CALENDAR 2014

FACULTY OF NATURAL SCIENCES
UNDERGRADUATE

Potchefstroom Campus

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PLEASE MENTION YOUR UNIVERSITY NUMBER IN ALL CORRESPONDENCE.

The **General Academic Rules** of the University, to which all students have to subject themselves and which apply to all the qualifications offered by the University, appear in a separate publication and are available on the web page at:

http://www.nwu.ac.za/webfm_send/57621

Yearbook available on the web page at: http://www.nwu.ac.za/node/5661

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 H Swart

Administrative Manager, Faculty of Natural Sciences, June 2013

FACULTY OF NATURAL SCIENCES

OFFICIALS

DEAN

Prof JJ Pienaar, HED, DSc (PU for CHE)

SCHOOL DIRECTORS

School of Biological Sciences

Prof V Wepener, PhD (RAU)

School of Physical and Chemical Sciences

Prof CA Strydom, Pr Sci Nat, PhD (UP)

School of Geo- and Spatial Sciences

Prof F P Retief, MTRP (UFS); MEM (UFS), PhD (University of Manchester)

School of Computer, Statistical and Mathematical Sciences

Prof GJ Groenewald, Hons BSc (UWC), MSc (Univ of Illinois at Urbana-Champaign) MSc (UK), PhD (Vrije Univ at Amsterdam)

RESEARCH DIRECTORS

Unit for Business Mathematics and Informatics

Prof JH Fourie, DSc (PU for CHE), THED (PCE)

Unit for Environmental Sciences and Management

Prof L van Rensburg, PhD (PU for CHE), HED (PCE)

Centre for Space Research (Centre of Excellence)

Prof SES Ferreira, PhD (PU for CHE)

Focus Area for Chemical Resource Beneficiation

Prof HCM Vosloo, Hons BSc (UOVS), PhD (PU for CHE), HED (UOVS)

CENTRE DIRECTORS

Centre for Business Mathematics and Informatics

Prof PJ de Jongh, BCom (US), MSc (UNISA), PhD (UCT)

Centre for Human Metabonomics

Prof BC Vorster, MMed (Chem Paths), (UP)

Centre for Environmental Management

Prof JG Nel, BA (Ed), Hons BA (UPE), MA (UPE)

Administrative Manager

Mrs H Swart, BBibl (UNISA)

SUBJECT GROUP CHAIRPERSONS

Biochemistry
Prof FH van der Westhuizen, MSc (Biochem) (NWU), PhD (Biochem) (NWU)

Chemistry
Dr CE Read, PhD (Chemistry) (PU for CHE)

Zoology

Prof N Smit, PhD (UOFS)

Physics
Dr H Krüger, PhD (Physics) (NWU)

Geography and Environmental Management
Dr LA Sandham, BSc Ed (RAU), PhD (RAU)

Geology
Prof MS Coetzee, Pr Sci Nat, PhD (UFS)

Microbiology
Prof CC Bezuidenhout, Pr Sci Nat, PhD (Rhodes)

Botany
Prof SS Cilliers, PhD, HED (N), Postgraduate diploma, Terreineval (PU for CHE)

Computer Science and Information Systems
Dr E Taylor, PhD (NWU), HED(N) (PU for CHE)

Urban and Regional Planning

Dr JE Drewes, Pr Pln (A/817/1995) SS(SA) PhD (Urban and Regional Planning) (PU for CHE)

Statistics and Operational Research

Dr JS Allison, PhD (NWU)

Mathematics and Applied Mathematics

Dr EHA Venter, MSc (UP), PhD (PU for CHE)

Natural Science, Mathematics and Technology Education
Dr J Röscher, PhD (Chemistry) (NWU)

Centre for Business Mathematics and Informatics: Professional Programs

Ms J Larney, BSc Actuarial Science (US), Post Graduate Diploma Actuarial Science (UCT), FASSA, FIA, CERA

FACULTY BOARD

The Faculty Board existing of the following members:

- The Dean
- School/Centre and Research entity Directors
- Full Professors
- Subject Group Chairpersons
- One student representatives of each School
- Two representatives of designated groups of each School
- One representative from the Faculties of Economic and Management Sciences, Education Sciences, Engineering and Health Sciences
- Administrative Manager

N.1 FACULTY RULES

N.1.1 AUTHORITY OF THE GENERAL ACADEMIC RULES (A-RULES)

The faculty rules that apply to the different qualifications, programmes and curricula of the Faculty and are included in this *Calendar* are subject to the rules contained in *General Rules* of the University, as determined by the Council of the University on recommendation of the Senate from time to time, and therefore the faculty rules have to be read together with those General Rules.

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

N.1.2 EVALUATION OF ACADEMIC LITERACY

a) All Natural Sciences students (except students in curricula N134P, N135P, N136P, N137P, N183P and N150P) must register for the module AGLA111 [Afrikaans] or AGLE111 [English]. The module selected is taken into account for purposes of credits.

b) Student enrolled for the curricula N134P, N135P, N136P, N137P, N183P and N150P, must report for a compulsory test of skills in academic literacy in order that their ability to function in an academic environment may be evaluated. The purpose of the test is to identify students who, due to inadequate academic skills, run the risk of failing to complete their study program successfully within the stipulated period. Students may decide themselves whether they want to take the test in Afrikaans or English. With the exception of students identified as borderline cases by the test, each student has only one opportunity to write the test. Students regarded as borderline cases will be afforded a second opportunity. It is the student's responsibility to establish his/her results within 14 days of writing the test and to register for the correct module and in the correct semester.

c) Students who are identified as borderline cases must register for module AGLA111 [Afrikaans]/AGLE111 [English], depending on the language in which they have taken the compulsory skills test. The credits earned for these modules do not contribute to the number of credits required by a curriculum, but are regarded as additional credits.

d) To be admitted to the examination in AGLA111/AGLE111 a participation mark of 35% is required. Students, who are not admitted to the examination in AGLA111/AGLE111, or who fail the relevant examination, as well as two or more other modules, will have to be re-evaluated by the Evaluation Committee if they want to continue their studies the following semester. In order to avoid termination of studies, AGLA111/AGLE111 must be passed at the end of the second historic year at the latest.

e) Admission to module AGLA121/AGLE121, which is compulsory for all students who register at the University for the first time, requires that a student who had to complete AGLA111/AGLE111 beforehand, should obtain a module mark of at least 40% in AGLA111/AGLE111. The module AGLA121/AGLE121 carries a weight of 12 credits, which contributes to the number of credits required by the curriculum for which the student is registered. The module has to be taken in the language in which the compulsory skills test and AGLA111/AGLE111 were taken. AGLA/E121consists of three papers, viz. Academic Literacy, Computer and Information Skills and Reading Skills. There is a subminimum in each of the three components. The student must pass each of the three components in the same semester in which he/she has registered for the module in order to pass the module.

f) Students who failed the module AGLA111/AGLE111, but were allowed to continue with AGLA121/AGLE121 and who passed the examination in this module, may have the results of AGLA111/AGLE111 condoned by the relevant school director to allow for a pass mark in the module.

g) Students who have already successfully completed a module[s]/course[s] equivalent to AGLA111, AGLA121 or AGLE111, AGLE121 at another institution and can provide proof of the relevant achievement[s], may apply in writing to the **Head of the Centre for Academic and Professional Language Practice** for formal recognition thereof.

N.1.3 WARNING AGAINST PLAGIARISM

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

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

N.1.4 CAPACITY CONSTRAINTS

Please take cognisance of the fact that, owing to specific capacity constraints, the University reserves the right to select candidates for admission to certain fields of study. This means that prospective students who comply with the minimum requirements may not necessarily be admitted to the relevant courses. Because of capacity constraints and the overflow of students in certain fields of study, students will be selected for admission to these fields according to their scholastic achievements.

N.1.5 PROVISIONAL ADMISSION REQUIREMENTS FOR UNDER-GRADUATE STUDIES (POTCHEFSTROOM CAMPUS) 2013

a) GENERAL ADMISSION REQUIREMENTS

Taking due cognisance of the General Rules and faculty rules as contained in the relevant yearbooks and with specific reference to the A-rule that determines a **National Senior Certificate** has been obtained and that the minimum statutory requirements for admission to **Diploma** and/or **B-degree studies** at a university in the RSA have been complied with, the University reserves the right to consider candidates' applications on the basis or their results.

b) CALCULATION OF THE ADMISSION POINTS SCORE(APS) SCORE IN THE FACULTY OF NATURAL SCIENCES

Selection model: Determining the APS

NSC scale	APS score
8 (90-100%)	8
7 (80-89%)	7
6 (70-79%)	6
5 (60-69%)	5
4 (50-59%)	4
3 (40-49%)	3
2 (30-39%)	2
1 (0-29%)	1

APS: Admission Points Score

1. **APS score:** The results obtained in four prescribed designated and two NSC subjects are used for the calculation of the APS Score. The results obtained in Life Orientation are excluded.

2. **Language requirement:** A pass at level 4 (50-59%) in two languages, including the language of instruction on either the Home or First additional Language level.

3. **Mathematics requirement:**
   a) A student who wishes to follow any module in Mathematics, with the exception of Mathematical Techniques (WISN122, WISN113 or WISN123), must have obtained a mark of at least 60% (level 5) in the grade 12 Mathematics exam or at least 70% (level 6) in another Mathematics exam considered by the Senate as equivalent to the above.

b) **Comments:**

- Students who do not meet these requirements, but who managed to obtain a Mathematics mark of at least 50% (level 4) or at least 60% (level 5) in another Mathematics exam considered by the Senate as equivalent to the above, are admitted to a refresher course in Mathematics presented in January by the School of Computer, Statistical and Mathematical Sciences. If such students perform satisfactorily in the tests taken during this course, they may be considered for admission to Mathematical modules.

- Prospective students who do not meet the grade 12 requirement for enrolling for WISN111, and who have not attended the refresher course, can gain admission to WISN111 in the second study year by passing the module Mathematical Techniques (WISN112, WISN113 or WISN123) in the first study year, provided that persons seeking to follow this route to obtain admission to programmes that would otherwise have been inaccessible to them, should take into consideration that they may not be able to complete their studies in the minimum period.

- A student who wishes to take Mathematical Techniques (WISN112, WISN113 or WISN123), must have obtained a mark of at least 40% (level 3) in the grade 12 Mathematics exam or at least 50% (level 4) in another Mathematics exam considered by the Senate as equivalent to the above.

