CALENDAR 2011

FACULTY OF NATURAL SCIENCES

POSTGRADUATE STUDIES

Potchefstroom Campus

Address all correspondence to:

The Registrar
North-West University
Potchefstroom Campus
Private Bag X6001
Potchefstroom
2520

Tel: (018)299-1111/2222
Fax: (018)299-2799
Internet: http://www.nwu.ac.za

PLEASE MENTION YOUR UNIVERSITY NUMBER IN ALL CORRESPONDENCE.

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

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

Warning against plagiarism: Assignments are individual tasks and not group activities (unless explicitly indicated as group activities).

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Compiled by Mrs. L. Grimbeek, M.A. (NWU)
Administrative Manager, Faculty of Natural Sciences
June 2010

FACULTY OF NATURAL SCIENCES

OFFICIALS

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School of Computer, Statistical and Mathematical Sciences
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Space Physics
Prof. R.A. Burger, D.Sc. (PU for CHE)

Focus Area for Chemical Resource Beneficiation
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Centre for Environmental Management

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Botany

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Computer Sciences and Information Systems

Prof. H.M. Huisman, Ph.D. (PU for CHE)

Urban and Regional Planning

Prof. C.B. Schoeman, D.Sc. (Eng.) (Century University, VSA), D.Phil. (PU for CHE)

Statistics and Operational Research

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Natural Science, Mathematics and Technology Education

Mrs. J.A. Vorster, M.Ed. (Maths Education) (NWU-Potchefstroom Campus)

Dr S.D. Rapule, Ph.D. (Education) (North-West University)

FACULTY BOARD

The faculty board is compiled by:

- The Dean
- School-/Centre-/Research directors
- Subject group chairpersons
- Student representatives; and
- Administrative manager
- A representative from the faculty of Economic and Management sciences, Health sciences, Engineering and Education sciences.

N.1 RULES: FACULTY OF NATURAL SCIENCES

N.1.1 INTRODUCTION

N.1.1.1 Authority of the A-rules

The faculty rules that apply to the different programmes of the Faculty of Natural Sciences and are included in this calendar of the Faculty are subject to the general academic rules of North West University, as determined by the Council of North West University from time to time, and therefore the faculty rules have to be read together with the general academic rules (hence referred to as general rule(s)).

The *General Academic Rules* is found at "General"/"General Calendar/"Rules" in the WebPages of the University at http://www.nwu.ac.za. Printed copies of the rules may be consulted in the Ferdinand Postma Library and at the Director: Academic Administration.

N.1.2 SCHOOLS, CENTRE AND RESEARCH ENTITIES IN THE FACULTY

The Faculty of Natural Sciences consists of three schools and one centre, of which each one is made up of one or more subject groups. At the head of each school is a director and he/she is assisted by the subject chairpersons, one of each from the various subject groups. The schools are responsible for teaching graduate, honours and lectured master's programmes. These schools, centre as well as the subjects groups that make up each school are represented in the following table:

SCHOOL/CENTRE	SUBJECT GROUP
School of Physical and Chemical Sciences	Biochemistry Chemistry Physics Natural Science, Mathematics and Technology Education
School of Environmental Science and Development	Zoology Geography and Environmental Studies Geology Microbiology Botany Urban and Regional Planning
School of Computer, Statistical and Mathematical Sciences	Computer Science and Information Systems Statistics and Operational Research Mathematics and Applied Mathematics
Centre for Business Mathematics and Informatics	Actuarial Science Data-mining Financial Mathematics Quantitative Risk Management Risk Analysis

Research in the Faculty is managed in research entities The research entities are further responsible for the master's (M.Sc.) and doctorate (Ph.D.) training programmes, i.e. programmes that contain a significant research component.

At the moment there are three research units, each of them connected to a programme, viz. Business Mathematics and Informatics, Environmental Sciences and Management, Space Physics; the focus area, Chemical Resource Beneficiation and the Centre for Human Metabonomics.

N.1.3 QUALIFICATIONS, PROGRAMMES AND CURRICULA

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

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

N.1.3.1 Degrees

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

Qualification; Abbreviation	Programme / Curricula	Qualification/ Curriculum Codes
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Biochemistry**	**202156**
	Biochemistry	N650P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Chemistry**	**202117**
	Chemistry	N651P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Physics**	**202121**
	Physics	N652P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Computer Science and Information Systems**	**202134**
	Computer Science and Information Systems	N653P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Statistics**	**202135**
	Statistics	N654P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Applied Mathematics**	**202136**
	Applied Mathematics	N655P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Mathematics**	**202137**
	Mathematics	N656P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Mathematics Education**	**202138**
	Mathematics Education	N657P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Actuarial Science**	**202126**
	Actuarial Science (following on B.Sc. N137P)	N609P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Quantitative Risk Management**	**202127**
	Quantitative Risk Management (following on B.Sc. N134P, N135P, N136P)	N610P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Financial Mathematics**	**202128**
	Financial Mathematics (following on B.Sc. N135P)	N611P
Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Data Mining**	**202129**
	Data Mining (following on B.Sc. N134P, N136P)	N612P

Honneurs Baccalaureus Scientiae; Hons.B.Sc.	**Program: Environmental Sciences**	**202124**
	Geography and Environmental Management	N640P
	Ecological Remediation and Sustainable Management	N641P
	Biodiversity and Conservation Ecology	N642P
	Aquatic Ecosystem Health	N643P
	Plant Protection	N644P
	Environmental Geology	N646P
Honneurs Baccalaureus Commercii; Hons.B.Com.	**Program: Computer Science and Information Systems**	**504143**
	Computer Science-Information Systems	N658P
Honneurs Baccalaureus Artium; Hons.B.A.	**Program: Environmental Sciences**	**102170**
	Geography and Environmental Management	N645P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Computer Science**	**203155**
	Computer Science	N861P
	Computer Science	N802P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Statistics**	**203156**
	Statistics	N862P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Applied Mathematics**	**203157**
	Applied Mathematics	N863P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Mathematics**	**203158**
	Mathematics	N864P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Quantitative Risk Management**	**203181**
	Quantitative Risk Management (following on Hons.B.Sc. N609P or N610P)	N809P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Financial Mathematics**	**203182**
	Financial Mathematics (following on Hons.B.Sc. N611P)	N810P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Data Mining**	**203183**
	Data Mining (following on Hons.B.Sc. N612P)	N811P

Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Risk Analysis**	**203127**
	Risk Analysis	N865P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Space Physics**	**203128**
	Physics	N866P
	Astro Physics and Space Science	N867P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Reactor Science**	**203130**
	Reactor Science	N814P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Chemistry**	**203123**
	Chemistry	N868P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Biochemistry**	**203132**
	Biochemistry	N869P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Environmental Sciences**	**203194**
	Environmental Sciences	N830P
	Chemistry	N831P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Zoology**	**203190**
	Zoology	N826P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Microbiology**	**203191**
	Microbiology	N827P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Botany**	**203192**
	Botany	N828P
Magister Scientiae; M.Sc. (following on Hons.B.Sc.)	**Program: Geography and Environmental management**	**203193**
	Geography and Environmental Management	N829P
Magister Scientiae; M.Sc.	**Science Education**	**203134**
	Science education	N860P
Master's in Environmental Sciences (following on B.Sc.)	**Program: Environmental Sciences**	**217104**
	Ecological Remediation and Sustainable Utilisation	N820P
	Biodiversity and Conservation Biology	N821P
	Water Sciences	N822P
	Plant Protection	N823P
	Environmental Analysis and Management	N825P

Master's in Environmental Management (following on B.Sc. (Hons.))	**Program: Environmental Management**	**218106**
	Environmental Management	N824P
Magister Commercii; M.Com. (following on B.Com. (Hons.))	**Program: Computer Science and Information Systems**	**505 138**
	Computer Science and Information Systems	N870P
Magister Artium et Scientiae (Planning); M.Art. et Scien.	**Program: Urban and Regional Planning**	**119102**
	Urban and Regional Planning	N825P
Philosophiae Doctor; Ph.D.	**Program: Computer Science**	**204132**
	Computer Science	N901P
Philosophiae Doctor; Ph.D.	**Program: Statistics**	**204138**
	Statistics	N902P
Philosophiae Doctor; Ph.D.	**Program: Applied Mathematics**	**204139**
	Applied Mathematics	N903P
Philosophiae Doctor; Ph.D.	**Program: Mathematics**	**204140**
	Mathematics	N904P
Philosophiae Doctor; Ph.D.	**Program: Business Mathematics and Informatics**	**204111**
	Risk Analysis	N905P
Philosophiae Doctor; Ph.D.	**Program: Risk Analysis**	**204133**
	Business Mathematics	N915P
Philosophiae Doctor; Ph.D.	**Program: Space Physics**	**204112**
	Physics	N906P
Philosophiae Doctor; Ph.D.	**Program: Chemistry**	**204120**
	Chemistry	N907P
Philosophiae Doctor; Ph.D.	**Program: Environmental Sciences**	**204114**
	Environmental Sciences	N914P
	Chemistry	N916P
Philosophiae Doctor; Ph.D.	**Program: Zoology**	**204136**
	Zoology	N908P
Philosophiae Doctor; Ph.D.	**Program: Geography and Environmental Management**	**204137**
	Geography and Environmental Management	N909P
Philosophiae Doctor; Ph.D.	**Program: Microbiology**	**204113**
	Microbiology	N910P
Philosophiae Doctor; Ph.D.	**Program: Botany**	**204134**
	Botany	N911P
Philosophiae Doctor; Ph.D.	**Program: Urban and Regional Planning**	**204115**
	Urban and Regional Planning	N912P

Philosophiae Doctor; Ph.D.	**Program: Biochemistry**	**204116**
	Biochemistry	N913P
Philosophiae Doctor; Ph.D.	**Reactor Physics**	**204117**
	Reactor Science	N920P
Philosophiae Doctor; Ph.D.	**Science Education**	**204118**
	Science Education	N921P

N.1.4 MODULES AND CREDITS

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 or three 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.

N.1.4.1 Relationship between credits and examination papers

The duration for an examination paper of an 8 and 12 credit module is usually two hours and the duration of examination papers that count for 16, 24 or 32 credit points is usually three hours.

N.1.5 RECOGNITION OF PRIOR LEARNING

a) 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 other institutions, or informally (by experience), is an indispensable element in deciding on admission to and awarding credits in an explicitly chosen teaching-learning programme of the University.

b) Recognition of prior learning concerns the provable knowledge and learning that an applicant has acquired, whether by having completed formal education programmes, or by experience. At all times the question will concentrate on the level of skills, and skills will be judged in the context of the exit level skills required for 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.

c) North West University accepts that recognition of prior learning must take place in a valid, trustworthy and fair way, within the normal existing policy on awarding credits to potential and existing students, whether they are from this or another institution.

d) With the view of processing an application for recognition of prior learning a non-refundable administrative levy determined from time to time by the University has to be paid by the prospective student.

N.1.6 ADMISSION AND REGISTRATION

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.

N.1.7 APPROVAL OF STUDY PROGRAMMES

Approval of study programmes for master's (M.Sc.) and doctorate (Ph.D.) degrees is given in accordance with general. **Prospective postgraduate students are advised to study these rules carefully beforehand.**

N.1.8 EXAMINATIONS

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 Postgraduate Studies* also contains very useful information in this regard.

The Faculty of Natural Sciences stipulates that in all honours curricula and in master's and Ph.D. curricula that contain endorsed modules each endorsed module must be passed individually before the degree will be conferred on the student.

N.1.8.1 Deadlines

Students must beforehand make sure of the official deadlines for submitting examination documents, i.e. mini-dissertations, dissertations and theses. These dates are determined annually. A student who submits his examination documents after the prescribed deadline will most probably not receive his degree at the next graduate ceremony and he/she will have to wait to the next graduation ceremony. The implication of this negligence will be that the student will have to register and pay class fees for another year.

N.1.9 ASSUMED LEARNING-BASED PROGRESS IN A CURRICULUM

In compiling each curriculum care has been taken that assumed learning, i.e. prior knowledge and the general level of insight and experience necessary to comfortably take the modules prescribed in a specific semester of a curriculum, has been acquired in preceding semesters. A student having failed one or more modules in preceding semesters will probably not be adequately equipped to take the modules of the following semester. Such students are URGENTLY advised to consult the director of the relevant school BEFOREHAND to find out which modules of the semester concerned they can take with a reasonable expectancy of being successful.

N.1.10 TERMINATION OF STUDIES

The studies of students who fail to keep scheduled appointments for their studies or do not progress satisfactorily may be terminated in terms of the general rules.

N.1.11 PROFESSIONAL STATUS

Persons who obtained the following qualifications at a university in the Republic of South Africa and have acquired the experience as indicated below may register as a Professional Natural Scientists (Pr.Sci.Nat.) at the South African Council for Natural Scientific Professions:

a) A four year B.Sc. or Hons.B.Sc. plus three years of experience in a natural science profession;
b) M.Sc. plus two years of experience in a natural science profession;
c) D.Sc. or Ph.D. plus one year of experience in a natural science profession.
d) In order to become a professional medical scientist in the registration category Independent Practice in South Africa the Health Professions council

of South Africa requires a minimum of an appropriate BSc (honours) degree as well as an internship at an approved institution and Board approved assessment of competence. The duration of the internship is 24 months and may only commence after completion of the degree. A scientist who has completed an MSc or PhD degree may apply for a shortened internship. In such a case a minimum of 6 months internship as well as an assessment of competence is required.

e) Students who took the B.Art. et Scien. degree may apply for membership of the South African Council for Town and Regional Planners.

N.2 RULES FOR THE DEGREE HONOURS BACHELOR OF SCIENCE

The honours degree follows on an appropriate baccalaureus degree (see N.2.3). The studies may be taken full-time or part-time.

