL: 8 |
|---|---|---|

**Research Report /**
***Navorsingsverslag***

**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 delivery:** Full Time

**Assessment methods:**

**Formal Formative**

The formative assessment includes an initial individual oral project plan presentation during March.

**Summative**

The final summative assessment consists of a mark for the written project report and oral presentation of the project.

**Assessment plan:**

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%.

| **BMCM613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Bacteriology**

**Module outcomes:**

After completion of module Bacteriology, the student will demonstrate:

- Integrated knowledge and clear understanding of bacteria classification characteristics.
- The knowledge to differentiate between different pathogenic and nosocomial bacteria of public health significance.
- Integrated knowledge and a detailed understanding of ethical procedures required when conduction research on bacteria.
- The ability to assess and review multiple resources in order to understand bacteria host range, evolution, and genetic diversity, and the contribution of the latter to source tracking.
- The knowledge of strategies through which bacteria acquire virulence and resistant determinants as well as the impacts and applications thereof in clinical diagnosis.
- Understanding on the use and application of approved SOPs for collecting, handling, and propagation of bacterial host.
- Practical knowledge on techniques to understand pathogenicity/virulence of bacteria species.
- The ability to effectively communicate their findings regarding the bacteria species.

**Method of delivery:** Full-time

**Assessment methods:**

Written and oral assignments, exam.

| **BMCM614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Virology And Immunology**

**Module outcomes:**

After completion of the module, students are expected to:

- Demonstrate awareness and clear understanding of the different groups of vertebrate viruses.
- Demonstrate an integrated knowledge and be able to explain the concepts of current key viruses, e.g. coronaviruses, cancer-causing viruses and HIV.
- Demonstrate an integrated knowledge and detailed understanding of virology and immunology techniques and their application in the industry.
- Demonstrate advanced ability to effectively analyze and interpret the host immune system and its defence mechanisms.
- Effectively identify, evaluate and address their own learning needs in a self-directed manner and facilitate collaborative learning processes.
- Demonstrate capacity for critical scientific analysis and ability to communicate information and research findings in well-formulated writing and oral presentation.

**Method of delivery:** Full Time

**Assessment methods:** Written and oral assignments, exam

| BMCM621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Mycology** | | |
| **Module outcomes:**<br>Upon completion of this module learners will demonstrate:<br>• Integrated knowledge and clear understanding of fungal classification characteristics.<br>• Differentiation of the fungal structurally from other organisms.<br>• The diversity of fungi in various habitats including their mechanisms for survival in ecosystems.<br>• Methods employed to cultivate and identify fungi utilizing correct lab and microscopic techniques.<br>• The knowledge and impact of fungi on plant, animal, and human pathologies, the food industry, and the production of antibiotics as well as other pharmaceuticals.<br>• How fungi are utilized to elucidate genetic principles as well as a description of their metabolites and energy-releasing metabolic pathways. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Written and oral assignments, exam. | | |
| **BMCM622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Environmental and Industrial Microbiology** | | |
| **Module outcomes:**<br>After completion of module BMCM622, the student will demonstrate:<br>• A detailed understanding of the terrestrial environment from an integrated physical, chemical, and biological perspective.<br>• The knowledge of surface soil, the vadose zone, and the saturated zone; components of soil discussed in class such as texture, pore size distribution, organic matter, soil structure, interaggregate and intraaggregate pores, cation exchange, soil water potential.<br>• A detailed understanding of how soil water potential relates to microbial activity; and the basics of contaminant sorption and microbial sorption.<br>• Knowledge of how microbial activity can influence the soil atmosphere.<br>• The ability to describe the types, numbers, and relative movements of microbes found in surface soil, vadose zone, and saturated zone environments.<br>• The knowledge of the respective competitiveness of the bacteria, actinomycetes, and fungi in soil.<br>• The ability to describe the four types of aquatic habitats for microbes; the microbial loop<br>• Understanding of the biogeochemical cycling of carbon and nitrogen in the benthos.<br>• Be able to describe the makeup of a microbial mat, including examples of microorganisms found in a mat.<br>• Understanding of how biofilms develop and the reasons why microbes form biofilms<br>• The ability to define the thermocline, epilimnion, and hypolimnion; the different regions of a water body: neuston, limnetic, littoral, and profundal zones<br>• The knowledge of the ranges of numbers of microbes in oligotrophic and eutrophic water bodies; the driving force behind the vertical stratification of primary producers in the water column; how bacteria adapt to extreme temperatures<br>• The ability to describe geothermal vents and their associated community | | |

- The ability to discuss and give examples of microorganisms of concern in disease, biological warfare and closed environments that may be spread through aerosols
- The ability to describe the three components of the aeromicrobiological pathway: launching, transport, and deposition
- Describe the biosafety levels used in research and medicine; how microorganisms in the air are measured; how bioaerosols can be controlled; and factors that impact microbial survival in bioaerosols
- Account for the significance of organisms in the food and foodservice industry
- Discuss the ancient, medieval and recent history of industrial microbiology
- Identify areas where environmental and industrial microbiology are applicable
- Give at least two examples of further possible research in Industrial microbiology
- Understanding of how to Improving strain selection and fermentation Process- Titre, Yield and VP.
- Demonstrate knowledge and understanding of Primary and Secondary Metabolites; Industrial Bioprocesses; the necessity for Growth; distinguish Large and Small Scale Processes.
- Understanding of the terms enrichment, selective, and differential medium, and the difference between culturable counts and direct counts, and MPN and culturable counts.
- The ability to adequately describe a dilution scheme given a soil or water sample, and convert soil wet weight results to soil dry weight results.

**Method of delivery:** Full Time

**Assessment methods:** Class tests, assignments, oral presentations, exam.

| **BWIA671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Actuarial Risk Management**

**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 delivery:** 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

| BWIB611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**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.

| **BWIB621** | **SEMESTER 2** | **NQF-LEVEL:8** |
|---|---|---|

**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 delivery:** Full Time

**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

| **BWIB623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**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

| **BWIN611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 ofdelivery:** 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.

| **BWIN613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** 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.

| **BWIN614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
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**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 delivery:** 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.

| **BWIN615** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Financial Modelling 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 delivery:** 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.

| **BWIN621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
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**Quantitative Risk Analysis II**

**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 delivery:** 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.

| **BWIN622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
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**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 delivery:** Full Time

**Assessment methods:**

- Describe, compare, combine, apply and critically investigate, through a research project, a range of contiguous claims pricing models, its assessement and selection, and the techniques associated with contiguous claims.
- Use MatLab to implement basic numerical procedures to price contingent claims in continuous time.
- Work independently and be well prepared for lectures.
- 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 Financial Mathematics.
- Demonstrate the 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.

| **BWIN625** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** 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

| **BWIR622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report: Financial Engineering and Pricing of Derivatives**

**Module outcomes:**

On completion of the module, the student 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 mastery of introductory research methodology in derivative pricing.
- 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).
- Conduct and write a report with reference to the current academic discourse on derivative pricing under the guidance of a supervisor.

**Method of delivery:** 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.

| **BWIR671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report: Financial Engineering and Financial Modelling**

**Module outcomes:**

On completion of the module, the student 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 financial 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 mastery of introductory research methodology in financial modelling.
- 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).
- Conduct research and write a report with reference to the current academic discourse on a specified financial instrument under the guidance of a supervisor.

**Method of delivery:** 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.

| **BWIR672** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report: Financial Modelling and Optimisation**

**Module outcomes:**

On completion of the module, the student 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 mastery of introductory research methodology in financial optimisation.
- Demonstrate the ability to present and communicate academic/professional work effectively.
- Demonstrate the ability to apply and implement mathematical approaches in financial optimisation using designated software packages (e.g SAS/IML and MS Excel).
- Conduct research and write a report with reference to the current academic discourse on a financial optimisation problem under the guidance of a supervisor.

**Method of delivery:** 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.

| **CISM614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs).

| CISM615 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs).

| CISM616 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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

**Method of delivery:** Full Time

**Assessment methods:**

Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs).

| CISM621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**Networks**

**Module outcomes:**

- This module involves knowing how to install, configure, and troubleshoot a computer network which is a highly marketable and exciting skill. This course first introduces the fundamental building blocks that form a modern network, such as protocols, media, topologies, and hardware. It then provides in depth coverage of the most important concepts in contemporary networking, such as TCP/IP, Ethernet, wireless transmission, virtual networks, security, and troubleshooting.

**After completion of the module the student will be able to show that he/she:**

- Can select the best network design, hardware, and software for your environment.

- Has the skills to build a network from scratch and maintain, upgrade, troubleshoot, and manage an existing network.
- Will be in position to pass any certificatification exam in networking

**Method of delivery**: Full Time

**Assessment methods:**

Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs).

| **CISM622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Databases**

**Module outcomes:**

This module involves studying of advanced database management systems and administration. Advanced aspects such as query optimisation and analysis are covered and this is supported by practical w ork which focusses on large data sets. The module has two study divisions: The main aim 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. The other aim is to provide the student with the necessary knowledge and skills to create, implement and maintain large-scale databases (VLDB) and find solutions to possible problems.

**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

**Method of delivery:** Full Time

**Assessment methods:**

Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs).

| CISM623 | SEMESTER 2 | NF-LEVEL: 8 |
|---|---|---|
| **Machine Learning** | | |
| **Module outcomes:**<br>This module involves mainly introducing students to the current state-of-the-art methodologies along with the latest programming tools and practices when it comes to data analysis.There are two areas in machine learning that the module will introduce thus supervised and unsupervised.The python programming language will be the main language to be used.<br>**After completion of the module the student will be able to show that he/she:**<br>• Fully understands the steps involved during data learning and analysis.<br>• Knows a variety of learning algorithms and their limitations<br>• Knows state-of-the-art data analysis oriented computing<br>• Can execute machine learning experiments given real-world data sets. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Formative and summative assessment (Tests, Assignments, Tutorials, exams, practical evaluation & Labs). | | |
| **CISM670** | **YEAR MODULE** | **NQF-LEVEL: 8** |
| **Research Report** | | |
| **Module outcomes:**<br>On completion of this module, you should:<br>• Have an understanding of the research methods and techniques relevant to the particular research project;<br>• Be able to use multiple sources and critically review available literature on a scientific topic;<br>• Have an understanding of the research process as well as the complexities of selecting and applying standard techniques under the guidance of a supervisor;<br>• Be able to conduct research, applying all of the above;<br>• Be able to present results according to accepted scientific norms and communicate ideas and concepts effectively to a range of audiences. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods/criteria:**<br>Students have reached the module outcomes when:<br>• They able to successfully write and integrate relevant research methods and literature that is specific to the identified research question into a final research proposal, serving as an appropriate working document for the research project;<br>• They are able to clearly communicate their research findings in written text and both orally to a range of audiences. | | |
| **EKRP623** | **SEMESTER 2** | **NQF-LEVEL:8** |
| **Risk Management** | | |
| **Module outcomes:**<br>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 of delivery:** Full Time / 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.

| **ELEM611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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%.

| **ELEM612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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%.

| **ELEM613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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%.

| ELEM614 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**Opto-electronics 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%.

| ELEM625 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Control Systems** | | |
| **Module outcomes:**<br>At the end of this module, the student is expected to:<br>• To understand the theory and practice of control system engineering<br>• To understand classical control theory and fundamentals of modern control theory<br>• To know about various control systems and how the different system variables interact and affect the system performance<br>• To understand concepts affecting the operation analysis and stabilization of control systems.<br>• To understand the open-loop and closed-loop (feedback) systems.<br>• To understand time domain and frequency domain analysis of control systems required for stability analysis.<br>• To understand the compensation technique that can be used to stabilize control systems.<br>• To be able to relate mathematical representations in Feedback Control Systems.<br>• To be able to discriminate and evaluate the concept and importance of a Control System model and its applicability | | |
| **Method of delivery:**<br>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:**<br>Integrated assessments with be used, which will involve both formative and summative assessments.<br>The following is a list of formative assessment methods: quizzes, tutorials questions, take-home assignments, interactive sessions with students, group and individual consultations with students and supervision of mini-projects.<br>Semester mark consitutes 50% of the summative assessment, while examination constitutes the remaining 50%. | | |
| **ELEM626** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Engineering Electromagnetics** | | |
| **Module outcomes:**<br>At the end of this module, the student is expected to:<br>• To develop an understanding of the fundamental concepts of electromagnetic fields, with an emphasis on wave propagation.<br>• To understand the relationship between basic electromagnetic concepts and the performance of devices, circuits, and systems<br>• To determine parameters associated with waves on lossless and lossy transmission lines, including frequency, phase velocity, attenuation and phase constants.<br>• 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%.

| **ELEM627** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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%.

| ELEM628 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **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%.

| ELEM671 | SEMESTER 1 & 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Research Report** | | |

**Module outcomes:**

At the end of this module, the student is expected to:

- Demonstrate applied knowledge at the forefront of the field of electronics 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 a 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
- Ability to conduct and report research under supervision.

**Method of delivery:** Full Time

**Assessment methods/criteria:**

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.

At the end of this module the student is expected to:

Build and characterize a working electronic prototype that solves a particular problem.

Write a research report from results obtained from the working prototype in the form of journal article.

Present the results of the project to an expert audience in a seminar.

| **ESFP616** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**African Fish Parasitology**

**Module outcomes:**

After completion of module African Fish Parasitology, the student will demonstrate:

- Integrated knowledge and a detailed understanding of the different fish parasites in Africa.
- Integrated knowledge and a detailed understanding of the ethics involved in research on fishes
- Understanding on the use and application of approved SOPs for collecting, handling, humane killing and dissection of fish hosts.
- The knowledge to differentiate between different freshwater parasites and understand the importance of each parasite.
- The ability to assess and review multiple resources in order to understand the different aspects of the parasites, especially regarding their hosts and distribution.
- The ability to deduce the appropriate method to remove and preserve a freshwater parasite for identification.
- Practical knowledge in fish dissection, parasite identification and additional ecological techniques to understand these freshwater parasites.
- The ability to collect, compare and identify the different parasites from different parts of the fish host.
- The ability to effectively communicate their findings regarding the parasite species.

**Method of delivery:** Full Time

**Assessment methods/criteria:**

The student will prove that he/she has attained the outcomes of the African Fish Parasitology, module when he/she can:

- Demonstrate knowledge and understanding of some of the different fish parasites in Africa
- Provide a detailed discussion on ethics involved in research on fishes and identify and address ethical issues that may occur
- Use appropriate SOPs for the collection, handling, humane killing and dissection of fishes
- Discern between the different parasitic groups

- Demonstrate the ability to make use of multiple resources to evaluate different aspects of the parasites
- Remove parasites from a fish host following the dissection of the fish and properly preserve and store the parasites thereafter
- Use appropriate techniques to identify the fish parasites
- Compare different species of fish parasites and use problem solving techniques to determine the species identification
- Present the results of the parasites collected in a precise format, critically reviewing the work done and providing their interpretations and conclusions

| **EXTM514** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **Rural Community Development** | | |
| **Module outcomes:**<br>To be able to identify and apply different community development theories and models, give advice to agrocilyural stakeholders on rural develpment strategies, develop a rural devcelopment strategy, analyse rural community development programmes. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods**: | | |

| **EXTM515** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **Essentials of Agricultural Extension** | | |
| **Module outcomes:**<br>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 advice agricultural stakeholders on rural development strategies. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| **EXTM516** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|
| **Elements of Communication in Extension** | | |
| **Module outcomes:**<br>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 of delivery:** Full Time | | |
| **Assessment methods:** | | |

| EXTM525 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Research Methods and Project** | | |
| **Module outcomes:**<br>• Demonstrate knowledge of and understanding of agricultural extension research methods,<br>• Engage in this field to be able to identify a research proposal and formulate a proposal in the agricultural extension environment,<br>• Demonstrate the ability to critically review information gathering, synthesise data, evaluate and manage information,<br>• 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 of delivery:** Full Time | | |
| **Assessment methods:** | | |
| **EXTM526** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Change in Agriculture** | | |
| **Module outcomes:**<br>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 of delivery:** Full Time | | |
| **Assessment methods**: | | |
| **EXTM527** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Leadership Development in Extension** | | |
| **Module outcomes:**<br>To able to demonstrate an understanding of leadership principles, identify different leadership types and tasks, give advice to agricultural stakeholders, promote participation in leadership process. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |
| **GEOG611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Research Methods** | | |
| **Module outcomes:**<br>After completion of the module, the student should be able to demonstrate:<br>• Integrated knowledge of and engagement in the field of Geography and Environmental Science and critical understanding and application of theories and research methodologies relevant to Geography and Environmental science;<br>• An ability to critically interrogate multiple sources of knowledge within the field Geography and Environmental Science, and critically evaluate and review that knowledge and the manner in which the knowledge was produced with a view to create new knowledge; | | |

- The ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant techniques and procedures with a view to draw appropriate conclusions;
- The ability to analyse, select and effectively apply carefully supervised scientific methods of research methods in the field of Geography and Environmental Science to reflect on and then address complex or abstract problems and contribute to positive change.

**Method of delivery:** Full Time

**Assessment methods:**

**Formal Formative**

Case study analysis

Seminar presentations

Class Tests

**Summative**

Examination

**Assessment Plan**

Participation Mark = Class Tests (60%) + rest of other activities (40%)

Examination Mark = Written Examination (100%)

Final Mark = Participation Mark (50%) + Examination Mark (50%)

Requirements for successful completion of the module:

Participation mark: minimum of 50% to obtain admission to examination.

Examination minimum of 50%

| **GEOG612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Selected Fields In Human Geography**

**Module outcomes:**

On completion of the module the student should be able to demonstrate:

- Give a detailed review of the development of geographic thought and research philosophies over time
- Critically assess the contributions and limitations of each of the paradigms which have dominated geography as a discipline
- Engage with the history of geographic thought and interrogate the process of knowledge production within the academic discipline of geography
- Recognize the influence of a dominant paradigm in legitimizing certain knowledge
- To be able to critique the benefits, drawbacks, and limitations of each of the schools of thought

**Method of delivery:** Full Time

**Assessment methods:**

**Formative Assessment**

Formative assessment will contribute 50% of the module grade. The 50% will be broken down as follows: 20% from Semester test, 20% from assignments, 10% from class/test participation

**Summative Assessment**

There will be a three hour theory examination at the end of the semester. The grade from this examination will contribute 50% of the final module mark.

| GEOG613 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Geographic Information Systems Techniques (GIS)** | | |
| **Module outcomes:**<br>• Analyse the concepts, principles, techniques and applications that are fundamental to Geographical Information Systems.<br>• Apply spatial analysis to address real world spatial problems and mapping applications and critically evaluate how Geographical Information Systems assist management decisions.<br>• Expertly use GIS techniques to create maps that are fit for purpose and effectively convey the information.<br>• Analyse, select and effectively apply carefully supervised scientific research methods to reflect on and then address spatial issues and communicate the research findings in an academically appropriate format.<br>• Recognise and deal responsibly with the moral and ethical issues that relate to sensitive spatial data. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Formal Examination<br>Practical Exercises<br>GIS Tutorials<br>Class Presentations | | |
| **GEOG614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Environmental Problems and Management in Africa** | | |
| **Module outcomes:**<br>• Achieve competency in the critical analysis of environmental problems and management in Africa;<br>• Describe and discuss the historical and contemporary factors which underlie the analysis of environmental problems in Africa<br>• Describe and explain the development of environmental problems in South Africa during the previous few decades<br>• Use different paradigms to explain geographical thinking about environmental problems in Africa | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Students must be able to write coherent arguments, in tests, essays and examination, to show their achievement of the specified learning outcomes.<br>Students must be able to critically analyse texts and understand environmental problems.<br>**Formative assessment** opportunities will include essays and tests. All assignments must be completed.<br>When **summative assessment** is used there will be a three hour end of semester examination. | | |

| GEOG616 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Selected fields in Geomorphology** | | |
| **Module outcomes:**<br>Will not be presented in 2021. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** | | |

| GEOG621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Remote Sensing** | | |

**Module outcomes:**

1. Integrated knowledge of, and engagement with, Remote Sensing (Earth Observation) and critical understanding and application of Remote Sensing techniques relevant to environmental assessments.
2. Ability to select, apply and critically judge the effectiveness of the implementation of a range of relevant/appropriate imagery from the broad spectrum of available sensors with a view to collecting appropriate environmental data.
3. Advanced ability to effectively apply digital image processing with a view to generating thematic data that answer relevant environmental assessment questions.

***Module outcome 1***

- Demonstrate specialist knowledge of the science in the various stages of the Remote Sensing process.
- Demonstrate specialist knowledge of Remote Sensing terminology.
- Demonstrate specialist knowledge through comprehension of Remote Sensing journal articles.