N.1.6 FACULTY SPECIFIC ADMISSION REQUIREMENTS

DEGREE/DIPLOMA	REQUIRED NSC SUBJECTS PLUS SELECTION CRITERIA	APS	SELECTION TEST
BSc (3 yrs.*)* **Programme: Physical and Chemical Sciences** ***(Qualification code – 200190)***			
Chemistry-Physics **N151P** Chemistry, Mathematics-Applied Maths **N152P** Physics-Mathematics **N154P** Physics-Applied Maths **N155P**	Maths level 5 (60-69%) and Physical Science level 4 (50-59%)	24	No
Chemistry-Biochemistry **N174P** Chemistry-Physiology **N177P**	Maths level 5 (60-69%) and Physical Science level 4 (50-59%)	24	No

B*Sc (3 yrs.)* ***Programme: Computer and Mathematical Sciences*** ***(Qualification code – 200191)***			
Physics-Computer Science **N153P** Computer Science-Statistics **N156P** Computer Science-Mathematics **N157P** Statistics-Mathematics **N158P** Mathematics **N159P**	Maths level 5 (60-69%) and Physical Science level 4 (50-59%)	24	No
Computer Science-Economics **N175P** Mathematics-Economics **N176P**	Mathematics level 5 (60-69%)	24	No
BSc in Information Technology *(3 yrs.)* ***Programme: Information Technology-Computer Science*** ***(Qualification code – 264100)***			
Information Technology-Computer Science **N150P**	Maths level 4 (50-59%)	24	No

BSc (3 yrs.) **Programme: Environmental and Biological Sciences** ***(Qualification code – 200118)***			
Zoology-Biochemistry– **N160P** Zoology-Chemistry – **N161P** Botany-Chemistry – **N149P** Microbiology-Biochemistry – **N167P** Microbiology-Chemistry – **N168P** Botany-Biochemistry – **N170P** Geology-Chemistry **– N180P**	Maths level 5 (60-69%) plus Physical Science at level 4 (50-59%)	24	No
Geology-Geography – **N147P** Geology-Botany **- N148P** Zoology-Geography – **N162P** Zoology-Microbiology – **N163P** Zoology-Botany **– N164P** Geography – Botany **– N165P** Geography-Computer Sciences – **N166P**	Maths 50-59% (4) plus Physical Science level 4 (50-59%)	24	No

Microbiology-Botany – **N169P** Geology-Microbiology **– N181P** Zoology-Geology **- N182P** Zoology-Physiology – **N185P** Microbiology-Physiology **N186P**			
BSc (3 yrs.*)* **Programme: Tourism *(Qualification code – 200119)***			
Tourism-Zoology-Botany **N171P** Tourism-Geography-Botany **N172P** Tourism-Geography-Zoology **N173P**	Maths 50-59% (4) plus a science subject (preferably Physical Science) passed at level 4 (50-59%)	24	No

BArt et Scien (4 yrs.) Programme: Planning *(Qualification code* – 118101)			
Urban and Regional Planning with Geography and Environmental Studies N183P	Selection: The deadline for applications is 30 June. Late applications will be considered on merit. Maths level 5 (60-69%)	28	Yes
BSc (3 yrs.) Programme: Quantitative Risk Management *(Qualification code – 200166)*			
Quantitative Risk Management N134P	Mathematics level 6 (70-79%)	32	No
BSc (3 yrs.) Programme: Financial Mathematics *(Qualification code – 200167)*			
Financial Mathematics N135P	Mathematics level 6 (70-79%)	32	No
BSc (3 yrs.) Programme: Data Mining *(Qualification code – 200168)*			
Data Mining N136P	Mathematics level 6(70-79%)	32	No
BSc (3 yrs.) Programme: Actuarial Science *(Qualification code – 200123)*			
Actuarial Science N137P	Mathematics level 6 (70-79%)	32	No

N.1.7 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 another institution, or informally (from experience), is an indispensable element in deciding on admission to and awarding credits with a view to placement in an explicitly selected teaching-learning programme of the University.
b) Recognition of prior learning concerns the provable knowledge and learning that an applicant has acquired, whether by having completed formal education programmes, or from experience. At all times the question will be what the level of the skills is, and skills will be assessed in the context of the exit level skills required by the intended teaching-learning programme or modules in the programme, or the status for which the applicant applies, and not merely by virtue of the experience recorded by the applicant. Recognition of prior learning will therefore take place in terms of applied competencies demonstrated by the applicant in his/her application, taking into consideration the exit level outcomes that have to be obtained by means of the selected teaching-learning programme.
c) North-West University accepts that recognition of prior learning can and must take place in a valid, trustworthy and fair way, within the normal existing policy on awarding credits to prospective and existing students, whether they are from this or another institution.
d) For processing an application for recognition of prior learning a non-refundable administrative levy is payable as determined by the University from time to time.

N.1.8 REGISTRATION

Registration is the prescribed completed process a student has to follow to register as a student of North-West University (see General Rule 1.3.5).

N.1.9 REGISTRATION OF ADDITIONAL MODULES

Apart from the required modules of the relevant curriculum, a student may take additional modules in terms of the provision in the General Rule 2.3.4.

N.1.10 DURATION OF STUDIES

The minimum duration of the studies for a BSc degree is three years and the maximum duration for completing the degree is four years.

N.1.11 TRAINING OF TEACHERS

The Faculty of Natural Sciences regards the training of teachers to be of such importance that information regarding the Postgraduate Certificate in Education (PGCE) is summarised below for the convenience of prospective teachers. However, students should not neglect consulting the PGCE calendar of the Faculty of Education Sciences for complete information.

The following curricula comply with the entry requirements of the PGCE:

Curriculum	Curriculum name	Field of specialisation
N161P***	Zoology-Chemistry	Physical Science
N162P*	Zoology-Geography	Life Sciences Geography
N163P	Zoology-Microbiology	Life Sciences*
N164P	Zoology-Botany	Life Sciences
N165P**	Geography-Botany	Life Sciences Geography
N166P	Geography-Information Technology	Geography Information Technology
N169P**	Microbiology-Botany	Life Sciences
N149P***	Botany-Chemistry	Physical Science
N151P	Chemistry-Physics	Physical Science Mathematics
N152P	Chemistry, Mathematics-Applied Mathematics	Physical Science Mathematics
N154P	Physics-Mathematics	Mathematics
N155P	Physics-Applied Mathematics	Mathematics
N174P	Chemistry-Biochemistry	Physical Science
N153P	Physics-Rekenaar-wetenskap	Information Technology Mathematics
N156P	Rekenaarwetenskap-	Information Technology

	Statistics	Mathematics
N157P	Rekenaarwetenskap-Mathematics	Information Technology Mathematics
N158P	Statistics-Mathematics	Mathematics
N159P	Mathematics	Mathematics
N175P	Rekenaarwetenskap-Economics	Information Technology Economics
N176P	Mathematics-Economics	Mathematics Economics

* Only if Botany II is selected.
** Only if Zoology II is selected.
*** Only if Physics I is selected.

a) Nature and aims of the PGCE

The PGCE serves as a professional 'capping' qualification for candidates who have completed an appropriate 360 or 480 credits Bachelor's degree and would like to join the education profession. With this certificate an educator can teach from Grade 7 to Grade 12.

b) Duration of studies

The minimum duration of the study is one (1) year and the maximum duration is two (2) years.

c) Method of delivery

This qualification can be taken full-time or through Open Distance Learning. Contact the Faculty of Education Sciences for more information regarding the methods of delivery.

d) Admission requirements

A first university degree with two recognised school subjects.

Students must also be able to take two (2) methodologies in order to obtain the PGCE qualification. The curriculum of the certificate must be structured as follows:

- Recognised school subject/learning area at level 3 + recognised school subject/learning area at level 2

Students must enrol for the methodologies of the subject in which he/she obtained the highest qualification.

Exceptions

A student who wants to take Life Sciences as methodology need to present one of the subjects Botany, Zoology or Physiology at level three and another of these subjects at level 2 OR two of the three subjects at level 2. Students who majored in Physiology or Botany or Zoology only are provisionally admitted to the PGCE until they passed maximally three (3) additional modules, namely LIFE 121, LIFE 211 and/or LIFE311. (The number of additional modules will be determined by the Faculty of Education Sciences.) Students that only qualify to present Life Sciences as school subject will receive the PGCE with Methodology of Life Sciences and Methodology of the Learning Area Natural Sciences. These students must register for LIFD511 and LAND521 as well as for LAND411 and ADSD521.

A student who wants to take Physical Sciences as methodology needs to present one of the subjects Chemistry or Physics on level three and the other at level 1 OR both subjects at level 2. Students that only qualify to present Physical Science as school subject will receive the PGCE with Methodology of Physical Sciences and Methodology of the Learning Area Natural Sciences. These students must register for PHSD511 and LAND521 as well as for LAND411 and ADSD521.

A student who wants to take the Methodology of Mathematics must have completed Mathematics on level 2 or otherwise Mathematics on level 1 with one of the following on level 2: Statistics, Mathematical Statistics, Applied Mathematics and Financial Mathematics. A student with only Mathematics as main subject must register for MATD511, MATD 521 as well as for MATD411 and ADSD521.

A student who wants to take the Methodology of Life Orientation must have two of the following subjects on degree level: Sociology, Psychology, Political Studies, Human Movement Science, Labour -and Industrial studies, Human Rights and Ethics and Nutrition. The student must already have a second school subject on degree level for the second methodology.

A student who wants to take the Methodology of any language must have completed that language at level 3

Students who have as yet not completed their first degree may in rare cases be admitted to the PGCE. Such students should direct applications to the applicable School Director at the Faculty of Education Sciences.

e) Directed observation

Before starting the PGCE a student must attend an approved school for preparatory work related training for at least two weeks. If there are valid reasons for a student not fulfilling this requirement, it may be undertaken earlier/later with the written consent of applicable School Director at the Faculty of Education Sciences.

N.1.12 EXAMINATIONS

a) Examination opportunities

Examination opportunities and relevant rules are in accordance with the General Rule 2.4.

b) Composition of the participation mark

The participation mark for a module (General Rule 2.4.2) is compiled from tests, assignments and practical work. For every teaching-learning task (class tests, assignments, exercises etc.) that is carried out by means of formative assessment in a module, a mark is allocated. A student's participation mark is the weighed mean of all these marks.

The relationship between theory and practical work for the calculation of the participation mark for the modules in the relevant study stated.

c) Admission to examinations

i. Admission to examinations in any module is granted by acquiring a proof of participation (see General Rule 2.4.2).

ii. In terms of the General Rule 2.4.2 a proof of participation will only be issued to a student in the Faculty of Natural Sciences if he –

- has complied with the specific requirements of the module as set out in the relevant **study guide**;
- where applicable, has completed the practical work required for a module; and
- has obtained a participation mark of at least 35% for every first level module and 40% for every second and third level module.

iii. Proof of participation obtained for a module for the first examination opportunity is transferred without any change to the second examination opportunity (see General Rule 2.4.4.3).

d) Number of examination opportunities

The General Rule 2.4.4.1 regulates the number of examination opportunities. An implication of these rules is that a student who has not passed a module with the second examination opportunity will not be entitled to exemption from classes.