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

N.2.1 DURATION OF STUDIES

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

N.2.2 ADMISSION AND REGISTRATION

The studies may be undertaken in a study programme approved by the Faculty Board of the Faculty of Natural Sciences. These study programmes are set out in N.2.4. Apart from the provisions in A.4.1 and A.12 the additional requirements set out in the relevant curricula in N.2.7 have to be complied with.

N.2.3 ASSUMED PRIOR LEARNING

a) 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.

b) 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.B.Sc. studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

c) For admission to curricula N610P-N612P in the programme Business Mathematics and Informatics a further learning requirement above and beyond the assumed learning as mentioned in a) and b) will be that a student must have taken the B.Sc. qualification in Business Mathematics and Informatics or the B.Com. qualification in Quantitative Risk Management, subject to the following prerequisites:

Honours curriculum	Graduate curriculum
N610P	N134P or N135P or N136P or N137
N611P	N135P
N612P	N134P or N135P or N136P or N137

d) A minimum prerequisite for registration for the postgraduate BMI qualifications N610P, N611P and N612P 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 directors of the Centre for Business Mathematics and Informatics and the Research Unit for Business Mathematics and Informatics.

e) Students in Actuarial Science who passed the curriculum N137P and obtained an average of at least 60% in the core modules in the third year may be admitted to the curriculum N609P.

f) 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 Unit for Business Mathematics and Informatics.

N.2.4 STUDY PROGRAMMES

Save for exceptions that the Dean might approve the honours degree may be taken in the following possible study programmes: Chemistry and Biochemistry, Physics (School of Physical and Chemical Sciences), Computer, Statistical and Mathematical Sciences (School of Computer, Statistical and Mathematical Sciences), Business Mathematics and Informatics (Centre for Business Mathematics and Informatics), Environmental Sciences and Development (School of Environmental Sciences and Development).

N.2.5 EXIT LEVEL OUTCOMES

The outcomes described regarding the first Baccalaureus Scientiae degree are still striven after in this Honours Bachelor of Science, with special reference to a specific discipline or a few disciplines from natural 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.

N.2.5.1 Natural science (including mathematical and computer) and technology problem solving

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

N.2.5.2 Applying fundamental and expert knowledge

At the end of the studies the student will have abilities to integrate a basic knowledge and techniques from natural science and information technology in such a way that he/she will be able to investigate human and natural phenomena and to solve accompanying problems. These abilities will include the following:

a) application of natural science knowledge and methods (with emphasis on those of the specific discipline) to problems by the appropriate use of -

   i) formal analysis and modelling of human activities and natural phenomena, systems and problems;

   ii) communication of theories, concepts and ideas;

   iii) discussions and conceptualisation of human activities and natural phenomena, systems and problems;

   iv) management of uncertainties and risks by utilising statistical principles and methods;

v) computer skills and information technology;

b) implementation of principles, laws and techniques of natural sciences and health sciences (with emphasis on those of the specific discipline) at the fundamental level to -

i) identify and solve open business and community problems;

ii) identify and utilise applications;

iii) make use of common fundamental expertise across the boundaries of disciplines.

N.2.5.3 Investigations, experimenting and data analysis

At the end of the studies the student will be able to -

a) plan and perform investigations and experiments by utilising scientific modelling techniques;

b) analyse, interpret and derive information from data.

The student will have a limited knowledge of the fundamental research methodology of the specific discipline.

N.2.5.4 Scientific methods, skills and information technology

At the end of the studies the student will be able to -

a) apply appropriate scientific methods and to evaluate the results obtained;

b) use computer software for calculations, modelling, simulation and handling of information, including -

i) the evaluation of the appropriateness and limitations of software;

ii) the correct application and functioning of software;

iii) 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.

N.2.5.5 Professional and general communication

At the end of the studies the student will be able to -

a) communicate effectively both orally and in writing with scientists (with emphasis on the specific discipline) and the community by using the appropriate structure, style and graphic and electronic aids;

b) apply methods of information communication for use by others, especially in the world of natural sciences and economic sciences (with emphasis on those methods of the specific discipline).

N.2.5.6 Impact of natural science activities on the community and environment

The student will be critically aware of -

a) the impact of natural science activities (especially those of the specific discipline) on the community and the environment;

b) the necessity to take into account in natural science activities

i) the impact of technology on the community and

ii) the personal, social and cultural values and expectancies of those people on whom scientific activities have an influence.

N.2.5.7 Team and multidisciplinary work

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.

N.2.5.8 Lifelong learning

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.

N.2.5.9 Professional ethics and practice

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.

N.2.6 ARTICULATION POSSIBILITIES

a) On successfully completing the Hons.B.Sc. programme the student may be admitted to further learning for the M.Sc. 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.

N.2.7 PROGRAM: BIOCHEMISTRY

SCHOOL: PHYSICAL AND CHEMICAL SCIENCES

Qualification code: 202156

N.2.7.1 Curriculum N650P: Biochemistry

This curriculum is compiled from the modules in the table below. It is designed in view of training biochemists as natural scientists. However, the curriculum has also been approved with the aim that a student who has completed it successfully may apply to be registered as a Medical Scientist. For this purpose the contents of sections of the modules below are modified to comply with the requirements of the registration.

To register the student must on completion of the honours degree of curriculum N650P do two years of practical work in an approved pathology laboratory. A selected number of students are admitted to this curriculum (maximum 14). Students in this group wishing to become Medical Scientist are selected by pathologists for the practical work. In all instances regulations apply as determined from time to time by the Medical Council.

This curriculum is compiled of the following modules:

Module code	Descriptive name	Credits
Semester 1		
BCHN611	Analytical Biochemistry	24
BCHN612	Advanced Metabolism	24
Semester 2		
BCHN621	Advanced Molecular Biology	24
BCHN622	Bio-molecular Interactions	24
BCHN671	Project	32
	Total number of credits	**128**

N.2.8 PROGRAM: CHEMISTRY

SCHOOL: PHYSICAL AND CHEMICAL SCIENCES

Qualification code: 202117

N.2.8.1 Curriculum N651P: Chemistry

This curriculum is compiled of the following modules:

Module code	Descriptive name	Credits
Semester 1		
CHEN611	Advanced organic Chemistry	16
CHEN612	Advanced physical Chemistry	16
CHEN613	Advanced inorganic Chemistry	16
CHEN614	Molecular modelling	8
CHEN671	Project	48
Semester 2 **Select THREE of the following optional modules in consultation with the subject chairperson and the school director:**		
CHEN621	Homogeneous catalysis	8
CHEN622	Coal chemistry	8
CHEN623	Membrane science and technology	8
CHEM621	Polymer chemistry	8
CHEM622	Advanced structural clarification	8
CHEM623	Environmental chemistry	8
CHEM624	Techniques for organic synthesis	8
CHEM625	Platinum group metal chemistry	8
	Total number of credits	**128**

N.2.9 PROGRAM: PHYSICS

SCHOOL: PHYSICAL AND CHEMICAL SCIENCES

Qualification code: 202121

N.2.9.1 Curriculum N652P: Physics

This curriculum is compiled of the following modules:

Module code	Descriptive name	Credits
Semester 1		
FSKH611	Classical Mechanics	16
FSKH612	Quantum Mechanics I	16
FSKH613	Electrodynamics	16
FSKH614	Plasma Physics	16
FSKH671	Project I	8
Semester 2		
FSKH621	Quantum Mechanics II	16
FSKH622	Statistical Mechanics	16
FSKH623	Computer Physics (Research)	16
FSKH672	Project II	8
	Total number of credits	**128**

N.2.10 PROGRAM: COMPUTER SCIENCE AND INFORMATION SYSTEMS

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 202134

N.2.10.1.1 Curriculum N653P: Computer Science and Information Systems

This curriculum is compiled, as indicated, from the following modules:

Module code	Descriptive name	Credits
First semester		
ITRI671	Project I	8
AND FOUR of the following modules in consultation with the school director:		
ITRI611	Data Warehouses I	12
ITRI612	Linear Programming I	12
ITRI613	Databases I	12
ITRI614	Information Systems Engineering I	12
ITRI615	Computer Security I	12
ITRI616	Artificial Intelligence I	12
ITRI617	Image Processing I	12
ITRI618	Decision Support Systems I	12
Second semester		
AND FOUR of the following modules in consultation with the school director:		
ITRI621	Data Warehouses II	12
ITRI622	Linear Programming II	12
ITRI623	Databases II	12
ITRI624	Information Systems Engineering II	12
ITRI625	Computer Security II	12
ITRI626	Artificial Intelligence II	12
ITRI627	Image Processing II	12
ITRI628	Decision Support Systems II	12
	Elective module*	12
Total number of credits of this curriculum		128

This curriculum N653P grants admission to M.Sc. studies in Computer Science and Information Systems

N.2.11 PROGRAM: STATISTICS

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 202135

N.2.11.1.1 Curriculum N654P: Statistics

This curriculum is compiled, as indicated, from the following modules:

Module code	Descriptive name	Credits
First semester		
STTN671	Research project I (practice directed)	16
STTN612	Statistical Data-analysis I: Models	12
STTN613	Resampling	12
And two modules, in consultation with the School director and the head of subject group Statistics, from the following list:		
STTN614	Statistical Inference	12
STTN615	Stochastic Processes I	12
STTN616	Nonparametric estimation methods	12
STTN617*	Mathematical and Computer-intensive methods I	12
STTN618**	Financial-driven Statistics I	12
Second semester		
STTN671	Research project II (Research journal directed)	16
STTN622	Statistical Data-analysis II: Time Series	12
STTKN23	Multivariate Statistics	12
And two modules, in consultation with the School director and the head of subject group Statistics, from the following list:		
STTN624	Discrete Data-analysis	12
STTN625	Stochastic Processes II	12
STTN626	Probability Theory	12
STTN627*	Mathematical and Computer-intensive methods II	12
STTN628**	Financial-driven Statistics II	12
Total number of credits of this curriculum		**128**

* **Choose subject in consultation with the school director and subject chairperson on honours level, one of the following modules for the first or second semester from N653P, N655P of N656P.**

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

This curriculum N654P grants admission to M.Sc. studies in Statistics

N.2.12 PROGRAM: APPLIED MATHEMATICS

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 202136

N.2.12.1.1 Curriculum N655P: Applied Mathematics

This curriculum is compiled, as indicated, from the following modules:

Module code	Descriptive name	Credits
TGWN671	Project	32
TGWN672	Numerical Analysis	24
TGWN673	Partial differential equations	24
TGWN674*	Control theory and mechanical systems	24
TGWN675*	Control theory and optimization of financial systems	24
WISN673	Complex function theory	24
WISN675	Functional analysis	24
Total number of credits of this curriculum		**128**

* Students choose between TGWN674 and TGWN675

This curriculum N655P grants admission to M.Sc. studies in Applied Mathematics

N.2.13 PROGRAM: MATHEMATICS

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 202137

N.2.13.1.1 Curriculum N656P: Mathematics

This curriculum is compiled, as indicated, from the following modules:

Module code	Descriptive name	Credits
WISN671	Project	32
WISN672	Modern Algebra	24
WISN673	Complex function theory	24
WISN674	Topology and measure and integration theory	24
WISN675	Functional analysis	24
Total number of credits of this curriculum		**128**

This curriculum N656P grants admission to M.Sc. studies in Mathematics

N.2.14 PROGRAM: MATHEMATICS EDUCATION

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 202138

N.2.14.1.1 Curriculum N657P: Mathematics Education

This curriculum is compiled, as indicated, from the following modules:

Module code	Descriptive name	Credits
WISN671	Project	32
WISN672	Modern Algebra	24
WISN673	Complex function theory	24
WISN674*	Topology and measure and integration theory	24
WISN675*	Functional analysis	24
WISN676	Mathematics for teaching	24
Total number of credits of this curriculum		**128**

* * Students choose between WISN674 and WISN675

This curriculum N657P (in combination with a postgraduate teaching qualification) grants admission to the M.Sc. in Natural Science Education.

N.2.15 PROGRAM: ACTUARIAL SCIENCES

CENTRE FOR BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 202126

N.2.15.1 Curriculum N609P: Actuarial Science (following on B.Sc. N137P) - 202126

This curriculum is compiled from the following modules:

Module code	Descriptive name	Credits
First semester		
BWIN613	Financial Engineering I	16
BWIN614	Investment Theory I	16
BWIA612	Models: Survival Models and Stochastic Processes (A202/CT4)	24
Second semester		
BWIN623	Financial Engineering II	16
Year Module		
BWIA672	Actuarial Risk Management (A301/CA1)	56
BWIA673	Contingencies (A203/CT5)	32
	Total number of credits of this curriculum	**160**

The integrated assessment of this curriculum takes lace during the assessment of the modules BWIN623.

N.2.16 PROGRAM: QUANTITATIVE RISK MANAGEMENT

CENTRE FOR BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 202127

N.2.16.1 Curriculum N610P: Quantitative Risk Management (following on B.Sc. N134P, N135P, N136P)

This curriculum consists of the following modules divided into two semesters:

Module code	Descriptive name	Credits
First semester		
BWIN611	Quantitative Risk Analysis I	16
BWIN613	Financial Engineering I	16
BWIN614	Investment Theory I	16
STTN612	Statistical Data-analysis I: Models	12
	Elective Module	12/16
Second semester		
BWIN623	Financial Engineering II	16
ECON623	Risk Management	16
STTN622	Statistical Data-analysis II: Time Series	12
STTN623	Multivariate Statistics	12
	Elective Module[#]	16
	Total number of credits	**140/148**

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

Module code	Descriptive name	Credits
BWIN615	Financial Modelling I	16
ECON617	Econometrics	16

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

Module code	Descriptive name	Credits
BWIN625	Financial Modelling II	16
BWIN621	Quantitative Risk Analysis	16
ECON622	Fiscal and monetary policy	16
STTN624	Discrete Data analysis	12

The integrated assessment of this curriculum takes lace during the assessment of the modules BWIN623 and ECON623.