***Module outcome 2***

- Demonstrate knowledge of the comparative advantages of a range of satellite and airborne sensors on the basis of their sensor capability specifications.
- Demonstrate knowledge of the comparative advantages of a range of satellite and airborne sensors on the basis of their technology and history.

***Module outcome 3***

- Demonstrate specialist knowledge of image processing software, and inter-relationships of the software with other software, to yield and effectively communicate environmental assessment solutions through digital image processing.
- Demonstrate digital image processing skills by selecting and correctly applying the appropriate technique for a given stage in the image processing chain.

**Method of delivery:** Full Time

**Assessment methods:**

**Formative Assessment**

Formative assessment will contribute 50% of the module grade. The 50% will be broken down as follows: 20% from practicals (a minimum of four digital image processing laboratory tasks), 20% from two theory tests, and 10% from a journal article presentation assignment.

**Summative Assessment**

There will be a three hour theory examination at the end of the semester. The grade from this examination will contribute 50% of the final module mark.

| GEOG622 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Selected Fields In Climatology** | | |
| **Module outcomes:**<br>On completion of the module the students should be able to:<br>• Critically discuss the role of climatology in the socio-economic development of South Africa.<br>• Understand the role and use of various climatological methodologies.<br>• Identify creative new topics for research in the field of climatology, pose research questions and determine appropriate methods to test hypotheses. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Formal examination (45%) – The exam will be in the form of three long essay question.<br>Assignment (30%) – Students will be expected to submit a formal piece of writing on the specified date. The assignment will be in the form of a detailed climatology research proposal.<br>Class Presentations (20%)<br>Peer teaching (5%) | | |
| **GEOG623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Applications in Geographic Information System (GIS)** | | |
| **Module outcomes:**<br>• An integrated knowledge of and engagement in Geographical Information Systems (GIS) and critical understanding of the theoretical underpinnings of organisational and analytical procedures within GIS.<br>• 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.<br>• The ability to apply spatial analysis to address real world spatial problems and mapping applications and critically evaluate how GIS assist management decisions.<br>• Advanced ability to effectively apply GIS processes to spatial data analysis and to develop a critical understanding of the limitations of GIS methodologies.<br>• Proficiency in the use of GIS techniques to create maps that are fit for purpose and effectively convey the information.<br>• The ability to analyse, select and effectively apply scientific research methods to address spatial problems and then communicate the research findings in an academically appropriate format.<br>• The ability to recognise the moral and ethical issues that relate to sensitive spatial data and to treat them in a responsible manner. | | |
| **Method of delivery: Full Time** | | |
| **Assessment methods:**<br>Formal Examination<br>Practical Exercises<br>GIS Tutorials<br>Class Presentations | | |

| GEOG624 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Rural Geography** | | |

**Module outcomes:**

- Achieve competency in the critical analysis of changing rural landscapes and production systems;
- Describe and discuss the historical and contemporary factors which underlie changing rural landscapes in both first and third world environments.
- Describe and explain the development of rural geography in South Africa during the previous few decades
- Assess the contemporary health of rural geography in this country.
- Use different paradigms to explain rural and agricultural thinking in geography

**Method of delivery:** Full Time

**Assessment methods:**

Students must be able to write coherent arguments, in tests, essays and examination, to show their achievement of the specified learning outcomes.

Students must be able to critically analyse texts and understand changing rural landscapes and production systems.

**Formative assessment** opportunities will include essays and tests. All assignments must be completed.

When **summative assessment** is used there will be a three hour end of semester examination.

| GEOG672 | SEMESTER 1 & 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Urban Geography** | | |

**Module outcomes:**

At the end of this module, students should be able to demonstrate:

- Knowledge of the theories, research methodologies, methods and techniques of urban geography and an understanding of how to apply such knowledge to particular contexts;
- The ability to interrogate and evaluate multiple sources of knowledge in urban geography and other related disciplines;
- The ability to use a range of skills and techniques to analyse and address complex problems identified within the field of urban geography;
- The ability to critically review information gathering, synthesis of data, evaluation and management processes in order to develop innovative responses to problems and issues facing urban communities; and
- The ability to present and communicate academic research effectively to a range of audiences, by offering insight, interpretations and possible solutions to problems and issues in urban areas.

**Method of delivery:** Full Time

**Assessment methods:** Written and oral assignments completed individually and as a group.

The student will prove that he/she has attained the outcomes of the module when he/she can:

- Apply his/her knowledge of the theories, research methodologies, methods and techniques of urban geography to particular contexts;
- Evaluate multiple sources of knowledge in urban geography and other related disciplines;

- Use a range of skills and techniques to analyse and address complex problems identified within the field of urban geography;
- Critically review data and information in order to develop innovative responses to problems and issues facing urban communities; and
- Present and communicate academic research effectively to a range of audiences, by offering insight, interpretations and possible solutions to problems and issues in urban areas.

| **GEOG671** | **SEMESTER 1& 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report**

**Module outcomes:**

On successful completion of this module, students should be able to demonstrate:

- The ability to independently conduct research under supervision, and collect, process, analyse, evaluate and interpret information and data, and to document these findings meaningfully in a research proposal in the field of Geo- and Spatial Sciences,
- Integrated knowledge of and engagement in scientific research, and critical understanding and application of theories, research methodologies and techniques relevant to Geo- and Spatial research,
- The ability to critically interrogate multiple sources of knowledge within the field of Geo- and Spatial Sciences, and critically evaluate and review the knowledge and the manner in which the knowledge was produced,
- The ability to identify, analyse and effectively apply supervised research methods in order to reflect on and address complex or abstract problems in Geo- and Spatial Sciences, and
- The ability to assume full responsibility for own research, learning, decision-making and use of resources, as well as writing of the research proposal and presentation thereof.

**Method of delivery:** Full Time

**Assessment methods:** Research project will be internally and externally marked.

| **GGFS673** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Introduction to Earth Observation /**
***Inleiding tot Aardwaarneming***

**Module outcomes:**

On completion of the module, the candidates should be able to demonstrate:

- Integrated knowledge of the principles and fundamentals of earth observation and a critical understanding regarding its application to environmental science,
- 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,
- 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,
- 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,

- The ability to identify, critically reflect on and effectively solve problems by using appropriate observations from a variety of different platforms,
- 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:*

- *Geïntegreerde kennis van die beginsels en grondslae van aardwaarneming en 'n kritiese begrip ten opsigte van die toepassing daarvan in omgewingswetenskappe;*
- *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;*
- *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;*
- *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;*
- *Die vermoë om probleme te identifiseer, krities daarop te reflekteer en effektief op te los met behulp van toepaslike waarnemings vanaf 'n verskeidenheid platforms;*
- *'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 delivery:** Full Time

**Assessment methods:**

A flipped classroom strategy is the principle approach used in this module.

The learning process is continually enhanced through a minimum of six different formal formative assessment methods.

Each formative assessment opportunity aims to assess knowledge and application, while also building auxiliary skill that addresses outcomes such as communication and demonstrating the ability to act as an expert in the field.

Formal **formative assessment** methods include writing literature studies, practical demonstrations, oral presentations, debates with peers and essays.

A minimum of one **summative assessment** opportunity is provided in the form of a take-home assignment.

| **GGFS674** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Air Pollution /**
***Lugbesoedeling***

**Module outcomes:**

On completion of the module students should be able to:

- 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;
- Understand and critically assess the principles and implementation of air pollution modelling;

- Independently investigate literature on the current state of knowledge, recognise current research needs and formulate appropriate research responses in the area of air pollution;
- Demonstrate the ability to provide insight as an expert and provide potential solutions for an area experiencing air pollution problems;
- 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:*

- *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;*
- *Die beginsels en toepassing van lugbesoedelingmodellering te verstaan en krities te evalueer;*
- *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;*
- *Die vermoë te demonstreer om as 'n kenner insig en moontlike oplossings vir 'n gebied met lugbesoedelingsprobleme, te verskaf;*
- *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 delivery:** Full Time

**Assessment criteria:**

Students have mastered the outcomes if they are able to:

- Source, integrate and interpret literature independently;
- Understand the input requirements of air pollution models, interpret air pollution modelling outputs and understand and account for their limitations;
- Integrate collected knowledge and data to assess the air quality of a region taking into account:
  - pollution emissions
  - ambient air quality
  - atmospheric transport of pollutants from the area and outside the area
  - the prevailing meteorology
- Independently identify research needs in air pollution and devise a research plan to investigate appropriate solutions.

| **HDGH611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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.

***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 delivery: 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%

***Assesseringsmetodes:***

*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 %

| HDGH612 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Environmental Hydrology** | | |

**Module outcomes:**

On completion of the module, the candidates should be able to demonstrate:

- A comprehensive knowledge of key terms and concepts used in hydrology.
- A background knowledge of the physical processes involved in hydrology related to the occurrence, circulation and distribution of water.
- A working knowledge of available tools and methods used for hydrological computation and measurement.
- The ability to interrogate, analyse and manage multiple sources of data for hydrological computation and measurement.
- The ability to identify and effectively solve practical hydrological problems through the means of applied scientific methodologies.

***Module uitkomste:***

*Na voltooiing van die module, moet die student die volgende kan demonstreer:*

- *'n Omvattende kennis van sleutelterme en konsepte wat in hidrologie gebruik word.*
- *'n Agtergrondkennis van die fisiese prosesse betrokke by hidrologie wat verband hou met die voorkoms, sirkulasie en verspreiding van water.*
- *'n Werkende kennis van beskikbare gereedskap en metodes wat gebruik word vir hidrologiese berekening en meting.*
- *Die vermoë om verskeie bronne van data vir hidrologiese berekening en meting te ondervra, te analiseer en te bestuur.*
- *Die vermoë om praktiese hidrologiese probleme deur middel van toegepaste wetenskaplike metodologieë te identifiseer en effektief op te los.*

**Method of delivery:** 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%.

***Assesseringsmetodes:***

*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 %

| HDGH613 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Spatial Analysis** | | |

**Module outcomes:**

At the end of the module the student should be able to demonstrate:

- An integrated knowledge of analytical procedures within GIS.
- 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.
- The ability to assess and interpret spatial and temporal data to address real world problems.
- Advanced ability to effectively apply GIS processes to hydrological/geohydrological data analyses e.g. the generation of water level maps, catchment delineation, etc.
- Proficiency in the use of GIS techniques to create maps related to the field of hydrology and geohydrology that can effectively convey the information.
- 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.

***Module uitkomste:***

*Aan die einde van die module moet die student in staat wees om die volgende te demonstreer:*

- *Geëintegreerde kennis van die analitiese prosedures relevant tot GIS.*
- *Die vermoë om veelvoudige inligtingsbronne in GIS te ondersoek en om inligting en inligtingsgenererende prosesse krities te evalueer.*
- *Die vermoë om ruimtelike en temporale data toe te pas en te interpreteer om werklike wêreldprobleme aan te spreek.*
- *Die gevorderde vermoë om GIS prosesse effektief toe te pas op ruimtelike data analises insluitend die skep van watervlak kaarte, afbakening van opvanggebiede, ens.*
- *Vaardighede in die gebruik van GIS tegnieke om hidrologiese en geohidrologiese probleme aan te spreek en doelmatige kaarte wat relevante inligting doeltreffend oordra.*
- *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 delivery:** 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%

***Assesseringsmetodes:***

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 %

| HDGH621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**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.

***Module uitkomste:***

- *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 delivery:** 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%

***Assesseringsmetodes:***

*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 %*

| **ITRI611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Data Warehouses I /**

***Datapakhuise 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| ITRI612 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Linear Programming I /**<br>***Lineêre Programmering I*** | | |
| **Module outcomes:**<br>After completion of this module, students should know the following and be able to apply it:<br>• Introduction to modelling and linear programming<br>• Linear algebra and geometric representations<br>• The simplex method<br>• Artificial variables and convergence aspects<br>• Implementation aspects, data handling and optimisation<br>• Duality and sensitivity analysis<br>• Complexity aspects and other algorithms | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation). | | |
| **ITRI613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Databases I /**<br>***Databasisse I*** | | |
| ITRI613 involves the studying of advanced database management systems and administration. Advanced aspects such as query optimisation and analysis are covered and this is supported by practical work which focusses on large data sets.<br>The module has two study divisions:<br>**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.<br>**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.<br><br>**Module outcomes:**<br>On completion of division 1 students should be able to:<br>• Discuss the purpose and architecture of a typical Database Management System (DBMS);<br>• Write SQL statements in Relational Algebra (RA), convert a RA to SQL and to discuss a RA as basis for a query;<br>• Describe the way SQL and other approaches are supposed to execute;<br>• Explain the way large files are managed and do calculations to determine the cost implications;<br>• Describe the organisation of different index approaches and do calculations to determine the cost implications.<br>• On completion of division 2 students should be able to:<br>• 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 handling Data-base maintenance and backups.

*ITRI613 behels die bestudering van gevorderde databasisbestuurstelsels (DBBS) en die administrasie daarvan. Gevorderde aspekte soos navraag optimalisering en analise word gedek en dit word ondersteun deur praktiese werk wat fokus op groot datastelle. 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 van DB instandhouding en rugsteun.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Information Systems Engineering I /**
***Inligtingstelselingenieurswese 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI615** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Computer Security I /**
***Rekenaarsekuriteit I***

**Module outcomes:**

- 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.
- 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 asook 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI616** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Artificial Intelligence I /**
***Kunsmatige Intelligensie I***

**Module outcomes:**

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

- Define artificial intelligence and evaluate a definition critically;
- Describe the historical bases and history of the subject;
- Discuss logical agents and the environments in which they operate;
- Define and apply the concept ‘rationality’ on intelligent agents;
- Solve problems by using various informed and uninformed search methods;
- Describe the history and applications of neural networks;
- Explain the biological inspiration for neural networks;
- Discuss various neural network models and architectures and use them to solve practical problems;
- Integrate information from various modules and use them to solve practical problems (the outcome will be reached by means of one or more integrated evaluations);
- Work together in groups;
- Communicate effectively, orally as well as in writing, by using appropriate technology; and
- Perform ethically in all aspects regarding 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 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*
- *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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

***Assesseringsmetodes:*** *Formatiewe en summatiewe assessering (Toetse, eksamens, praktiese evaluering).*

| **ITRI617** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Image Processing I /**
***Beeldverwerking I***

**Module outcomes:**

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 quantisation, 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| ITRI618 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Decision Support Systems I /**<br>***Besluitsteunstelsels I*** | | |
| **Module outcomes:**<br>• Mastered the knowledge of methods and techniques relevant to Decision Support Systems through the engagement in the field of IT.<br>• The ability to evaluate the effect of multiple input sources of knowledge to processes or systems.<br>• Understanding the complexities and uncertainties of selecting and applying techniques to unfamiliar problems in an operational environment.<br>• 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.<br>• Communicate and defend the selected specialised techniques and applications to an appropriate field, discipline or practice.<br>• Develop own learning strategies by being creative to sustain independent learning and academic development.<br>• Demonstrate an ability to operate independently and take full responsibility for his or her own work.<br><br>***Module uitkomste:***<br>• *Bemeester die kennis van metodes en tegnieke toepaslik vir Besluitneming Stelsels deur die verbintenis in die veld van IT.*<br>• *Die vermoë om die effek van meervoudige insette in prosesse en stelsels te evalueer.*<br>• *Verstaan die kompleksiteit in terme van die onbekende wanneer keuses en toepassings van tegnieke vir probleem oplossing gekies word in 'n operasionele omgewing*<br>• *Die vermoë om 'n reeks gespesialiseerde tegnieke te gebruik deur kompleks of abstrakte probleme te analiseer toepaslik tot die evaluerings gebied.*<br>• *Kommunikeer en verdedig die gebruik van geselekteerde tegnieke vir die toepassings op 'n toepaslike veld, disipline of praktyk*<br>• *Ontwikkel eie kennis deur kreatief te wees vir volhoubare kennis en akademiese ontwikkeling*<br>• *Demonstreer die vermoë om onafhanklik te werk en volle verantwoordelikheid te aanvaar vir sy werk* | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation) | | |
| **ITRI621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Data Warehouses II /**<br>***Datapakhuise II*** | | |
| **Module outcomes:**<br>• At the end of this module the student should have insight and knowledge of data warehousing.<br>• Students should have sufficient theoretical knowledge to participate in discussion with practitioners.<br>• 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 te 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Linear Programming II /**
***Liniêre Programmering 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| ITRI623 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Databases II /**<br>***Databasisse 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 the ability to:

- 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;
- Responsibly coordinate 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 databases 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 by 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 te hou en probleme oplos;*
- *'n Volledige databasis te ontwikkel en administratiewe take te demonstreer;*
- *Ondersoek nuwe tegnologie in die gebied van databasisse, 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI624** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Information Systems Engineering II /**
***Inligtingstelselingenieurswese 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI625** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Computer Security II /**
***Rekenaarsekuriteit 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 maatreëls 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI626** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Artificial Intelligence II /**
***Kunsmatige Intelligensie 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 te kan 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).
***Assesseringsmetodes****: Formatiewe en summatiewe assessering (Toetse, eksamens, praktiese evaluering).*

| **ITRI627** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Image Processing II /**
***Beeldverwerking II***

**Module outcomes:**

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.

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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI628** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 vermoë 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 vermoë 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 vermoë om onafhanklik te werk en volle verantwoordelikheid te aanvaar vir sy werk*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRI671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report /**
***Navorsingsverslag***

**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 'n 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 delivery:** Full Time / Part Time

**Assessment methods:** Evaluation of research report by supervisor(s) and moderator(s)/
***Assesseringsmetodes:*** Evaluering van navorsingsverslag deur studieleier(s) en moderator(s).

| **MARS621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Radiation and Environment**

**Module outcomes:**

- Environmental and Radiation Protection I
- The students should be able to understand Radiobiological Concepts, viz:
  - Radiation interactions, Biological target, Normal tissue response, Biochemical and or biological damage, Cell survival
- Students should be competent in working with radiation and radio-nuclides safely and to use detectors and monitors for the measurements of main radiation parameters.
- Students should be competant in explaining the concepts of Environmental and Radiation protection, viz:
  - Exposure circumstances, Normal exposure and Potential exposures
  - Practices, Interventions and Radiation safety
  - Quantities and measurements
  - External dose assessment and Internal dose assessment

**Method of delivery:** Full Time

**Assessment methods**:

| **MARS622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Not received.**

| MTHS611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| MTHS612 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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:

- Algebras and semi-algebras, sigma-algebras, measurable spaces, Borel sets, measurable functions, Borel functions, monotone classes of functions, measure theory, extension of measures and Caratheodory's theorem, Lebesgue(-Stieltjes) measures, integration theory, properties of the integral, monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, comparison of the Lebesgue- and Riemann-integrals, brief review of absolutely continuous functions and the fundamental theorem of Calculus for 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:*

- *Algebras en semi-algebras, sigma-algebras, meetbare ruimtes, Borel versamelings, meetbare funksies, Borel-funksies, monotone klasse funksies, maatteorie, uitbreiding van mate en Caratheodory se stelling, Lebesgue(-Stieltjes) mate, integrasieteorie, eienskappe van die integraal, monotone konvergensiestelling, Fatou se lemma, Lebesgue se gedomineerde konvergensiestelling, vergelyking van die Lebesgue-integraal met die Riemann-integraal, kort oorsig oor absoluut kontinue funksies en die grondstelling van Calculus vir Lebesgue integrale.*

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| MTHS615 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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. 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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS619** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **MTHS621** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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, separation axioms and regularity, compactness (revisited), local en para-compactness, compactifications, metrisability, connectedness, topological manifolds and the imbedding theorem.

***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, skeidingsaksiomas en regulariteit, kompaktheid (herbesoek), lokaal- en parakompaktheid,*

*kompaktifiserings, metriseerbaarheid, samehangendheid, topologiese variëteite en die inbeddingstelling.*

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS622** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS623** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **MTHS624** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Measure and IntegrationTheory 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:

- Fubini's theorem and product measures, modes of convergence and Lp-spaces, the Radon-Nikodym theorem and applications, signed measures and complex measures.

***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:*

- *Fubini se stelling en produkmate, tipes konvergensie en Lp-ruimtes, die Radon-Nikodym stelling en toepassings, betekende mate en komplekse mate.*

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| MTHS625 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| MTHS626 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Evolution of Mathematical Ideas** | | |
| **Module outcome:**<br>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:<br>• 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.<br><br>***Module uitkomste:***<br>*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:*<br>• *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 delivery:** Full Time | | |
| **Assessment methods:**<br>**Formative assessment**<br>Class tests and assignments that integrate the module outcomes.<br>**Summative assessment**<br>A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions. | | |
| **MTHS671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
| **Research Report** | | |
| **Module outcomes:**<br>After completion of this module, the student should, taking into account previous studies, be able to do the following:<br>• Demonstrate mastery of introductory research methods in the subject;<br>• Be able to read and interpret and analyse literature in a mathematical journal;<br>• Be able to handle references and sourcing;<br>• Be able to perform scientific literature searches;<br>• Be able to apply knowledge and skills from different subdisciplines in an integrated fashion in the solution of mathematical problems;<br>• Be able to communicate the subject content orally and in written form (in appropriate scientific language and appropriate programmes);<br>• Be able to conduct and report research on a mathematical problem under the guidance of a supervisor<br>• Be able to work together in a team on a topic. | | |
| **Method of delivery:** Full Time | | |

**Assessment methods:**

**Formative assessment**

Initial presentation of project proposal in the second quarter.