Students in Actuarial Science, i.e. students taking the curriculum N137P, who would like to be considered for actuarial exemption, must write their examinations

during the first examination opportunity. Complete requirements for students in Actuarial Science may be obtained from the Director of the Centre for Business Mathematics and Informatics.

e) Module mark

The module mark for every module is calculated (see General Rule 2.4.4.3) from the participation mark and the examination mark at the ratio of 1:1.

f) Pass requirements of a module and a curriculum

The terms and conditions for passing modules and curricula are set out in the General Rule 2.4.3.

The subminimum for all modules in the examination is 40%.

Where a first-semester module (in the first year) has been failed with a module mark of not less than 40% and a second-semester module in the same subject, which follows on it and for which it is prescribed as assumed learning, is passed, the school director may award a pass mark of not more than 50% in that first-semester module. (This applies only for first year modules).

g) **Attainment of qualification (See General Rule 2.5.1)**

With reference to General Rule 2.5.2 a B-degree is obtained with distinction , where the student completes the degree in the minimum period and has achieved an average of at least 75% in the following core modules:

In a 3 year curriculum, the third level modules in the final year of the curriculum.

In a 4 year curriculum, the fourth level modules in the final year of the curriculum.

For purposes of calculating the average, modules completed at other institutions and that are recognised as such by the NWU, must be taken into account.

h) Relation between credits and teaching periods

With regard to practical work (for example Chemistry, Physics, Zoology etc.), four continuous periods every second week are allocated for practical work at the first year level and four continuous periods per week at the second and third year level. Depending on the nature of the different subjects, deviations from this guideline might be found.

i) Relation between credits and examination papers

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

j) Progress in a curriculum based on prerequisites

In compiling each curriculum care has been taken that assumed learning, i.e. the necessary prior knowledge and the general level of insight and experience needed to complete the modules prescribed with ease in a specific semester of a curriculum, has been acquired in the preceding semesters. A student having failed one or more modules in a preceding semester will therefore 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 may take with a reasonable expectancy of success.

The aim of the rules below is to make sure that a student in any semester will only take those modules of which he has the minimum prior knowledge.

In the Faculty of Natural Sciences, a student may only get started on a new curriculum at the beginning of the first semester of the first study year of a curriculum. When students change from one curriculum to another, the entrance level in the new curriculum will have to be determined in consultation with the director of the school under which the relevant curriculum falls.

A module in any subject may only be taken if it conforms to the requirements regarding the assumed learning, as indicated in the list of modules of the relevant subject.

k) Termination of studies

In terms of the General Rule 2.4.8, the rules below apply in the Faculty of Natural Sciences. Students who have to apply for readmission in terms of these rules probably have neither the ability nor the motivation to complete the relevant curriculum successfully.

A student who has obtained *less* than half of the credits of year level 1 of a curriculum must apply for readmission. If this application is successful, the student will have to plan his curriculum for the second study year in consultation with the school director or his delegated.

A student who, having completed his second historic study year, has not yet obtained half of the prescribed credits of the first two years of a curriculum, must apply for readmission. If the application is successful, the student will not be permitted to take any modules from year level three in his historic third study year, but he will only be allowed to register for the lacking modules of year levels 1 and 2.

A student who, having completed his third historic study year, has not yet obtained all of the credits of the first two study years of the curriculum, must apply for readmission. If this application is successful, the student's curriculum for his fourth study year will have to be planned in consultation with the director of the relevant school.

Important:: No student's studies will be terminated in terms of these faculty rules before he and/or his parents have been invited in writing to explain his circumstances personally or in writing to the Dean.

N.1.13 PROFESSIONAL STATUS

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

- 4-year BSc or Hons BSc plus three years of experience in a natural science profession;
- M.Sc. plus two years of experience in a natural science profession;
- D.Sc. or Ph.D. plus one year of experience in a natural science profession.

At least 50% of the modules in this qualification must be from natural sciences. At least two appropriate **first** and **second semester modules** (in Physics, Mathematics, Chemistry, Botany or Zoology) must be taken at first year level.

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

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

N.1.14 MODULES LACKING TO COMPLETE DEGREE

If a student lacks **five** modules at the most to complete his/her degree, these modules may be completed at UNISA, subject to the following conditions:

- The degree must be completed within **five** years. If it takes longer, a written application must be made for extension of the studies.
- At least **one** core module must be completed at NWU.
- The student must register both at NWU and at UNIS

N.1.15 SCHOOLS IN THE FACULTY

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

School/Centre	Subject Group
School of Biological Sciences	Zoology Microbiology Botany
School of Physical and Chemical Sciences	Biochemistry Chemistry Physics Natural Science, Mathematics and Technology Education (Specialises in training teachers)
School of Geo- and Spatial Sciences	Geography and Environmental Management Geology 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

Research in the Faculty is managed in research entities. These research entities are further responsible for the master's and doctoral training programmes, i.e. programmes that contain a significant research component.

The Faculty consists fo the following Research Entities:

a) Unit for Business Mathematics and Informatics
b) Unit for Environmental Sciences and Management
c) Centre of Excellence in Space Research
d) Research Focus Area for Chemical Resource Beneficiation
e) Centre for Human Metabonomics

N.2 QUALIFICATIONS, PROGRAMMES AND CURRICULA

Different qualifications (degrees) can be obtained in the Faculty of Natural Sciences. A specific qualification may be obtained in one or more programmes (the term *programme* indicates a specific field of study), and in each programme one or more curricula are available. A prospective student must therefore first decide which qualification he wants to obtain. For example, after a student has decided he would like obtain a BSc degree, he has to select a programme, for instance the physical and chemical programme, the computer and mathematical programme or the environmental and biological programme etc. If the student decides on the environmental and biological programme for instance, he must then study the different curricula offered in this programme and finally decide on a curriculum. Information and the rules for the different qualifications, programmes and curricula are explained in this Calendar.

North-West University is authorised to award the following degrees in undergraduate studies in the Faculty of Natural Sciences:

LIST OF QUALIFICATIONS AND PROGRAMMES

Qualification	Programme and code	Curriculum and curriculum code	Method of delivery
Baccalaureus Scientiae (BSc)	Physical and Chemical Sciences: 200 190	Chemistry-Physics **N151P** Chemistry, Mathematics-Applied Mathematics **N152P** Physics-Mathematics **N154P** Physics-Applied Mathematics **N155P** Chemistry-Biochemistry **N174P** Chemistry-Physiology **N177P**	Full-time

Baccalaureus Scientiae (BSc)	Computer and Mathematical Sciences 200 191	Physics-Computer Science **N153P** Computer Science-Statistics **N156P** Computer Science-Mathematics **N157P** Statistics-Mathematics **N158P** Mathematics **N159P** Computer Science-Economics **N175P** Mathematics-Economics **N176P**	Full-time
Baccalaureus Scientiae in Information Technology (BSc IT)	Information Technology-Computer Science 264 100	Information Technology and Computer Sciences **N150P**	Full-time
Baccalaureus Scientiae (BSc)	Environmental and Biological Sciences: 200 118	Geology-Geography **N147P** Geology-Botany **N148P** Botany-Chemistry **N149P** Zoology-Biochemistry **N160P**	Full-time

		Zoology-Chemistry **N161P** Zoology-Geography **N162P** Zoology-Microbiology **N163P** Zoology-Botany **N164P** Geography-Botany **N165P** Geography-Computer Science **N166P** Microbiology-Biochemistry **N167P** Microbiology-Chemistry **N168P** Microbiology-Botany **N169P** Botany-Biochemistry **N170P** Geology-Chemistry **N180P** Geology-Microbiology **N181P** Zoology/Geology **N182P** Zoology-Physiology **N185P**	

		Microbiology-Physiology **N186P**	
Baccalaureus Scientiae (BSc)	Tourism 200 119	Tourism-Zoology-Botany **N171P** Tourism-Geography-Botany **N172P** Tourism-Geography-Zoology **N173P**	Full-time
Baccalaureus Scientiae (BSc)	Quantitative Risk Management 200 166	Quantitative Risk Management **N134P**	Full-time
Baccalaureus Scientiae (BSc)	Financial Mathematics 200 167	Financial Mathematics **N135P**	Full-time
Baccalaureus Scientiae (BSc)	Data Mining 200 168	Data Mining **N136P**	Full-time
Baccalaureus Scientiae (BSc)	Actuarial Science 200 123	Actuarial Science **N137P**	Full-time
Baccalaureus Artium et Scientiae (B Art et Scien)	Urban and Regional Planning 118 101	Urban and Regional Planning with Geography and Environmental Studies **N183P**	Full-time

N.3 RULES FOR THE DEGREE BACCALAUREUS SCIENTIAE (BSC)

N.3.1 DURATION (MINIMUM AND MAXIMUM DURATION)

The minimum duration of the studies for a BSc degree is three years and the maximum duration for completing the degree is four years.

N.3.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

N.3.3 FACULTY-SPECIFIC REQUIREMENTS

See paragraph N.1.6.

N.3.4 STRUCTURE OF A GENERIC BACCALAUREUS SCIENTIAE DEGREE

The diagram shows how a generic BSc degree is compiled. Professional degrees are compiled differently.

<table>
<tr><th></th><th colspan="7">Semester 1</th><th colspan="7">Semester 2</th></tr>
<tr><td>Year 1
(Tot. cr.= 120)</td><td colspan="2">12</td><td colspan="2">12</td><td colspan="2">12</td><td>12
AGLE</td><td colspan="2">12</td><td colspan="2">12</td><td colspan="2">12</td><td>12
AGLE</td></tr>
<tr><td>Year 2
(Tot. cr. = 120)</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>12
WVNS</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>12
WVNS</td></tr>
<tr><td>Year 3
(Tot. cr.= 128)</td><td colspan="2">16</td><td colspan="2">16</td><td colspan="2">16</td><td>16</td><td colspan="2">16</td><td colspan="2">16</td><td colspan="2">16</td><td>16</td></tr>
<tr><td>TOTAL CREDITS (368)</td><td colspan="7">184 credits</td><td colspan="7">184 credits</td></tr>
</table>

N.3.5 OUTCOMES OF A GENERIC BACCALAUREUS SCIENTIAE DEGREE

i) General

At the end of the studies, the student will have the ability to integrate the basic knowledge and techniques of the core subjects in the curriculum he completed with a view to investigating phenomena in nature relevant to the core subjects of the curriculum and solving relevant problems.

ii) Knowledge

The student must have a thorough knowledge of the core subjects of the curriculum he completed in order to be able to apply his knowledge; to understand the physical reality in terms of this knowledge; and to be ready to continue with postgraduate studies in one of the core subjects.

iii) Skills

The student must have acquired the following skills:

- the ability to retrieve knowledge and information electronically and otherwise in preparation of lifelong learning;
- the ability to perform mathematical-analytical and mathematical-numerical data processing, problem solving and modelling;
- the ability to process, evaluate and report on scientific information;
- where applicable, the basic laboratory skills;
- the ability to work in groups and where necessary to exercise the necessary leadership.

iv) Values

The student ought to have acquired the following values:

- the ability to understand and strive after the normative aspects of practising science and in this way demonstrate a sense of responsibility towards fellow human beings and the environment in scientific investigations;
- scientific honesty and integrity.