N.2.17 PROGRAM: FINANCIAL MATHEMATICS

CENTRE FOR BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 202128

N.2.17.1 Curriculum N611P: Financial Mathematics (following on B.Sc. N135P)

This curriculum consists of the following modules divided into two semesters:

Module code	Descriptive name	Credits
First semester		
BWIN613	Financial Engineering I	16
STTN612	Statistical Data-analysis I: Models	12
STTN615	Stochastic Processes I	12
WISK613	Topology of Metric and Normed Spaces	8
WISK614	Measure and Integration Theory I	8
WISK615	Differential Equations	16
Second semester		
BWIN622	Pricing of Derivatives A	16
BWIN623	Financial Engineering II	16
STTN622	Statistical Data-analysis II: Time Series	12
STTN625	Stochastic Processes II	12
WISK624	Measure and Integration Theory II	16
	Total number of credits	**144**

The integrated assessment of this curriculum takes lace during the assessment of the modules BWIN623.

N.2.18 PROGRAM: DATA-MINING

CENTRE FOR BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 202129

N.2.18.1 Curriculum N612P: Data Mining (following on B.Sc. N134P, N136P)

This curriculum consists of the following modules divided into two semesters:

Module code	**Descriptive name**	Credits
	First semester	
ITRI616	Artificial Intelligence I	12
STTN612	Statistical Data-analysis I: Models	12
	Elective Module	16
	Elective Module	12/16
	Elective Module	12/16
	Second semester	
ITRI626	Artificial Intelligence II	12
STTN622	Statistical Data-analysis II: Time Series	12
STTN623	Multivariate Statistics	12
	Elective Module	12/16
	Elective Module	12/16
	Total number of credits	**124/140**

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

Module code	**Descriptive name**	**Credits**
BWIN615	Financial Modelling	16
ITRI613	Databases I	12
ECON617	Econometrics	16
ITRI618	Decision Support Systems I	12
BWIN613	Financial Engineering I	16
BWIN614	Investment Theory I	16
ITRI611	Data Warehouses I	12
ITRI614	Information Systems Engineering I	12
STTN613	Re-sampling Methods	12

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

Module code	**Descriptive name**	**Credits**
BWIN625	Financial Modelling II	16
ITRI623	Databases II	12
ITRI628	Decision Support Systems II	12
BWIN623	Financial Engineering II	16
ITRI621	Data Warehouses II	12

ITRI624	Information System Engineering II	12
STTN624	Discrete Data Analysis	12

The integrated assessment of this curriculum takes place during the assessment of the modules ITRI626.

N.2.19 PROGRAM: ENVIRONMENTAL SCIENCES

SCHOOL: ENVIRONMENTAL SCIENCES AND DEVELOPMENT

Qualification code: 202124

N.2.19.1 Curriculum N640P: Geography and Environmental Management

This curriculum consists of the following modules divided into two semesters:

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMBO674	Environmental Management	Year	24
OMBO675	Environmental Analysis	Year	24
OMBE672	Research project	Year	32
	Total compulsory modules		**96**
Elective modules			
Student selects 2 of the following modules			
OMBO613	Introduction to GIS	1	16
OMBO614	GIS Applications (full-time only)	1	16
OMBE621	Hydrology (full-time only)	2	16
HOBR612	Public Management and Leadership	1	16
HOBR623	Public Performance Management	2	16
	Total elective modules		**32**
Total Curriculum			**128**

N.2.19.2 Curriculum N641P: Ecological Remediation and Sustainable Management

Faculty specific rules for the curriculum

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.

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMSE612	Introduction to Landscape Ecology	1	16
OMSE674	Research Project	Year	32
	Total compulsory modules		**64**

Elective modules			
Student selects 4 of the following modules in consultation with programme manager, research mentor and School Director			
OMWE611	Rehabilitation of disturbed areas	1	16
OMSE611	Environmental Soil Science	1	16
OMBO613	Introduction to GIS	1	16
OMBO614	GIS Applications (full-time only)	1	16
OMSB611	Conservation Ecology	1	16
OMSE621	Restoration of degraded ecosystems	2	16
OMSE622	Urban Ecology	2	16
OMSE623	Plant ecophysiology and stress physiology	2	16
OMSE624	Plant growth and -development	2	16
OMSE625	Advanced Ecotoxicology	2	16
OMSE626	Microbial Ecology	2	16
	Total elective modules		**64**

Total Curriculum	**128**

N.2.19.3 Curriculum N642P: Biodiversity and Conservation Ecology

Faculty specific rules for the curriculum

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.

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMWB611	Biodiversity: past, present and future tendencies	1	16
OMSB611	Conservation Ecology	1	16
OMSE674	Research project	Year	32
	Total compulsory modules		**80**
Elective modules			
Student selects 3 of the following modules in consultation with programme manager, research mentor and School Director			
OMSB612	Systematics in practice	1	16
OMSE612	Introduction to Landscape Ecology	1	16
OMBO613	Introduction to GIS	1	16
OMSB621	Bio-informatics	2	16
OMSB622	Evolutionary Biology and Ethology	2	16
OMSB623	Biogeography	2	16
OMSB624	Biodiversity Planning	2	16
OMSB625	Biomonitering and Risk Assessment	2	16
OMSE621	Restoration of degraded ecosystems	2	16
OMWP621	Biodiversity and population dynamics in agricultural ecosystems	2	16
	Total elective modules		**48**
Total Curriculum			**128**

N.2.19.4 Curriculum N643P: Aquatic Ecosystem Health

Faculty specific rules for the curriculum

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.

An undergraduate module in parasitism is a prerequisite for OMWW614.

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMWW611	Physical, chemical and biological properties of inland water	1	16
OMSW611	Aquatic Ecosystems: Pollution and Ecotoxicology	1	16
OMSE674	Research project	Year	32
	Total compulsory modules		**80**
Elective modules			
Student selects 3 of the following modules in consultation with programme manager, research mentor and School Director			
OMWW614	Waterborne diseases*	1	16
OMWW629	Water purification and treatment	2	16
OMSW622	Phycology	2	16
OMBE621	Hydrology (full-time only)	2	16
OMSE623	Plant ecophysiology and stress physiology	2	16
OMSW623	Environmental Hydrology	2	16
	Total elective modules		**48**
Total Curriculum			**128**

* Prior knowledge in parasitology and epidemiology is a prerequisite

** This module includes a week long practical session in Potchefstroom. Part time students can only register for this module if they are willing to travel to Potchefstroom for this practical session.

N.2.19.5 Curriculum N644P: Plant Protection

Faculty specific rules for the curriculum

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.

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMSP611	Principles of integrated pest management	1	16
OMSE674	Research project	Year	32
		Total compulsory modules	**64**

Elective modules			
Student selects 4 of the following modules in consultation with programme manager, research mentor and School Director			
OMWP611	Pest phenology and damage symptoms	1	16
OMWP613	Economic damage and threshold values	1	16
OMSP621	Biodiversity and population dynamics in agricultural ecosystems	2	16
OMSP622	GM crops and integrated pest management	2	16
OMSP623	Nematodes and crops	2	16
OMSP624	Arthropoda/plant interactions	2	16
OMSP625	Nematode/plant interactions and control	2	16
OMSB621	Bio-informatics	2	16
OMSA622	Weeds: interactions and control	2	16
OMSA623	Plant pathology	2	16
		Total elective modules	**64**

Total Curriculum	**128**

N.2.19.6 Curriculum N646P: Environmental Geology

Faculty specific rules for the curriculum

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.

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMSG611	Environmental geochemistry	1	16
OMWE611	Rehabilitation of disturbed areas	1	16
OMSE674	Research project	Year	32
		Total compulsory modules	**64**
Elective modules			
Student selects 4 of the following modules in consultation with programme manager, research mentor and School Director			
Module code	**Module name**	**Semester**	**Cr**
OMSE611	Environmental Soil Science	1	16
OMWW611	Physical, chemical and biological properties of inland water	1	16
OMSG621	Environmental Mineralogy	2	16
OMSG622	Applied environmental geology	2	16
OMBE621	Hydrology (full-time only)	2	16
OMSE621	Restoration of degraded ecosystems	2	16
		Total compulsory modules	**64**
Total Curriculum			**128**

N.2.20 EXAMINATIONS

Examination opportunities and relevant rules apply in terms of the general rules.

N.2.20.1 Compiling the participation mark

A participation mark for a module is calculated in terms of the general rules and may be compiled from tests, assignments and other forms of assessment.

N.2.20.2 Admission to examinations

Admission to the examination in any module takes place by acquiring a proof of participation issued by the school director/centre director after the requirements of the relevant curriculum and/or module have been complied with (see general rules).

N.2.20.3 Module mark

The module mark (see general rules) is calculated from the participation mark and the examination mark at the ratio 1:1 unless it is stated otherwise in the description of the curriculum in which the relevant module is found.

N.2.20.4 Pass requirements

Passing modules and a curriculum takes place in terms of the general rules of this Calendar.

N.2.20.5 Repetition of modules

See general rules.

N.2.20.6 Termination of studies

See general rules.

N.2.21 RULES FOR THE DEGREE HONOURS BACHELOR OF COMMERCE

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.B.Com. studies. The studies may take place full-time or part-time.

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.

N.2.22 DURATION OF THE STUDIES

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.

N.2.23 ADMISSION AND REGISTRATION

Honours studies may be undertaken in a study programme that has been approved by the Faculty Board and is set out in N.3.4. Apart from the provisions in A.4.1 and A.12 the specific requirements stated in the description of the relevant curricula in N.3.7 must additionally be complied with.

N.2.24 ASSUMED PRIOR LEARNING

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.

If a prospective student does not conform to N.3.3.1 he may be admitted to the Hons.B.Com. studies by the school director on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

N.2.25 STUDY PROGRAMMES

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

N.2.26 GENERAL EXIT LEVEL OUTCOMES

The outcomes described in N.2.5 are still striven after in this Honours Bachelor of Commerce, with emphasis on a specific discipline or a few disciplines from the natural 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.

N.2.27 PROGRAM: COMPUTER SCIENCE-INFORMATION SYSTEMS

SCHOOL: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

Qualification code: 504143

N.2.27.1 Curriculum N658P: Computer Science-Information Systems

The curriculum is compiled as follows:

Module code	Descriptive name	Credits
First semester		
ITRI671	Project	32
AND another FOUR of the following modules in consultation with the school director:		
ITRI611	Data Warehouses I	12
ITRI613	Databases I	12
ITRI614	Information Engineering Systems I	12
ITRI615	Computer Security I	12
ITRI616	Artificial Intelligence I	12
ITRI618	Decision Support Systems I	12
Second semester		
AND FOUR of the following modules in consultation with the school director:		
ITRI621	Data Warehouses II	12
ITRI623	Databases II	12
ITRI624	Information Systems Engineering II	12
ITRI625	Computer Security II	12
ITRI626	Artificial Intelligence II	12
ITRI628	Decision Support Systems II	12
Total number of credits of this curriculum		**128**

N.2.28 EXAMINATIONS

The examination opportunities and related rules are set out in the general rules.

N.2.28.1 Compilation of the participation mark

A participation mark for a module (see general rules) may be compiled from tests, assignments and other forms of assessment.

N.2.28.2 Admission to examinations

Admission to the examinations is obtained by attaining a proof of participation issued by the school director after compliance with the requirements of the relevant curriculum and/or module (see general rules).

N.2.28.3 Module mark

The module mark (see general rules) is calculated from the participation mark and the examination mark at the ratio 1:1 unless otherwise stated in the description of the curriculum in which the relevant module is found.

N.2.28.4 Pass requirements

Passing modules and a curriculum takes place in terms of the general rules of this Calendar.

N.2.28.5 Repetition of modules

See General rules.

N.2.28.6 Termination of studies

See General rules.

N.3 RULES FOR THE DEGREE HONOURS BACHELOR OF ARTS

Qualification codes

The honours degree follows on a 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 programme they intend to take 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.

N.B. Lectures for honours modules in the Faculty of Natural Sciences are presented full-time only.

N.3.1 DURATION OF STUDIES

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.

N.3.2 ADMISSION AND REGISTRATION

The studies may be undertaken in a study programme approved by the Faculty Board. These study programmes are set out in N.4.7. Apart from the provisions in A.4.1 and A.12 the additional requirements set out in the relevant curricula in N.4.7 have to be complied with.

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

N.3.3 ASSUMED PRIOR LEARNING

The student has already obtained an appropriate baccalaureus degree of which he/she has taken at least 60 module credits at NQR level 7 in the core subject of the relevant honours programme for which he/she 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.B.A. studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

N.3.4 STUDY PROGRAMME

Save for exceptions that the Dean might approve the honours degree may be taken in the following possible study programme: Environmental Sciences with curricula from the School of Environmental Sciences and Development.

N.3.5 EXIT LEVEL OUTCOMES

The outcomes described regarding the first Baccalaureus Artium degree are still striven after in this Honours Bachelor of Arts, with special reference to a specific discipline or a few disciplines from human 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.

N.3.5.1 Natural science, human science and technology problem solving

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

N.3.5.2 Applying fundamental and expert knowledge

At the end of the studies the student will have abilities to integrate a basic knowledge and techniques from natural sciences, human sciences 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:

a) application of natural science and human science knowledge and methods (with emphasis on those of the specific discipline) to problems by the appropriate use of -

i) formal analysis and modelling of human activities and natural phenomena, systems and problems;

ii) communication of theories, concepts and ideas;

iii) discussions about and conceptualisation of human activities and natural phenomena, systems and problems;

iv) management of uncertainties and risks by utilising statistical principles and methods;

v) computer skills and information technology;

b) implementation of principles, laws and techniques of natural sciences and human sciences (with emphasis on those of the specific discipline) at the fundamental level to -

i) identify and solve open business and community problems;

ii) identify and utilise applications;

iii) make use of common fundamental expertise across the boundaries of disciplines.