**Summative assessment**

Present the chosen topic verbally using standard resources of the field of study (Beamer/Powerpoint).

| NCHE611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**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;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| NCHE612 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**Advanced Physical Chemistry**

**Module outcomes:**

After completion of the module NCHE612, 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.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| NCHE613 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Advanced Inorganic Chemistry** | | |
| **Module outcomes:**<br>After completion of the module NCHE613, the student should demonstrate:<br>• Applied knowledge and critical understanding of mechanisms related to the most important types of reactions occurring in inorganic chemistry;<br>• 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;<br>• 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;<br>• 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;<br>• 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 delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NCHE614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Advanced Analytical Chemistry** | | |
| **Module outcomes:**<br>After completion of the module NCHE614, the student should be able:<br>• To demonstrate integrated advanced knowledge regarding surface chemistry, electrochemical, spectroscopic and separation methods;<br>• 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;<br>• To understand the complexities and uncertainties of selecting, applying and interpreting appropriate procedures or techniques for unfamiliar problems in a specialised practice;<br>• To identify, demarcate, analyse, critically reflect on and effectively solve problems in analytical chemistry by using appropriate techniques; | | |
| **Method of delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |

| NCHE621 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Molecule Modelling (Elective)** | | |
| **Module outcomes:**<br>After completion of the module, the student should demonstrate:<br>• 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;<br>• 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;<br>• Advanced ability to effectively interpret and apply theoretical calculated modelling data with a view to explain or predict experimental data;<br>• 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<br>• 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 delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NCHE622** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Polymer Chemistry (Elective)** | | |
| **Module outcomes:**<br>After completion of the module NCHE622 the student should demonstrate:<br>• Integrated knowledge of and engagement in polymer chemistry relating to:<br>- structure and morphology of polymers<br>- different polymerization mechanisms<br>- mechanical properties of polymers<br>- analytical techniques<br>- different families of polymers<br>• Students should have the ability to utilize Organic Chemistry skills to design monomers to produce new polymers. | | |
| **Method of delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NCHE623** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Advanced Structural Elucidation (Elective)** | | |
| **Module outcomes:**<br>After completion of the module NCHE623 the student should demonstrate:<br>• Integrated knowledge of and engagement in polymer chemistry relating to:<br>- 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.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE624** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Environmental Chemistry (Elective)**

**Module outcomes:**

After completion of the module NCHE624 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.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE625** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Techniques for Organic Synthesis (Elective)**

**Module outcomes:**

After completion of the module, the student should demonstrate:

- Integrated knowledge of and critical understanding and application of advanced organic synthesis techniques, particularly focused on retrosynthetic analysis;
- 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;
- 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;
- The ability to identify, demarcate, analyse, critically reflect on and effectively solve complex synthetic problems in advanced organic chemistry;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| NCHE626 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Electrochemistry (Elective)** | | |
| **Module outcomes:**<br>After completion of the module, the student should demonstrate:<br>• 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;<br>• 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;<br>• 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;<br>• 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;<br>• Problem solving skills related to the interface between theory and experiment and to analyse and critically reflect on the outcome/result;<br>• An understanding of the ethical and professional conduct required of a professional chemist and the ethical application of electrochemistry. | | |
| **Method of delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NCHE627** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Homogeneous Catalysis (Elective)** | | |
| **Module outcomes:**<br>After completion of the module NCHE627, the student should demonstrate:<br>• 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;<br>• 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.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE628** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Coal Chemistry (Elective)**

**Module outcomes:**

After completion of the module NCHE628, 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.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE629** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Membrane Science and Technology (Elective)**

**Module outcomes:**

After completion of the module NCHE629, the student should demonstrate:

- An integrated knowledge of the concepts and definitions used in membrane science;
- The ability to identify and critically solve complex problems related to the calculations commonly used in membrane technology;
- An understanding of the ethical and professional conduct required of a professional scientist;

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report**

**Module outcomes:**

After completion of the module NCHE671, the student should demonstrate:

- Integrated knowledge and understanding of research
- Methodology and the ability to successfully plan, execute and report on a chemistry-related research project;
- The ability to assimilate multiple sources of knowledge such as books, journals and the internet, and critically evaluate and review that knowledge;
- The ability to formulate a project proposal;

- Supervised research skills by selecting and implementing experimental methods to effectively execute a planned research design;
- Communicate findings and conclusions in a scientific manner;
- The ability to identify, demarcate, analyse, critically reflect on and effectively solve problems associated with the specific project by using appropriate methods;

An understanding of the safety, ethical and professional conduct required of a professional chemist working in a research environment.

**Method of delivery:** Full Time and Part Time

**Assessment methods/criteria:**

Students have mastered the outcomes of this module if they are able to integrate knowledge from various fields of chemistry to successfully complete a research project by employing appropriate research methodology under supervision.

The outcome of the research project will be assessed as follows: project proposal (5%), execution of the project (15%), poster presentation (20%), oral presentation (20%), scientific communication (15%) and a research report in the form of a scientific article (25%).

| **NCHE672** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Electronic Structure Methods and Solvation Models (Elective)**

**Module outcomes:**

At the end of this module the student should

- Understand the theoretical development to the Hartree-Fock theory,
- Understand the concept of basis sets and criterion for selection of basis sets;
- Understand the concept of electron correlation
- Understand the theoretical development to the Moller-Plesset perturbation theory and Density-Functional theory
- Understand the fundamental concepts of quantum mechanical continuum solvation models

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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE673** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Thermodynamics of Solution (Elective)**

**Module outcomes:**

After completion of the NCHE673 module, the student should demonstrate:

- 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;
- 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;
- Communicate findings and conclusions in a scientific manner;

- 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;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE674** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE675** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Introduction to Nanomedicine (Elective)**

**Module outcomes:**

After completion of the module NCHE675, the student should demonstrate:

- Integrated knowledge and understanding of the basic principles of nanomedicine theory related to: synthesis, fabrication, characterization and application of nanomaterials.
- 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;
- Communicate findings and conclusions in a scientific manner;
- 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;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE676** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Natural Products in Drug Discovery (Elective)**

**Module outcomes:**

After completion of the module NCHE676, the student should demonstrate:

- Integrated knowledge and understanding of the basic principles of natural products related to: drug discovery, biosynthesis, South African medicinal plants and phytochemicals.
- 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;
- communicate findings and conclusions in a scientific manner;
- 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;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NCHE677** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Electrochemical Sensors (Elective)**

**Module outcomes:**

After completion of the module NCHE677, the student should demonstrate:

- 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
- 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;
- Communicate findings and conclusions in a scientific manner;
- The ability to identify, demarcate, analyse, critically processed and interpret experimental data by using appropriate electrochemical techniques;
- An understanding of the ethical and professional conduct required of a professional chemist.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NPHY611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Classical Mechanics**

**Module outcomes:**

After the completion of this module, 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 Lagrangian 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 progresses 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 for 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 delivery:** Full Time

**Assessment methods:** Oral presentations, written assignments, examination

| **NPHY612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Quantum Mechanics I**

**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 delivery:** Full Time

**Assessment methods:** Oral presentations, written assignments, examination

| NPHY613 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Electrodynamics** | | |
| **Module outcomes:**<br>Upon completion of this course, the student is expected to:<br>• Master the concept of the potential formulation of electrodynamics, the connection between potentials and fields, and understand the concept of gauge invariance;<br>• Be able to evaluate potentials and fields for various charge and current configurations, including point charges;<br>• Master the concept of retarded potentials and fields;<br>• Understand the connection between electromagnetic fields and radiation, and be able to identify terms in the electromagnetic fields that contribute to radiation;<br>• Have a basic understanding of the radiation produced by oscillating electric and magnetic dipoles and by accelerated point charges;<br>• Master the concepts of special relativity, Lorentz transformations and the four-vector formulation of relativistic kinematics and mechanics;<br>• Master the co-variant formulation of relativistic electrodynamics in terms of the field tensor. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NPHY614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Computational Physics /**<br>***Rekenaarfisika*** | | |
| **Module outcomes:**<br>After completing this module the student will have the skills and necessary background knowledge to<br>• 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<br>• Apply the fast Fourier transform and calculate a power spectrum from signals or periodic data.<br>• Simulate physical systems involving stochastic processes (e.g. random walk and diffusion) using Monte Carlo methods.<br>• Be able choose an appropriate scheme to integrate and differentiate numerically.<br>• To compute, visualize and communicate data and results in a scientific manner.<br>• 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 delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |

| NPHY615 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Astrophysical Fluids /**<br>***Astrofisiese Fluïedes*** | | |
| **Module outcomes:**<br>After completion of this module, the student will demonstrate:<br>• Comprehensive knowledge and insight into how and under what circumstances collections of neutral particles can be modelled as continua, how this is done for both incompressible and compressible flows,<br>• A clear understanding of the effects of viscosity on fluid flows and insight into instabilities that can occur,<br>• A clear understanding of how the theoretical results are applied to a variety of astrophysical applications. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods/criteria:**<br>The student will prove that he/she has attained the outcomes of this module when he/she can:<br>• Prove Liouville's theorem as starting point to derive Boltzmann's equation in the presence of binary collisions, and the Maxwellian equilibrium distribution<br>• Derive the hydrodynamic equations with and without viscosity from macroscopic considerations<br>• Derive the equations for acoustic waves, shock waves and spherical blast waves<br>• Derive the equations for convective instabilities in both gases and incompressible fluids, and for perturbations at a two-fluid interface<br>• Apply the equations derived to astrophysical problems like the Oort limit for dark matter, the solar corona, accretions discs, supernova explosions, extragalactic jets, stellar winds, and Rayleigh-Taylor and Kelvin-Helmholtz instabilities | | |
| **NPHY616** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Observational Techniques /**<br>***Waarnemingstegnieke*** | | |
| **Module outcomes:**<br>After completion of this module, the student will demonstrate:<br>• Comprehensive knowledge and insight into the fundamentals of optical and infrared observational astronomy, with emphasis on the instrumentation and techniques used.<br>• A clear understanding of the theory underlying basic observational principles in optical and infrared astronomy: e.g. atmospheric diffraction and dispersion; aberration theory; telescope parameters and configurations; active and adaptive optics; CCD principles and operation; noise sources and error propagation; spectral energy distributions; atmospheric and dust extinction and reddening; radiation fundamentals (continuous emission, line emission and absorption); spectroscopic principles (e.g. diffraction gratings and parameters).<br>• Comprehensive knowledge and understanding of the fundamental of radio astronomy and radio interferometry, along with the instrumentation, various data acquisition, and calibration techniques involved. | | |
| **Method of delivery:** Full Time | | |

**Assessment methods/criteria:**

The student will prove that he/she has attained the outcomes of this module, when he/she can:

- Prove an understanding of the physical and statistical basis for contemporary optical and radio astronomical instrumentation, observational techniques and observational data processing.
- Apply a first-order numerical simulation of an optical telescope system and perform a case study using one of the techniques commonly used (photometry, astrometry, spectroscopy), to predict e.g. the observing time needed under certain conditions to obtain a given precision measurement.
- Understand limitations and challenges imposed by observing at different optical, infrared, and radio wavelengths, and how they are mitigated.
- Prove understanding of radio interferometry techniques and its pros and cons.
- Apply basic optical and radio data reduction methods, e.g. data format, wavelength and flux calibration, errors and signal-to-noise calculations.
- Understand and compute reliable errors of the measured physical quantities from images and spectra.
- Identify an observational technique/instrument that best suits a given scientific question or astronomical phenomenon.

| **NPHY617** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Introduction to General Relativity /**
***Inleiding tot Algemene Relatiwiteit***

**Module outcomes:**

After the successful completion of this module, the student must be able to demonstrate:

- In-depth know ledge 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 delivery:** Full Time

**Assessment methods:** Oral presentations, written assignments, examination

| NPHY621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Statistical Mechanics** | | |
| **Module outcomes:**<br>Upon completion of this course the student would:<br>• Have a detailed and integrated knowledge of statistical mechanics, as especially applicable to the specialized fields of quantum mechanics and solid-state physics.<br>• Be able to describe the state of a large system in terms of particle distributions with increasing complexity.<br>• Derive and understand the meaning of the Fermi-Dirac and Bose-Einstein distributions.<br>• Understand the meaning of these distribution functions, and how these are related to macroscopic quantities.<br>• Demonstrate a detailed knowledge of the statistical nature of matter and how this can be described mathematically.<br>• 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 delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NPHY623** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Plasma Physics /**<br>***Plasmafisika*** | | |
| **Module outcomes:**<br>Upon completion of this course the student will:<br>• Have a general knowledge of the occurrence of plasmas, especially space plasmas, and the applications of plasma physics.<br>• Be able to describe the motion of singly-charged particles in increasingly complex electric and magnetic fields.<br>• Derive and understand the meaning of a complete set of fluid equations for a plasma.<br>• 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.<br>• Understand diffusion and mobility in weakly-ionised gases and diffusion in fully-ionised plasmas.<br>• Apply the above knowledge to identify and creatively solve problems in plasma physics. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Class tests, discussions, assignments, examination | | |

| NPHY625 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Introduction to Stellar Astrophysics /**<br>***Inleiding tot Sterre Astrofisika*** | | |
| **Module outcomes:**<br>Upon completion of this course the student will:<br>• Have a detailed and integrated knowledge of stellar astrophysics, as especially in terms of the structure of the atmospheres and interior.<br>• Be able to describe the structure of a star from its centre to the surface<br>• Derive and understand all four stellar structure equations<br>• Derive and understand the various energy transport mechanisms (convection and radiation).<br>• Demonstrate a detailed knowledge of concepts such stellar magnitudes, colours and their relationship to stellar effective temperature, as well as the HR diagram.<br>• Apply the knowledge about photometry and spectroscopy to determine physical properties of stars.<br>• 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 delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |

| NPHY626 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Nuclear Physics /**<br>***Kernfisika*** | | |
| **Module outcomes:**<br>At the end of this module, students should be able to:<br>• Understand and explain elements of quantum mechanics, nuclear properties and the force between nucleons.<br>• Explain the principles of radioactivity and properties of a nucleus.<br>• Identify the basic features of radioactivity and the radioactive decay process.<br>• Describe the radiations emitted by a radioactive substance and their interaction with matter.<br>• Compare and explain the nuclear reactions and nuclear energy.<br>• Understand and explain the applications of physics in accelerators, astrophysics and the nuclear reactors.<br>• Apply accelerator principles and designs.<br>• Discuss the applications of nuclear physics in medicine, nuclear industry and engineering.<br>• Apply different detecting and measuring techniques to monitor nuclear particles. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |

| NPHY627 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Solid State Physics /**<br>***Vastetoestandfisika*** | | |
| **Module outcomes:**<br>At the end of this module the student should be able to:<br>• Demonstrate an understanding of how solids are held together and the principles of their structure determination experimentally.<br>• Describe the crystal types, the Miller indices and the reciprocal lattice.<br>• Have an understanding of the elastic properties of solids and lattice vibrations.<br>• Demonstrate an understanding of the properties of metals on the basis of the free and nearly free electron gas models.<br>• Understand what makes a material a metal, insulator or semiconductor in terms of the band theory.<br>• Demonstrate an understanding of the magnetic properties of condense matter and describe the basic classification of magnetic solids. | | |
| **Method of delivering:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NPHY628** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Quantum Mechanics II /**<br>***Kwantummeganika II*** | | |
| **Module outcomes:**<br>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:<br>• Non-degenerate and degenerate perturbation theory<br>• Application of the above to the hydrogen atom<br>• Multiparticle systems<br>• Time-dependent perturbation theory and the application thereof on radiative transitions in simple systems<br>• The semi-classical description of the interaction between radiation and charged particles<br>• Quantization of the electromagnetic field.<br>• 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 delivery:** Full Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **NPHY629** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Introduction to Cosmology /**<br>***Inleiding tot Kosmologie*** | | |
| **Module outcomes:**<br>After completion of this module, the student will:<br>• Demonstrate length and time scales of the Universe.<br>• Understand and explain distances in cosmology and epochs of the universe. | | |

- Have a detailed and integrated knowledge of the cosmological solutions of general relativity.
- Understand the assumptions in cosmology that led to the formulation of the standard cosmological model.
- Derive the cosmological field equations from first principles and analyze their solutions
- Understand the physical processes and mechanisms that lead to large-scale structure formation.
- Apply the specialized and integrated knowledge of general relativity and cosmology to critically analyse the shortcomings of the standard Big Bang Model, such as the problems of dark energy and dark matter.
- Discuss the cosmological implications of alternative gravitational theories and how the aforementioned shortcomings can be addressed with such theories.

**Method of delivery:** Full Time

**Assessment methods/criteria:**

The student will prove that he/she has attained the outcomes of this module when he/she can:

- Explain the length and time scales of, and the different definitions of distances in, the universe.
- Derive the cosmological field equations from the Einstein field equations.
- Apply the equations derived to find exact and numerical solutions for the cosmic expansion dynamics.
- Apply the knowledge and skills attained to explain the need for inflation in the early universe and dark energy and dark matter in late-time cosmology.
- Demonstrate an understanding of how alternative gravitational/cosmological models can shed light on the dark side of the Universe.

| **NPHY671** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report /**
***Navorsingsverslag***

**Module outcomes:**

Conduct and report research under supervision and produce a research report to demonstrate:

- Applied knowledge at the forefront of the field and understanding the theories and methodologies, methods and techniques of the chosen research topic.
- An understanding of 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.
- Effective presentation and communication of academic ideas and texts.
- Creative insights, rigorous interpretations and solutions.
- Ability to apply learning strategies self-critically to address professional and ongoing learning needs of self and others.

**Method of delivery:** Full Time- Research presentation

**Assessment methods/criteria:**

The final summative assessment consists of a mark for the written project report and oral presentation of the project.

The module mark is comprised of the oral project presentation (10%) and written project report (90%).

| NRCM611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**Conservation of Natural Resources**

**Module outcomes:**

After completion of the module, the student should demonstrate:

- A detailed insight into the basic principles on conservation ecology
- An engaged understanding of the meaning of ecosystems in a degraded state
- An application of ecology techniques to assess ecosystem degradation in areas subjected to land degradation and apply conservation principles.
- Exhibit a critical and detailed understanding of how certain ecosystems, especially in semiarid areas are degraded, which include freshwater resources, deserted areas and areas subjected to woody plant invasion
- The ability to analyze, interpret and report human anthropogenic changes to an ecosystem.

**Method of delivery:** Full-time

**Assessment methods/criteria:** Assignments and exam

| NRCM621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**Further Conservation of Natural Resources**

**Module outcomes:**

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

- Evaluate ecosystem data to determine the type of degradation that took place over time.
- Distinguish between degradation in freshwater, arid and semiarid ecosystems and identify the methods to use to determine change.
- Distinguish between woody plant invasion and alien plant invasion and its eventual effects on the economy.
- Sample, analyze and interpret scientific data, especially regarding problems caused by woody plant encroachment in semiarid rangelands.

**Method of delivery:** Full-time

**Assessment methods/criteria:** Assignments and exam

| OMBE622 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**Applied Hydrology**

**Module outcomes:**

On completion of the module the student should be knowledgeable and demonstrate critical comprehension in the following:

- Conceptual model translation into the equivalent numerical model
- Apply appropriate interpolation techniques to field data
- Statistical methods and fit probability distribution functions to field data for use in modelling

- Hydrological and geohydrological risk assessments
- Groundwater flow and mass transport models
- Rainfall runoff models, flood peak simulations and flood line determinations
- Surface water yield modelling water resource management

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests and assignments that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| **OMBE623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Groundwater Geology**

**Module outcomes:**

- On completion of the module the student should be knowledgeable and demonstrate critical comprehension in the following:
  - geodetic and cartesian coordinate systems
  - basic GPS operation
  - rock types and stratigraphy as related to aquifers
  - geological borehole logging
  - interpretation of geological maps
  - introduction to the geology of South Africa
  - theory and analysis of geophysical methods used in groundwater investigations:
  - Magnetometer
  - Electro-Magnetics
  - Resistivity
  - Spectrometer
  - theory and analysis of radiometric methods
- Practical execution of geophysical surveys using the following methods:
  - Magnetometer
  - Electro-Magnetics
  - Resistivity
  - Spectrometer

**Method of delivery:** Full Time

**Assessment methods:**

**Formative assessment**

Class tests, assignments and field work that integrate the module outcomes.