N.3.6 CURRICULA

All of the curricula in this programme are compiled from the module list in N.15.

Every year a student registers subject to the rules valid for the specific year. If the curriculum for which a student registered the previous year has been changed in this Calendar, the curriculum of the student will be adapted according to the version in this Calendar. If possible, adaptation will be done in such a way that a student's load of studies will not be aggravated.

If obstacles such as insurmountable clashes in the schedule should arise because of necessary curriculum changes, the Dean may decide that students who enrolled previously must switch to the changed curriculum, even if an aggravation should result.

In the case where students have to repeat one or more modules at a specific year level of a curriculum, the following apply:

- The total number of credits of the modules taken by a student in any semester at any year level, also by the student who has to repeat modules, is limited in accordance with the General Rule 2.3.4.3;
- The Faculty cannot undertake that modules that have to be repeated and the other modules that must be taken will all fit in the class schedule. Clashes that arise because of modules that have to be repeated will result in the student having to take those modules in a future year.
- If a student has not completed the modules of a specific year level of the curriculum for which he enrolled in the minimum prescribed period of study, and the modules of the specific year level of the curriculum have since been changed, the Dean may decide that the student must complete the relevant year level as published in the latest edition of the Calendar. This means that if a student must repeat a module that has since been replaced by another module, the Dean may decide that the student must take the latter module.

N.3.7 ARTICULATION POSSIBILITIES

- Credits will be awarded for modules that have been passed in other faculties or at other universities, provided such modules contribute to the outcomes and total credit requirements of the curriculum concerned.

- With the basic and applied skills that the student has acquired by this qualification in the mathematical, computer and natural science disciplines he will be prepared to continue further learning in several specialised subject areas at other institutions.

N.4 PROGRAMME: PHYSICAL AND CHEMICAL SCIENCES (200190)

N.4.1 SPECIFIC PROGRAMME OUTCOMES

a) General

At the end of the studies, the student will have the ability to integrate the basic knowledge and techniques of Physics and Mathematics in the curriculum he completed with a view to investigating phenomena in nature relevant to the core subjects of the curriculum and solving relevant problems.

b) Knowledge

- The student must have knowledge and insight into concepts, structures, procedures, models, theories, principles, research methods and the place and boundaries of science in man's life.
- The student must understand the physical reality in terms of this knowledge.
- Besides knowledge of the subject, the student must also have insight into the encyclopaedia and coherence of science by understanding amongst others that problems are not solved in isolation.
- The student must be ready to continue with postgraduate studies in one of the core subjects.

c) Skills

The student must have the following skills:

- identifying and solving problems in a critical and creative manner;
- embarking on entrepreneurship;
- retrieving knowledge and information;
- applying effective and responsible self-management;
- describing natural phenomena in a mathematical-analytical and mathematical-numerical manner;
- problem solving and modelling;
- applying sufficient knowledge and experience in an applicable programming language and/or data visualising software in order to do basic processing and calculations and to represent results graphically;
- investigating astrophysical phenomena empirically (experimentally) with an optical telescope, processing data meaningfully, representing it graphically and interpreting it in a theoretical framework;
- basic laboratory skills;
- acquiring, commanding, applying, analysing, integrating and evaluating knowledge in a well-founded manner;
- communicating knowledge scientifically in different media and therefore having command of listening, reading, talking, writing, arguing and computer skills;

- using science and technology adequately, effectively and responsibly with regard to the environment and own health and that of others;
- demonstrating efficient learning skills, realising the importance of life-long learning;
- accuracy and punctuality;
- articulating and justifying an own way of thinking (paradigm);
- processing and evaluating scientific information and reporting on it;
- working in a group and exercising/accepting leadership.

d) Values

The student must have the following skills:

- understanding and pursuing the normative aspects of science and by doing that demonstrating a sense of responsibility towards society and environment in scientific research;
- scientific honesty;
- thinking in a principled way, which becomes clear in well-founded adaptability;
- pursuing excellence;
- devotion and integrity.

e) Awareness of the importance of:

- participating as a responsible citizen in the activities of the local, national and international community;
- cultural and esthetical sensitivity to the variety of social structures, and the possibilities and constraints of a plural society.

N.4.2 ADMISSION REQUIREMENTS FOR THE QUALIFICATION

See paragraph N.1.5.

N.4.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.4.4 CURRICULUM: CHEMISTRY AND PHYSICS – N151P

Compilation of curriculum N151P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	CHEN211	H	8	CHEM311	H	16
CHEM111	H	12	CHEN212	H	8	CHEN312	H	16
FSKS111	H	12	FSKS211	H	8	FSKS311	H	16
ITRW112	X	12	FSKS212	H	8	FSKS312	H	16
WISN111	X	12	TGWN211	X	8			
			WISN211	X	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	CHEN222	H	8	CHEN321	H	16
CHEM121	H	12	CHEN223	H	8	CHEN322	H	16
FSKS121	H	12	FSKS221	H	8	FSKS321	H	16
TGWN122	X	12	FSKS222	H	8	FSKS322	H	16
WISN121	X	12	TGWN222	X	8			
			WISN221	X	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.4.5 CURRICULUM: CHEMISTRY, MATHEMATICS AND APPLIED MATHEMATICS – N152P

Compilation of curriculum N152P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	CHEN211	H	8	CHEM311	H	16
CHEM111	H	12	CHEN212	H	8	CHEN312	H	16
FSKS111	X	12	FSKS211	X	8	TGWN312	H	16
STTN111	X	12	TGWN211	H	8	WISN312	H	16
WISN111	H	12	WISN211	H	8			
			WISN212	H	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	CHEN222	H	8	CHEN321	H	16
CHEM121	H	12	CHEN223	H	8	CHEN322	H	16
FSKS121	X	12	WISN221	H	8	TGWN322	H	16
TGWN122	H	12	FSKS222	X	8	WISN322	H	16
WISN121	H	12	TGWN222	H	8			
			WISN222	H	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.4.6 CURRICULUM: PHYSICS AND MATHEMATICS – N154P

Compilation of curriculum N154P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	FSKS211	H	8	FSKS311	H	16
FSKS111	H	12	FSKS212	H	8	FSKS312	H	16
ITRW115	X	12	TGWN211	X	8	WISN313	H	16
CHEM111 **or** STTN111	X	12	TGWN212	X	8	WISN312	H	16
WISN111	H	12	WISN211	H	8			
			WISN212	H	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	FSKS221	H	8	FSKS321	H	16
FSKS121	H	12	FSKS222	H	8	FSKS322	H	16
ITRW124	X	12	TGWN221	X	8	WISN323 **or** FSKS323	H	16
TGWN122	X	12	TGWN222	X	8	WISN322	H	16
WISN121	H	12	WISN221	H	8			
			WISN222	H	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.4.7 CURRICULUM: PHYSICS AND APPLIED MATHEMATICS – N155P

Compilation of curriculum N155P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	FSKS211	H	8	FSKS311	H	16
FSKS111	H	12	FSKS212	H	8	FSKS312	H	16
ITRW115	X	12	TGWN211	H	8	TGWN311	H	16
CHEM111 **or** STTN111	X	12	TGWN212	H	8	TGWN312	H	16
WISN111	H	12	WISN211	X	8			
			WISN212	X	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	FSKS221	H	8	FSKS321	H	16
FSKS121	H	12	FSKS222	H	8	FSKS322	H	16
ITRW124	X	12	TGWN221	H	8	TGWN321 **or** FSKS323	H	16
TGWN122	H	12	TGWN222	H	8	TGWN322	H	16
WISN121	H	12	WISN221	X	8			
			WISN222	X	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.4.8 CURRICULUM: BIOCHEMISTRY-CHEMISTRY – N174P

Compilation of curriculum N174P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
CHEM111	H	12	FLGX213	X	16	BCHS316	H	16
FLGX113	X	12	BCHN213	H	16	BCHS317	H	16
FSKS113	X	12	CHEN211	H	8	CHEM311	H	16
WISN111	X	12	CHEN212	H	8	CHEN312	H	16
AGLE111	X	12	WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	CHEN222	H	8	BCHS321	H	16
CHEM121	H	12	CHEN223	H	8	BCHS322	H	16
FSKS123	X	12	BCHN222	H	16	CHEN321	H	16
FLGX123	X	12	FLGX223	X	8	CHEN322	H	16
WISN121	X	12	FLGX224	X	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.4.9 CURRICULUM: CHEMISTRY-PHYSIOLOGY – N177P

Compilation of curriculum N177P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	BCHN213	X	16	CHEM311	H	16
CHEM111	H	12	CHEN211	H	8	CHEN312	H	16
FLGX113	H	12	CHEN212	H	8	FLGX312	H	8
FSKS113	X	12	FLGX213	H	16	FLGX313	H	8
WISN111	X	12	WVNS211	X	12	FLGX314	H	16
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	BCHN222	X	16	CHEN321	H	16
CHEM121	H	12	CHEN222	H	8	CHEN322	H	16
FLGX123	H	12	CHEN223	H	8	FLGX325	H	16
FSKS123	X	12	FLGX223	H	8	FLGX326	H	16
WISN121	X	12	FLGX224	H	8			
			WVNS222	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.5 PROGRAMME: COMPUTER AND MATHEMATICAL SCIENCES (200191)

N.5.1 PROGRAMME OUTCOMES

The goal of this qualification is to train graduates scientifically in an outcomes-based programme in which the subjects Computer Science, Applied Mathematics, Mathematics, Statistics, Physics and Economics figure strongly. Graduates who have completed this programme will be able to serve nationally as data-analysts, (industrial) mathematicians, computer scientists, programmers, systems analysts, database administrators, teachers, etc, and will also be ready to proceed nationally and internationally (depending on the focus inside this program) with post graduate studies in the economical, physical, computer, statistical and mathematical sciences. The qualification will equip graduates with degree level expertise and appropriate skills in the field of Mathematics, Applied Mathematics, Statistics, Computer Science, Physics and Economics, in which a worldwide shortage, especially in South Africa, of well-qualified and equipped human resources exists, especially in the field of mathematics.

N.5.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

N.5.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.5.4 CURRICULUM: PHYSICS AND COMPUTER SCIENCE – N153P

Compilation of curriculum N153P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	H	12	ITRW212	H	16	ITRW311	H	16
WISN111	X	12	WISN211	X	8	ITRW316	H	16
STTN111	X	12	WISN212	X	8	FSKS311	H	16
FSKS111	H	12	FSKS211	H	8	FSKS312	H	16
AGLE111	X	12	FSKS212	H	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW124	H	12	ITRW222	H	16	ITRW321	H	16
WISN121	X	12	TGWN222	X	8	ITRW322	H	16
TGWN122	X	12	WISN222	X	8	FSKS321	H	16
FSKS121	H	12	FSKS221	H	8	FSKS322	H	16
AGLE121	X	12	FSKS222	H	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

This curriculum (N153P) does not lead to postgraduate studies in Physics.