N.3.5.3 Investigations, experimenting and data analysis

At the end of the studies the student will be able to –

a) plan and perform investigations and experiments by utilising scientific modelling techniques;

b) analyse, interpret and derive information from data.

The student will have a limited knowledge of the fundamental research methodology of the specific discipline.

N.3.5.4 Scientific methods, skills and information technology

At the end of the studies the student will be able to -

a) apply appropriate scientific methods and to evaluate the results obtained;

b) use computer software for calculations, modelling, simulation and handling of information, including –

i) the evaluation of the appropriateness and limitations of software;

ii) the correct application and functioning of software;

iii) 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.

N.3.5.5 Professional and general communication

At the end of the studies the student will be able to –

a) communicate effectively both orally and in writing with scientists (with emphasis on those of 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 sciences and economic sciences (with emphasis on those of the specific discipline).

N.3.5.6 Impact of natural science and human science activities on the community and environment

The student will be critically aware of -

a) the impact of natural science and human science activities (especially those of the specific discipline) on the community and the environment;

b) the necessity to take into account in natural science and human science activities –

i) the impact of technology on the community and

ii) the personal, social and cultural values and expectancies of those people on whom scientific activities have an influence.

N.3.5.7 Team and multidisciplinary work

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.

N.3.5.8 Lifelong learning

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.

N.3.5.9 Professional ethics and practice

The student will be 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 will be able to make judgements according to his/her knowledge and experience.

N.3.5.10 Programme outcomes

On completing these curricula the postgraduate will be able to provide proof that he/she has the following knowledge, skills and values:

a) the ability to retrieve subject-specific and general environmental scientific knowledge and to apply skills at limited levels;

b) the ability to independently plan and conduct research on a limited scale, to collect, process and analyse data, and to write down these findings in a report and present them orally;

c) the ability to apply the knowledge and skills acquired in these studies meaningfully for the benefit of the national economy and the land and its people, as an entrepreneur or in a specific work situation;

d) the ability to act as a leader in the local or general community;

e) 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.

N.3.6 ARTICULATION POSSIBILITIES

a) On successfully completing the Hons.B.A. programme the student may be admitted to further learning for the Master's of Environmental Sciences 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 the different disciplines in which the qualification may be taken will equip the student to continue with further learning in several specialist areas at other institutions.

N.3.7 PROGRAMME: ENVIRONMENTAL SCIENCES

SCHOOL: ENVIRONMENTAL SCIENCES AND DEVELOPMENT

Qualification code: 102170

N.3.7.1 Curriculum N645P: Geography and Environmental Management

This curriculum consists of the following modules that are divided into two semesters:

Compulsory modules			
Module code	**Module name**	**Semester**	**Cr**
OMBO611	Introduction to Environmental Management	1	16
OMBO674	Environmental Management	Year	24
OMBO675	Environmental Analysis	Year	24
OMBE672	Research project	Year	32
	Total compulsory modules		**96**
Elective modules			
	Student selects 2 of the following modules		
OMBO613	Introduction to GIS	1	16
OMBO614	GIS Applications (full-time only)	1	16
OMBE621	Hydrology (full-time only)	2	16
HOBR612	Public Management and Leadership	1	16
HOBR623	Public Performance Management	2	16
	Total elective modules		**32**
Total Curriculum			**128**

N.3.8 EXAMINATIONS

The examination opportunities and related rules are set out in the general rules.

N.3.8.1 Admission to examinations

Admission to the examinations is obtained by attaining a proof of participation issued by the school director after compliance with the requirements of the relevant curriculum and/or module (see general rules).

N.3.8.2 Compilation of the participation mark

A participation mark for a module (see general rules) may be compiled from tests, assignments and other forms of assessment.

N.3.8.3 Module mark

The module mark (see general rules) is calculated from the participation mark and the examination mark at the ratio 1:1 unless otherwise stated in the description of the curriculum in which the relevant module is found.

N.3.8.4 Pass requirements

Passing modules and a curriculum takes place in terms of the general rules of this Calendar.

N.3.8.5 Repetition of modules

See general rules.

N.3.8.6 Termination of studies

General rules apply here.

N.4 RULES FOR THE DEGREE MAGISTER SCIENTIAE

The M.Sc. degree is a qualification that may follow on a four year baccalaureus degree or another recognised degree approved by the Dean.

Studies may be taken full-time or part-time.

Prospective students must, before the date as set by the relevant research director in consultation with the relevant school director, 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 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.

N.B. Lectures for the lectured modules for this degree in the Faculty of Natural Sciences are with a single exception presented full-time only.

N.4.1 INTRODUCTION

Research in the Faculty of Natural Sciences is managed in research entities... The research entities deal with the master's and Ph.D. training curricula, i.e. curricula that contain a considerable research component. Currently three research units fall under the Faculty of Natural Sciences, viz. the Research Unit for Business Mathematics and Informatics, Environmental Sciences and Management and the Research Unit for Space Physics, as well as one research focus area, viz. the Research Focus Area of Chemical Resource Beneficiation.

Except for very rare exceptions, which must be approved by the Dean, research that is required for a master's dissertation or minidissertation must be conducted within a research entity. In the following table the most important connections between schools, centres, subject groups and the corresponding research entities are represented.

School/Centre	Subject group	Research entity
School of Physical and Chemical Sciences	Biochemistry	Human Metabonomics
	Chemistry	Chemical Resource Beneficiation
	Physics	Space Physics
	Natural Science, Mathematics and Technology Education	Business Mathematics and Informatics

School/Centre	Subject group	Research entity
School of Environmental Science and Development	Zoology Geography and Environmental Studies Geology Microbiology Botany Urban and Regional Planning	Environmental Sciences and -Management
School of Computer, Statistical and Mathematical Sciences	Computer Science Statistics Applied Mathematics Mathematics	Business Mathematics and Informatics
Centre for Business Mathematics and Informatics	Actuarial Sciences Business Mathematics and Informatics Risk Analysis	Business Mathematics and Informatics

The Master's curricula that are presented in the Faculty of Natural Sciences are in this calendar classified in the research entity under which the research component of the programme falls.

N.4.2 DURATION OF THE 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 four 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.

N.4.3 ASSUMED PRIOR LEARNING

The student has already obtained an appropriate four year baccalaureus degree.

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 M.Sc. studies on the strength of knowledge and skills acquired by prior learning and work experience.

Programme-specific assumed prior learning is, where applicable, indicated in each of the programme descriptions.

N.4.4 ADMISSION AND REGISTRATION

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 unit 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.

N.4.5 APPROVAL OF THE STUDY PROGRAMME

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**.

N.4.6 ARTICULATION POSSIBILITIES

a) On successful completion of most of the M.Sc. 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.

b) 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.

c) 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.

d) Programme-specialised articulation possibilities will be indicated, where applicable, in the programme descriptions.

N.4.7 CHANGING FROM MASTER'S STUDIES TO DOCTORATE STUDIES

The general rules 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.

N.4.8 EXIT LEVEL OUTCOMES

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:

a) identification and formulation of a problem statement;

b) thorough investigation of existing knowledge as reflected in appropriate scientific literature;

c) appropriate research to solve the problem;

d) scientific evaluation of the results in the context of the problem statement;

e) scientific communication of the results in the form of a minidissertation, research report or dissertation.

N.4.8.1 Natural science (including mathematical and computer) and technological problem solving

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.

N.4.8.2 Applying fundamental and expert knowledge

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:

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 -

i) formal analysis and modelling of human activities and natural phenomena, systems and problems;

ii) communication of theories, concepts and ideas;

iii) discussions and conceptualisation of human activities and natural phenomena, systems and problems;

iv) management of uncertainties and risks by utilising statistical principles and methods;

v) computer skills and information technology.

b) use of principles, laws and techniques of natural sciences and health sciences (with emphasis on those of the specific discipline) at the fundamental level to -

i) identify and solve open business and community problems;

ii) identify and utilise applications;

iii) work with common fundamental expertise across the boundaries of disciplines.

N.4.8.3 Investigations, experiments and data-analysis

At the end of the studies the student will be able to -

a) plan and perform investigations and experiments by utilising scientific modelling techniques;

b) analyse, interpret and derive information from data.

The student will have a limited knowledge of the fundamental research methodology of the specific discipline.

N.4.8.4 Scientific methods, skills and information technology

At the end of the studies the student will be able to -

a) apply appropriate scientific methods and to evaluate the results delivered;

b) use computer software for calculations, modelling, simulation and handling of information, including -

i) evaluation of the appropriateness and limitations of software;

ii) correct application and functioning of software;

iii) 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.

N.4.8.5 Professional and general communication

At the end of the studies the student will be able to -

a) communicate effectively both orally and in writing with scientists (with emphasis on the specific discipline) and the community by using the appropriate structure, style and graphic and electronic support;

b) apply methods of information communication for use by others, especially in the world of natural sciences and health sciences (with emphasis on those of the specific discipline).

N.4.8.6 Impact of natural science activities on the community and environment

The student is 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 and health science activities

i) the impact of technology on the community and

ii) the personal, social and cultural values and expectancies of those people influenced by the scientific activities.

N.4.8.7 Team and multidisciplinary work

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.

N.4.8.8 Lifelong learning

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.

N.4.8.9 Professional ethics and practice

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.

N.4.9 PROGRAMMES IN THE RESEARCH UNIT FOR BUSINESS MATHEMATICS AND INFORMATICS AND THE CENTRE FOR BUSINESS MATHEMATICS AND INFORMATICS

N.4.9.1 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 M.Sc. studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

a) For an M.Sc. 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:

b) An honours baccalaureus degree in Mathematics in which Statistics has been taken at level 7 grants admission to Statistics.

c) A four-year Baccalaureus degree in Engineering with Applied Mathematics at level 7 grants admission to Applied Mathematics.

d) For admission to the curricula N809P-N811P in Business Mathematics and Informatics (BMI) above and beyond the assumed prior learning as stated in the general programme description of the M.Sc. programme a student is also required to have taken the Hons.B.Sc. qualification in Business Mathematics and Informatics, subject to the following specific prerequisites:

Magister curriculum	Honours curriculum
N809P	N610P or N609P
N810P	N611P
N811P	N612P

Switching between the curricula may take place in consultation with the centre director.

e) Apart from the prerequisites specified for admission in N.4.9.1 (d) students may be refused to be admitted to the postgraduate BMI qualifications N809P, N810P and N811P if the Centre should have insufficient capacity to handle the accompanying projects (BWIN826). 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.

f) For the M.Sc. in Risk Analysis (N865P) the candidate must already have obtained an honours degree in mathematical sciences with theoretical or practical experience in risk analysis.

N.4.9.2 Programme-specific articulation possibilities

N.4.9.2.1 M.Sc. curricula N861P-808P in Computer Science, Statistics, Applied Mathematics and Mathematics

a) On successful completion of the M.Sc. programme the student will have direct access to further learning for the doctoral degree at NQF level 10.

b) 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.

c) 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.

N.4.9.2.2 M.Sc. curricula N809P-N811P in Business Mathematics and N865P in Risk Analysis

This M.Sc. curriculum's grants admission to a Ph.D. in Risk Analysis.

N.4.10 PROGRAM: COMPUTER SCIENCE

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203155

N.4.10.1 Curriculum N861P: Computer Science

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
First Semester		
ITRN872	Dissertation	100
RSWW811	Research Methodology	8
Selects in consultation with the research director and the school director TWO other modules from the following list:		
ITRW876	Databases	32
ITRW877	Decision Support Systems	32
ITRW878	Artificial Intelligence	32
ITRW883	Image Processing	32
ITRW884	Information Systems Engineering	32
ITRW885	Computer Security	32
ITRW886	Data Warehouses	32
Second Semester		
ITRN872	Dissertation (continue)	
RSWW821	Research Communication	8
	Total number of credits	**180**

N.4.10.2 Curriculum N802P: Computer Science

Please note that this curriculum is closed for new entries from 2010 onwards.

This curriculum is compiled as follows: the student selects ITRW82 (Research Project) and in consultation with the research director and the school director THREE other modules from the following list:

Module code	Descriptive name	Credits
ITRW882	Research Project	32
ITRW874	Parallel Computing	32
ITRW875	Mathematical Programming	32
ITRW876	Databases	32
ITRW877	Decision Support Systems	32
ITRW878	Artificial Intelligence	32
ITRW879	Integer Programming	32
ITRW881	Capita Selecta**	32
ITRW611 and ITRW621*	Data Warehouses I and Data Warehouses II	16 + 16 = 32
ITRW614 and ITRW624*	Information Systems Engineering I and Information Systems Engineering II	16 + 16 = 32
ITRW615 and ITRW625*	Computer Security I and Computer Security II	16 + 16 = 32
ITRW617 and ITRW627*	Image Processing I and Image Processing II	16 + 16 = 32
	Total number of credits	**128**

*In this curriculum both these two modules must both be taken to acquire the 32 credits.

**Select in consultation with the research and school directors one advanced topic on master's level from the following: Databases, Data mining, Image processing, Decision support systems, System development methodologies, Mathematical Programming.