**Summative assessment**

A written examination wherein the extent to which students have attained the outcomes of the module will be assessed by means of applied and theoretical questions.

| OMBE675 | SEMESTER 1 & 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Introduction to Hydrology and Integrated Water Resources Management** | | |
| **Module outcomes:**<br>Students have mastered the outcomes if they are able to:<br>• 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.<br>• 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.<br>• 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.<br>• Analyse and apply specialised problem solving skills in hydrology and integrated water resources management.<br>• 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.<br>• Demonstrate an ability to operate effectively within a system of integrated water resources management.<br>• Recognise and deal responsibly with the moral and ethical issues that relate to hydrology and integrated water resource management. | | |
| **Method of delivery:** Full Time Only.<br>Teaching methods will include formal lectures by lecturer, student self-study, discussion groups, student presentations, videos, demonstrations and case study work. | | |
| **Assessment methods:**<br>**Formative**<br>Individual tutorials. Individual and group assignments. Class tests. Practical exercises and reports after completion of certain study units.<br>**Summative**<br>Theoretical and/or practical exam at the end of the module. | | |
| **OMBE674** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
| **Research Report /**<br>***Navorsingsverslag*** | | |
| **Module outcomes:**<br>At the end of the module the student should be able to demonstrate:<br>• The ability to analyse, select and effectively apply scientific research methods within the field of Geography and Environmental Management to address real world problems.<br>• 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 delivery:** Full Time

**Assessment methods:**

Research report written in the prescribed format

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

| **OMBO611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Introduction to Environmental Management**

**Module outcomes:**

- Critically discuss the definition of environmental management.
- Demonstrate an in-depth understand of the Deming Cycle (PDCA) and how it relates to environmental management.
- Provide a holistic perspective of the key challenges facing environmental management and sustainability.
- Critically discuss the strengths and weaknesses of different environmental management approaches and tools.
- Critically reflect on the governance, biophysical, social and economic dimensions of sustainability and how it relates to environmental management

***Module uitkomste:***

- *Die definisie van omgewingsbestuur krities te bespreek.*
- *Die Deming Cycle (PDCA) krities te bespreek in verband met omgewingsbestuur.*
- *'n Holistiese perspektief te voorsien van die sleuteluitdagings vir omgewingsbestuur en volhoubaarheid.*
- *Die sterk- en swakpunte van die verskillende benaderings en instrumente in omgewingsbestuur krities te bespreek.*
- *Krities te dink oor die bestuurs-, bio-fisiese, sosiale en ekonomiese dimensies van volhoubaarheid en hoe dit verband hou met omgewingsbestuur.*

**Method of delivery:** Full Time

**Assessment methods:** Written and oral assignments completed individually and as a member of a group.

| **OMBO613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Introduction to Geographic Information Systems [GIS] /**
***Inleiding tot GIS***

**Module outcomes:**

At the end of the module the student should be able to demonstrate:

- An integrated knowledge of and engagement in GIS and critical understanding and application of theories and techniques relevant to GIS.
- 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.
- The ability to select, apply and critically judge the effectiveness of spatial data with a view to map making.
- A critical understanding of how GIS aids in management decisions.
- 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:*

- *Geïntegreerde kennis van en betrokkenheid in GIS en 'n kritiese begrip en toepassing van teorieë en tegnieke relevant tot GIS.*
- *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.*
- *Die vermoë om toepaslike ruimtelike data te kan selekteer en die effektiwiteit daarvan krities te beoordeel met die oog op kaartproduksie.*
- *Kritiese begrip toon van hoe GIS bestuursbesluite kan ondersteun.*
- *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 delivery:** Full Time Only */ Slegs Voltyds*

**Assessment methods:** Theoretical and/or practical exam at the end of the module

| **OMBO684** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Geographic Information Systems (GIS) Applications /**
***GIS Toepassings***

**Module outcomes**

At the end of the module the student should be able to demonstrate:

- An integrated knowledge of and engagement in GIS and critical understanding of the theoretical underpinnings of organizational and analytical procedures within GIS.

- 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.
- The ability to apply spatial analysis to address real world spatial problems and mapping applications and critically evaluate how GIS assists management decisions.
- Advanced ability to effectively apply GIS processes to spatial data analysis and to develop a critical understanding of the limitations of GIS methodologies.
- Proficiency in the use of GIS techniques to create maps that are fit for purpose and effectively convey the information.
- 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.
- 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:*

- *Geëintegreerde kennis van en betrokkenheid in GIS asook 'n begrip van teorieë, organisatoriese en analitiese prosedures relevant tot GIS.*
- *Die vermoë om veelvoudige kennisbronne in GIS te ondersoek en om kennis en kennisgenererende prosesse te evalueer in die gebruik van GIS.*
- *Die vermoë om ruimtelike analise toe te pas op werklike werêldprobleme en karteringstoepassings en die bydrae van GIS tot bestuurbesluite krities evalueer.*
- *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.*
- *Vaardighede in die gebruik van GIS tegnieke vir die skep van doelmatige kaarte wat relevante inligting doeltreffend oordra.*
- *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.*
- *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 delivery:** Full Time Only */ Slegs Voltyds*

**Assessment methods:** Theoretical and/or practical exam at the end of the module

| **OMBO682** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Environmental Management I**

**Module outcomes:**

On completion of the module, the student should be able to demonstrate:

- 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.
- The ability to interrogate multiple sources of knowledge in environmental management, and to evaluate knowledge and processes of knowledge production.
- 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.

- The ability to identify, critically reflect on and effectively solve problems related to environmental management.
- 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.
- Demonstrate an ability to act as an expert in the field of environmental management.
- 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:***

*Na voltooiing van die module, moet die student die volgende kan demonstreer:*

- *Geïntegreerde kennis van en 'n kritiese begrip oor konsepte, beginsels, onderwerpe, en instrumente relevant tot omgewingsbestuur volgens die beginsels van gelykheid, volhoubaarheid en doeltreffendheid.*
- *Die vermoë om veelvoudige kennisbronne in omgewingsbestuur te ontgin en om kennis en kennisgenererende prosesse te evalueer.*
- *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.*
- *Die vermoë om krities en effektief probleme betreffende omgewingsbestuur te kan identifiseer, daarop te reflekteer asook op te los.*
- *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.*
- *Demonstreer die vermoë om as 'n kundige op te kan tree binne die gebied van omgewingsbestuur.*
- *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 delivery:** Full Time

**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

| **OMBO683** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Environmental Analysis I**

**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.

***Module uitkomste:***

*Na voltooiing van die module, moet die student die volgende kan demonstreer:*

- *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.*
- *Die vermoë om verskeie kennisbronne in omgewingsassessering te ontgin en om kennis en kennisgenererende prosesse te evalueer.*
- *Begrip van die kompleksiteite en onsekerhede oor die keuse of toepassing van toepaslike prosedures, prosesse of tegnieke op praktiese of teoretiese probleme in omgewingsassessering.*
- *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.*
- *Die vermoë om inligtingsinsamelingstegnieke, evaluering en bestuursprosesse in omgewingsassessering krities te ondersoek om sodoende kreatiewe oplossings vir probleme en vraagstukke te ontwikkel.*
- *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.*
- *Demonstreer die vermoë om as 'n kundige op te tree binne die gebied van omgewingsassessering.*
- *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 delivery:** Full Time

**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.

| OMBW684 (YEAR MODULE) | SEMESTER 1 & 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Fundamentals of Waste Management /**<br>***Grondbeginsels van Afvalbestuur*** | | |

**Module outcomes:**

At the end of the module the student should be able to:

- An integrated know ledge of and engagement in integrated w aste management and critical understanding and application of theories, techniques and requirements relevant to waste management;
- The ability to gather multiple sources of know ledge and information within the field of integrated waste management, and evaluate, review and apply this know ledge;
- An understanding of the complex nature of know ledge 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 / 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.

| OMSB611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **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.*
- *Evalueer die stelselprosesse en identifiseer navorsingsvrae wat met Bewaringsekologie geassosieer word.*
- *Selekteer en pas verskeie metodes toe wat vereis word om Bewaringsekologie te beoefen.*
- *Wees bewus van die omvang en kompleksiteit van etiese- en waardesisteme van beide die omgewing en menslike perspektiewe.*
- *Neem ingeligte besluite oor bewaringsbestuur deur beginsels van ekologie en bewaringsbiologie te integreer.*
- *Simuleer hoe om bewaringsbestuur strategie aan belanghebbendes te kommunikeer.*

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentations and written exam.

| **OMSB613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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.*
- *'n Vermoë om veelvuldige bronne van kennis binne die veld van biodiversiteitsbewaring krities te ondersoek en die wyse waarop dit bewaringsinisiatiewe fasiliteer te evalueer.*
- *Die vaardigheid om die geskikte metodologieë en prosedures te selekteer vir die identifisering en ruimtelike kartering van gebiede van kritieke belang vir biodiversiteitsbewaring.*
- *Die vermoë om toegang te verkry tot inligting oor bewaring en biodiversiteitsbeplanning inisiatiewe in Suid-Afrika en dit te interpreteer en bespreek.*

- *Die vermoë om sensitiewe data wat handel oor kritiese en sensitiewe biodiversiteit op 'n verantwoordelike wyse te interpreteer en te hanteer.*

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and written examination

| **OMSB614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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.*
- *Evalueer die omgewings/taksonomiese prosesse en identifiseer navorsingsvrae wat met Biomonitering en Risiko Assessering geassosieer word.*
- *Selekteer en pas verskeie metodes toe wat vereis word om programme te ontwikkel vir Biomonitering en Risiko Assessering.*
- *Wees bewus van die omvang en kompleksiteit van etiese- en waardesisteme van beide die omgewing en menslike perspektiewe.*
- *Neem ingeligte besluite oor habitat bestuur wat gebaseer is op die uitkomste van Biomonitering en Risiko Assessering programme.*
- *Simuleer hoe om bestuursvoorstelle van Biomonitering en Risiko Assessering programme aan belanghebbendes te kommunikeer.*

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and written examination.

| **OMSB627** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Written assignments, oral presentation and written examination..

| **OMSB628** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Written assignments, oral presentation and written examination

| **OMSB629** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full-time and part-time

**Assessment methods:** Written assignments, oral presentation and written examination

| **OMSE611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 vermoë 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 vermoë 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 delivery:** Full Time

**Assessment methods:**

Work assignments during the semester.

Semester test.

Examination at the end of the module.

| **OMSE613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time and Part Time

**Assessment methods:** Assignments, class tests, exam.

| **OMSE621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and written examination.

| **OMSE622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and written examination.

| OMSE623 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **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 vermoë 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.*
- *Die vermoë te kan demonstreer om volle verantwoordelikheid te neem vir sy of haar eie werk, besluitneming en die gebruik van hulpbronne.*

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and written examination.

| OMSE625 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **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, and 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 hê 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 hê 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 delivery:** Full Time and Part Time

**Assessment methods:** Written assignments, oral presentation and open book written examination

| **OMSE626** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Microbial Ecology**

**Module outcomes:**

*Microbiology at third-year level is a prerequisite.*

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:***

*Mikrobiologie op derdejaarsvlak is 'n voorvereiste vir hierdie module.*

*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 delivery:** Full Time and part time

**Assessment methods:** Written assignments, oral presentation and written examination

| **OMSE674** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report /**
***Navorsingsverslag***

**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 delivery:** Full Time and 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.

| **OMSG611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Written assignments, oral presentations, partial open book examination

| OMSG621 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**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 vermoë 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 vermoë 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;*
- *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 delivery:** 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.

| OMSG622 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|

**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:***

*Na voltooiing van die module, behoort die suksesvolle student in staat te wees om die volgende te demonstreer:*

- *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 delivery:** Full Time

**Assessment methods:** Written assignments, oral presentations, partial open book examination

| **OMSP611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 'n kritiese begrip van die beginsels van geïntegreerde plaagbestuur.*
- *Begrip van die impak van plaagbestuursmaatreëls in komplekse landboustelsels.*
- *Die vermoë om n 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 delivery:** Full Time

**Assessment methods:** Oral presentations, written assignments, examination

| OMSP622 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **GM Crops and Integrated Pest Management** | | |
| **Module outcomes:**<br>After completion of this module, the student will be able to:<br>• Integrate knowledge of genetically modified crops, resistance evolution processes, and insect resistance management to enhance Integrated Pest Management startegies.<br>• 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.<br>• Be able to critically investigate sources of knowledge within the field of genetically modified crops, and critically evaluate that knowledge.<br>• Demonstrate an awareness of stewardship responsibilities and application thereof in the context of genetically modified crops.<br>• Prepare and present oral and written reports and use appropriate platforms to communicate academic principles regarding use of biotechnology in agriculture.<br><br>***Module uitkomste:***<br>*By die voltooiing van die module, sal die student die volgende kan demonstreer:*<br>• *Geïntegreerde kennis van geneties-gemodifiseerde gewasse, die prosesse van evolusie van weerstandigheid en insekweerstandbestuur strategieë, om geïntegreerde plaagbestuur strategieë te verbeter.*<br>• *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 'n risiko-assesseringsproses.*<br>• *Die vermoë om kritiese ondersoek te doen van kennisbronne in die veld van geneties-gemodifiseerde gewasse, en om hierdie kennis krities te evalueer.*<br>• *Bewustheid van rentmeesterskap-verantwoordelikhede en toepassing daarvan in die konteks van geneties-gemodifiseerde gewasse*<br>• • *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 delivery:** Full Time and Part Time | | |
| **Assessment methods:** Oral presentations, written assignments, examination | | |
| **OMSP623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
| **Nematodes and Crops** | | |
| **Module outcomes:**<br>After completion of this module, the student will be able to demonstrate:<br>• Applied knowledge about Nematology, an understanding of the relevant theories and research methodologies, how to integrate, evaluate and practically apply such knowledge.<br>• 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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments, examination

| **OMSP624** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Arthropod/ 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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments and exam

| OMSW611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **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 delivery:** Full Time and Part Time

**Assessment methods:** Oral presentations, written assignments and exam.

| OMSW622 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **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 delivery:** Full Time and Part Time

**Assessment methods:** Assignments, class tests, presentations and written examination

| **OMSW624** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Assignments, presentations and a written examination paper at the end of the semester.

| **OMSW625** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery**: 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.

| **OMSW626** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** 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.

| OMWE611 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Rehabilitation of Disturbed Areas**<br>***(Pre-requisites GDKN121;GDKN211;GDKN221)*** | | |

**Module outcomes:**

On completion of the module, the student should be able to demonstrate:

- 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.
- 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;
- 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.
- 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.
- 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.
- Demonstrate the ability to operate, manage group exercises and demonstrate critical understanding of the roles of group members and monitoring the progress of task
- 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:*

- *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.*
- *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;*
- *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.*
- *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.*

- *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.*
- *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.*
- *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 delivery:** 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

| **OMWF621** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Advanced Waste Water Treatment /**
***Gevorderde Afvalwaterbehandeling***

**Module outcomes:**

Upon successful completion of this module, the student will be able to demonstrate:

- An understanding of the legislation pertaining to the management of water resources in South Africa and how the legislation relates to developmental, social and economic goals for South Africa
- An understanding into the relation between the National Water Act and the National Water Resource Strategy to achieve the stipulated developmental, social and economic goals for South Africa
- Applied knowledge with regards to health and aesthetic aspects of drinking water from an international and South African context
- An ability to apply a wide body of knowledge to analyse and identify methods or technologies appropriate for the treatment of various types of wastewater
- 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 regards to health and aesthetic quality of water, as well as suitable wastewater treatment technologies.
- An ability to apply, in a self-critical manner, learning strategies which effectively address own professional and ongoing learning needs the fields of advancement wastewater treatment and the applicable legislation.

***Module uitkomste:***

*Na voltooiing van die module behoort die student in staat te wees die volgende te demonstreer:*

- *Begrip betreffende wetgewing van toepassing op die bestuur van waterhulpbronne in Suid Afrika en hoe die wetgewing verband hou met ontwikkelling, sosiale en ekonomiese doelwitte van Suid Afrika.*
- *Begrip ten opsigte van die verwantskap tussen die Nasionale Water Wetgewing (National Water Act) en die Nasionale Water Hulpbron Strategie om die genoemde ontwikkeling, sosiale en ekonomiese doelwitte van Suid Afrika te behaal.*
- *Toegepaste kennis met betrekking tot gesondheid en estetiese aspekte van drinkwater uit beide 'n internasionale en Suid Afrikaanse konteks*
- *Die vermoë om 'n wye reeks van kennis te analiseer om gepaste metodes en tegnologieë te kan identifiseer vir die behandeling van verskeie tipes afvalwater*
- *Die vermoë om akademiese en professionele inligting en idees effektief aan 'n verskeidenheid gehore te kan aanbied en kommunikeer, tesame met kreatiewe insigte, kritiese interpretasies en oplossings vir probleme en kwessies rakende die gesondheid en estetiese kwaliteit van water, sowel as geskikte afvalwaterbehandelingstegnologieë.*
- *Die vermoë om op 'n selfkritiese manier leerstrategieë toe te pas wat effektief aan die professionele en voortdurende leerbehoeftes voldoen in die velde van gevorderde afvalwaterbehandeling en toepaslike wetgewing.*

**Method of delivery:** Full time and part 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.

| **OMWP611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Oral presentations, written assignments, insect collection and exam.

| **OMWP613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Economic Damage and Threshold Values**

**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 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 delivery:** Full Time or Part Time

**Assessment methods:** Oral presentations, written assignments and exam.

| **OMWW611** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time or Part Time

**Assessment methods:** Assignments, presentations and written examination.

| **OMWW616** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time ONLY

**Assessment methods:**

Short theoretical and practical assignments completed as an individual or in groups that may be evaluated.

Practical 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.

| **OMWW617** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time or Part Time (provided that students attend practicals)

**Assessment methods:** Assignments, practical reports and written examination paper.

| PTSM618<br>PHASING OUT 2020-2021 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|
| **Higher Plant Taxonomy and Systematics** | | |
| **Module outcomes:**<br>• To be able to collect and prepare herbarium specimens as an inventory of plant taxa.<br>• To be able to identify and classify common plants of the North West Province.<br>• To be familiar with the construction and use of keys for the identification of plant taxa.<br>• To demonstrate the ability in interpreting bio-diversity and relationships among plants.<br>• Ability to collect, analyse and interpret taxonomic data.<br>• Ability to interpret the concept of shared derived characteristics to the classification of plant taxa. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** Assignments, practical reports and written examination paper. | | |
| **PTSM628 : Further Higher Plant Taxonomy and Systematics**<br>**Phasing out 2020-2021** | | |
| **PTSM619** | **SEMESTER 1** | **NQF-LEVEL: 8** |
| **Plant Taxonomy** | | |
| **Module outcomes:**<br>After completion of the module, the student should demonstrate:<br>• An engaged understanding of the meaning of plant taxonomy and systematics.<br>• An application of the significance of taxonomy and systematics in biodiversity, conservation and ecology.<br>• Exhibit a critical and detailed understanding of species and species concepts.<br>• An understanding of the application of the International Code of Botanical Nomenclature.<br>• The ability to collect, analyze, interpret and report taxonomic data.<br>• An understanding and ability to apply the different methods of classification. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods/criteria:**<br>The student has reached the module outcomes when he/she can:<br>• Explain and describe plant taxonomy and systematics.<br>• Distinguish and compare plant taxonomy and systematics.<br>• Apply taxonomy and systematics to solve problems in biodiversity, conservation and ecology.<br>• Critically evaluate species and species concepts.<br>• Analyze, compare and contrast different species concepts.<br>• Apply the rules and regulations of the International Code of Botanical Nomenclature when evaluating or choosing a scientific name.<br>• Choose the correct methodology to collect and analyze taxonomic data.<br>• Write a scientific report.<br>• Distinguish and compare different methods of classification.<br>• Choose a classification method to solve a taxonomic problem. | | |

| PTSM629 | SEMESTER 2 | NQF-LEVEL: 8 |
|---|---|---|
| **Herbarium Management** | | |
| **Module outcomes:**<br>After completion of the module, the student should demonstrate:<br>• Knowledge of the most common plant families in southern Africa and be able to identify these families.<br>• Knowledge and an understanding on the procedures of preparing plant collections.<br>• Ability to prepare plant collections.<br>• Knowledge and an understanding of a herbarium and the management thereof.<br>• Ability to follow procedures in the curation of plant collections.<br>• Ability to do research using plant collections. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods/criteria:**<br>The student has reached the module outcomes when he/she can:<br>• Identify and classify the most common plant families in southern Africa.<br>• Prepare plant collections by collecting, pressing, drying and mounting plant specimens.<br>• Explain and describe different types of herbaria and the functions of these herbaria.<br>• Describe the procedures involved in the physical and scientific curation of a herbarium. | | |
| **RESM672** | **SEMESTER 1 & 2** | **NQF-LEVEL: 8** |
| **Research Report** | | |
| **Module outcomes:**<br>After completion of the module, the student should demonstrate:<br>• 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.<br>• An understanding of the complexities and uncertainties of selecting and applying standard techniques to the unfamiliar problem of the research project.<br>• 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.<br>• An ability to present and communicate academic, professional or occupational ideas and concepts effectively to a range of audiences.<br>• 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 delivery:** Full-time | | |
| **Assessment methods:** Test, presentation and project report | | |

| SGSS614 | SEMESTER 1 | NQF-LEVEL: 8 |
|---|---|---|

**Research Methods /**
***Navorsingsmetodes***

**Module outcomes:**

On successful completion of this module, students should be able to demonstrate*:*

- The ability to independently conduct research under guidance, and collect, process, analyse, evaluate and interpret information and data, and to document these findings meaningfully in a research proposal in the field of Geo- and Spatial Sciences,
- Integrated knowledge of and engagement in scientific research, and critical understanding and application of theories, research methodologies and techniques relevant to Geo- and Spatial research,
- The ability to critically interrogate multiple sources of knowledge within the field of Geo- and Spatial Sciences, and critically evaluate and review the knowledge and the manner in which the knowledge was produced,
- The ability to identify, analyse and effectively apply supervised research methods in order to reflect on and address complex or abstract problems in Geo- and Spatial Sciences, and
- The ability to assume full responsibility for own research, learning, decision-making and use of resources, as well as writing of the research proposal and presentation thereof.