N.5.5 CURRICULUM: COMPUTER SCIENCE AND STATISTICS – N156P

Compilation of curriculum N156P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	H	12	ITRW212	H	16	ITRW311	H	16
STTN115	H	12	STTN215	H	16	ITRW316	H	16
WISN111	X	12	WISN211	X	8	STTN311	H	32
FSKS111	X	12	WISN212	X	8			
AGLE111	X	12	WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW124	H	12	ITRW222	H	16	ITRW321	H	16
STTN125	H	12	STTN225	H	16	ITRW322	H	16
WISN121	X	12	WISN221	X	8	STTK321	H	24
TGWN122	X	12	WISN222	X	8	STTK322	H	8
AGLE121	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.5.6 CURRICULUM: COMPUTER SCIENCE AND MATHEMATICS – N157P

Compilation of curriculum N157P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	H	12	ITRW212	H	16	ITRW311	H	16
WISN111	H	12	WISN211	H	8	ITRW316	H	16
STTN115	X	12	WISN212	H	8	WISN313	H	16
FSKS111	X	12	STTN215	X	16	WISN312	H	16
AGLE111	X	12	WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW124	H	12	ITRW222	H	16	ITRW321	H	16
WISN121	H	12	WISN221	H	8	ITRW322	H	16
STTN125	X	12	WISN222	H	8	WISN323	H	16
TGWN122	H	12	STTN225	X	16	WISN322	H	16
AGLE121	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.5.7 CURRICULUM: STATISTICS AND MATHEMATICS – N158P

Compilation of curriculum N158P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	X	12	ITRW212	X	16	WISN313	H	16
FSKS111	X	12	WISN211	H	8	WISN312	H	16
WISN111	H	12	WISN212	H	8	STTN311	H	32
STTN115	H	12	STTN215	H	16			
AGLE111	X	12	WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
TGWN122	H	12	ITRW222	X	16	WISN323	H	16
ITRW124	X	12	WISN221	H	8	WISN322	H	16
WISN121	H	12	WISN222	H	8	STTK321	H	24
STTN125	H	12	STTN225	H	16	STTK322	H	8
AGLE121	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.5.8 CURRICULUM: MATHEMATICS – N159P

Compilation of curriculum N159P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
FSKS111	X	12	STTN215	X	16	TGWN311	H	16
ITRW112	X	12	TGWN211	H	8	TGWN312	H	16
STTN115	X	12	TGWN212	H	8	WISN313	H	16
WISN111	H	12	WISN211	H	8	WISN312	H	16
AGLE111	X	12	WISN212	H	8			
			WVNS211	X	12			
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	STTN225	X	16	TGWN321	H	16
ITRW123	X	12	TGWN221	H	8	TGWN322	H	16
STTN125	X	12	TGWN222	H	8	WISN323	H	16
TGWN122	H	12	WISN221	H	8	WISN322	H	16
WISN121	H	12	WISN222	H	8			
			WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.5.9 CURRICULUM: COMPUTER SCIENCE AND ECONOMICS – N175P

Compilation of curriculum N175P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	H	12	ECON211	H	16	EKRP311	H	16
WISN111	X	12	ITRW212	H	16	ECON311	H	16
ECON111	H	12	WISN211	X	8	ITRW311	H	16
ACCF111	X	16	WISN212	X	8	ITRW316	H	16
ACCS111	X	16	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**64**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW124	H	12	ECON221	H	16	EKRP321	H	16
WISN121	X	12	ITRW222	H	16	ECON321	H	16
ECON121	H	12	WISN221	X	8	ITRW321	H	16
ACCF121	X	16	WISN222	X	8	ITRW322	H	16
ACCS121	X	16	WVNS221	X	12			
AGLE121	X	12			8			
Total 2nd semester		**64**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**128**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**376**

N.5.10 CURRICULUM: MATHEMATICS AND ECONOMICS – N176P

Compilation of curriculum N176P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	X	12	ECON211	H	16	ECON311	H	16
WISN111	H	12	ITRW212	X	16	TGWN312	H	16
ECON111	H	12	WISN211	H	8	WISN313	H	16
ACCF111	X	16	WISN212	H	8	WISN312	H	16
ACCS111	X	16	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**64**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW124	X	12	ECON211	H	16	ECON321	H	16
WISN121	H	12	ITRW222	X	16	TGWN322	H	16
ECON121	H	12	WISN221	H	8	WISN323	H	16
ACCF121	X	16	WISN222	H	8	WISN322	H	16
ACCS121	X	16	WVNS221	X	12			
AGLE121	X	12			8			
Total 2nd semester		**64**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**128**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**376**

N.6 PROGRAMME: ENVIRONMENTAL AND BIOLOGICAL SCIENCES (200118)

NB: Students who fail in 2013 GGFS111/311/321 (N147P/N162P/N165P/N166P/ N173P) repeat the same module in 2014.

N.6.1 SPECIFIC PROGRAMME OUTCOMES

The Faculty of Science has a number of approved curricula that have a good basic training in environmental sciences. In compiling the curricula work possibilities and manpower needs of our country are also considered. This curriculum prepares the student for postgraduate studies (Honours in Environmental Sciences) recommended in order to registration with the South African Council for Natural Scientific Professions (SACNASP).

On completing this programme, the student must be able –

- to demonstrate a well-rounded and systematic knowledge base of the biological and earth sciences, with the focus on environmental sciences, which comprise aspects of zoology, botany, microbiology, geology, soil science, environmental management and geography;
- to demonstrate a coherent and critical understanding of applicable key terms, rules, concepts, principles and theories, and be able to place new knowledge in existing theoretical frameworks and apply processes and techniques in a wider environmental perspective;
- to identify and analyse general environmental problems and issues and to use the most important research methods to propose theoretically driven solutions;
- to demonstrate well developed skills in gathering information, analysing and integrating quantitative and qualitative data and communicating information, own ideas and opinions, in writing and orally, using well structured arguments and IT skills effectively;
- to act as a lifelong student in the job market and to participate in value-adding economic activities in an entrepreneurial way.

N.6.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

N.6.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6

N.6.4 CURRICULUM: GEOLOGY-GEOGRAPHY – N147P

N.6.4.1 Faculty-specific rules for the curriculum

A compulsory soil mapping camp takes place for second-year soil science students (i.e. students who have registered for GDKN 221) during the winter recess. Second-year students will hand in a soil map and a report, of which the mark will contribute to the practical mark for GDKN221. Third-year geology students (i.e. students who have registered for GLGN 321) will attend a compulsory geology mapping camp in the same period. A geological map and a report will be handed in during the second semester, of which the mark contributes to laboratory mark for GLGN 321. NO excuses for absence from the mapping camp will be accepted. In the event of illness, the onus is on the student to catch up with the work and to hand in the required assignments, maps and reports, as applicable, to be considered for admission to the examination.

Compilation of curriculum N147P (There will be a limited intake of students majoring in Geology due to capacity restrictions.)

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN112	H	12	GLGN211	H	16	GLGN311	H	32
GGFS112	H	12	GGFS212	H	16	GGFS312	H	32
CHEM111	X	12	GDKN211	H	16			
FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN122	H	12	GLGN221	H	16	GLGN321	H	32
GGFS121	H	12	GGFS222	H	16	GGFS322	H	32
GDKN121	X	12	GDKN221	H	16			
CHEM121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014. Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014**.** Students who fail GGFS111/311/321 repeat the same module in 2014.

N.6.5 CURRICULUM: GEOLOGY-BOTANY – N148P

N.6.5.1 Faculty-specific rules for the curriculum

See paragraph N.6.4.1

Compilation of curriculum N148P (There will be a limited intake of students majoring in Geology due to capacity restrictions.)

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN112	H	12	GLGN211	H	16	GLGN311	H	32
PLKS111	H	12	PLKN213	H	16	PLKS311	H	32
CHEM111	X	12	GDKN211	H	16			
FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN122	H	12	GLGN221	H	16	GLGN321	H	32
PLKS121	H	12	PLKS221	H	16	PLKN323	H	32
GDKN121	H	12	GDKN221	H	16			
CHEM121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.6 CURRICULUM: BOTANY-CHEMISTRY - N149P

N.6.6.1 Faculty-specific rules for the curriculum

See paragraph N.6.4.1.

Compilation of curriculum N149P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS111	H	12	PLKN213	H	16	PLKS311	H	32
CHEM111	H	12	CHEN211 **&** CHEN212	H	8 8	CHEM311	H	16
WISN111	X	12	BCHN213	X	16	CHEN312	H	16
GLGN112 **or** DRKS111 **or** FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS121	H	12	PLKS221	H	16	PLKN323	H	32
CHEM121	H	12	CHEN222 **&** CHEN223	H	16	CHEN321	H	16
WISN121	X	12	BCHN222	X	16	CHEN322	H	16
GLGN122 **or** DRKS121 **or** FSKS123	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.7 CURRICULUM: ZOOLOGY-BIOCHEMISTRY – N160P

Compilation of curriculum N160P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
CHEM111	H	12	BCHN213	H	16	BCHS316	H	16
FLGX113	X	12	CHEN211 **&** CHEN212	X	8 8	BCHS317	H	16
WISN111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
CHEM121	H	12	BCHN222	H	16	DRKS322	H	16
FLGX123	X	12	CHEN222 **&** CHEN223	X	16	BCHS321	H	16
WISN121	X	12	WVNS221	X	12	BCHS322	H	16
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.8 CURRICULUM: ZOOLOGY-CHEMISTRY – N161P

Compilation of curriculum N161P:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
CHEM111	H	12	CHEN211 **&** CHEN212	H	8 8	CHEM311	H	16
FLGX113 **or** FSKS113	X	12	BCHN213 **or** FLGX213	X	16	CHEN312	H	16
WISN111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
CHEM121	H	12	CHEN222 **&** CHEN223	H	8 & 8	DRKS322	H	16
FLGX123 **or** FSKS123	X	12	BCHN222 **or** FLGX223 **&** FLGX224	X	16	CHEN321	H	16
WISN121	X	12	WVNS221	X	12	CHEN322	H	16
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.9 CURRICULUM: ZOOLOGY-GEOGRAPHY – N162P

Compilation of curriculum N162P:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
GGFS112	H	12	GGFS212	H	16	GGFS312	H	32
CHEM111	X	12	PLKN213 **or** FLGX213	X	16			
FLGX113 **or** PLKS111 **or** FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
GGFS121	H	12	GGFS222	H	16	DRKS322	H	16
CHEM121	X	12	PLKS221 **or** FLGX223 **&** FLGX224	X	16	GGFS322	H	32
FLGX123 **or** PLKS121 **or** FSKS123	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014.
Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014.
Students who fail GGFS111/311/321 repeat the same module in 2014.