N.4.11 PROGRAM: STATISTICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203156

N.4.11.1 Curriculum N862P: Statistics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
First Semester		
STTN872	Dissertation	100
RSWW811	Research Methodology	8
Select in consultation with the research director and the school director TWO other modules from the following list:		
STTK874	Advanced Resampling Methods	32
STTK875	Advanced Statistical Models	32
STTK876	Advanced Multivariate Statistics	32
STTK877	Advanced Probability Theory	32
STTK878	Advanced Time Series Models	32
STTK879	Advanced Stochastic Processes	32
STTN874	Advanced Survival Models	32
Second Semester		
STTN872	Dissertation (continue)	
RSWW821	Research Communication	8
	Total number of credits	**180**

N.4.12 PROGRAM: APPLIED MATHEMATICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203157

N.4.12.1 Curriculum N863P: Applied Mathematics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
First Semester		
TGWN872	Dissertation	100
RSWW811	Research Methodology	8
Select in consultation with the research director TWO modules from the following list:		
TGWS874	Numerical Analysis	32
TGWS875	Modelling of Financial Systems	32
TGWS876	Optimization of Financial Systems	32
TGWS877	Advanced Optimization	32
TGWS878	Control Theory of Mechanical Systems	32
Second Semester		
TGWN872	Dissertation (continue)	
RSWW821	Research Communication	8
	Total number of credits	**180**

N.4.13 PROGRAM: MATHEMATICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203158

N.4.13.1 Curriculum N864P: Mathematics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
First semester		
WISK872	Dissertation	100
RSWW811	Research methodology	8
Select in consultation with the research director TWO modules from the following list:		
WISN874	Operator theory	32
WISN875	Functional analysis	32
WISN876	Riesz space theory	32
WISN877	Topological vector spaces	32
WISN878	Advanced linear algebra	32
Second semester		
WISK872	Dissertation (continue)	
RSWW821	Research communication	8
	Total number of credits	**180**

N.4.14 PROGRAM: QUANTITATIVE RISK MANAGEMENT

CENTRE: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203181

N.4.14.1 Curriculum N809P: BMI (Quantitative Risk Management) (following on Hons.B.Sc. N609P or N610P)

This curriculum consists of the following modules that are divided into two semesters:

Module code	Descriptive name	Credits
First semester		
BWIN811	Practical Risk Management SAS RD	16
BWIN815P	Industry Integration Project	32
	Elective Module #NQF level 9	16
	Elective Module #	16
	Elective Module#	12/16
Second semester		
BWIN826	Industry Directed Research Project	80
	Elective Module #	12/16
	Total number of credits	**184/192**

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

Module code	Descriptive name	Credits
BWIN615	Financial Modelling I	16
ITRI612	Linear Programming I	12
BWIN816	Modern Portfolio Theory	16
BWIN817	Retail Credit Risk	16
BWIN813	Practical Data Mining	16
BWIN818	Topical research issues in risk analysis	16
BWIA811*	Enterprise-wide Risk Management	16
BWIA812*	Enterprise-wide Risk Management I	24
BWIA813	Finance and Investments (F105/ST5)	24

- * Students take only BWIA811 or BWIA812. At least one of the elective modules must be on NQF level 9.

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

Module code	Descriptive name	Credits
BWIN625	Financial Modelling II	16
BWIN621	Quantitative Risk Analysis II	16
ITRI622	Linear Programming II	12
BWIA821	Enterprise-wide Risk Management	16

The integrated assessment of this curriculum takes lace during the assessment of the module BWIN826. At least one of the elective modules must be on NQF level 9.

N.4.15 PROGRAM: FINANCIAL MANAGEMENT

CENTRE: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203182

N.4.15.1 Curriculum N810P: BMI (Financial Mathematics) (following on Hons. B.Sc. N611P)

This curriculum consists of the following modules divided into two semesters:

Module code	Descriptive name	Credits
First semester		
BWIN812	Pricing of Derivatives B	16
BWIN811	Practical Risk Analysis	16
BWIN815P	Industry Integration Project	32
	Elective Module[# NQF level 9]	16
	Elective Module [#]	12/16
Second semester		
BWIN826	Industry Directed Research Project	80
	Elective Module [#]	12/16
	Total number of credits	**184/192**

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

Module code	Descriptive name	Credits
BWIN615	Financial Modelling I	16
ITRI612	Linear Programming I	12
BWIN817	Retail Credit Risk	16
BWIN818	Topical research issues in Risk Analysis	16
BWIN614	Investment Theory I	16
BWIN611	Quantitative Risk Analysis I	16
BWIA811	Enterprise-wide Risk Management	16

[#]The elective module in the second semester is chosen from the modules in the following table. At least one of the elective modules must be on NQF level 9.

Module code	Descriptive name	Credits
BWIN625	Financial Modelling II	16
ITRI622	Linear Programming II	12
STTN623	Multivariate Statistics	12
STTN624	Discrete Data Analysis	12
BWIA821	Enterprise-wide Risk Management	16

The integrated assessment of this curriculum takes lace during the assessment of the modules BWIN826. At least one of the elective modules must be on NQF level 9.

N.4.16 PROGRAM: DATA-MINING

CENTRE: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203183

N.4.16.1 Curriculum N811P: BMI (Data Mining) (following on Hons. B.Sc. N612P)

This curriculum consists of the following modules that are divided into two semesters:

Module code	Descriptive name	Credits
First semester		
BWIN813	Practical Data Mining	16
BWIN815P	Industry Integration Project	32
	Elective Module #NQF level 9	16
	Elective Module #	16
	Elective Module #	12/16
Second semester		
	Elective Module #	12/16
BWIN826	Industry Directed Research Project	80
	Total number of credits	**184/192**

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

Module code	Descriptive name	Credits
BWIN615	Financial Modelling I	16
ITRI612	Linear Programming I	12
ITRI618	Decision Support Systems I	12
BWIN816	Modern Portfolio Theory	16
BWIN817	Retail Credit Risk	16
BWIN614	Investment Theory I	16
BWIN613	Financial Engineering I	16
BWIA811	Enterprise-wide Risk Management	16

#The elective module in the second semester is chosen from the modules in the following table. At least one of the elective modules must be on NQF level 9.

Module code	Descriptive name	Credits
BWIN625	Financial Modelling II	16
ITRI628	Decision Support Systems II	12
ITRI622	Linear Programming II	12
BWIN623	Financial Engineering II	16
STTN624	Discrete Data Analysis	12
ITRI624	Information Systems Engineering II	12
BWIA821	Enterprise-wide Risk Management II	16

The integrated assessment of this curriculum takes place during the assessment of the module BWIN826. At least one of the elective modules must be on NQF level 9.

N.4.17 PROGRAM: BUSINESS MATHEMATICS AND INFORMATICS

CENTRE: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203127

N.4.17.1.1 Curriculum N865P in Risk Analysis

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.

Module code	Descriptive Name	Credits
First Semester		
BWIN872	Dissertation	132
RSWW811	Research Methodology	8
Select in consultation with the research director and director of the Centre for BMI one of the following modules:		
BWIN611	Quantitative Risk Analysis I	16
BWIN613	Financial Engineering I	16
BWIN615	Financial Modelling I	16
BWIN811	Practical Risk Management SAS RD	16
BWIN812	Pricing of Derivatives B	16
BWIN813	Practical Data Mining	16
BWIN816	Modern Portfolio Theory	16
BWIN817	Retail Credit Risk	16
BWIN818	Topical Research issues in Risk Analysis	16
BWIA811	Enterprisewide Risk Management I	16
Semester 2		
BWIN872	Dissertation (continue)	
RSWW821	Research Communication	8
Select in consultation with the research director and director of the Centre for BMI one of the following modules:		
BWIN621	Quantitative Risk Analysis II	16
BWIN622	Pricing of Derivatives A	16
BWIN623	Financial Engineering II	16
BWIN625	Financial Modelling II	16
BWIA821	Enterprise wide Risk Management II	16
	Total number of credits	**180**

N.4.18 PROGRAM: SPACE PHYSICS

RESEARCH UNIT: SPACE PHYSICS

Qualification code: 203128

All of the modules described in the curricula below are not necessarily presented every year. The school director decides in consultation with the research director which modules may be taken in each semester.

Capita Selecta may replace the contents of two of the modules in curriculum N866P in consultation with the school director and the research director.

N.4.18.1 Curriculum N866P: Physics (following on Hons.B.Sc.)

Module code	Descriptive name	Credits
FSKS872	Dissertation	132
First semester		
FSKM811	Astrophysics I	16
FSKM812	Transport Theory	16
FSKM813	Astrophysics II	16
FSKM814	Heliospheric Physics	16
FSKM815	Capita Selecta I*	16
Second semester		
FSKS872	Dissertation (continue)	
FSKM821	General Relativity	16
	Total number of credits	**180**

*Select in consultation with the school director one of the following: Space Physics or Nuclear Physics or Solid State Physics.

N.4.18.2 Curriculum N867P: Astrophysics and Space science

This curriculum is taken by students in the National Astrophysics and Space Science Programme (NASSP). It is compiled from FSKB872 and lectured modules. The lectured modules, which represent 60 credits, are presented and examined by the NASSP consortium and are selected from the 12 and 24 credit modules in the list following below. **Students are permitted to start on the dissertation only after they have passed all of the lectured modules**.

Module code	Descriptive name	Credits
FSKB874	Plasma Physics	12
FSKB875	Magnetohydrodynamics	12
FSKB876	Current topics in Cosmology	12
FSKB877	Cataclysmic variables	12
FSKB878	Extragalactic astronomy and galactic dynamics	12
FSKB879	Advanced General Relativity	12
FSKB880	High energy astrophysics and pulsars	12
FSKB881	General Astrophysics 1	24
FSKB882	Stellar structure and -evolution	12
FSKB883	Observation techniques	12
FSKB884	Space technology	24
FSKB885	Geomagnetism and Aeronomy	12
FSKB886	Computational Astrophysics	12
FSKB872	Dissertation	132
	Credits for selective modules	60
	Total number of credits	**190**

N.4.19 PROGRAM: CHEMISTRY

RESEARCH FOCUS AREA: CHEMICAL RESOURCE BENEFICIATION

Qualification code: 203123

There are five research areas in this research entity and a research topic for a M.Sc. dissertation must therefore be selected from one of these research areas. The research areas are:

a) Chromium Technology

b) Catalysis and Synthesis

c) Membrane Technology

d) Platinum Group Metal Chemistry

e) Coal- and Femtochemistry

N.4.19.1 Curriculum N868P: Chemistry

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
CHEN872	Dissertation	132
CHEN874	Advanced Chemistry*	48
	Total of credits of the curriculum	**180**

*Select in consultation with the research director a topic at the M-level from the subject Chemistry.

N.4.20 PROGRAM: BIOCHEMISTRY

Centre for Human Metabonomics

Qualification code: 203132

N.4.20.1 Curriculum N869P: Biochemistry

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
BCHN872	Dissertation	135
BCHN876	Biochemical research methogology	45
	Total of credits of the curriculum	**180**

#Select in consultation with the research director a Biochemistry topic on Master's level.

N.4.21 PROGRAMME: ENVIRONMENTAL SCIENCES

RESEARCH UNIT ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 203194

This curriculum can only be followed if a student already has an appropriate honours degree.

The topic of a M.Sc. dissertation must be selected in conjunction with the directors of the School and Research Unit, from one of the followed research fields:

a) Environmental management: environmental analysis, environmental hydrology, determining environmental impact, environmental economy, geographic information systems, integrated environmental management; distance observation.

b) Ecological remediation and sustainable utilisation: Anthropogenetic environmental impacts, bio-remediation, sustainable utilisation; environmental remediation and restoration, ecophysiology, ecotoxicology; plant and animal parasitism, urban ecology.

c) Water sciences and management: Phycology, industrial microbiology and fermentation biotechnology, water health, paracitology and epidemiology; water management and water purification, water treatment, aquatic ecotoxicology, aquatic ecophysiology, microbic ecology, biodiversity and limnology.

d) Biodiversity and Conservation Biology: threatened species, conservation management, biodiversity studies, biodiversity collections, biogeography, demography, ecology, evolution, phylogenetics, behaviour ecology, genome analysis, monitoring and taxonomy.

e) Plant protection: pest phenology, damage symptoms, principles of integrated pest management, levels of harmfulness, threshold values, biodiversity, population ecology in agricultural systems, Insecta, Acari and Nematoda.

N.4.21.1 Curriculum N830P: Environmental Sciences (Full-Time and Part-Time)

This curriculum is composed of the following

Module code	Descriptive name	Credits
OMWN871	Dissertation	180
Total credits for the curriculum		**180**

NB: For further programmes in the Research Unit Environmental Sciences and Management readers are referred to N.5 and N.6.

N.4.21.2 Curriculum N831P: Chemistry

This curriculum is composed of the following:

Module code	Descriptive name	Credits
CHEM871	Dissertation	180
Total credits for the curriculum		**180**

N.4.22 PROGRAMME: ZOOLOGY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 203190

In this programme research can be conducted on any area in Zoology, although the School retains the right not to accept a candidate in instances where there does not exist sufficient capacity in the School for Environmental Sciences and Development.

N.4.22.1 Curriculum N826P: Zoology (Full-Time and Part-Time)

This curriculum is composed of the following

Module code	Descriptive name	Credits
DRKN871	Dissertation	180
Total credits for the curriculum		**180**

N.4.23 PROGRAMME: GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 203193

In this programme research can be conducted on any aspect of Geography and environmental management, although the School 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.

N.4.23.1 Curriculum N829P: Geography and Environmental Management (Full-Time and Part-Time)

This curriculum is composed of the following

Module code	Descriptive name	Credits
GGFN871	Dissertation	180
	Total credits for the curriculum	**180**

NB: For further programmes in the Research Unit Environmental Sciences and Management readers are referred to N.5 and N.6.

N.4.24 PROGRAMME: MICROBIOLOGY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 203191

In this programme research can be conducted on any subject in Microbiology, although the school retains the right not to accept a candidate in instances where there is not sufficient capacity in the School for Environmental Sciences and Development.