***Module uitkomste:***

*Ná suksesvolle voltooiing van die module behoort studente in staat te wees om die volgende te demonstreer:*

- *Die vermoë om selfstandig navorsing uit te voer onder toesig, inligting en data te versamel, te verwerk, te analiseer, te evalueer en te interpreteer en dit sinvol te dokumenteer in ŉ navorsingsvoorstel in die veld van Geo- en Ruimtelike wetenskappe,*
- *Geïntegreerde kennis van en deelname aan wetenskaplike navorsing, asook kritiese begrip en toepassing van teorieë, navorsingsmetodes en -tegnieke wat relevant is vir Geo- en Ruimtelike navorsing,*
- *Die vermoë om verskeie bronne van kennis in die veld van Geo- en Ruimtelike navorsing te kan raadpleeg, en daardie kennis en die wyse van produksie van daardie kennis krities te evalueer,*
- *Die vermoë om navorsingsmetodes te identifiseer, analiseer en effektief toe te pas onder leiding van 'n studieleier, ten einde komplekse of abstrakte probleme in Geo- en Ruimtelike Wetenskap te oorweeg en aan te spreek, en*
- *Die vermoë om volle verantwoordelikheid te aanvaar vir eie navorsing, leer, besluitneming en gebruik van hulpbronne, as ook vir die skryf van die navorsingsartikel en aanbieding daarvan.*

**Method of delivery:** Full Time

**Assessment methods/criteria:**

- Illustrate the ability to independently conduct research. /
- Display integrated knowledge to enable engagement and critique of current research and practices within the field Geo- and Spatial Sciences
- Engage in systematic and disciplined thinking about research relating to Geo- and Spatial Sciences.
- Identify and interpret relevant sources in order to formulate a research problem and question
- Select and understand the appropriate research method(s) to solve the research problem or answer the research question

- Manage own research plan to successfully complete and present the research proposal.

***Assesseringsmetodes/ -kriteria:***

- *Illustreer die vermoë om onafhanklik navorsing te doen.*
- *Toon geïntegreerde kennis om betrokkenheid en kritiek van huidige navorsing en praktyke binne die veld Geo- en Ruimtelike Wetenskappe te aktiveer.*
- *Betrek stelselmatige en gedissiplineerde denke oor navorsing rakende Geo- en Ruimtelike Wetenskappe.*
- *Identifiseer en interpreteer relevante bronne om 'n navorsingsprobleem en -vraag te formuleer.*
- *Kies en verstaan die toepaslike navorsingsmetode(s) om die navorsingsprobleem op te los of beantwoord die navorsingsvraag.*
- *Bestuur eie navorsingsplan om die navorsingsvoorstel suksesvol te voltooi en aan te bied.*

| **STAT612** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**Financial 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 delivery:** Full Time (Contact)

**Assessment methods:** Class tests, assignments, and exam.

| **STAT622** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**Linear Statistical Models and Experimental Design**

**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 delivery:** Full Time (Contact)

**Assessment methods:** Class tests, assignments, and exam.

| **STTN613** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN614** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN615** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN617** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery**: Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN618** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN619** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN623** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN624** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN625** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN626** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN627** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 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 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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN628** | **SEMESTER 2** | **NQF-LEVEL: 8** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, and exam.

| **STTN671** | **YEAR MODULE** | **NQF-LEVEL: 8** |
|---|---|---|

**Research Report**

**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 probleem 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, 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 etiese kwessies te identifiseer op grond van kritiese besinning oor etiese waardesisteme in die konteks van statistiese eksperimentele ontwerp en data analise.*

**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.

| **WISK615** | **SEMESTER 1** | **NQF-LEVEL: 8** |
|---|---|---|

**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;

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|---|
| • Derivation of the Black-Scholes equation as a partial differential equations and solving of this equation using a PDE numerical solution. |
| **Method of delivery:** Full Time |
| **Assessment methods:**<br>Formative assessment in the form of class tests and assignments and summative assessment in the form of an examination paper. |

## NAS.19.3 MASTERS / *MAGISTER*

| **AECM871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|
| **Dissertation** | | |

**Module outcomes:**

- 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.
- 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.
- 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.
- The ability to address complex and challenging problems in a specialised field of Agricultural Economics and to understand and contextualise their finding;
- 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.
- An understanding of the context of their research and associated consequences thereof to influence the field of Agricultural Economics
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module-uitkomste:***

- *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 .*
- *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.*
- *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 .*

- *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.*
- *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.*
- *Om die konteks en verwante gevolge van hul navorsingsresultate te verstaan binne die gebied van Landbou-ekonomie.*
- *Selfgereguleerde leer en verantwoordelikheid vir akademiese en professionele ontwikkeling met inagneming van hul etiese verantwoordelikheid*.

**Method of delivery: Full Time / Part Time**

**Assessment methods: Internal and external evaluation/examination of dissertation**

| **AEXM871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

Student should be able to:

- Plan, implement, monitor and evaluate agricultural extension programmes
- Plan, implement and evaluate training programmes in agriculture
- Plan and conduct research in agricultural extension
- Manage agricultural organizations
- Pursue advanced studies in agriculture, agricultural education and agricultural extension

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Internal and external evaluation/examination of dissertation

| **AGRM871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%)

| AHMM871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |
| **Module outcomes:**<br>Upon completion of the MSc in Animal health, students should demonstrate a: advanced knowledge and understanding of animal health theories and principles and be able to apply such to problems in this field;<br>• the ability to independently appraise research problems, conduct research and interpret findings within the context of current scientific knowledge;<br>• an appropriate level of problem identification and conceptualization skills to focus on complex, sometimes realistic, but often abstract research problems;<br>• the capability to integrate theory, technical information and appropriate methods to analyze and solve agricultural, resource and rural-related problems in animal health;<br>• an appropriate level of communication skills to effectively disseminate research and technical information, including the practical implications of research findings. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Dissertation (100%)<br>The report is to provide an assessment of whether the dissertation contains proof of the candidate's independent ability to do research in the relevant field of study and to report such research results satisfactorily. | | |
| **APPM871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
| **Dissertation** | | |
| **Module outcomes:**<br>**Knowledge:**<br>• 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.<br>• Methods for committing the above process to paper in a scientific manner are acquired.<br>• The student's thorough fundamental training acquired beforehand in selected, advanced theoretical subjects is embodied in the dissertation. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Dissertation (100%) | | |
| **APPM872** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
| **Dissertation** | | |
| **Module outcomes:**<br>**Knowledge:**<br>• 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 delivery:** Full Time / Part Time (Scheduled classes)

**Assessment methods:** Dissertation (100%)

| **APPM874** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Applicable Analysis I**

**Module outcomes:**

Building on prior knowledge, the student should upon completion of APPM874 demonstrate a thorough and advanced knowledge of and skill in the deeper principles, the methods, the application of the theory and the interface with related fields 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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **APPM875** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Applicable Analysis II**

Module outcomes:

The module APPM875 complements and extends the material covered in APPM874 (Applicable Analysis I).

Building on prior knowledge, the student should upon completion of APPM875 demonstrate a thorough and advanced knowledge of and skill in:

the deeper principles, the methods, the application of the theory and the interface with related fields 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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **APPM876** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Modelling I**

**Module outcomes:**

Building on prior knowledge, the student should upon completion of APPM876 demonstrate a thorough and advanced knowledge of and skill in:

the deeper principles, the methods, the application of the theory and the interface with related fields 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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **APPM877** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Modelling II**

**Module outcomes:**

This module complements and extends the material covered in APPM876 (Modelling I). Building on prior knowledge, the student should upon completion of APPM877 demonstrate a thorough and advanced knowledge of and skill in the deeper principles, the methods the application of the theory and the interface with related fields 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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| APPM878 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Principles and Paradigms: Applied Mathematics / Beginsels en Paradigmas: Toegepaste Wiskunde** | | |

**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 and the interface with related fields 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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| ASDM871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |

**Module outcomes:**

Student must be able to demonstrate:

1. Analyse and synthesis of information on the development of science and the livestock industry
2. Have a thorough knowledge of study conceptualization, literature analysis and a comprehensive understanding of scientific methods and techniques applicable
3. Apply the principles of animal production, science and technology to enhance livestock socio - economics in relation to food security
4. Design and carry out research in the livestock industry including analysis and interpretation of the data

5. Be able to identify areas where ethical issues may arise in their research articulate strategies for dealing with ethical issues including risk-benefit analysis.
6. Prepare and present the research findings in written dissertation in scientific manner.
7. Write at least one peer-reviewed publication in a DHET accredited journal
8. Become an independent professional and/or researcher in the field of study (Animal Science sub-specialization)
9. Work collaboratively with all stakeholders to create, develop and exchange research knowledge to influence and benefit society and the economy.

**Method of delivery:** Full Time and Part Time

**Assessment methods:** Dissertation 100%

| **BIOM871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- Adequate knowledge and understanding of research within the field of Microbiology.
- Ability to critique and contribute to relevant matters with particular reference to area(s) of specialisation.
- The ability to evaluate, plan and execute a research project for knowledge production in an appropriate area of specialization in the field of Microbiology.
- The ability to choose appropriate methods of analysis to solve practical in the area of specialisation within the field of Microbiology
- The ability to address complex and challenging problems in a specialised field of Microbiology and to understand and contextualise their finding;
- Demonstrate the ability to independently process, analyze, manage research data and communicate their findings effectively in academically appropriate ways, writing of scientific papers
- An understanding of the context of their research and associated consequences thereof to influence the field of Microbiology
- Self-directed learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Final module assessment: Final module assessment: Dissertation (100%)

| **BCHN872** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods**: Final module assessment: Dissertation (100%)

| **BCHN877** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:**

Final module assessment: Oral presentation (25%)

Dissertation (75%)

| **BWIA812** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**Enterprise-Wide Risk Management 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 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 delivery:** Full Time

**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.

| **BWIA821** | **SEMESTER 2** | **NQF-LEVEL: 9** |
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**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 delivery:**

**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.

| **BWIB817** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**Optimisation for Decision Making /**
***Optimering vir Besluitneming***

**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 and banking.
- The ability to identify, select, apply, interpret, and critically judge the input and output following the practical implementation of complex optimisation problems in computer packages.
- 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 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 delivery:** Full Time

**Assessment methods:**

Students have mastered the outcomes if they are able to:

- Describe, compare, combine, apply, and critically examine a range of mathematical programming formulations used in solving complex optimisation problems.

- Identify the appropriate mathematical programming formulations for a particular business questions relevant in finance and banking.
- Use the designated software packages to apply appropriate mathematical programming formulations 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 Multiple Criteria Decision Making.
- 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.

| **BWIB818** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**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 delivery:** 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.

| **BWIB821** | **SEMESTER 2** | **NQF-LEVEL: 9** |
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**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 delivery:** Full Time

**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.

| **BWIB822** | **SEMESTER 2** | **NQF-LEVEL:9** |
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**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 delivery:** Full Time

**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.

| **BWIM815** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**Industry Integration Methodology /**
***Bedryfsintegrasie Metodologie***

**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 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 delivery:** Full Time

**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.

| **BWIN811** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**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 delivery:** Full Time

**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.

| **BWIN812** | **SEMESTER 1** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time

**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.

| **BWIN816** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**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 delivery:** 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.
- 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.

| **BWIN817** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**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 delivery:** Full Time

**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.

| **BWIN818** | **SEMESTER 1** | **NQF-LEVEL: 9** |
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**Topical Research Issues in Risk Analysis**

**Module outcomes:**

On completion of the module, the student should be able to demonstrate:

- 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.
- Knowledge and understanding of the allocation of risk capital for financial institutions as well as the relationship between financial risk and insurance risk.
- The ability to critically evaluate cutting edge risk issues and research breakthroughs.

**Method of delivery:** Full Time

**Assessment methods**:

Students have mastered the outcomes if they are able to:

- Analyse and critically evaluate the use of models to quantify market risk, credit risk, liquidity risk and operational risk (including model risk) as well as the relationship between financial risk and insurance risk.
- Critically evaluate cutting edge risk issues and research breakthroughs for practical application.
- Track own learning progress and manage all resources successfully to realise all outcomes of the module.

| **BWIN872** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
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**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 delivery:** Full Time

**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.

| **BWIR828** | **SEMESTER 2** | **NQF-LEVEL:9** |
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**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 delivery:** Full Time

**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.

| CHEM871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |

**Module outcomes:**

- 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.
- 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.
- A command of relevant methods and procedures required to solve practical and theoretical problems in the field of Atmospheric Chemistry.
- The ability to address complex and challenging problems in a specialised field of Atmospheric Chemistry and to understand and contextualise their findings.
- 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.
- Demonstrate the ability to access, process and manage information and to communicate their findings in academically appropriate ways.
- An understanding of the context of their research and associated consequences thereof to influence the field of Atmospheric Chemistry.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *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.*
- *'n Bemeestering van relevante metodes en prosedures wat nodig is om praktiese en teoretiese probleme op die gebied van Atmosferiese Chemie op te los.*
- *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.*
- *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.*
- *Demonstreer die vermoë om inligting te verky, verwerk en bestuur en om hul bevindinge in akademies toepaslike maniere te kommunikeer.*
- *Die begrip om hul navorsing te kontekstualiseer, asook om die verwante invloed daarvan om die gebied van Atmosferiese Chemie te begryp.*
- *Selfgereguleerde leer en verantwoordelikheid vir akademiese en professionele ontwikkeling met inagneming van hul etiese verantwoordelikheid.*

**Method of delivering:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

| CHEN874 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **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:***

*Aan 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 / Part Time

**Assessment methods:** Assignment(s) and/or oral examination(s) and/or written examination(s).

| DRKN871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |

**Module outcomes:**

- 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.
- Contribute towards scholarly debate concerning the practice and possible implementation of the new knowledge generated.
- Apply existing methods towards new research questions in original, creative and innovative ways to address the chosen research topic.
- 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.
- Apply all relevant ethical requirements as set out by the relevant ethical committees, procedures, and regulations
- Collect, process, analyse, and interpret new data, findings, and information in the context of existing knowledge.
- Produce and communicate new data, findings, analyses, and insights as presentable and potentially publishable work
- Be held accountable for scientific integrity

***Module uitkomste:***

- *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.*
- *Bydraes te kan lewer tot die vakkundige debat betreffende die praktyk, en moontlike toepassing van die nuwe kennis en vrae.*
- *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*
- *Deur toepassing van spesialiskennis and advies, probleemoplossingsvaardighede in oorspronklike maniere te gebruik ter aanspreking van die navorsingsvraagstuk(ke).*
- *Die toepaslike etiese vereistes na te kom soos voorgeskryf deur die toepaslike etiese komitees, prosedures, en regulasies.*
- *Nuwe data, bevindings, en inligting te versamel, formuleer, prosesseer, analiseer, en te interpreteer binne die kader van bestaande kennis.*
- *Nuwe data, bevindings, analises, en insigte as potesieel-publiseerbare en werk te produseer.*
- *Vir wetenskaplike integriteit aanspreeklik gehou te kan word*

**Method of delivering:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

| **DRRS871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|
| **Dissertation** | | |

**Module outcomes:**

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Provide an understanding of the context of their research and associated consequences thereof to influence the field of Disaster Risk Studies.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *Gespesialiseerde kennis en insig om interaksie met en kritiek van ramp risiko bestuur en multi-dissiplinere navorsings en praktyke in die veld van ramp studies te bewerkstellig; en om gevorderde vakundigheid of navorsing in 'n bepaalde veld, dissipline of praktyk the demonstreer.*
- *Die vermoë om heersende prosesse waardeur kennis gegenereer word in die veld van ramp studies te demonstreer, en om gepaste prosesse van ondersoek in die spesialiseringsarea of praktyk van ramp studies the evalueer.*
- *Die vermoë om 'n wye reeks van gespesialiseerde vaardighede en toepaslike metodes the identifiseer, konseptualiseer, ontwerp en te implenteer om komplekse en uitdagende probleme in die veld van rampstudies the bemeester.*
- *Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met generering van kennis of komplekse organisatoriese of professionele kwessies; demonstreer ook die vermoë om krities by te dra tot die ontwikkeling van etiese standaarde in ramp studies.*
- *Demonstreer die vermoë om'n strategie vir die prosessering en bestuur van inligting te ontwerp en te implementeer sodat 'n omvattende oorsig van leidende en resente navorsing in 'n area vavan ramp studies gedoen kan word met die oog op generering van betekenisvolle insigte.*
- *Demonstreer die vermoë om 'n wye reeks van gevorderde gespesialiseerde kennis en beroepsgerigte diskoerse in ramp studies te gebruik, en te kommunikeer na 'n multi-dissiplinere omgewing met verskeie vlakke van kennis en vaardighede.*
- *Demonstreer die vermoë om die konteks van navorsing en die toepaslike gevolge daarvan in die veld van ramp studies te verstaan.*
- *Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese sowel as professionele ontwikkeling in stand sal hou; kan effektief interaktief binne 'n leer- of professionele groep optree om daardeur leer te bevorder*.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

| **FSKM811** | **SEMESTER 1** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time

**Assessment methods:** Homework assignments, class participation, tests and final exam

| FSKM812 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|
| **Transport Theory** | | |
| **Module outcomes:**<br>After completion of this module the student should have advanced knowledge of neutral fluids relevant to astrophysical applications.<br><br>***Module uitkomste:***<br>*Na voltooiing van hierdie module behoort die studente oor gevorderde kennis te beskik oor neutrale vloeistowwe relevant tot astrofisika-toepassings*. | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:** Class tests, discussions, assignments, exam | | |
| **FSKM813** | **SEMESTER 1** | **NQF-LEVEL: 9** |
| **Astrophysics II** | | |
| **Module outcomes:**<br>Upon completion of this module the student should demonstrate advanced knowledge and understanding of the characteristics of and the physical processes that occur in the diffuse interstellar medium (ISM).<br><br>***Module uitkomste:***<br>*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 diffuse interstellêre medium (ISM) plaasvind.* | | |
| **Method of delivery:** Full Time | | |
| **Assessment methods:**<br>Assessment includes a formal examination at the end of the module, plus homework assignments which includes problem solving.<br>The student has to demonstrate that he/she understands the Physics of, and the physical processes that occur in, the ISM, and be able to independently do appropriate calculations in order to solve problems. | | |
| **FSKM814** | **SEMESTER 1** | **NQF-LEVEL: 9** |
| **Heliospheric Physics** | | |
| **Module outcomes:**<br>Upon completion of this module the student should demonstrate advanced knowledge and understanding of the characteristics of and the physical processes that occur in the Heliosphere.<br><br>***Module uitkomste:***<br>*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:** Full Time | | |
| **Assessment methods:**<br>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.