N.6.10 CURRICULUM: ZOOLOGY-MICROBIOLOGY – N163P

Compilation of curriculum N163P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
CHEM111	H	12	MKBN211	H	16	MKBS313	H	16
FLGX113	X	12	BCHN213 **or** PLKN213 **or** FLGX213	X	16	MKBS314	H	16
PLKS111 **or** FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
CHEM121	H	12	MKBS221	H	16	DRKS322	H	16
FLGX123	X	12	BCHN222 **or** PLKS221 **or** FLGX223 **&** FLGX224	X	16	MKBS323	H	16
PLKS121 **or** FSKS123	X	12	WVNS221	X	12	MKBS324	H	16
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.11 CURRICULUM: ZOOLOGY-BOTANY – N164P

Compilation of curriculum N164P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
PLKS111	H	12	PLKN213	H	16	PLKS311	H	32
CHEM111	X	12	BCHN213 **or** GDKN211 **or** MKBN211	X	16			
FLGX113 **or** FSKS113 **or** GLGN112	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
PLKS121	H	12	PLKS221	H	16	DRKS322	H	16
CHEM121	X	12	BCHN222 **or** GDKN221 **or** MKBS221	X	16	PLKN323	H	32
FLGX123 **or** FSKS123 **or** GDKN121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.12 CURRICULUM: GEOGRAPHY-BOTANY – N165P

Compilation of curriculum N165P:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GGFS112	H	12	GGFS212	H	16	GGFS312	H	32
PLKS111	H	12	PLKN213	H	16	PLKS311	H	32
CHEM111	X	12	DRKN211 **or** MKBN211	X	16			
DRKS111 **or** FSKS113 **or** GLGN112	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GGFS121	H	12	GGFS222	H	16	GGFS322	H	32
PLKS121	H	12	PLKS221	H	16	PLKN323	H	32
CHEM121	X	12	DRKS221 **or** MKBS221	X	16			
DRKS121 **or** FSKS123 **or** GLGN122	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014.
Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014.
Students who fail GGFS111/311/321 repeat the same module in 2014.

N.6.13 CURRICULUM: GEOGRAPHY-COMPUTER SCIENCE – N166P

Compilation of curriculum N166P:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GGFS112	H	12	GGFS212	H	16	GGFS312	H	32
ITRW112	H	12	ITRW212	H	16	ITRW311	H	16
GLGN112	X	12	PLKN213 **or** GLGN211	X	16	ITRW316	H	16
STTN111 **or** PLKS111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GGFS121	H	12	GGFS222	H	16	GGFS322	H	32
ITRW124	H	12	ITRW222	H	16	ITRW321	H	16
GLGN122	X	12				ITRW322	H	16
STTN121 **or** PLKS121	X	12	PLKS221 **or** GLGN221	X	16			
AGLE121	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**68**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**128**	**Total year level 3**		**128**
Total of curriculum credits								**376**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014.
Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014.
Students who fail GGFS111/311/321 repeat the same module in 2014.

N.6.14 CURRICULUM: MICROBIOLOGY-BIOCHEMISTRY – N167P

Compilation of curriculum N167P:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
CHEM111	H	12	MKBN211	H	16	MKBS313	H	16
WISN111	X	12	BCHN213	H	16	MKBS314	H	16
FSKS113	X	12	CHEN211 **&** CHEN212	X	16	BCHS316	H	16
PLKS111 **or** FLGX113	X	12	WVNS211	X	12	BCHS317	H	16
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
CHEM121	H	12	MKBS221	H	16	MKBS323	H	16
WISN121	X	12	BCHN222	H	16	MKBS324	H	16
FSKS123	X	12	CHEN222 **&** CHEN223	X	16	BCHS321	H	16
FLGX123 **or** PLKS121	X	12	WVNS221	X	12	BCHS322	H	16
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.15 CURRICULUM: MICROBIOLOGY-CHEMISTRY – N168P

Compilation of curriculum N168P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
CHEM111	H	12	MKBN211	H	16	MKBS313	H	16
WISN111	X	12	CHEN211 **&** CHEN212	H	8 8	MKBS314	H	16
FSKS113	X	12	BCHN213	X	16	CHEM311	H	16
DRKS111	X	12	WVNS211	X	12	CHEN312	H	16
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
CHEM121	H	12	MKBS221	H	16	MKBS323	H	16
WISN121	X	12	CHEN222 **&** CHEN223	H	8 8	MKBS324	H	16
FSKS123	X	12	BCHN222	X	16	CHEN321	H	16
DRKS121	X	12	WVNS221	X	12	CHEN322	H	16
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.16 CURRICULUM: MICROBIOLOGY-BOTANY – N169P

Compilation of curriculum N169P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS111	H	12	MKBN211	H	16	MKBS313	H	16
CHEM111	X	12	PLKN213	H	16	MKBS314	H	16
FSKS113	X	12	BCHN213 **or** DRKN211	X	16	PLKS311	H	32
DRKS111 **or** GLGN112	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS121	H	12	MKBS221	H	16	MKBS323	H	16
CHEM121	X	12	PLKS221	H	16	MKBS324	H	16
FSKS123	X	12	BCHN222 **or** DRKS221	X	16	PLKN323	H	32
DRKS121 **or** GLGN122	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.17 CURRICULUM: BOTANY-BIOCHEMISTRY – N170P

Compilation of curriculum N170P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS111	H	12	PLKN213	H	16	PLKS311	H	32
CHEM111	X	12	BCHN213	H	16	BCHS316	H	16
WISN111	X	12	CHEN211 **&** CHEN212	X	8 8	BCHS317	H	16
DRKS111 **or** GLGN112	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
PLKS121	H	12	PLKS221	H	16	PLKN323	H	32
CHEM121	X	12	BCHN222	H	16	BCHS321	H	16
WISN121	X	12	CHEN222 **&** CHEN223	X	8 & 8	BCHS322	H	16
DRKS121 **or** GLGN122	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.18 CURRICULUM: GEOLOGY-CHEMISTRY – N180P

N.6.18.1 Faculty-specific rules for the curriculum

See paragraph N.6.4.1

Compilation of curriculum N180P (There will be a limited intake of students majoring in Geology due to capacity restrictions.)

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN112	H	12	GLGN211	H	16	GLGN311	H	32
CHEM111	H	12	CHEN211 **&** CHEN212	H	8 8	CHEM311	H	16
WISN111	X	12	GDKN211	H	16	CHEN312	H	16
FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN122	H	12	GLGN221	H	16	GLGN321	H	32
CHEM121	H	12	CHEN222 **&** CHEN223	H	8 8	CHEN321	H	16
GDKN121	H	12	GDKN221	H	16	CHEN322	H	16
WISN121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.19 CURRICULUM: GEOLOGY-MICROBIOLOGY – N181P

N.6.19.1 Faculty-specific rules for the curriculum

See paragraph N.6.4.1

Compilation of curriculum N181P (There will be a limited intake of students majoring in Geology due to capacity restrictions.)

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN112	H	12	GLGN211	H	16	GLGN311	H	32
CHEM111	X	12	GDKN211	H	16	MKBS313	H	16
FSKS113	X	12	MKBN211	H	16	MKBS314	H	16
PLKS111 **or** DRKS111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
GLGN122	H	12	GLGN221	H	16	GLGN321	H	32
GDKN121	H	12	GDKN221	H	16	MKBS323	H	16
CHEM121	X	12	MKBS221	H	16	MKBS324	H	16
PLKS121 **or** DRKS121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.20 CURRICULUM: ZOOLOGY-GEOLOGY – N182P

N.6.20.1 Faculty-specific rules for the curriculum

See paragraph N.6.4.1

Compilation of curriculum N182P (**There will be a limited intake of students majoring in Geology due to capacity restrictions.)**

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS111	H	12	DRKN211	H	16	DRKS311	H	32
GLGN112	H	12	GLGN211	H	16	GLGN311	H	32
CHEM111	X	12	GDKN211	H	16			
PLKS111 **or** FSKS113	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
DRKS121	H	12	DRKS221	H	16	DRKN321	H	16
GLGN122	H	12	GLGN221	H	16	DRKS322	H	16
GDKN121	H	12	GDKN221	H	16	GLGN321	H	32
CHEM121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.21 CURRICULUM: ZOOLOGY-PHYSIOLOGY – N185P

Compilation of curriculum N185P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	DRKN211	H	16	DRKS311	H	32
CHEM111	X	12	FLGX213	H	16	FLGX312	H	8
DRKS111	H	12	MKBN211	X	16	FLGX313	H	8
FLGX113	H	12	WVNS211	X	12	FLGX314	H	16
FSKS113 **or** PLKS111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	DRKS221	H	16	DRKN321	H	16
CHEM121	X	12	FLGX223	H	8	DRKS322	H	16
DRKS111	H	12	FLGX224	H	8	FLGX325	H	16
FLGX123	H	12	MKBS221	X	16	FLGX326	H	16
FSKS123 **or** PLKS121	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.6.22 CURRICULUM: MICROBIOLOGY-PHYSIOLOGY – N186P

Compilation of curriculum N186P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE111	X	12	CHEN211	X	8	FLGX312	H	8
CHEM111	X	12	CHEN213	X	8	FLGX313	H	8
DRKS111	X	12	FLGX213	H	16	FLGX314	H	16
FLGX113	H	12	MKBN211	H	16	MKBS313	H	16
FSKS113	X	12	WVNS211	X	12	MKBS314	H	16
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
AGLE121	X	12	BCHN222	X	16	FLGX325	H	16
CHEM121	X	12	FLGX223	H	8	FLGX326	H	16
DRKS121	X	12	FLGX224	H	8	MKBS323	H	16
FLGX123	H	12	MBKS221	H	16	MKBS324	H	16
FSKS123	X	12	WVNS221	X	12			
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

N.7 PROGRAMME: TOURISM (200119)

The Faculty Board of Natural Sciences has approved a number of curricula that provide a good basic training in tourism. In compiling the curricula, possible occupations and our country's need for human resources were also considered. These curricula also prepare the student for postgraduate studies (Honours in Environmental Sciences). These studies are recommended in view of registration with the South African Council for Natural Scientific Professions (SACNASP).

N.7.1 SPECIFIC PROGRAMME OUTCOMES

On completing this programme, the student must be able –

- to demonstrate a well-rounded knowledge and insight into the subject contents of fundamental, core and alternative modules of subject combinations completed, and the application of these the multidisciplinary environmental and tourism field;
- to demonstrate skills in identifying and analysing environmental- and tourism problems and in collecting, evaluating and interpreting the necessary information and data and using these to propose possible solutions and also to manage human resources in a creative way;
- as an individual or member of a group, to communicate in an ethical and responsible manner information and solutions verbally, electronically and in writing to peers and professional people;
- to use entrepreneurial skills in identifying opportunities in practice and developing these while maintaining respect for society and the environment.