Curriculum N827P: Microbiology (Full-Time and Part-Time)

This curriculum is composed of the following

Module code	Descriptive name	Credits
MKBN871	Dissertation	180
	Total credits for the curriculum	**180**

N.4.25 PROGRAMME: BOTANY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 203192

In this programme research can be conducted on any subject in the field of Botany, although the school retains the right not to accept a candidate in cases where there is not sufficient capacity in the School for Environmental Sciences and Development.

N.4.25.1 Curriculum N828P: Botany (Full-Time and Part-Time)

This curriculum is composed of the following

Module code	Descriptive name	Credits
PLKN871	Dissertation	180
	Total credits for the curriculum	**180**

N.4.26 PROGRAM: REACTOR PHYSICS

SCHOOL: PHYSICS

Qualification code: 203130

This is the only M.Sc. programme in the Faculty of Natural Sciences that does not belong to a research entity. The curriculum has been designed in consultation with the National Energy Council of South Africa (Necsa) to train reactor scientists for the growing nuclear energy industry of South Africa. The contents of the Capita Selecta modules are determined in consultation with the school director.

N.4.26.1 Curriculum N814P: Reactor Science*

Please note that this curriculum is closed for new entries from 2008 onwards.

A recognised honours degree in Physics or Applied Mathematics grants admission to this curriculum. This curriculum is compiled from the following modules:

Module code	Descriptive name	Credits
FSKR815	Capita Selecta I	16
FSKR816	Capita Selecta II	16
FSKR817	Capita Selecta III	16
FSKR872	Dissertation	80
	Total number of credits	**128**

*This curriculum is phased out and new registrations for N812P will therefore not be accepted in 2011.

N.4.27 PROGRAM: SCIENCE EDUCATION

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 203134

N.4.27.1 Curriculum N860P: Science Education

Prospective students must hold an applicable honours degree and a Post-Graduate Certificate in Education (PGCE).

Module Code	Descriptive name	Credits
NWON871	Dissertation	180
	Total number of credits	**180**

N.4.28 EXAMINATIONS

a) Admission to the examination in any module takes place in terms of the general rules.

b) Examinations for the master's degree are taken in terms of the provisions of the general rules.

c) A dissertation of minidissertation is submitted only with the consent of the study leader(s) (see general rules).

d) The provisions of the general rules determine the number of times that a student may present him-/herself for examinations.

e) The modules BWIN868P and BWIN825 may only be presented once for examinations due to their project nature.

N.4.29 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with the general rules of this calendar.

N.5 RULES FOR THE DEGREE MASTER OF ENVIRONMENTAL SCIENCES

Please note that this qualification is closed for new entries from 2010 onwards. Students who are registered in this programme will be permitted to complete their studies within this curriculum until the end of 2012.

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.

N.B. Lectures for the lectured modules for this degree in the Faculty of Natural Sciences are with a single exception presented full-time only.

N.5.1 INTRODUCTION

Students have two options in the Master of Environmental Sciences studies:

a) An option directed at research (Master of Environmental Studies) in curricula N820P, N821P, N822P and N 25P. This program follows on a relevant Bachelor's degree and consists of a year of theory followed by a 128 credits dissertation. Students that have completed the theoretical part of this program be allowed to exit with a B.Sc.Hons. degree only in exceptional circumstances, and only if official approval is obtained from the dean by means of a special request.

b) An option directed at environmental management in which students, on completing one of the curricula N820P-N825P, change to the Master of Environmental Sciences by following curriculum N824P (Environmental Management). This change is subject to selection. This option contains a limited research component (in the form of a 48 credits minidissertation) and the Master of Environmental Sciences is presented part-time only over two years.

Research in the Faculty of Natural Sciences is managed in research entities. The research entities are furthermore responsible for the masters (M.Sc.) and doctoral (Ph.D.) training curricula, i.e. curricula that contain a considerable research component.

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.

N.5.2 DURATION OF THE STUDIES

The minimum duration of the studies is two years full-time and three years part-time and the maximum duration is three years full-time and four years part-time, taken from the date of first registration for the relevant curriculum. In terms of the procedure set out in the general rules, the student may apply for an extension of the period of study.

N.5.3 ASSUMED PRIOR LEARNING

The student has already obtained an appropriate four year baccalaureus degree.

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 Master of Environmental Sciences studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions.

N.5.4 ADMISSION AND REGISTRATION

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 entities 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.

N.5.5 APPROVAL OF THE STUDY PROGRAMME

Approval of the study programme takes place on the grounds 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 entity.

N.5.6 ARTICULATION POSSIBILITIES

a) On completion of the theoretical section of curriculum N866P it is possible to switch to the Master's Degree in Environmental Management (Master of Environmental Management) and to complete the modules lacking for this degree. Candidates will be subject to selection.

b) A student having completed this degree may be admitted to Ph.D. studies in a core subject in which adequate credits have been obtained.

c) The general rules make provision for a student who is registered for a master's degree and has, according to the unanimous judgement of the study leader and the research and school directors concerned, attained 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.

N.5.7 EXIT LEVEL OUTCOMES

N.5.7.1 General exit level outcomes

On completion of this qualification the student ought to be able to provide proof that he/she has mastered the following skills and competencies:

a) the ability to apply subject-specific and general environmental scientific knowledge and skills in addressing environmental issues and in identifying, analysing and solving environmental issues;

b) the ability to independently plan research, collect, process, analyse and interpret data and to write down these findings meaningfully in a dissertation;

c) the ability to retrieve current knowledge and to remain at the forefront of the latest technology and experimental methods in environmental sciences;

d) the ability to apply the 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;

e) the ability to act as a leader in the local or general community;

f) 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.

N.5.7.2 Specific exit level outcomes

N.5.7.2.1 Knowledge

On completing this qualification the student ought to be able to provide proof that he/she has knowledge of and insight into a selected section of the following:

fundamental environmental management systems, impact, analysis, legislation, economics, policy and ethics; function and ecology of natural environments, including the biotic and abiotic influences on soil, water, agricultural ecosystems and air; the nature and impact of interference/disturbances, pollution and anthropogenetic influences on soil, water and air, and the bioremedy, rehabilitation or restoration thereof; ecological aspects like population dynamics and modelling, energy flow and community analysis, urban ecology, community ecology and sustainable ecosystem utilisation; ecophysiology, stress physiology, ecotoxicology; evolutionary biology of plants and animals, cladistic principles, biological nomenclature and curation of biodiversity; genome analysis, conservation biology and biogeographic patterns; molecular biology; principles of integrated plague management systems and the application of biotechnology in agriculture; biodiversity and population dynamics in natural and agricultural ecosystems and the assessment of plague phenology, damage symptoms, economic damage and threshold values; principles of chemical insect management, plant disease and weed management, as well as application methods; morphology, systematics and taxonomy of plaque organisms and interactions with plants, aspects of physico-chemical and biological properties of water and water management; aquatic toxicology, water pollution and biomonitoring, water health, as well as water purification and treatment;

environmental metabolism, bio-economic aspects of swamps/marshes and modelling; bioprocess engineering and fermentation biotechnology.

N.5.7.2.2 Skills

On successful completion of this qualification the student ought to be competent in a selected section of:

sampling methods in terrestrial and aquatic environments; chemical and biological analysis of soil and water samples; the use of analytical apparatus in modern practising of science and GIS; basic techniques in qualifying and monitoring biodiversity, as well as curation techniques; techniques in isolating and analysing genetic material; techniques in determining environmental impacts and methods of environmental impact analyses; digital processing of data, multivariate analysis, statistical analyses and other relevant computer skills; planning, collecting, analysing, interpreting data and writing down the findings in a research project or a dissertation that conforms to scientific standards; oral, written and visual communication of all forms of information; functioning in groups and applying responsible and effective self-management; creating an own frame of thought in writing a dissertation.

N.5.7.2.3 Values

On completion of this degree the student ought to be able to provide proof that he/she is familiar with the following values:

environmental, research and conservation ethics from a fundamental perspective; the development of a holistic view on the position of a specific subject in environmental sciences; appreciation of the nationally and internationally shared responsibility and stewardship regarding the management and conservation of the environment and biodiversity.

N.5.8 PROGRAMME: ENVIRONMENTAL SCIENCES

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 217104

N.5.8.1 Programme rules

a) For part-time students who, due to their work conditions, are unable to make use of the laboratories and research infrastructure of the Potchefstroom campus of North West University admission to these curricula is dependent on such students' access to an appropriate laboratory and research infrastructure.

b) On completion of the theoretical section it is possible to switch from curriculum N825P to the Master of Environmental Management degree and complete the lacking modules of the curriculum N 824P of that degree. **Candidates will be subject to selection**.

c) Programme-specific rules are, where applicable, indicated in the description of each curriculum.

N.5.8.2 Curriculum N820P: Ecological Remediation and Sustainable Utilisation (following on B.Sc.)

NOTE: **Please note that this qualification has been closed for new entries.**

The dissertation is compulsory. The student selects four of the Elective Modules A in consultation with the school director and the research director. Students from the Tourism environment elect the Elective Modules B.

Module code	Descriptive name	Credits
Compulsory modules		
OMBO611	Introduction to Environmental Management	16
OMWE611	Rehabilitation of Disturbed Areas	16
OMWE612	Anthropogenic Environmental Impacts and Biological Remediation	16
OMEW621	Sustainable Ecosystem Utilisation and Restoration	16
OMWE615	Conservation Biology	16
OMWE674	Practical Work/Project	24
Elective modules (student selects four)		
Elective Modules A		
OMWE614	Applied Soil Science	8
OMWE621	Urban Ecology	8
OMWE622	Plant Physiology and Stress-physiology	8
OMWE623	Plant Growth and Development	8
OMWE624	Animal Ecophysiology	8
OMWE627	Advanced Ecotoxicology	8
The student selects one module to the value of 8 credits in consultation with the School Director from any curriculum in this program or any other relevant module at honours level.		
Elective Modules B		
ONTP672	Ecotourism (Year module)	32
ONTP673	Marketing Tourism (Year module)	32
Dissertation		
OMWO872	Dissertation	128
	Total of credits of the curriculum	**264**

N.5.8.3 Curriculum N821P: Biodiversity and Conservation Biology (following on B.Sc.)

NOTE: **Please note that this qualification has been closed for new entries.**

The dissertation is compulsory. The student selects four of the Elective Modules A in consultation with the school director and the research director. Students from the Tourism environment elect the Elective Modules B.

Module code	Descriptive name	Credits
Compulsory modules		
OMBO611	Introduction to Environmental Management	16
OMWB611	Biodiversity: Past, Present and Future Tendencies	16
OMWB613	Systematics in Practice	16
OMEW621	Sustainable Ecosystem Utilisation and Restoration	16
OMWE615	Conservation Biology	16
OMWE674	Practical Work/Project	24
Elective modules A (student selects four)		
OMWB622	Genome Analysis and Bio-informatics	8
OMWB623	Evolutionary Biology - Plantae	8
OMWB624	Evolutionary Biology - Animalia	8
OMWB626	Evolutionary Ethology	8
OMWB628	Reconstructing Phylogenies	8
OMWB629	Biogeography	8
The student selects one module to the value of 8 credits in consultation with the School Director from any curriculum in this program or any other relevant module at honours level.		
Elective Modules B (Only for students from the tourism environment)		
ONTP672	Ecotourism (Year module)	32
ONTP673	Marketing Tourism (Year module)	32
Dissertation		
OMWO872	Dissertation	128
	Total of credits of the curriculum	**264**

N.5.8.4 Curriculum N822P: Water Sciences (following on B.Sc.)

NOTE: **Please note that this qualification has been closed for new entries.**

The dissertation is compulsory. The student selects four of the elective modules in consultation with the school director and the research director.

For OMWW612 the following ratio applies: participation mark : examination mark = 2:1.

An undergraduate module in parasitism is a prerequisite for OMWW614

Module code	Descriptive name	Credits
Compulsory modules		
OMBO611	Introduction to Environmental Management	8
OMWW611	Physical-Chemical and Biological Characteristics of Inland Water	16
OMWW612	General Aquatic Toxicology, Water Pollution and Biomonitoring	16
OMWW614	Waterbourne Diseases	16
OMWW629	Water Purification and Water Treatment	16
OMWE674	Practical Work/Project	24
Elective modules (student selects four)		
OMWW622	Environmental Metabolism	8
OMWW623	Phycology	8
OMWE627	Advanced Ecotoxicology	8
OMWW625	Wetlands	8
OMWW626	Introduction to Bioprocess Engineering / Fermentation Technology	8
OMWW627	Advanced biological waste water treatment	8
OMWE622	Plant Ecophysiology and Stress-physiology	8
OMWE624	Animal Ecophysiology	8
OMBO622	Theoretical Hydrology	8
OMBO623	Applied Hydrology (Only fulltime)	8
The student selects one module to the value of 8 credits in consultation with the School Director from any curriculum in this program or any other relevant module at honours level.		
Dissertation		
OMWO872	Dissertation	128
	Total of credits of the curriculum	**264**

N.5.8.5 Curriculum N823P: Plant Protection (following on B.Sc.)

NOTE: **Please note that this qualification has been closed for new entries.**

The dissertation is compulsory. The student selects five of the elective modules in consultation with the school director and the research director, at least 3 modules from elective modules groups A **or** B and the rest from elective modules group C.