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.

| FSKM815 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|

**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:***

*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 die module.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** The examination in this module will consist of: A 3hour examination paper

| FSKM816 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|

**Advanced Plasma Physics /**
**Gevorderde Plasmafisika**

**Module outcomes:**

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

- Advanced and integrated knowledge and insight into various aspects of plasma physics pertinent to current research in space plasma physics, including the kinetic theory of plasmas.
- A critical understanding of, and specialised skills in, the topic of magnetohydrodynamics and an integrated knowledge of the various processes relevant to the mathematical description of collisional plasmas.
- The acquisition of an advanced working knowledge and critical understanding of the physics of magnetic discontinuities and shock waves, as well as the physics of hot magnetized plasmas.
- The ability to evaluate current processes of knowledge production within the subject of plasma micro-instabilities, as well as being able to derive and understand the properties of such instabilities relevant to space physics applications.
- The ability to select and apply appropriate models with a view to solve problems in plasma physics, demonstrating the ability to use the resources of academic discourses to communicate and defend ideas that are the product of research and development in the field of plasma physics.
- The ability to evaluate and review the solutions obtained from models by referring to multiple sources in the scientific literature, thereby demonstrating an advanced ability to access, process and manage information, while taking full ethical responsibility for the independently done work.

**Method of delivery:** Full Time

**Assessment methods:**

The student will prove that he/she has attained the outcomes of this module when he/she can:

- Display a sufficient scope of knowledge in terms of engaging with and critically assessing advanced knowledge in the field of plasma physics, with emphasis on applications pertinent to space plasmas. This would include a knowledge of, and literacy in, current research and practices in the field, and would require the student to demonstrate a command of the various methods and procedures employed, which includes the utilization of specialised skills and knowledge, to identify and solve complex problems in plasma physics, and in the process developing their own learning strategies.
- Process, manage and communicate complex information relating to advanced topics in the field of plasma physics, displaying the ability to convey information as to a wide range of topics at a level relevant to current research discourse in this field, thereby also demonstrating the development of their own learning strategies and thus continued independent learning.
- Clearly demonstrates within the scope of this module, the ability to operate independently and take full responsibility for their own work, according to academic and professional standards of ethics and practice.
- Demonstrate the ability to communicate his/her results with future collaborators according to the highest standards of ethics and accountability required of a future scientific career.

| **FSKM817** | **SEMESTER 1** | **NQF-LEVEL: 9** |
|---|---|---|

**General Relativity /**
***Algemene Relatiwiteit***

**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 Relativity.

***Module 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 delivery:** Full Time

**Assessment methods:** The examination in this module will consist of: a 3 hour examination paper

| **FSKS872** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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:

- 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.

***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:*

- *Die identifisering en wetenskaplike formulering van 'n probleemstelling;*
- *'n Deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike wetenskaplike literatuur;*
- *Die uitvoer van toepaslike navorsing ter oplossing van die probleem;*
- *Die wetenskaplike evaluering van die resultate in die konteks van die probleemstelling;*
- *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.

| **MPHY871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

Students will be familiar with the general scientific methods of research, with emphasis on the special research methodologies, and will have to demonstrate:

- Identification and formulation of a suitable problem statement;
- Thorough investigation of existing knowledge as reflected in appropriate scientific
- literature;
- Mastery of the theory and principles in the field;
- Appropriate research to solve the problem;
- Capability to integrate theory and practice;
- • Scientific interpretation and evaluation of the results in the context of the problem statement;
- Scientific communication of the results in the form of a dissertation.

A topic for a thesis may be selected from one of the following research directions:

a. Gamma-ray astronomy
b. Radio astronomy
c. Optical astronomy
d. Cosmic-ray Physics / Space Physics
e. Heliospheric Physics
f. Cosmology
g. Experimental/technical work on neutron monitors as cosmic ray recorders, and their data analysis.
h. Technological innovation studies based on astro-technologies.

***Module uitkomste:***

Studente sal bekend wees met die algemene wetenskaplike navorsingsmetodes, spesifiek die besondere navorsingsmetodologieë, en sal die volgende moet kan demonstreer:

- *Die identifisering en wetenskaplike formulering van 'n geskikte probleemstelling;*
- *'n Deeglike ondersoek van bestaande kennis soos gereflekteer deur toepaslike*

- *wetenskaplike literatuur;*
- *Bemeestering van die teorie en beginsels in die veld;*
- *Die uitvoer van toepaslike navorsing ter oplossing van die probleem;*
- *Vermoë om teorie en praktyk te integreer;*
- *Die wetenskaplike interpretasie en evaluering van die resultate binne die konteks van die probleemstelling;*
- *Die wetenskaplike kommunikering van die resultate in die vorm van 'n verhandeling.*

*'n Onderwerp vir 'n verhandeling kan uit een van die volgende navorsingsrigtings gekies word:*

*a. Gammastraal-astronomie*
*b. Radio-astronomie*
*c. Optiese astronomie*
*d. Kosmiese-straalfisika / Ruimtefisika*
*e. Heliosferiese fisika*
*f. Kosmologie*
*g. Eksperimentele/tegniese werk op neutronmonitors as detektore van kosmiese strale, en die analise van hulle data.*
*h. Tegnologiese innovasie-studies gebaseer op Astro-tegnologie.*

**Method of delivery:** Full Time & Part time

**Assessment methods:**

The examination results of the dissertation count 100% towards the final module mark.

Assesseringsmetodes:

Die eksamineringsresultate van die verhandeling sal 100% van die finale modulepunt uitmaak.

| **GGFN871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- 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.
- 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.
- A command of relevant methods and procedures required to solve practical and theoretical problems in the field of Geography and Environmental Management.
- The ability to address complex and challenging problems in a specialised field of Geography and Environmental Management and to understand and contextualise their findings.
- 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.
- The ability to access, process and manage information and to communicate their findings in academically appropriate ways
- 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.

- An understanding of the context of their research and associated consequences thereof to influence the field of Geography and Environmental Management.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *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.*
- *Beheersing van toepaslike metodes en prosedures om praktiese en toegpaste probleme op die terrein van Geografie en Omgewingsbestuur aan te spreek.*
- *Die vermoë om komplekse en uitdagende probleme in 'n spesialiseringsterrein binne Geografie en Omgewingsbestuur aan te spreek en om die bevindings te verstaan en te kontekstualiseer.*
- *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.*
- *Die vermoë om inligting te ontsluit, verwerk en bestuur en die bevindinge op 'n akademies aanvaarbare wyse te kommunikeer.*
- *Die vermoë om die resultate van navorsing aan spesialiste en nie-spesialiste te kommunikeer m.b.v die hulpbronne van 'n akademies-professionele diskoers in Geografie en Omgewingsbestuur.*
- *Die vermoë om die konteks van navorsing en die toepaslike gevolge daarvan in die veld van Geografie en Omgewingsbestuur te verstaan.*
- *Die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese sowel as professionele ontwikkeling in stand sal hou; effektief interaktief binne 'n leer- of professionele groep kan optree om daardeur leer te bevorder.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners

| **HDGH871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of Hydrology and Geohydrology
- The ability to conduct a relevant in-depth literature review and evaluate and critically manage current knowledge in the field of Hydrology and Geohydrology
- 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
- The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers

- 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.
- 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:***

- *Om gevorderde spesialis kennis te bekom en krities huidige navorsing of veld praktyke op die gebied van Hidrologie en Geohidrologie te evalueer*
- *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*
- *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*
- *Die vermoë om navorsingsresultate korrek te interpreteer asook om sulke resultate in die vorm van wetenskaplike artikels effektief te kommunikeer*
- *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*
- *Vermoë te demonstreer om gebruik te maak van akademiese en professionele hulpbronne, om idees wat voorvloei uit navorsing te kommunikeer en verdedig*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **HDMG871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of Mining Hydrology
- The ability to conduct a relevant in-depth literature review and evaluate and critically manage current knowledge in the field of Mining Hydrology
- 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
- The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers
- 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
- 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 delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| IPMM871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |
| **Module outcomes:**<br>• 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.<br>• Command of an applied competency in research methodology and in scientific penmanship.<br>• The ability to carry out the desired research in view of solving the problem<br>• The ability to evaluate the results scientifically in the context of the problem statement. The ability to communicate the results scientifically. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners. | | |

| ITRN872 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |
| **Module outcomes:**<br>At the end of this module the learner is expected to:<br>• Critically appraise available literature in order to justify a research question relating to research study.<br>• Formulate a feasible systematic literature review relating to a research area.<br>• Justify the selection of an appropriate research method in order to fulfill the research objectives.<br>• Justify the selection of appropriate data analysis methods in order to fulfill the research objectives.<br>• Write a research proposal<br>• 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 delivery:** Full Time / Part Time | | |
| **Assessment methods:** Assessment regulations of the faculty for Master dissertations apply. | | |

| ITRW876 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Databases /**<br>**Databasisse** | | |
| **Module outcomes:**<br>After completion of the module the student will be able to show that he/she:<br>• 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;<br>• Can repair possible failures in Oracle databases;<br>• Can describe the most important steps that are part of an adjustment methodology;<br>• 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:***

*Die 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 'n 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRW877** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRW878** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRW883** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Image Processing**

**Module outcomes:**

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.
- 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:***

*Aan 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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRW884** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 tekan 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 n bepaalde projek kan aanbeveel.*

- *Studente sal stelsel-ontwikkelingsmetodologieë kan toepas en n groot projek daarmee kan ontwikkel.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams practical evaluation).

| **ITRW885** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITRW886** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 'n datapakhuis verstaan en elkeen van die fases in besonderhede kan bespreek;*
- *Dimensionele model vir 'n gevallestudie kan opstel;*
- *Verskillende programmatuurhulpmiddele vir datapakhuise kan bespreek.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **ITWV871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**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 delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%)

| MARR811 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|

**Radioanalytical Applications**

**Module outcomes:**

Student must be able to demonstrate:

- Progressive and integrated knowledge and critical understanding of how radiopharmaceuticals are produced and to specifically enable them to engage with the requirements for radionuclidic and radiochemical purity;
- Full understanding of reactors and accelerators operation and explain different types of neutron sources
- An ability to evaluate current processes applied in neutron radiography & diffraction and then select appropriate principles for residual stress analysis,;
- Expert understanding of- and ability to use- appropriate software for equipment control'
- Ability to critique the radioanalytical techniques used to determine purity;
- Innovative and critical understanding of the mining and mineral processing industries associated with the natural occurring radioactive materials (norms), specifically, to apply the radioanalytical techniques to determine the radiological impact of each radiation to humans and the environment.

**Method of delivery:** Full Time / Part Time

**Assessment methods**: Formative and summative assessment (Tests, exams, practical evaluation).

| MARR812 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|

**Environmental Applications**

**Module outcomes:**

Student must be able to demonstrate:

- Innovative and integrated knowledge and full understanding of the various techniques used to evaluate dam leakages, to specifically enable them to apply and critique the application of isotope hydrology to determine the sustainable re-supply of underground water resources,
- Specialised knowledge of various environmental radioanalytical techniques such as neutron activation analysis and radiotracer measurement in environmental studies as well as sampling and analysis of water, soil, and air,
- An ability to apply radiotracers to perform environmental impact assessment,
- Critical analysis of alternative approaches to environmental applications of nuclear radiation and the ability to offer value-driven and logical arguments for judgements on the results.

**Method of delivery:** Full Time / Part Time

**Assessment methods** Formative and summative assessment (Tests, exams, practical evaluation).

| MARR813 | SEMESTER 1 | NQF-LEVEL: 9 |
|---|---|---|

**Radioactive Waste Management**

**Module outcomes:**

Student must be able to demonstrate:

- Full and critical understanding of the fundamental principles of radioactive waste management enabling them to explain the approaches to radioactive waste categorisation for land rehabilitation,
- An ability to design and implement interventions for land rehabilitation strategies and the approach to quantification of a land cleanup criteria,
- The ability to use a range of advanced and specialised skills in the management of nuclear waste from decommissioning and restoration activities
- Skills in dealing with each of the the three main decommissioning tasks of
- Progressive knowledge of appropriate legislation regarding radioactive waste minimization and design and implement a strategy for the effective siting of a radioactive waste disposal site.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **MARR814** | **SEMESTER 1** | **NQF-LEVEL: 9** |
|---|---|---|

**Industrial Applications**

**Module outcomes:**

Student must be able to demonstrate:

- Ability to use a range of advanced and specialised skills in Radiochemistry to explain the principles of the interaction of high energy radiation with matter, and its application to the sterilisation of medical devices and pharmaceutical products(citing innovative developments in South Africa),
- Critical and progressive knowledge to design and develop elements of industrial radiation plants, inclusive of large Gamma irradiators, X-ray generators, and Electron beam accelerators,
- An ability to evaluate and apply dosimetry and quality control measures in industrial radiation processing in agriculture as well as the international traceability.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| **MARR815** | **SEMESTER 1** | **NQF-LEVEL: 9** |
|---|---|---|

Title: Technology Management

**Module outcomes:**

Student must be able to demonstrate:

- Progressive and integrated knowledge of effective management of a business unit through operational & financial planning, organising, and control,
- An ability to initiate, defend and implement projects, and to evaluate whether value has been added.
- Critical analysis and interpretation of financial statements and a full understanding of the budgeting process

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Formative and summative assessment (Tests, exams, practical evaluation).

| MARR873 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Mini - dissertation** | | |
| **Module outcomes:**<br>Student must be able to demonstrate:<br>• An ability to conduct a comprehensive review of research in Applied Radiation Science to identify and generate findings that will clarify a significant research problem that needs further elucidation,<br>• Under supervision, design, select, and apply appropriate and quantitative methods, techniques, and technologies, to collect data for radiation science analysis of samples,<br>• The capacity to engage in informed argument and reasoning, based on a principled defense of substantial ideas that are the result of research and practices in applied radiation science,<br>• Critically evaluate problems relevant to their specific project by applying and developing intellectual independent research skills, applicable to nuclear science. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods**: Mini-dissertation (100%) | | |
| **MENV871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
| **Dissertation** | | |
| **Module outcomes:**<br>Student must be able to demonstrate:<br>• An ability to contributie to the development of new knowledge<br>• Skills in conduting research in Applied Radiation Science and Technology,<br>• Critical analysis of past literature leading to a scientific formulation of a problem statement;<br>• Ability to select appropriate and specific research methodology applied in radiation science,<br>• Innovative ability to apply appropriate methodologies and techniques to investigate a chosen research topic in Applied radiation science and technology.<br>• Critical and outstanding evaluation of the findings and defence of own opinion therefrom. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Dissertation (100%) | | |
| **MGEO871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
| **Dissertation** | | |
| **Module outcomes:**<br>• Demonstrate specialist knowledge to enable engagement with and critique of current research and practices in the field of Geography.<br>• 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<br>• Demonstrate a command of, design, and select appropriate methods, techniques and processes in the research of Geography.<br>• 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. | | |

- Access, process and manage information in order to conduct a review on the current research in the area of Geography.
- Communicate and defend important ideas that are the products of research or development in the area of Geography.
- Exhibit ability to place research findings in context within the prevailing understanding of the research problem within Geography and suggest solutions/intervention.
- 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 delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **MIKS871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**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:** Full Time / Part Time

**Assessment methods:** The student shall submit a dissertation on a suitable research topic.

| **MKBN871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- Demonstrate specialist knowledge and understanding to engage with and critique research and practices within the field of Microbiology.
- Demonstrate a command of relevant methods and procedures required to solve practical and theoretical problems in the field of Microbiology.
- Demonstrate the ability to address complex and challenging problems in a specialised field of Microbiology and to understand and contextualise their findings.
- Demonstrate the ability to access, process and manage information and to communicate their own findings in academically appropriate ways.
- Demonstrate an understanding of the context of their research and associated consequences thereof to influence the field of Microbiology.

- Demonstrate self-regulated learning and responsibility for academic and professional development; knowledge of the ethics of research and practice in Microbiology

***Module uitkomste:***

- *Gespesialiseerde kennis en begrip te toon om interaksie met en kritiek van navorsing en praktyke in Mikrobiologie te bewerkstellig.*
- *Bemeestering te toon van relevante metodes en prosedures wat vereis word om praktiese en teoretiese probleme van Mikrobiologie op te los.*
- *Te toon dat komplekse en uitdagende probleme in 'n gespesialiseerde Mikrobiologiese veld aangespreek kan word en om eie bevindinge te verstaan en te kontekstualiseer.*
- *Die vermoë te demonstreer om inligting in te samel, te verwerk en te bestuur en om eie bevindinge te kommunikeer op akademies gepaste wyse.*
- *Begrip te demonstreer van die konteks van eie navorsing en die geassosieerde gevolge daarvan om die Mikrobiologiese veld te beïnvloed.*
- *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 delivery:** Ful Time / Part Time

**Assessment methods/criteria:**

Students have mastered the outcomes if they are able to:

- Evaluate current processes of knowledge production in the field of Microbiology and to choose appropriate processes of enquiry for the area of specialisation.
- Choose and apply appropriate methods, techniques, procedures or technologies to complex practical and theoretical problems within Microbiology, with specific reference to their specialisation area.
- Analyse complex research questions in the field of Microbiology and to apply specialised problem solving skills in identifying, conceptualising, designing and implementing methods of enquiry to solve problems within their specialisation area.
- Gather, analyse, evaluate and interpret relevant scientific literature and write a comprehensive literature review regarding their specific project; conduct and write a dissertation to communicate the findings, context and significance of their research.
- Findings of their own research and how this relates to or can influence future research in their area of specialisation.
- Apply high levels of responsibility, self-reflexivity and adaptability in own management of learning; adhere to the requirements set by the University regarding ethical research practices.

**Formal Formative:**

Not applicable

**Summative:**

Dissertation that will be examined according to the Faculty guidelines by internal and external examiners.

**Assessment Plan:**

Dissertation - 100%

***Assesseringsplan:***

*Verhandeling - 100%*

| MTHS871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |
| **Module outcomes:**<br>**Knowledge:**<br>• 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.<br>• 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.<br>**Skills:**<br>• After the successful completion of the module the student will have mastered the Mathematics way of thinking.<br>• 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.<br>• 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.<br>• 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 delivery:** Full Time / Part Time | | |
| **Assessment methods:** Dissertation (100%) | | |

| MTHS872 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Dissertation** | | |
| **Module outcomes:**<br>**Knowledge:**<br>• 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.<br>• 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 delivery:** Full Time / Part Time (Scheduled classes) | | |
| **Assessment methods:** Dissertation (100%) | | |

| MTHS874 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Abstract Analysis I**

**Module outcomes:**

Building on prior knowledge, the student should upon completion of the module MTHS874 demonstrate a thorough and advanced knowledge of, and skill in

the deeper principles,

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| MTHS875 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Abstract Analysis II**

**Module outcomes:**

The module MTHS875 complements and extends the material covered in MTHS874 (Abstract Analysis I).

Building on prior knowledge, the student should upon completion of the module MTHS875 demonstrate a thorough and advanced knowledge of, and skill in

the deeper principles

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **MTHS876** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Algebra I**

**Module outcomes:**

Building on prior knowledge, the student should upon completion of MTHS876 demonstrate a thorough and advanced knowledge of, and skill in:

the deeper principles,

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **MTHS877** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Algebra II**

**Module outcomes:**

The module MTHS877 complements and extends the material covered in MTHS876 (Algebra I). Building on prior knowledge, the student should upon completion of MTHS877 demonstrate a thorough and advanced knowledge of, and skill in:

the deeper principles,

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **MTHS878** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Discrete Structures I**

Module outcomes:

Building on prior knowledge, the student should upon completion of MTHS878 demonstrate a thorough and advanced knowledge of, and skill in:

the deeper principles,

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.

- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| MTHS879 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Discrete Structures II**

**Module outcomes:**

The module MTHS879 complements and extends the material covered in MTHS878 (Discrete Structures I). Building on prior knowledge, the student should upon completion of MTHS879 demonstrate a thorough and advanced knowledge of, and skill in:

the deeper principles,

the methods

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| MTHS888 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Principles and Paradigms: Pure Mathematics**

**Module outcomes:**

Building on prior knowledge, the student should upon completion of MTHS888 demonstrate a thorough and advanced knowledge of, and skill in

the deeper principles,

the methods,

the application of the theory

and the interface with related fields

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 delivery:** 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.