N.7.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

N.7.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.7.4 CURRICULUM: TOURISM-ZOOLOGY-BOTANY – N171P

Compilation of curriculum N171P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
TMBP111	H	12	TMBP211	H	16	TMBP311	H	16
DRKS111	H	12	DRKN211	H	16	TMBP312	H	16
PLKS111	H	12	PLKN213	H	16	DRKS311	H	32
CHEM111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
BMAN121	H	12	TMBP221	H	16	TMBP321	H	16
DRKS121	H	12	DRKS221	H	16	TMBP322	H	16
PLKS121	H	12	PLKS221	H	16	DRKS322	H	16
CHEM121	X	12	WVNS221	X	12	PLTN323	H	24
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**72**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**136**
Total of curriculum credits								**376**

N.7.5 CURRICULUM: TOURISM-GEOGRAPHY-BOTANY – N172P

Compilation of curriculum N172P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
TMBP111	H	12	TMBP211	H	16	TMBP311	H	16
GGFS112	H	12	GGFS212	H	16	TMBP311	H	16
PLKS111	H	12	PLKN213	H	16	GGFS312	H	32
CHEM111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
BMAN121	H	12	TMBP221	H	16	TMBP321	H	16
GGFS121	H	12	GGFS222	H	16	GGFS322	H	32
PLKS121	H	12	PLKS221	H	16	PLTN323	H	24
CHEM121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**72**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**136**
Total of curriculum credits								**376**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014.
Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014.
Students who fail in 2013 GGFS111/311/321 repeat the same module in 2014.

N.7.6 CURRICULUM: TOURISM-GEOGRAPHY-ZOOLOGY –N173P

Compilation of curriculum N173P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
TMBP111	H	12	TMBP211	H	16	TMBP311	H	16
GGFS112	H	12	GGFS212	H	16	TMBP312 **or** DRTS311 **	H	16
DRKS111	H	12	DRKN211	H	16	GGFS312	H	32
CHEM111	X	12	WVNS211	X	12			
AGLE111	X	12						
Total 1st semester		**60**	**Total 1st semester**		**60**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
BMAN121	H	12	TMBP221	H	16	TMBP321	H	16
GGFS121	H	12	GGFS222	H	16	GGFS322	H	32
DRKS121	H	12	DRKS221	H	16	TMBP322 **or** DRKN322	H	16
CHEM121	X	12	WVNS221	X	12			
AGLE121	X	12						
Total 2nd semester		**60**	**Total 2nd semester**		**60**	**Total 2nd semester**		**64**
Total year level 1		**120**	**Total year level 2**		**120**	**Total year level 3**		**128**
Total of curriculum credits								**368**

****Selection possibilities depend on the student's choice for undergraduate studies: Zoology/Tourism**

Students who fail GGFS211 in 2013 will have to pass GGFS222 in 2014.
Students who fail GGFS221 in 2013 will have to pass GGFS212 in 2014.
Students who fail in 2013 GGFS111/311/321 repeat the same module in 2014.

N.8 PROGRAMME: QUANTITATIVE RISK MANAGEMENT (200166)

N.8.1 PROGRAMME OUTCOMES

The programme outcomes discussed for the BSc degree in N.3 also apply to this programme. In addition, the student will also have the following specific knowledge and skills.

a) Knowledge

On completing the programme, the student will have adequate knowledge and insight into the following topics:

- Functioning of an economy, introductory micro- and macroeconomics, determining the national income and the influence of different policy measures on it, national accountancy concepts and the macro-equilibrium equation, economic conjuncture and stabilisation, transferring funds between countries, exchange rate systems, balance of payment and international monetary system; monetary policy in South Africa.
- The impact of the asset and liability management of banks on the national economy. Risk, liquidity policy, lending policy, liability management and the apportionment of capital by banks, the South African futures market. Functioning of derivative instruments and their application to risk hedging.
- The nature, aim and basic theory of accountancy. Financial statements, fixed assets and depreciation. Control, departmental and manufacturing accounts. Partnerships, close corporations and appropriate GAAP viewpoints.
- Probability theory, sampling theory and techniques, and statistical inference.
- Theory and topology of real numbers and finite dimensional vector spaces, algebraic and measurable spaces, integrals of measurable functions and monotone convergence, linear transformations between general vector spaces, complex functions, ordinary and partial linear differential equations, optimisation.
- Basic computer literacy, object-directed programming language, artificial intelligence, data structures and algorithms, and modern IT developments.

b) Skills

On completing this programme, the student will have the following skills:

- The ability to identify and solve convergent and divergent quantitative risk management problems in a creative and pro-active manner.
- In-depth knowledge of and insight into the financial markets and financial risk instruments and related problems, together with the ability to solve problems in interaction with other disciplines.

- The ability to identify and develop quantitative financial risk, computer and data analysis techniques and/or approaches on an entrepreneurial basis with a view to managing financial risks.
- The ability to work efficiently as an individual or in a team in an organisation in order to address quantitative financial risk management problems.
- The ability to organise and manage own activities in a responsible and efficient manner to attain desired aims.
- The ability to handle questionnaires, meaningful data collecting methods, data presentation methods and exploratory data evaluation by using amongst others statistical computer software (e.g. Statistica, S-Plus and SAS), as well as standard executive inference methods over wide range.
- The ability to prepare and present written an oral reports and presentations professionally.
- Mathematical modelling of practical problems by using partial differential equations, combinatory mathematics, linear programmes and optimisation methods, together with computerised implementation where applicable.
- Programming in a modern high-level language, together with the ability to analyse and design computer systems and algorithms.
- The ability to handle database management systems with ease.

c) Articulation possibilities

The programme grants admission to postgraduate studies in Hons BSc(BMI) programmes and may grant admission to honours studies in Economics, Statistics or Computer Science. The honours BSc(BMI) programmes are subject to the following requirements:

Honours curriculum	Graduate curriculum
N610P	N134P or N137P
N611P	N135P
N612P	N134P or N136P

N.8.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

Students who do not have accounting as school subject, must do the basic accounting course at the beginning of the first semester in the first year. If the student pass with 75% or more the student can register for ACCC111 in the first semester. If the student pass with a mark between 60% and 75% a student can register for ACCF111 in the first semester. Students who get less than 60% for the course must register for ACCS111.

Should a student at the end of the first semester not have fulfilled the prerequisites for ACCF121 or ACCC121, the student should consult with the Director or the Nominated Accreditation Actuary of the Centre for BMI to discuss the implications. *Please compare with the Faculty of Economic and Management Sciences yearbook.*

Permission requirements for all Business Mathematics and Informatics courses (N134P, N135P, N136P and N137P), Mathematics 70-79% (level 6), APS Score 32.

Mathematics Refresher course

Before the classes start in the beginning of the year, there will be a refresher course for Mathematics. All students that enrol for curriculums where the module WISN111 appears, are strongly recommended to do the refresher course.

N.8.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.8.4 QUANTITATIVE RISK MANAGEMENT N134P

Compilation of curriculum N134P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCF111 **or** ACCC111	H	16	ECON211	H	16	BWIA311	H	24
BWIA111	X	12	EKRP211	H	16	EKRP311	H	16
ECON111	H	12	STTN215	H	16	STTN311	H	32
ITRW112	X	12	WISN211	X	8			
STTN115	H	12	WISN212	X	8			
WISN111	X	12	WVES311	X	12			
Total 1st semester		**76**	**Total 1st semester**		**76**	**Total 1st semester**		**72**

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCF121 **or** ACCC121	H	16	EKRP221	H	16	BWIN321	H	16
AGLA/E121	X	12	STTN225	H	16	EKRP321	H	16
BWIA121	H	12	TGWN222	X	8	FINM221	H	16
ECON121	H	12	WISN222	X	8	STTK321	H	24
ITRW123	X	12	WVES221	X	12	STTK322	H	8
STTN125	H	12						
WISN121	X	12						
Total 2nd semester		**88**	**Total 2nd semester**		**60**	**Total 2nd semester**		**80**
Year Module			**Year Module**			**Year Module**		
			BWIA271	H	32			
Total year level 1		**164**	**Total year level 2**		**168**	**Total year level 3**		**152**
Total of curriculum credits								**484**

N.9 PROGRAMME: FINANCIAL MATHEMATICS (200167)

N.9.1 PROGRAMME OUTCOMES

See N.8.1 to N.8.3. Should a student at the end of the first semester not have fulfilled the prerequisites for ACCS121, the student should consult with the Director or the Nominated Accreditation Actuary of the Centre for BMI to discuss the implications. *Please compare with the Faculty of Economic and Management Sciences yearbook.*

N.9.2 FINANCIAL MATHEMATICS N135P

Compilation of curriculum N135P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCS111 **or** ACCF111	H	16	ECON211	H	16	BWIA311	H	24
ECON111	H	12	EKRP211	H	16	STTN311	H	32
ITRW112	X	12	STTN215	H	16	WISN313	H	16
STTN115	H	12	WISN211	H	8			
WISN111	X	12	WISN212	H	8			
BWIA111	H	12	WVES311	X	12			
Total 1st semester		**76**	**Total 1st semester**		**76**	**Total 1st semester**		**72**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCS121 **or** ACCF121	H	16	EKRP221	H	16	BWIN321	H	16
AGLA/E121	X	12	STTN225	H	16	STTK321	H	24
BWIA121	H	12	TGWN222	X	8	STTK322	H	8
ECON121	H	12	WISN221	H	8	WISN323	H	16
ITRW123	X	12	WISN222	H	8			
STTN125	H	12	WVES221	X	12			
WISN121	X	12						
Total 2nd semester		**88**	**Total 2nd semester**		**68**	**Total 2nd semester**		**64**
Year Module			**Year Module**			**Year Module**		
			BWIA271	H	32			
Total year level 1		**164**	**Total year level 2**		**176**	**Total year level 3**		**136**
Total of curriculum credits								**476**

N.10 PROGRAMME: DATA MINING (200168)

N.10.1 PROGRAMME OUTCOMES

See N.8.1 to N.8.3. Should a student at the end of the first semester not have fulfilled the prerequisites for ACCS121, the student should consult with the Director or the Nominated Accreditation Actuary of the Centre for BMI to discuss the implications. *Please compare with the Faculty of Economic and Management Sciences yearbook.*

N.10.2 DATA MINING N136P

Compilation of curriculum N136P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCS111 **or** ACCF111	H	16	ITRW212	H	16	ITRW311	H	16
BWIA111	H	12	ITRW213	H	16	ITRW317	H	16
ECON111	H	12	ITRW214	H	16	STTN311	H	32
ITRW112	X	12	STTN215	H	16			
STTN115	H	12	WISN211	X	8			
WISN111	X	12	WISN212	X	8			
			WVES311	X	12			
Total 1st semester		**76**	**Total 1st semester**		**92**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCS121 **or** ACCF121	H	16	ITRW123	H	12	ITRW325	H	16
AGLA/E121	X	12	ITRW222	H	16	ITRW321	H	16
BWIA121	H	12	STTN225	H	16	STTK321	H	24
ECON121	H	12	TGWN222	X	8	STTK322	H	8
ITRW124	H	12	WISN222	H	8			
STTN125	H	12	WVES221	X	12			
WISN121	X	12						
Total 2nd semester		**88**	**Total 2nd semester**		**72**	**Total 2nd semester**		**64**
Year Module			**Year Module**			**Year Module**		
Total year level 1		**164**	**Total year level 2**		**164**	**Total year level 3**		**128**
Total of curriculum credits								**456**

N.11 PROGRAMME: ACTUARIAL SCIENCE (200123)

The Faculty of Natural Sciences has approved one curriculum that provides a good basic training in actuarial science. In compiling this curriculum, possible occupations and our country's need for human resources were also considered. Furthermore this curriculum prepares the student for postgraduate studies in actuarial science (Hons BSc, curricula N609P), which are recommended with a view to registration with the South African Council for Natural Scientific Professions (SACNASP).