Module code	Descriptive name	Credits
Compulsory modules		
OMBO611	Introduction to Environmental Management	8
OMWP611	Pest Phenology and Damage Symptoms	16
OMWP612	Principles of Integrated Pest Management	24
OMWP613	Economic Damage and Threshold Values	16
OMWP614	Practical Work/Project	24
Elective modules A (Acarology/Entomology)		
OMWP621	Biodiversity and Populations Dynamics and Agricultural Ecosystems	8
OMWP622	Morphology, Systematics and Taxonomy of Insects	8
OMWP623	Morphology, Systematics and Taxonomy of the Acari	8
OMWP624	Arthropoda/Plant Interactions	8
Elective modules B (Nematology)		
OMWP625	Biology and Systematics of Nematodes	8
OMWP626	Tropical and Subtropical Nematology	8
OMWP627	Nematode/Plant Interactions	8
OMWP628	Principles of Sustainable Nematode Control	8
Elective modules C (General themes)		
OMWA621	Biotechnology: Applications in Agriculture	8
OMWA622	Weeds: Interactions and Control	8
OMWA623	Plant Pathology	8
The student selects one module to the value of 8 credits in consultation with the School Director from any curriculum in this program or any other relevant module at honours level.		
Dissertation		
OMWO872	Dissertation	128
	Total of credits of the curriculum	**264**

N.5.8.6 Curriculum N825P: Environmental Analysis and Management (following on B.Sc.)

NOTE: **Please note that this qualification has been closed for new entries.**

The dissertation is compulsory. The student selects modules to the value of 40 credits from the elective modules:

Module code	Descriptive name	Credits
Compulsory modules		
OMBO611	Introduction to Environmental Management	16
OMBO672	Research Project	24
OMBO874	Environmental Management	24
OMBO875	Environmental Analysis	24
Elective modules (student selects modules to the value of 40 credits)		
OMBO613	Introduction to GIS	16
OMBO614	Applied GIS	16
OMBO622	Theoretical Hydrology	8
OMBO623	Applied Hydrology (Only fulltime)	8
SBEL421	Planning Management	16
The student selects one module to the value of 8 credits in consultation with the School Director from any curriculum in this program or any other relevant module at honours level.		8
Dissertation		
OMBO872	Dissertation	128
	Total of credits of the curriculum	**256**

N.5.9 EXAMINATIONS

a) Admission to the examination in any module is granted in terms of the general rules.

b) Examinations for the master's degree are taken in terms of the provisions of the general rules.

c) A dissertation or minidissertation is submitted only with the written consent of the study leader(s) (see general rules).

d) The provisions of the general rules determine the number of times that a student may present him-/herself for examinations.

N.5.10 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with the general rules of this calendar.

N.6 RULES FOR THE DEGREE MASTER OF ENVIRONMENTAL MANAGEMENT

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.

N.B. Lectures for the lectured modules for this degree in the Faculty of Natural Sciences are with a single exception presented full-time only.

N.6.1 INTRODUCTION

Research in the Faculty of Natural Sciences is managed in research entities. The research entities are furthermore responsible for the master's (M.Sc.) and doctorate (Ph.D.) training curricula, i.e. curricula that contain a considerable research component.

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.

N.6.2 DURATION OF THE STUDIES

The minimum duration of the studies is two years part-time and the maximum duration is three years part-time, taken from the date of first registration for the relevant curriculum. In terms of the procedure set out in the general rules, the student may apply for an extension of the period of study

N.6.3 ASSUMED PRIOR LEARNING

The student has already obtained an honours baccalaureus degree in Geography and Environmental Studies.

If the student does not conform to the provision of N.7.3.1 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.

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.

Programme specific assumptions are, where applicable, indicated in the programme descriptions**.**

N.6.4 ADMISSION AND REGISTRATION

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.

N.6.5 APPROVAL OF THE STUDY PROGRAMME

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.

N.6.6 ARTICULATION POSSIBILITIES

A student having completed this degree may be admitted to the Ph.D. studies in a core subject in which adequate credits have been obtained.

N.6.7 EXIT LEVEL OUTCOMES

N.6.7.1 General exit level outcomes

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:

a) 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;

b) the ability to implement environmental management systems and apply environmental standards;

c) the ability to demonstrate expertise in carrying out and applying environmental auditing, environmental impact assessments, landscape assessment and all relevant environmental assessments and analyses;

d) the ability to independently plan research, collect, process, analyse and make a résumé of data in a minidissertation;

e) the ability to retrieve current knowledge and remain at the forefront of the latest technology and experimental methods in environmental sciences;

f) 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;

g) the ability to act as a leader in the local or general community;

h) 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.

N.6.7.2 Specific exit level outcomes

N.6.7.2.1 Knowledge

On completion of the qualification the student will have a knowledge and skills to:

a) understand the concept of environmental reporting and be able to initiate the "State of the environmental" report project;

b) understand and critically evaluate "command and control" and "joint management" strategies in legislation;

c) 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;

d) understand the requirements of an integrated management system based on ISO 14001, ISO 9000:2000 and OHSAS 18001;

e) understand and plan environmental monitoring and performance evaluation;

f) know the requirements of ISO 19011 and be able to take part in an environmental audit and to manage the auditing process;

g) understand the concept of sustainable development and be able to apply the principles of Agenda 21;

h) understand in what way government structures are functioning at a local, provincial and national level;

i) understand the legal requirements of an environmental impact study;

j) be able to carry out a base line study and to carry out a screening process successfully;

k) be able to understand the process to determine significant impacts and to identify and debate different possible processes;

l) manage the public participation process successfully;

m) compile a full environmental impact report and evaluate such a report;

n) understand and manage the process of reporting on social impact;

o) understand and be able to manage the process of reporting on strategic and life cycles impact;

p) understand and manage the process of environmental risk analysis.

N.6.7.2.2 Skills

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".)

The student will further be able to:

a) independently plan, collect, analyse and interpret data and report the findings in a minidissertation that conforms to scientific standards;

b) communicate in every mode, whether orally, in writing or visually;

c) function in multidisciplinary groups and apply responsible and effective self-management;

d) develop an own frame of thought in writing reports.

N.6.7.2.3 Values

On completion of the degree the student will be able to provide proof that he/she is familiar with the following values:

a) environmental, research and conservation ethics from a grounded perspective;

b) a holistic view of the nature, structure and functioning of the environment;

c) an appreciation of the nationally and internationally shared responsibility and stewardship with regard to the management and conservation of the environment and biodiversity.

N.6.8 PROGRAMME: ENVIRONMENTAL MANAGEMENT

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 218106

N.6.8.1 Programme rules

a) This programme is presented part-time only and extends over two years.

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.

c) The closing date for applications to be admitted to this programme is the last day of September of the previous year.

d) If a student has successfully completed the compulsory modules, but not in view of completing OMBO873, the student may apply that the degree B.Sc.Hons. (Geography and Environmental Management) be conferred to him/her after the student has completed additional module(s) to the value of 48 credits from curricula N613P, N614P, N615P, N616P or N617P in consultation with the director.

N.6.8.2 Curriculum N824P: Environmental Management (following on a relevant honours degree)

The curriculum consists of:

Module code	Descriptive name	Credits
Compulsory modules		
OMBO878	Environmental Management 2	40
OMBO879	Environmental Analysis 2	40
Minidissertation		
OMBO873	Minidissertation	100
	Total of credits of the curriculum	**180**

N.6.9 EXAMINATIONS

a) Admission to the examination in any module is granted in terms of the general rules.

b) Examinations for the master's degree are taken in terms of the provisions of the general rules.

c) A dissertation or minidissertation is submitted only with the written consent of the study leader(s) (See general rules).

d) The provisions of the general rules determine the number of times that a student may present him-/herself for examinations.

N.6.10 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with general rule A.8.7 and rule N.1.8 of this calendar.

N.7 RULES FOR THE DEGREE MAGISTER COMMERCII

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.

N.B. Lectures for the lectured modules for this degree in the Faculty of Natural Sciences are with a single exception presented full-time only.

N.7.1 INTRODUCTION

The M.Com. degree is a qualification in the Faculty of Natural Sciences following on a B.Com., Hons.B.Com. degree or an appropriate B.Sc. or Hons.B.Sc. degree.

The research component of the curricula for this degree is conducted in the Research Unit for Business Mathematics and Informatics.

The studies may be undertaken full-time or part-time.

N.7.2 DURATION OF THE STUDIES

The minimum duration of the studies is one year full-time and two years part-time and the maximum duration is three years full-time and five years part-time, taken from the date of first registration for the specific programme. In the case of curricula following on a baccalaureus degree, the minimum duration is two years and the maximum duration four years. In terms of the procedure set out in the general rules, the student may apply for an extension of the period of study.

N.7.3 ASSUMED PRIOR LEARNING

The student has already obtained an appropriate baccalaureus degree and/or appropriate honours baccalaureus degree. For an M.Com. degree in a specific subject the honours baccalaureus degree in the same subject is required with the following additional requirement: an honours baccalaureus degree in Mathematics in which Statistics up to level 6 has been taken grants admission to master's studies in Statistics.

If a student does not conform to the provision of N.7.3.1 the school director determines, in consultation with the research director and if necessary after consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to the M.Com. studies on the strength of knowledge and skills acquired by prior learning and work experience that led to learning.

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions.

N.7.4 ADMISSION AND REGISTRATION

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.

N.7.5 APPROVAL OF THE STUDY PROGRAMME

Approval of the study programme takes place on the basis of the provisions in the general rules and the relevant provisions in the *Manual for Postgraduate Studies*. **Prospective students must consult this manual carefully.**

N.7.6 ARTICULATION POSSIBILITIES

On successful completion of one of these M.Com. curricula the student may be admitted to further learning for the doctorate at NQF level 8 in the core subject in which the qualification has been taken.

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

With the basic, applied and expert skills, as well as the research skills that the student has acquired with this qualification in one of the mathematical, computer and natural science disciplines, he/she will be equipped to continue in related specialist areas at other institutions.

Programme specific articulation possibilities are, where applicable, indicated in the programme descriptions.

N.7.7 CHANGING FROM MASTER'S STUDIES TO DOCTOR'S STUDIES

The general rules make provision for a student who is registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors concerned, outcomes of a quality and scope acceptable for a doctorate, to apply to the Faculty Board to change his/her registration for master's studies to that for a doctorate.

N.7.8 EXIT LEVEL OUTCOMES

Above and beyond the exit level outcomes and the critical outcomes as described in the general M.Sc. programme description (see N.4.8) the student will also have mastered the following specific knowledge and skills:

N.7.8.1 Knowledge

a) Knowledge of the research methodology and techniques in one of the subjects that will be demonstrated by writing a minidissertation or dissertation on an advanced topic.

b) Knowledge of two or more advanced topics from one or more of the subjects as indicated below:

   i) *Computer Science*: linear programming, databases, data warehouses, pseudo-intelligence, decision support systems, information systems engineering and computer security;

   ii) *Statistics*: advanced resampling methods, statistical models, multivariate statistics, probability theory, stochastic processes and survival theory;

   iii) *Mathematics:* functional analysis, operator theory, algebra, Riesz spaces and Banach latices.

N.7.8.2 Skills

On successful completion of the programme the student will be able to demonstrate that he/she has the following skills:

a) the ability to identify problems from reality with computer/mathematical/ stochastic content, formulate these in forms lending themselves to computer/mathematical/statistical handling, handle them with the most appropriate methods and communicate the solutions;

b) the ability to learn new techniques and theories necessary in solving a problem stated and to consult and use literature by so doing;

c) the ability to see problems of a computer/mathematical/stochastic nature in a broad context and to work on them in a team;

d) the ability to understand, utilise and generalise abstract theories;

e) the ability to structure arguments logically and use them coherently in effective subject communication for the benefit of the broad community when teaching computer science and information systems, statistics or mathematics up to a tertiary level;

f) the ability to act as an independent practitioner in anyone of the topics and to take the lead in standard research projects in the work context;

g) the ability to communicate with non-subject specialists in view of applying results of abstract theories in the community;

h) the ability to use appropriate computer technology and software;

i) the ability to communicate internationally with collegial peers.

N.7.9 PROGRAMME: COMPUTER, STATISTICAL AND MATHEMATICAL SCIENCES

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 505138

N.7.9.1 Curriculum N870P: Computer Science and Information Systems

Module code	Descriptive name	Credits
First semester		
ITRN872	Dissertation	100
RSWW811	Research Methodology	8
Select in consultation with the research and school directors two of the following modules:		
ITRW876	Databases	32
ITRW877	Decision Support Systems	32
ITRW878	Artificial Intelligence	32
ITRW879	Integer Programming	32
ITRW886	Data Warehouses	32
ITRW884	Information Systems Engineering	32
ITRW885	Computer Security	32
ITRW883	Image Processing	32
Second semester		
ITRN872	Dissertation (continue)	
RSWW821	Research Communication	8
Total number of credits of the curriculum		**180**

N.7.10 EXAMINATIONS

a) Admission to the examination in any module is granted in terms of the general rules.

b) Examinations for the master's degree are taken in terms of the provisions of the general rules.

c) A dissertation of minidissertation is submitted only with the written consent of the study leader(s) (See general rules).

d) The provisions of the general rules determine the number of times that a student may present him-/herself for examinations.

N.7.11 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with the general rules of this calendar.

N.8 RULES FOR THE DEGREE MAGISTER ARTIUM ET SCIENTIAE (PLANNING)

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.

N.8.1 INTRODUCTION

Research in the Faculty of Natural Sciences is managed in research entities. The research entities areas are furthermore responsible for the master's (M.Sc.) and doctorate (Ph.D.) training curricula, i.e. curricula that contain a considerable research component.

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.

N.8.2 DURATION OF THE STUDIES

The minimum duration of the studies is minimum one year and maximum two years full-time and minimum two years and maximum four years part-time, taken from the date of first registration for the relevant curriculum. In terms of the procedure set out in the general rules, the student may apply for an extension of the period of study.

N.8.3 ASSUMED PRIOR LEARNING

The student has an appropriate honours baccalaureus degree.

If the student does not conform to the provision of N.8.3.1 the school director determines in consultation with the research director, and if necessary, after consulting the Dean and with notice to the Faculty Board, whether the candidate may be admitted to the M.Art. et Scien. studies on the strength of knowledge and skills acquired by prior learning and work experience.