Students have achieved these outcomes if they can furnish proof that they are able to do the following:

- 10% State and grasp the meaning of terms of the subject; able to solve problems that require no further insight than what was encountered in the examples.
- 10% Able to select the appropriate technique with seen/unseen problems; know in which direction to steer the argument, and know how to apply a theorem or a definition in a unseen context.
- 20% Know and understand the theorems and principles of the subject.
- 20% Able to think through an unseen problem, distinguish its components, and analyse those components, and from that analysis get an idea of a solution strategy.
- 40% Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| **NWON871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** The student shall submit a mini-dissertation on a suitable topic.

| **OMBO873** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- 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.
- 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.
- A command of relevant methods and procedures required to solve practical and theoretical problems in the field of environmental management.
- The ability to address complex and challenging problems in a specialised field of environmental management and to understand and contextualise their findings.
- 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.
- Demonstrate the ability to access, process and manage information and to communicate their findings in academically appropriate ways (f and g)
- 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.
- An understanding of the context of their research and associated consequences thereof to influence the field of environmental management.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om 'n gepaste proses van ondersoek te selekteer vir die spesialiseringsrigting of praktyk in omgewingsbestuur.*
- *Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in omgewingsbestuur.*

- *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.*
- *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.*
- *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).*
- *Die vermoë om navorsingsresultate effektief aan spesialis en nie-spesialis gehore aan te bied en te kommunikeer met behulp van 'n akademies-professionele diskoers.*
- *'n Begrip van die konteks van hul navorsing en hoe 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 delivery:** Part Time

**Assessment methods:** Assessment mark after examination and moderation of dissertation: 100 % of the final mark.

| **OMBO878** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Environmental Management II**

**Module outcomes:**

- 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.
- 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.
- A command of relevant methods and procedures required to solve practical and theoretical problems in environmental management and governance instruments and approaches.
- The ability to address complex and challenging problems in a specialised field of environmental management and governance and to understand and contextualise their findings.
- Demonstrate the ability to operate within the ethical requirements of environmental management and governance.
- Demonstrate the ability to access, process and manage information related environmental management and governance and to communicate their findings in academically appropriate ways.
- Candidates exhibit the potential to act as leaders and experts in the field of environmental management and governance.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*

- *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.*
- *Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in omgewingsbestuur.*
- *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.*
- *Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met omgewingsbestuur.*
- *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.*
- *Demonstreer die leierskapsvermoë tot ingryping op ’n toepaslike vlak binne ’n sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.*
- *Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou*.

**Method of delivery:** Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO879** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Environmental Assessment II**

**Module outcomes:**

- 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.
- 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.
- A command of relevant methods and procedures required to solve practical and theoretical problems in environmental assessment and governance instruments and approaches.
- The ability to address complex and challenging problems in a specialised field of environmental assessment and governance and to understand and contextualise their findings.
- Demonstrate the ability to operate within the ethical requirements of environmental assessment and governance.
- Demonstrate the ability to access, process and manage information related environmental assessment and governance and to communicate their findings in academically appropriate ways.
- Candidates exhibit the potential to act as leaders and experts in the field of environmental assessment and governance.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om 'n gepaste proses van ondersoek te selekteer vir die spesialiseringsrigting of praktyk in omgewingsassesering en -bestuur.*
- *Demonstreer bemeestering van en vermoë om toepaslike en kreatiewe metodes en prosedures te selekteer en toe te pas in omgewingsassesering en -bestuur.*
- *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.*
- *Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met omgewingsassesring en -bestuur.*
- *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.*
- *Demonstreer die leierskapsvermoë tot ingryping op 'n toepaslike vlak binne 'n sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.*
- *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 delivery:** Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO880** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Management of Ecological Drivers in Aquatic Systems**

**Module outcomes:**

- 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.
- 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.
- 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.
- 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.
- Demonstrate the ability to operate within the ethical requirements of water management and governance.
- Demonstrate the ability to access, process and manage information related to ecological water requirements and to communicate their findings in academically appropriate ways.

- Candidates exhibit the potential to act as leaders and experts in the field of water management and governance.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *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 water bestuur.*
- *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.*
- *Demonstreer die vermoë om komplekse en uitdagende probleme binne die veld van water bestuur 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.*
- *Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met water bestuur.*
- *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.*
- *Demonstreer die leierskapsvermoë tot ingryping op’n toepaslike vlak binne’n sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.*
- *Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.*

**Method of delivery:** Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO881** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Management of Ecological Responders in Aquatic Systems**

**Module outcomes**:

- 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.
- 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.
- 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.
- 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.

- Demonstrate the ability to operate within the ethical requirements of water management and governance.
- Demonstrate the ability to access, process and manage information related to ecological water requirements and to communicate their findings in academically appropriate ways.
- Candidates exhibit the potential to act as leaders and experts in the field of water management and governance.
- Self-regulated learning and responsibility for academic and professional development with cognisance of their ethical responsibility.

***Module uitkomste:***

- *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.*
- *Demonstreer die vermoë om heersende prosesse waardeur kennis gegenereer word, te evalueer en om ŉ gepaste proses van ondersoek te selekteer vir die spesialiseringsarea of praktyk in water bestuur.*
- *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.*
- *Demonstreer die vermoë om komplekse en uitdagende probleme binne die veld van water bestuur 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.*
- *Demonstreer die vermoë om selfstandige etiese besluite te neem wat verband hou met water bestuur.*
- *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.*
- *Demonstreer die leierskapsvermoë tot ingryping op ŉ toepaslike vlak binne ŉ sisteem gebaseer op begrip van die hiërargiese verhoudings binne die sisteem.*
- *Demonstreer die vermoë om eie leerstrategieë te ontwerp en gebruik wat onafhanklike leer, akademiese – sowel as professionele ontwikkeling in stand sal hou.*

**Method of delivery:** Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO882** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Integrated Waste Management**

**Module outcomes:**

- 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.
- 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.
- 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.
- 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:***

- *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 krities te evalueer, te hersien, en toe te pas.*
- *Kontekstualiseer 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, 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 delivery:** Full Time / Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO883** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Waste Management Law And Governance**

**Module outcomes:**

- 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.
- The ability to gather multiple sources of knowledge and information applicable to waste management legislation and governance, and evaluate, review and apply this knowledge;
- 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.
- 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:***

- *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.*
- *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.*
- *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.*

- *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 delivery:** Part Time

**Assessment methods:** Assignments, practical reports, presentations and examination

| **OMBO884** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Conservation Leadership /**
***Bewaringsleierskap***

**Module outcomes:**

After completion of the module, the student will demonstrate the following:

- A critical understanding of the essential features and important distinguishing characteristics of environmental ethics;
- The ability to critically reflect on conservation issues from a conservation psychology perspective by applying psychological principles to behavioural change in support of conservation.
- A conceptual and critical understanding of the pluralistic ideologies, world views and motives that underpin conservation framings.
- An in depth understanding of the conservation leadership skills required in the conservation context.

**Method of delivery:** Part Time (Contact)

**Assessment methods:**

An integrated approach to assessment will be followed through the use of different strategies, which include written assignments / examinations, continual assessments, seminars, individual and group presentations and practical exercises. The student mastered the outcomes if he/she can:

- Recognize and deploy ethical discourse for leadership in environmental fields.
- Describe the behavioural causes of environmental problems and specify the psychological factors that lead people to engage in conservation behaviour.
- Identify effective leadership strategies to deal with different conservation framings towards achieving conservation outcomes.
- Apply their knowledge of conservation leadership skill requirements to effectively deal with conservation challenges.

| **OMBO885** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Futures Thinking /**
***Toekomsbeplanning***

**Module outcomes:**

- After completion of the module, the student will demonstrate the following:
- A critical understanding of the legal and policy context for conservation governance.
- An in depth understanding of different conservation
- governance approaches and instruments.
- A critical theoretical understanding of different futures thinking paradigms.
- A practical understanding of the application of different futures thinking approaches and methods within the conservation context.

**Method of delivery:** Part Time (Contact)

**Assessment methods:**

An integrated approach to assessment will be followed through the use of different strategies, which include written assignments / examinations, continual assessments, seminars, individual and group presentations and practical exercises. The student mastered the outcomes if he/she can:

- Conceptualize different conservation governance approaches and instruments
- Select and design the optimal hybrid / combination of approaches towards achieving a particular conservation outcome.
- Use futures thinking paradigms to frame particular conservation challenges.
- Select and apply different futures thinking approaches and methods to conservation challenges.

| **OMWN871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- Demonstrate specialist knowledge and knowledge literacy regarding the field of environmental sciences.
- Demonstrate a command of, design, and select appropriate methods, techniques and processes in the research of environmental sciences.
- 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.
- Access, process and manage information in order to conduct a review on the current research in the area of environmental sciences.
- Produce and communicate information regarding his/her research in the field of environmental sciences.
- Place his/her research findings in context within the prevailing understanding of the research problem within environmental sciences and suggest solutions/intervention.
- Make autonomous ethical decisions, to operate independently and take full responsibility for his/her own work

***Module uitkomste:***

- *Gespesialiseerde kennis en kennisgeletterdheid met betrekking tot die veld van omgewingswetenskappe te demonstreer.*
- *Bemeestering, ontwerp en keuse van toepaslike metodes, tegnieke en prosesse in die navorsing van omgewingswetenskappe te demonstreer.*
- *'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.*
- *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.*
- *Inligting rakende sy/haar navorsingsveld in omgewingswetenskappe te produseer en te kommunikeer*
- *Sy/haar navorsingsbevindings in konteks met die heersende begrip van die navorsingsprobleem binne omgewingswetenskappe te stel en om oplossings/intervensies voor te stel.*
- *Outonomies etiese besluite te neem, onafhanklik te funksioneer en toerekenbaar te wees vir sy/haar eie werk.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| PLKN871 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Dissertation**

**Module outcomes:**

- Knowledge of the botanical field of specialisation (ecology, molecular biology, physiology or taxonomy) of terrestrial or aquatic environments.
- Ability to evaluate relevant literature in the field of specialisation.
- Ability to address complex problems within the field of specialisation by applying skills to identify, conceptualise and design relevant research questions.
- Application of appropriate and creative methods, techniques, processes or technologies to address practical or theoretical problems in the field of specialisation.
- Adoption of appropriate, responsible and approved ethical decisions for knowledge production in the field of specialisation.
- 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.
- Independent thought and responsibility for the research in the field of specialisation, and to communicate and defend findings in academically appropriate ways.

***Module uitkomste:***

- *Kennis van die plantkundige spesialiseringsrigting (ekologie, molekulêre biologie, fisiologie of taksonomie) van terrestriële of akwatiese omgewings.*
- *Vermoë om toepaslike literatuur in die spesialiseringsrigting te evalueer.*
- *Vermoë om ingewikkelde probleme binne die spesialiseringsrigting aan te spreek deur die toepassing van vaardighede om vraagstukke te identifiseer, konseptualiseer en te ontwerp.*
- *Aanwending van toepaslike en kreatiewe metodes, tegnieke, prosesse of tegnologieë om praktiese of teoretiese probleme in die spesialiseringsrigting aan te spreek.*
- *Inkorporering van toepaslike, verantwoordelike en goedgekeurde etiese besluite vir kennisproduksie binne die spesialiseringsrigting.*
- *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.*
- *Onafhanklike denke en verantwoordelikheid vir navorsing in die spesialiseringsrigting, asook om bevindinge te kommunikeer en te verdedig op akademies verantwoordbare maniere.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| RSWW811 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Research Methodology /**
***Navorsingsmetodologie***

**Module outcomes:**

- On completing this module the student will be able to demonstrate that he/she is ready for undertaking the literature study, for writing a research proposal, and for formulating a research strategy, 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 with the IMU statement on best practice in research, that he/she is able to choose and apply an appropriate research method, and that he/she is able to conduct research 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 met die oog op 'n verhandeling in sy/haar vakgebied gereed is om die literatuurstudieuit te voer, 'n navorsingsvoorstel te skryf, en 'n navorsingsstrategie te formuleer (wat kan behels 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 met die IMU verklaring oor beste beleid in navorsing, in staat is om 'n geskikte navorsingsmetode te kies en toe te pas, en navorsing te kan doen op 'n eties korrekte manier.*
- *Die student sal by voltooiing van hierdie module in staat wees om 'n navorsingsvoorstel te skryf.*

**Method of delivery:** Full Time / Part Time (Occasional scheduled lectures and hands-on demonstrations in support of reading assignments)

**Assessment methods:**

**Formative and summative assessment:** Assignments and exam.

Students have reached the outcomes of this module if they can furnish proof that they are able to do the following:

- 2 % Compile a suitable list of references for the study of a selected topic.
- 10% Give evidence that he/she is familiar with the philosophical foundation of the mathematical sciences.
- 7% Give evidence that he/she is familiar with the accepted standard for academic writing.
- 48% (or 58%) Able to work through a short research paper (or topic in a book/journal) and give a presentation on that topic with insight.
- 8% Able to design a research strategy for the chosen topic.
- 15% Successfully submit a research title and proposal for the MSc study to the Faculty management for title registration, and also successfully submit a research plan to the study leader and research director.
- 10% Where applicable able to give evidence that he/she has the necessary background to perform statistical analysis of data

| RSWW813 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Research Methods in Mathematical Sciences /**<br>***Navorsingsmetodes in Wiskundige Wetenskappe*** | | |

**Module outcomes:**

- On completing this module the student will be able to demonstrate that he/she is ready for undertaking the literature study, for writing a research proposal, and for formulating a research strategy, 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 with the IMU statement on best practice in research, that he/she is able to choose and apply an appropriate research method, and that he/she is able to conduct research 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 met die oog op 'n verhandeling in sy/haar vakgebied gereed is om die literatuurstudieuit te voer, 'n navorsingsvoorstel te skryf, en 'n navorsingsstrategie te formuleer (wat kan behels 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 met die IMU verklaring oor beste beleid in navorsing, in staat is om 'n geskikte navorsingsmetode te kies en toe te pas, en navorsing te kan doen op 'n eties korrekte manier.*
- *Die student sal by voltooiing van hierdie module in staat wees om 'n navorsingsvoorstel te skryf.*

**Method of delivery:** Full Time / Part Time (Occasional scheduled lectures and hands-on demonstrations in support of reading assignments)

**Assessment methods:**

**Formative and summative assessment:** Assignments and/ or exam.

| RSWW821 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **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 delivery:** Full Time / Part Time (Scheduled lectures)

**Assessment methods:** Summative assessment - Assignments

| **SBEL871** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation**

**Module outcomes:**

- 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.
- 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.
- 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;
- Illustrate the ability to apply the knowledge and skills acquired in these studies meaningfully in order to reflect significant insight.
- 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:***

- *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.*
- *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.*
- *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.*
- *Illustreer die vermoë om die kennis en vaardighede opgedoen in hierdie studie sinvol toe te pas ten einde betekenisvolle insig te reflekteer.*
- *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 delivery**: Full Time / Part Time

**Assessment methods:** Dissertation (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **STTK884** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Advanced Resampling Methods /**
***Hersteekproefnemingsmetodes***

**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 delivery:** Full Time

**Assessment methods/criteria:**

Students have mastered the outcomes if they are able to:

- Apply a wide range of advanced nonparametric inferential techniques to situations where classical analytical methods cannot be applied or when conventional bootstrap methods do not give satisfactory answers.
- Prove the necessary theoretical results concerning complex regression situations like generalized linear models, certain nonlinear models, semi and nonparametric regression models and survival models, as well as new inference concerning time series and point processes.
- Derive and prove the asymptotic properties of the bootstrap technique and compare these results to normal theory.
- Discuss the various resampling methods as well as be able to critically evaluate the strengths and weaknesses of each approach.
- Identify which problems and inference tasks can be solved by applying the bootstrap method and use software packages to perform statistical inference for certain problems which were previously not possible.

- Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen problems.

| STTK885 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Advanced Statistical Models /**
***Gevorderde Statistiese Modelle***

**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 delivery:** Full Time

**Assessment methods/criteria:**

Students have mastered the outcomes if they are able to:

- Derive and prove theoretical results relating to various type of non-parametric regression models (including nonparametric regression techniques for time series data) and specific smoothing techniques including kernel smoothing methods, orthogonal series estimators and spline smoothers.
- Use non-parametric regression in practical situations to explain the relationship between variables and to give answers to real-world problems.
- Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen regression

| STTK886 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|
| **Advanced Multivariate Statistics /**<br>***Gevorderde Meerveranderlike Statistiek*** | | |

**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 delivery:** Full Time

**Assessment methods:**

Students have mastered the outcomes if they are able to:

- Apply a wide range of advanced Multivariate Statistical techniques to help make sense out of high dimensional data.
- Derive and prove theoretical results relating to a variety of Multivariate Statistical methods,
- such as principal components, factor analysis, canonical correlation analysis, classification, clustering, MANOVA, partial least squares and support vector machines.
- Apply suitable multivariate techniques in a multivariate time series setting.
- Identify the appropriate multivariate analysis technique that should be applied to various problems and then be able to effectively implement these analyses with the aid of software packages.
- Effectively use Multivariate Statistical techniques to analyse big-data in such a way that useful information can be extracted from these large data sets.

- Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen multivariate statistical problems. These solutions should be presented in an ethical manner.

| **STTK887** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Advanced Probability Theory /**
***Gevorderde Waarskynlikheidsleer***

**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 delivery:** Full Time

**Assessment methods:**

Students have mastered the outcomes if they are able to:

- Derive and prove theoretical results relating to sigma-algebras, measure spaces, product spaces, stopping times, martingales, independence of random variables, limit theorems for U-statistics, empirical processes and other related concepts.
- Derive, understand and apply the following fundamental theorems of probability theory:
  - the Borel-Cantelli theorem,
  - the Central Limit theorem,
  - the monotone convergence theorem,
  - Fubini's theorem,
  - Kolmogorov consistency theorem and the zero one law,
  - the Radon Nikodym theorem,
  - the law of large numbers
  - other related theorems
- Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen probability theory.

| STTK888 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Advanced Time Series Models /**
***Gevorderde Tydsreeksmodelle***

**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 delivery:** Full Time

**Assessment methods:**

Students have mastered the outcomes if they are able to:

- Explain and prove the theoretical concepts related to various Time Series models.
- Explain the differences between the various models discussed as well as displaying insight into the correct choice of model based on the advantages and disadvantages of each.
- Explain, derive and prove results related to the practical and theoretical aspects of the spectral analysis of time series data.
- Use Time Series models in practical situations to explain time dependent phenomena and to solve real-world problems.
- Demonstrate research capabilities in the sense of interpretation, and verbal and written presentation of the solution of unseen time series problems.

| STTK889 | SEMESTER 1 & 2 | NQF-LEVEL: 9 |
|---|---|---|

**Advanced Stochastic Processes /**
***Gevorderde Stogastiese Prosesse***

**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 delivery:** Full Time

**Assessment methods:**

**Formative assessments:** Assignments, class tests, homework, and projects that integrate the various outcomes of the module.

**Summative assessments:** Exam

| **STTN872** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Dissertation /**
***Verhandeling***

**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 delivery:** 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.

| **STTN884** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**Advanced Survival Models /**
***Gevorderde Oorlewingsteorie***

**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 delivery:** Full Time

**Assessment methods:** Class tests, assignments, exam

## NAS.19.4 DOCTOR OF PHILOSOPHY / *DOCTOR PHILOSOPHIAE*

| AECM971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

- Demonstrate expertise and critical knowledge of a specialised area in Agricultural Economics and/or across specialised or applied areas.
- Demonstrate an ability to develop new methods, techniques or approaches in original, creative and innovative ways appropriate to specialised and complex contexts
- Demonstrate the ability to handle the research method that has been selected in a reflexive and responsible manner.
- 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 Agricultural Economics and/or across applied areas;
- Demonstrate by means of a literature investigation that he/she has a thorough and in-depth knowledge of related scientific literature and has looked up a large enough quantity of recent and appropriate historic primary and secondary sources in the speciality area.
- Demonstrate the ability to make independent judgements about managing incomplete or inconsistent information or data in an iterative process of analysis and synthesis.
- Demonstrate the ability to produce and communicate the findings of their research in academically appropriate ways;
- Has the ability to interpret and debate different viewpoints and theories on a scientific basis.
- 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:***

- *Kundigheid en kritiese kennis te demonstreer in 'n gespesialiseerde area in Landbou-ekonomie en/of oor gespesialiseerde of toegepaste areas.*

- *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;*
- *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 Landbou-ekonomie en/of oor toegepaste areas;*
- *Demonstreer dat hy/sy in diepte kennis het van die relevante wetenskaplike literatuur en die vaardighede het om dit te interpreteer en debatteer van verskillende oogpunte en teorieë. En dat die kandidaat geneog primere en sekondere literatuur bestudeer het in sy area van spesialiteit.*
- *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;*
- *Die vermoë wys om 'n probleem binne die landbou wetenskap veld te kan identifiseer en analiseer met aangeleerde vaardighede.*
- *Die vermoë te demonstreer om die bevindinge van sy/haar navorsing te kan genereer en op akademies-toepaslike wyses te kan kommunikeer;*
- *Moet sy/haar vermoë om die navorsingsprobleem effektief te kan aanspreek in die proefskrif en die resultate effektief te kan kommunikeer.*
- *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 delivery:** Distance

**Assessment methods:** Internal and external evaluation/examination of thesis

| **AEXM971** | **SEMESTER 1&2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- Capacity to design, conduct and write up original research
- Understanding of scientific procedures and an ability to cope with research techniques
- Understanding of literature related to the research problem
- Ability to write a thesis that is linguistically, technically and scientifically correct
- Apply the principles and philosophy of extension in practice
- Design an integrated development/extension project that improves the livelihoods of 'clients"
- Implement an integrated development/extension project that improves the livelihoods of 'clients".
- Manage and evaluate an integrated development/extension project that improves the livelihoods of 'clients'

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Internal and external evaluation/examination of thesis

| AGRM971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

By completion of this qualification, the student should be able to:

- Demonstrate a comprehensive and systematic knowledge base in the specific field of Agronomy and Crop Science.
- 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.
- 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.

***Module-uitkomste:***

*Na voltooiing van hierdie kwalifikasie behoort die student in staat te wees om:*

- *'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.*
- *'n Omvattende en sistematiese kennisbasis te demonstreer in die spesifieke gebied van Agronomie en Gewaskunde*
- *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.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Thesis 100%

| AHAM971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

The achievement of this qualification means that the Ph D graduate is able to demonstrate the following specific and critical cross-field outcomes:

1. Demonstrate intellectual independence through the ability to apply sophisticated knowledge and research methodologies for the solution of complex, unfamiliar problems in the field of Animal Health and the competence to integrate and apply theoretical knowledge and research findings within relevant local and global contexts as well as across disciplines.

2. Demonstrate a depth of knowledge and high levels of theoretical understanding in a complex and specialised area and /or across specialised or applied areas in the field of Animal Health.

3. Demonstrate knowledge and understanding of the specialised skills regarding the production, breeding, nutrition, physiology and management of domesticated and wild animals in different production systems.

4. Demonstrate the ability to provide innovative solutions regarding the production, breeding, nutrition, physiology and management of domesticated and wild animals, as well as the factors influencing the quality of animal products.

5. Question existing knowledge boundaries and practices and create responses to problems that expand or redefine existing knowledge and extend the boundaries of Animal Health knowledge. Critical cross-field outcomes Critical cross-field outcomes for this qualification include but are not limited to various competencies and applied competencies such as:

• 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;

• effectively using technology for strategies aimed at developing the field of Animal Health and 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 delivery:** Full Time / Part Time

**Assessment methods:**

Thesis - 100%

**Formal Formative:**

Formative assessment, during the course of the research, may be based on any of the following if required by the research topic or the discipline:

• Portfolios • Simulations • Work-place assessments • Group discussions • Presentations in front of peers and experts, • Oral and written examinations

**Summative:**

Summative assessment takes the form of the examination of the thesis or other acceptable forms of research output as appropriate to the field of study. In addition, an official defence of the thesis may be used.

| APPM971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>Students will have to 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. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Thesis | | |

| ARST971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>Student must be able to demonstrate:<br>• An ability to contributie to the development of new knowledge<br>• Skills in conduting research in Applied Radiation Science and Technology,<br>• Critical analysis of past literature leading to a scientific formulation of a problem statement;<br>• Ability to select appropriate and specific research methodology applied in radiation science,<br>• Innovative ability to apply appropriate methodologies and techniques to investigate a chosen research topic in Applied radiation science and technology.<br>• Critical and outstanding evaluation of the findings and defence of own opinion therefrom. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners. | | |

| ASCM971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>The PhD Animal Science is designed to produce graduates with rigorous research and analytical skills, and at the end students should:<br>• Be able to act autonomously in the planning and implementation of research;<br>• Be able to demonstrate originality in the application of knowledge, together with a practical understanding of how research and enquiry are used to create and interpret knowledge in their field;<br>• Prepare scientifically sound research project or protocol,<br>• Implement the protocol as proposed, collect data, analyse and interpret results,<br>• Prepare and present the research findings in written thesis, orally in scientific professional forums and publish in a DHET accredited journal.<br>• Be able to identify areas where ethical issues may arise in their research articulate strategies for dealing with ethical issues including risk-benefit analysis. | | |

- Become an independent professional and/or researcher in the field of study (Animal Science sub-specialization)
- Have self – direction and demonstrate leadership and originality in tackling and resolving problems and issues, through communication and working effectively with others.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by external examiners.

| **BCHN971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Thesis examination: 100% of marking allocation

| **BIYM971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 9** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** Dissertation (100%)

| **BWIN971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** The student shall submit a thesis on a suitable research topic.

| **BWIR971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:** The student shall submit a thesis on a suitable research topic.

| CHEN971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **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 delivery:** Full Time / Part Time

**Assessment methods**: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| CHEM971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

- Demonstrate expertise and critical knowledge of a specialised area in Atmospheric Chemistry and/or across specialised or applied areas.
- Demonstrate an ability to develop new methods, techniques or approaches in original, creative and innovative ways appropriate to specialised and complex contexts.
- 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.
- Demonstrate the ability to make independent judgements about managing incomplete or inconsistent information or data in an iterative process of analysis and synthesis.
- Demonstrate the ability to produce and communicate the findings of their research in academically appropriate ways.

- 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:***

- *Kundigheid en kritiese kennis te demonstreer in 'n gespesialiseerde area in Atmosferiese Chemie en/of oor gespesialiseerde of toegepaste areas.*
- *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.*
- *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.*
- *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.*
- *Die vermoë te demonstreer om die bevindinge van sy/haar navorsing te kan genereer en op akademies-toepaslike wyses te kan kommunikeer.*
- *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 delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **DRKN971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- 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.
- Contribute towards the scholarly debate concerning the theory, practice and possible implementation of the new knowledge generated.
- Develop new methods and/or apply existing methods towards new research questions in original, creative and innovative ways to address the chosen research topic.
- 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.
- Apply all relevant ethical requirements as set out by the relevant ethical committees, procedures, and regulations
- Collect, process, analyse, judge, and interpret new data, findings, information, and theory in the context of existing knowledge, discourse, and theory
- Produce, communicate, and defend new data, findings, analyses, insights, and theoretical and practical discourse as presentable and publishable work
- Be held accountable for scientific integrity

***Module uitkomste:***

- *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.*
- *Bydraes te kan lewer tot die vakkundige debat betreffende die teorie, praktyk, en moontlike toepassing van die nuwe kennis en vrae.*
- *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*
- *Deur toepassing van spesialiskennis en -teorie, probleemoplossingsvaardighede te gebruik in 'n oorspronklike, kritiese, en innoverende manier ter aanspreking van die navorsingsvraagstuk(ke).*
- *Die toepaslike etiese vereistes na te kom soos voorgeskryf deur die toepaslike etiese komitees, prosedures, en regulasies.*
- *Nuwe data, bevindings, inligting, en teorie te versamel, formuleer, prosesseer, analiseer, beoordeel, en te interpreteer binne die kader van bestaande kennis, diskoers, en teorie*
- *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.*
- *Vir wetenskaplike integriteit aanspreeklik gehou te kan word*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **DRRS971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- 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.
- 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.
- 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.
- 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.

- 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.

***Module uitkomstes:***

- *Demonstreer gespesialiseerde kennis en insig met betrekking tot ramp studies om interaksie met en kritiek van ramp risiko bestuur en multi-dissiplinere navorsings en praktyke in die veld van ramp studies te bewerkstellig; en om gevorderde vakundigheid of navorsing in 'n bepaalde veld, dissipline of praktyk the demonstreer.*
- *Demonstreer die vermoë om 'n wye reeks van gespesialiseerde vaardighede en toepaslike metodes the identifiseer, konseptualiseer, ontwerp en te implementeer om komplekse en uitdagende probleme in die veld van rampstudies the bemeester, die vermoë om selfstandige etiese besluite te neem wat verband hou met generering van kennis of komplekse organisatoriese of professionele kwessies; demonstreer ook die vermoë om krities by te dra tot die ontwikkeling van etiese standaarde in ramp studies.*
- *Demonstreer die vermoë om 'n wye reeks van gevorderde gespesialiseerde kennis en beroepsgerigte diskoerse in ramp studies te gebruik, en te kommunikeer na 'n multi-dissiplinere omgewing met verskeie vlakke van kennis en vaardighede, en die vermoë om 'n wye reeks van gespesialiseerde vaardighede en toepaslike metodes the identifiseer, konseptualiseer, ontwerp en te implenteer om komplekse en uitdagende probleme in die veld van rampstudies the bemeester.*
- *Demonstreer die vermoë om om strategiese inisiatiewe the maak op 'n aanvaarbare vlak in 'n sisteem, gebaseer op die verstaan van hierargiese verhoudings binne 'n sisteem.*
- *Demonstreer ook die vermoë om die gevolge van ingrypings, hetsy bedoel of nie bedoel te identifiseer.*
- *Demonstreer die vermoë om onafhanklik te kan funksioneer en volle verantwoordelikeid vir eie navorsing te neem, en waar toespaslik, om leiding te neem en prosesse te inisieer en sisteme te implementeer; en verseker en bevorder volhoubare bestuur van hulpbronne en regererings praktyke.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **ENVM971** | **SEMESTER 1&2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- Advanced research abilities in a topic in Environmental Science and/or Environmental Management, with in-depth engagement leading to a unique angle in the topic.
- Ability to effectively report research in a scholarly manner as a thesis and/or journal articles.
- Ability to authoritatively disseminate Environmental Science research using appropriate platforms, including conference presentations.

**Method of delivery:** Full Time / Part Time

**Assessment methods:** A thesis examined by three examiners.

| FSKN971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

On completion of the module, students should be able to demonstrate:

- 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.
- 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.
- 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:*

- *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.*
- *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.*
- *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 delivery:** Full Time / Part Time

**Assessment methods:** Assessment mark received after examination of the thesis: 100% of final module mark.

| GEOM971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>• Advanced research abilities in a topic in Human or Physical Geography, or their combination, with in-depth engagement leading to a unique angle in the topic.<br>• Ability to effectively report research in a scholarly manner as a thesis and/or journal articles.<br>• Ability to authoritatively disseminate Geographical research using appropriate platforms, including conference presentations. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** A thesis examined by three examiners. | | |

| GGFN971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |

**Module outcomes:**

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

***Module uitkomste**:*

- *Diepgang van kritiese kennis en hoë vlakke van teoretiese begrip in 'n 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 .*
- *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.*

- *Die vermoë om bestaande kennisgrense en -praktyke te bevraagteken, en met kompleksiteit en teenstrydighede in die kennisveld van Geografie en Omgewingsbestuur om te gaan.*
- *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.*
- *Navorsingsleierskap in Geografie en Omgewingsbestuur en oor dissiplinêre grense heen om alle aspekte van navorsingsprosesse in komplekse en onvoorspelbare kontekste te optimaliseer.*
- *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.*

**Method of delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners

| **HDGH971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- To have advanced specialist knowledge to enable engagement with and critique of current research or practices in the field of hydrology and geohydrology.
- To develop new methods/techniques/processes/systems in original, creative and innovative ways appropriate to the complex context of hydrology and geohydrology.
- 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.
- The ability to correctly interpret research results and to effectively communicate such results in the form of scientific papers.
- The ability to produce substantial publishable work that meets international standards because it is considered to be new/innovative.
- 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.

***Module uitkomstes:***

- *Gevorderde spesialis kennis te gebruik, om met huidige navorsing of praktyke in die studieveld van hidrologie en geohidrologieskakeling te skakel en krities te evalueer.*
- *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.*
- *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.*

- *Navorsingsresultate korrek te interpreteer en om sulke resultate effektief the kommunikeer in die vorm van wetenskaplike artikels.*
- *Om nuwe en innoverende navorsing te publiseer wat aan internasionale standaarde voldoen.*
- *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 delivery:** Full Time / Part Time

**Assessment methods:** Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **HIKS971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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:** Full Time / Part Time

**Assessment methods:** Thesis

| **ITRW971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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 delivery:** Full Time / Part Time

**Assessment methods:**

The student shall submit a thesis on a suitable research topic.

***Assesseringsmetodes:***

*Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in*.

| **ITWV971** | **SEMESTER 1&2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**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 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.

***Module uitkomste:***

Studente sal hul vermoë moet demonstreer om ? 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 ? wetenskaplik aanvaarde formaat.

**Method of delivery:** Full Time / Part Time

**Assessment Criteria:**

Students have mastered the outcomes if they are able to write a thesis of high technical quality that will demonstrate:

- their command of an applied competency in an applicable quantitative and/or qualitative research methodology and in scientific penmanship;
- their ability to identify a relevant research problem in a computer science and/or information technology discipline by integrating the above-mentioned skills;
- their ability to thoroughly investigate existent knowledge as reflected in appropriate scientific literature;
- their ability to carry out the desired research in view of solving the problem;
- their ability to evaluate the results scientifically in the context of the problem statement;
- their ability to communicate the results scientifically.

Students have to prove that the outcomes of the research project contribute positively to the applicable field of knowledge.

**Assessment Methods**

**Formal Formative:**

Candidates should follow an approved process of:

- selection for PhD study after students' academic capabilities and potential have been recognised by faculty;
- admission to proceed with the PhD and research project;

• approval of a proposal;

**Summative:**

The results of the research project (thesis) should be examined and approved by as least an expert in the field of the research.

The thesis should be approved by the faculty and senate of the university

**Assessment Plan:**

The PhD management plan is as follows:
Application of candidates
Student registration
Registration of title and appointment of promoter(s) and examiners
Study guidance
Examination and results:

- Give notice of submission;
- Submission of thesis copies and all relevant additional reports as specified in the post-graduate candidate checklist;
- Examination process;
- Receive examiners' results and reports;
- Release results.

***Assesseringsplan:***

*Die PhD bestuursplan is as volg:*
*Aansoeke van kandidate*
*Studente registrasie*
*Registrasie van titel en aanstelling van promotor(s) en eksaminatore*
*Studieleiding*
*Eksamen en resultate:*

- *Gee kennis van inhandiging*
- *Handig proefskrif kopieë an alle relevante addisionele verslae in soos dit in die nagraadse kandidate kontrolelys aangedui word*
- *Eksamineringsproses*
- *Ontvang resultate en verslae van eksaminatore*
- *Maak uitslae bekend*

| **MKBN971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- Demonstrate expertise and critical knowledge of a specialised area in Microbiology and/or across specialised or applied areas.
- Demonstrate an ability to develop new methods, techniques or approaches in original, creative and innovative ways appropriate to specialised and complex contexts.
- 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.
- Demonstrate the ability to make independent judgements about managing incomplete or inconsistent information or data in an iterative process of analysis and synthesis.
- Demonstrate the ability to produce and communicate the findings of their research in academically appropriate ways.

- 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:***

- *Kundigheid en kritiese kennis te demonstreer in 'n gespesialiseerde area in Mikrobiologie en/of oor gespesialiseerde of toegepaste areas.*
- *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.*
- *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.*
- *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.*
- *Die vermoë te demonstreer om die bevindinge van sy/haar navorsing te kan genereer en op akademies-toepaslike wyses te kan kommunikeer.*
- *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 delivery:** Full Time / Part Time

**Assessment methods/criteria:**

Students have mastered the outcomes if they are able to:

- Apply critical knowledge and theory to conceptualise new research initiatives within the field of Microbiology with a view to create new knowledge.
- Identify and apply appropriate methods, techniques and approaches to address specific research questions in their field of specialisation.
- Formulate, plan and execute an appropriate research design, complete with suitable research and data analysis methods in order to address a complex research problem or test a research hypothesis in Microbiology.
- Access, analyse, process, evaluate and manage/synthesise relevant information/knowledge/data to develop significant original insights into complex and abstract issues in their field of specialisation.
- Produce substantial and independent, in-depth and publishable work which meets international standards and makes a significant contribution to the field of Microbiology.
- Apply high levels of responsibility, self-reflexivity and adaptability in own management of learning; adhere to the requirements set by the University regarding ethical research practices.

**Assessment Methods - Formal Formative:**

Not applicable

**Assessment Methods - Summative:**

Thesis that will be examined according to the Faculty guidelines by internal and external examiner.

**Assessment Plan:**

Thesis - 100%

***Asseseringsplan:***

*Proefskrif - 100%*

| MTHS971 | SEMESTER 1&2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>Students will have to 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. | | |
| **Method of delivery:** Full Time / Part Time | | |
| **Assessment methods:** Thesis | | |

| NWON971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes:**<br>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.<br><br>***Module uitkomste:***<br>*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 delivery:** Full Time / Part Time<br>***Metode van aflewering:*** *Voltyds / Deeltyds* | | |
| **Assessment methods:** The student shall submit a thesis on a suitable research topic.<br>***Assesseringsmetodes:*** *Die student dien 'n proefskrif in oor 'n geskikte navorsingsonderwerp* | | |

| OMWN971 | SEMESTER 1 & 2 | NQF-LEVEL: 10 |
|---|---|---|
| **Thesis** | | |
| **Module outcomes**:<br>• 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.<br>• Demonstrate an ability to develop new methods/techniques/processes/systems to specialised and complex areas of environmental science. | | |

- Demonstrate an ability to apply specialist knowledge and theory to address complex problems in environmental science.
- 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.
- Demonstrate an ability to produce substantial, independent, in-depth and publishable work in environmental science.
- Demonstrate an understanding of theoretical underpinnings in the management of complex environmental scientific systems.
- 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 uitkomstes**:

- *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.*
- *Nuwe metodes/tegnieke/prosesse/stelsels te ontwikkel vir gespesialiseerde en komplekse areas van omgewingswetenskappe.*
- *Gespesialiseerde kennis en teorie toe te pas om komplekse probleme in omgewingswetenskappe aan te spreek.*
- *Onafhanklike beoordelings te maak rakende onvolledige/teenstrydige inligting/data in die veld van omgewingswetenskappe deur van herhalende analise en sintese gebruik te maak.*
- *Beduidende, selfstandige, in-diepte en publiseerbare werk in die veld van omgewingswetenskappe te produseer.*
- *Diepgaande onderbou in die bestuur van kompekse omgewingswetenskaplike stelsels te demonstreer.*
- *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 delivery:** Full Time / Part Time

**Assessment methods**: Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **ONAV972** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis /**
***Skripsie***

**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 delivery:** Full Time / Part Time

**Assessment methods:**

Thesis (100%) will be examined according to the Faculty guidelines by internal and external examiners.

| **PLKN971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- 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.
- 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.
- 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.
- 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.
- 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.
- 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 uitkomstes:***

- *Kundigheid en wye kennis van die plantkundige spesialiseringsrigting te vertoon (ekologie, molekulêre biologie, fisiologie of taksonomie) in terrestriële of akwatiese omgewings, om sodoende fundamentele navorsing te doen wat betekenisvol is in die primêre studiegebied.*
- *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.*
- *Toepaslike prosedures te inisieer, ontwikkel en implementeer om data in te samel, te verwerk, te analiseer en te bestuur om onafhanklik die doelstellings van die studie aan te spreek deur die aanwending van van kreatiewe vaardighede (metodes, tegnieke, prosesse of tegnologie) en geskikte analitiese metodes om 'n navorsingshipotese te toets.*

- *Toepaslike, verantwoordelike en goedgekeurde prosesse van etiese besluitneming vir kennisproduksie binne die spesialiseringsrigting te bewerkstellig en om die gevolge van hierdie besluite, waar van toepassing, te moniteer en te evalueer.*
- *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 lewer.*
- *Intellektuele onafhanklikheid, navorsingsleierskap en bestuur van navorsingsontwikkeling in die spesialiseringsrigting te demonstreer, en om kommunikasiestrategieë te inisieer wat die waarde van die navorsing kan verdedig en bevorder.*

**Method of delivery:** Full Time / 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).

| **SBEL971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**Thesis**

**Module outcomes:**

- 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.
- 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.
- Illustrate the ability to contribute to scholarly debates around theories and knowledge production within the field of Urban and Regional Planning
- 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.
- 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.
- 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:***

- *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.*
- *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*

- *Illustreer die vermoë om 'n bydrae te lewer tot vakkundige debat rakende teorieë en prosesse waardeur kennis gegenereer word binne Stads-en-Streekbeplanning*
- *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*
- *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.*
- *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 delivery:** Full Time / 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

***Assesseringsmetodes:*** *Nie van toepassing omdat hierdie n navorsingsmodule is.*

| **STTK971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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:***

S*tudente 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 delivery:** Not applicable – research project

**M*etode van aflewering:*** *Nie van toepassing – navorsingsprojek*

**Assessment methods:** The student shall submit a thesis on a suitable research topic.

***Assesseringsmetodes:*** *Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp*

| **TGWS971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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 delivery:** Not applicable – research project

***Metode van aflewering:*** *Nie van toepassing – navorsingsprojek*

**Assessment methods:** The student shall submit a thesis on a suitable research topic.

***Assesseringsmetodes:*** *Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp in.*

| **WISK971** | **SEMESTER 1 & 2** | **NQF-LEVEL: 10** |
|---|---|---|

**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.

***Assesseringsmetodes:*** *Die student dien 'n proefskrif oor 'n geskikte navorsingsonderwerp.*

**Original details: 11592370, Heleen Swart**
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