A student must have command of Afrikaans or English.

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions.

N.8.4 ADMISSION AND REGISTRATION

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.

N.8.5 APPROVAL OF THE STUDY PROGRAMME

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.**

N.8.6 ARTICULATION POSSIBILITIES

On taking this degree the student may be admitted to further learning for the Ph.D. degree in Urban and Regional Planning.

N.8.7 CHANGING FROM MASTER'S TO DOCTOR'S STUDIES

The general rules make provision for a student who is registered for a master's degree and has attained, according to the unanimous judgement of the study leader and the research and school directors concerned, outcomes of a quality and scope acceptable for a doctorate, to apply to the Faculty Board to change his/her registration for master's studies to that for a doctorate.

N.8.8 EXIT LEVEL OUTCOMES

On completion of this qualification the student ought to be able to provide proof that he/she has the following skills and competencies:

a) the ability to apply subject-specific and general planning knowledge and skills in addressing planning issues and in identifying, analysing and solving problems;

b) the ability to independently plan research, collect, process, analyse and interpret data and to write down these findings meaningfully in a dissertation;

c) the ability to retrieve new knowledge and to remain at the forefront of the latest technology and experimental methods in planning;

d) the ability to apply the 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;

e) the ability to act as a leader in the local or general community;

f) 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.

On completion of this degree the student may apply for membership of the professional association of planners in South Africa, viz. the South African Council for Town and Regional Planners.

N.8.9 OBJECTIVE

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 planning through further learning on NQF 10 level.

The student may after the successful completion of the degree able to apply to SACPLAN for registration. Students will enjoy national and international access to further learning within this field.

No article option will be considered due to the professional nature of the program. A complete dissertation based on research related to the core focuses within Urban and Regional Planning will have to be undertaken. Study leadership will internally be provided by a Professional Urban and Regional Planner registered with SACPLAN.

N.8.10 PROGRAM: URBAN AND REGIONAL PLANNING

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANGEMENT

Qualification code: 119102

N.8.10.1 Curriculum N825P: Urban and Regional Planning (Full-time or Part-time)

Module code	Descriptive name	Credits
SBEL871	Dissertation	180
	Total of credits for curriculum	**180**

N.8.11 EXAMINATIONS

a) A dissertation is submitted in terms of the general rules.

b) The examinations for the master's degree are taken in terms of the general rules.

c) A dissertation is submitted only with the written consent of the study leader(s) (see general rules).

d) The provisions of the general rules determine the number of times that a student may present him-/herself for examinations.

N.8.12 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with the general rules of this calendar.

N.9 RULES FOR THE DEGREE PHILOSOPHIAE DOCTOR

The Ph.D. degree is the doctor's degree in the Faculty of Natural Sciences following on a master's degree.

The studies may be undertaken full-time or part-time.

Prospective students must 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 relevant 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.

New Ph.D. students must register before 30 March of the year in which they wish to commence their studies.

N.9.1 INTRODUCTION

Research in the Faculty of Natural Sciences is managed in research entities. The research entities are responsible for the master's (M.Sc.) and doctorate (Ph.D.) training curricula, i.e. curricula that contain a considerable research component.

Currently three research units fall under the Faculty of Natural Sciences, viz. the Research Unit for Business Mathematics and Informatics, Environmental Sciences and Management and the Research Unit for Space Physics, as well as one research focus area, viz. the Research Focus Area of Chemical Resource Beneficiation.

Apart from very rare exceptions that must be approved by the Dean, research required for a doctoral thesis must therefore be conducted in the context of a research entity. In the following table the most important connections between schools, centres, subject groups and the corresponding research entity are represented.

School/Centre	**Subject group**	**Research Entity**
School of Physical and Chemical Sciences	Chemistry	Chemical Resource Beneficiation
	Biochemistry	Human Metabonomics
	Physics	Space Physics
	Natural Science, Mathematics and Technology Education	Business Mathematics and Informatics
School of Environmental Sciences and Development	Zoology Geography and Environmental Management Geology Microbiology Botany Urban and Regional Planning	Environmental Sciences and Management

School/Centre	Subject group	Research Entity
School of Computer, Statistical and Mathematical Sciences	Computer Science Statistics Applied Mathematics Mathematics	Business Mathematics and Informatics
Centre for Business Mathematics and Informatics	Actuarial Mathematics Business Mathematics Risk Analysis	Business Mathematics and Informatics

The Ph.D. curricula that are presented in the Faculty of Natural Sciences are in this calendar classified in the research entity in which the research component of the programme falls.

N.9.2 DURATION OF THE STUDIES

The minimum duration of the studies is two years and the maximum duration four years, 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.

The general rules apply to students of whom the registration for master's degree has been changed to registration for a doctor's degree (Ph.D.).

N.9.3 ASSUMED PRIOR LEARNING

The student has already obtained an appropriate master's degree.

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 Ph.D. studies on the strength of prior learning and work experience that led to learning.

Programme-specific assumed learning is, where applicable, indicated in each of the programme descriptions.

N.9.4 ADMISSION AND REGISTRATION

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.

N.9.5 APPROVAL OF THE STUDY PROGRAMME

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.**

N.9.6 ARTICULATION POSSIBILITIES

a) 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.

b) 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.

N.9.7 EXIT LEVEL OUTCOMES

The student in this programme will attain the following specific outcomes: 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; his ability to carry out the desired research in view of solving the problem; his ability to evaluate the results scientifically in the context of the problem statement; his ability to communicate the results scientifically.

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.

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.

Apart from the literature investigation the student will demonstrate that the research method is appropriate to the speciality area in view of handling the problem identified and that the research method has been selected in a reflexive and responsible manner.

By scientific *evaluation and communication of the results* the student will demonstrate the following: scientific processing of the thesis, with reference to the handling of appropriate quantitative or qualitative research methods and/or techniques, such as modelling, mathematical techniques of proof, experiments, observations, systematisation, founding of scientific statements, etc., as may be relevant to the problem investigated; the ability to formulate clearly; the ability to present a logical structure; a critical attitude and personal insight; the ability to formulate scientifically justified recommendations.

Summarised:

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.

The outcomes as described for the master's degrees are further refined and finally rounded off in this programme.

N.9.8 PROGRAMME: COMPUTER SCIENCE

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204132

N.9.8.1 Curriculum N901P: Computer Science

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
ITRW971	Thesis	360

N.9.9 PROGRAMME: STATISTICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204138

N.9.9.1 Curriculum N902P: Statistics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
STTK971	Thesis	360

N.9.10 PROGRAMME: APPLIED MATHEMATICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204139

N.9.10.1 Curriculum N903P: Applied Mathematics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
TGWS971	Thesis	360

N.9.11 PROGRAMME: MATHEMATICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204140

N.9.11.1 Curriculum N904P: Mathematics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
WISK971	Thesis	360

N.9.12 PROGRAMME: BUSINESS MATHEMATICS AND INFORMATICS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204111

Curriculum N905P: BUSINESS MATHEMATICS

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
BWIN971	Thesis	360

N.9.13 PROGRAMME: RISK ANALYSIS

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204133

Curriculum N915P: Business Mathematics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
BWIR971	Thesis	360

N.9.14 PROGRAM: SPACE PHYSICS

REASEARCH UNIT FOR SPACE PHYSICS

Qualification code: 204112

There is only one curriculum in this research unit. A topic for a thesis may be selected from one of the following research directions:

a) TeV-gamma ray astronomy;

b) radio astronomy;

c) cosmic rays in the heliosphere;

d) geomagnetic effects on electromagnetic and cosmic rays as studied by means of observations in Antarctica.

N.9.14.1 Curriculum N906P: Physics

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
FSKN971	Thesis	360

N.9.15 PROGRAMME: CHEMISTRY

RESEARCH UNIT: CHEMICAL RESOURCE BENEFICIATION

Qualification code: 204120

There are five research areas in this research entity and a research topic for a Ph.D. thesis must therefore be selected from one of these research areas. The research areas are:

a) Chromium Technology
b) Catalysis and Synthesis
c) Membrane Technology
d) Platinum Group Metal Chemistry
e) Coal- and Femtochemistry

N.9.15.1 Curriculum N907P: Chemistry

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
CHEN971	Thesis	360

N.9.16 PROGRAMME: ENVIRONMENTAL SCIENCES

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204114

The topic for a Ph.D. thesis must be selected from one of the following research fields in consultation with the directors of the School and Research Unit:

a) Environmental management: environmental analysis, environmental hydrology, determination of environmental impact, environmental economy, geographic information systems, integrated environmental management, distance observation.

b) Ecological remediation and sustainable utilisation: Anthropogenic environmental impacts, bioremediation, sustainable utilisation, environmental remediation and restoration, ecophysiology, ecotoxicology, plant and animal paracitism, urban ecology.

c) Water sciences and management: Psychology, industrial microbiology and fermentation-biotechnology, water health, paracitology and epidemiology, water management and water purification, water treatment, aquatic ecotoxicology, aquatic ecophysiology, microbic ecology, biodiversity and limnology.

d) Biodiversity and Conservation Biology: threatened species, conservation management, biodiversity studies, biodiversity collections, biogeography, demography, ecology, evolution, phylogenetics, behaviour ecology, genome analysis, monitoring and taxonomy.

e) Plant protection: pest phenology, damage symptoms, principles of integrated pest management, levels of harmfulness, threshold values, biodiversity, population ecology in agricultural systems, Insecta, Acari and Nematoda.

N.9.16.1 Curriculum N914P: Environmental sciences

Module code	Descriptive name	Credits
OMWN971	Thesis	360

N.9.16.2 Curriculum N916P: Chemistry

This curriculum is composed of the following

Module code	Descriptive name	Credits
CHEM971	Thesis	360

N.9.17 Programme: ZOOLOGY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204136

This curriculum can only be followed of the student already has an appropriate M.Sc. degree.

In this programme research can be conducted on any subject in Zoology, although the school retains the right not to accept a candidate in instances where there is not sufficient capacity in the School for Environmental Sciences and Development.

N.9.17.1 Curriculum N908P: Zoology

This curriculum is composed of the following

Module code	Descriptive name	Credits
DRKN971	Thesis	360

N.9.18 PROGRAMME: GEOGRAPHY AND ENVIRONMENTAL MANAGEMENT

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204137

This curriculum can only be followed of the student already has an appropriate M.Sc. degree.

In this programme research can be conducted on any subject in Geography, although the school retains the right not to accept a candidate in instances where there is not sufficient particular expertise among staff on the specific research topic. Specialist fields include (but are not limited to):

a) Spatial studies

b) Environmental impact analysis and all aspects thereof

c) Environmental management and all aspects thereof

d) Physical and human Geography.

N.9.18.1 Curriculum N909P: Geography and Environmental Management

This curriculum is composed of the following

Module code	Descriptive name	Credits
GGFN971	Thesis	360

N.9.19 PROGRAMME: MICROBIOLOGY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204135

This curriculum can only be followed of the student already has an appropriate M.Sc. degree.

In this programme research can be conducted on any subject in Microbiology, although the school retains the right not to accept a candidate in instances where there is not sufficient capacity in the School for Environmental Sciences and Development.

N.9.19.1 Curriculum N910P: Microbiology

This curriculum is composed of the following

Module code	Descriptive name	Credits
MKBN971	Thesis	360

N.9.20 PROGRAMME: BOTANY

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204134

This curriculum can only be followed of the student already has an appropriate M.Sc. degree.

In this programme research can be conducted on any subject in Botany, although the school retains the right not to accept a candidate in instances where there is not sufficient capacity in the School for Environmental Sciences and Development.

N.9.20.1 Curriculum N911P: Botany

This curriculum is composed of the following

Module code	Descriptive name	Credits
PLKN971	Thesis	360

N.9.21 PROGRAMME: URBAN AND REGIONAL PLANNING

RESEARCH UNIT: ENVIRONMENTAL SCIENCES AND MANAGEMENT

Qualification code: 204115

N.9.21.1 Curriculum N912P: Urban and Regional Planning

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
SBEL971	Thesis	360

N.9.21.2 Objective

The objective of the programme is to enable a student who has completed a recognized

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.

No article option will be considered due to the professional nature of the program. 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.

N.9.22 PROGRAMME: BIOCHEMISTRY

Centre for Human Metabonomics

Qualification Code: 204116

N.9.22.1 Curriculum N913P: Biochemistry

This curriculum is compiled as follows:

Module code	Descriptive name	Credits
BCHN971	Thesis	360

N.9.24 PROGRAMME: REACTOR PHYSICS

SCHOOL: PHYSICS

Qualification code: 204117

Please note that this curriculum is closed for new entries from 2011 onwards.

This Ph.D. programme in the Faculty of Natural Sciences that does not belong to a research entity. The curriculum has been designed in consultation with the National Energy Council of South Africa (Necsa) to train reactor scientists for South Africa's growing nuclear energy industry.

N.9.24.1 Curriculum N920P: Reactor Science

An M.Sc. in Reactor Science grants admission to this curriculum. This curriculum is structured from the following modules:

Module code	Descriptive name	Credits
FSKR972	Thesis	256

N.9.25 PROGRAM: SCIENCE EDUCATION

RESEARCH UNIT: BUSINESS MATHEMATICS AND INFORMATICS

Qualification code: 204118

N.9.25.1 Curriculum N921P: Science Education

Prospective students must hold an applicable masters degree and a Post-Graduate Certificate in Education (PGCE).

Module Code	Descriptive Name	Credits
NWON971	Thesis	360

N.9.26 EXAMINATIONS

a) Examinations for the doctorate are taken in terms of the provisions of the general rules.

b) Submitting the thesis takes place in terms of the general rules.

c) 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 rules.

N.9.27 PASS REQUIREMENTS

Passing modules and a curriculum takes place in accordance with general rule A.8.7 and rule N.1.8 of this calendar.