N.11.1 PROGRAMME OUTCOMES

a) Knowledge

On completing the programme, the student will have adequate knowledge and insight into the following topics:

- Functioning of an economy. Introductory micro- and macroeconomics. Determining the national income and the influence of different policy measures on it. National accounting concepts and the macro-equilibrium equation. Economic conjuncture and stabilisation. Transferring funds between countries, exchange rate systems. Balance of payment and international monetary system. Monetary policy in South Africa.

- The impact of the asset and liability management of banks on the national economy. Risk, liquidity policy, lending policy, liability management and the apportionment of capital by banks, interaction between bank risks and the monetary policy and regulations of the Reserve Bank. South African futures market. Functioning of derivative instruments and their application to risk hedging.

- The nature, aim and basic theory of accountancy. Financial statements, fixed assets and depreciation. Control, departmental and manufacturing accounts. Partnerships, close corporations and appropriate GAAP viewpoints.

- Close corporations, conversion of enterprises, company financial statements, pre-incorporation income, debentures, analysis and interpretation of financial statements, cash flow, deferred taxes. Lease agreements in financial statements, earnings per share, adjustments for previous years and group financial statements.

- Probability theory, sampling theory and techniques.

- Theory and topology of real numbers and finite dimensional vector spaces, algebraic and measurable spaces, integrals of measurable functions and

monotone convergence, linear transformations between general vector spaces, ordinary and partial linear differential equations and optimisation.

- Basic computer literacy, including the operation and components of a computer, storage of data, use of a spreadsheet and problem solving.

- Object-based programming language, including the basic structures, data types, methods, classes, objects and problem solving.

b) Skills

On completing this programme, the student will be able to demonstrate that he/she has the following skills:

- Identifying and solving convergent and divergent actuarial financial problems in a creative and pro-active manner.

- In-depth knowledge and insight into the financial markets and financial instruments and relevant problems, together with the ability to solve problems in interaction with other disciplines.

- Identifying and assessing financial risk, computer and data analysis techniques and/or approximations on an entrepreneurial basis, in order to manage financial risks.

- The ability to work effectively as an individual or in a team in an organisation and to address actuarial and financial problems.

- The ability to identify and investigate training and occupational possibilities in actuarial science, as well as research possibilities.

- The ability to master questionnaires and meaningful data collecting methods, to handle data presentation methods and exploratory data evaluation by using amongst others statistical computer software (e.g. Statistica, S-Plus and SAS), together with standard executive inference methods over wide range.

- The ability to prepare and present professional written and oral reports.

- Mathematical modelling of practical problems by using partial differential equations, combinatory mathematics, linear programmes and optimisation methods, together with computerised implementation where applicable.

- Programming in a modern high-level language, together with the ability to analyse and design computer systems and algorithms.

- The ability to do calculations, analyse and solve problems with the aid of a spreadsheet and to design algorithms and handle problems in an object-based programming language.

c) Articulation possibilities

The programme grants admission to postgraduate studies in the Hons BSc (Actuarial Science) programme and May also grant admission to honours studies in Economics and Statistics. Students who passed the Hons BSc (Actuarial Science) may also apply for admission to the Master's Degree in Business Mathematics and Informatics (see Postgraduate Calendar).

N.11.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

Students who do not have accounting as school subject, must do the basic accounting course at the beginning of the first semester in the first year. If the student pass with 75% or more the student can register for ACCC111 in the first semester. If the student pass with a mark between 60% and 75% a student can register for ACCF111 in the first semester. Students who get less than 40% for the course must register for ACCS111 and should consult either the Director or the Nominated Accreditation Actuary of the Centre for BMI to discuss the implications. Should a student at the end of the first semester not have fulfilled the prerequisites for ACCC121, a student must also consult with the Director or the Nominated Accreditation Actuary of the Centre for BMI. *Please compare with the Faculty of Economic and Management Sciences yearbook. Permission requirements for all Business Mathematics and Informatics courses (N134P, N135P, N136P and N137P), Mathematics 70-79% (level 6), APS Score 32*.

The following is only relevant to students who are from 2013 first year students in the N137P curriculum:
If a student does not obtain a final mark of at least 60% for both BWIA121 and STTN125, then the student may not continue with the N137P 2nd year curriculum. If this event occurs, the student must discuss the matter with either the Nominated Accreditation Actuary or Director of the Centre for BMI.

Mathematics Refresher course

Before the classes start in the beginning of the year, there will be a refresher course for Mathematics. All students that enrol for curriculums where the module WISN111 appears, are strongly recommended to do the refresher course.

N.11.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.11.4 ACTUARIAL SCIENCE N137P

Compilation of curriculum N137P

YEAR LEVEL 1			YEAR LEVEL 2			YEAR LEVEL 3		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCF111 **or** ACCC111	H	16	ECON211	H	16	BWIA311	H	24
BWIA111	X	12	EKRP211	H	16	STTN311	H	32
ECON111	H	12	STTN215	H	16	BWIA313	H	24
ITRW112	X	12	WISN211	X	8			
STTN115	H	12	WISN212	X	8			
WISN111	X	12	WVES311	X	12			
Total 1st semester		**76**	**Total 1st semester**		**76**	**Total 1st semester**		**80**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ACCC121	H	16	EKRP221	H	16	BWIN321	H	16
AGLA/E121	X	12	FINM221	H	16	STTK321	H	24
BWIA121	H	12	STTN225	H	16	STTK322	H	8
ECON121	H	12	TGWN222	X	8	BWIA323	H	8
ITRW123	X	12	WISN222	X	8			
STTN125	H	12	WVES221	X	12			
WISN121	X	12						
Total 2nd semester		**88**	**Total 2nd semester**		**76**	**Total 2nd semester**		**56**
Year Module			**Year Module**			**Year Module**		
			BWIA271	H	32	BWIA371	H	32
Total year level 1		**164**	**Total year level 2**		**184**	**Total year level 3**		**168**
Total of curriculum credits								**516**

N.12 PROGRAMME: INFORMATION TECHNOLOGY AND COMPUTER SCIENCE (264 100)

N.12.1 PROGRAMME OUTCOMES

This programme provides a good basic training in information technology. In compiling the curricula for this programme the Faculty also considered possible occupations and the need of our country for human resources. Furthermore this programme prepares the student for postgraduate studies (Hons BSc and/or M.Sc.) in computer science, which are recommended in view of registration with the South African Council for Natural Scientific Professions (SACNASP).

The purpose of the qualification is to:

- provide South Africa with graduates who have specific and relevant theoretical knowledge and practical skills in information technology. This will contribute to broadening the leadership base through well-qualified citizens for innovative and knowledge-based contributions to economic and other supporting activities for the country and its people;

- equip graduates with grade-level expertise and applied skills in the field of Information Technology (Computer Science and Information Systems) which is globally and especially in South Africa a shortage of well qualified and well-appointed human resources exist, and.

- enable graduates to enter the labour market of information technology as entrepreneurs or as employees of organisations at national and international level. The foundation laid as lifelong learners, will enable graduates to contribute to the support of strategic decision making and eventually to direct contributions in this regard.

The student will also have the following specific knowledge and skills, viz. he will have the ability to:

a) contribute in a professional manner and according to modern, acceptable methodologies to the design, development and delivery of computer systems in accordance with business needs and principles;

b) contribute meaningfully to the management of information and information sources on the basis of his knowledge and understanding of appropriate concepts, structures, models, theories, principles and research methods;

c) solve IT relevant problems in the context of approaches and techniques of other appropriate disciplines by means of a thorough, practice-directed knowledge of and insight into the field of information technology (IT);

d) realise the necessity to ensure continuing competency and to remain at the forefront of the latest technology and techniques, and as a lifelong student

to stay involved with these by means of established and well-developed learning skills;

N.12.2 ADMISSION REQUIREMENTS OF THE QUALIFICATION

See paragraph N.1.5.

N.12.3 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.12.4 CURRICULUM: INFORMATION TECHNOLOGY AND COMPUTER SCIENCE – N150P

Compilation of curriculum N150P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
First semester			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW112	H	12	ITRW211	H	8	ITRW311	H	16
STTN111	X	12	ITRW212	H	16	ITRW313	H	8
WISN111 **or** WISN113	X	12	ITRW213	H	16	ITRW315	H	8
BMAN111	X	12	ITRW214	H	16	ITRW316	H	16
ACCS111 **or** ACCF111	X	16	WVNS211	X	12	ITRW317	H	16
Total 1st semester		**64**	**Total 1st semester**		**68**	**Total 1st semester**		**64**
YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**		
Second semester			**Second semester**			**Second semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
ITRW123	H	12	ITRW222	H	16	ITRW321	H	16
ITRW124	H	12	ITRW225	H	16	ITRW322	H	16
STTN121	X	12	BMAN222	X	16	ITRW324	H	16
ACCS121 **or** ACCF121	X	16	WVNS221	X	12	ITRW325	H	16
AGLE121	X	12	WISN223	X	8			
Total 2nd semester		**64**	**Total 2nd semester**		**68**	**Total 2nd semester**		**64**
Total year level 1		**128**	**Total year level 2**		**136**	**Total year level 3**		**128**
Total of curriculum credits								**392**

N.13 RULES FOR THE DEGREE BACCALAUREUS ARTIUM ET SCIENTIAE (PLANNING)

N.13.1 PROGRAMME OUTCOMES

The Faculty Board of Natural Sciences has approved curriculum N183P, which provides a good basic training in urban and regional planning. In compiling this curriculum, possible occupations and our country's need for human resources were also considered. This curriculum also conforms to the requirements of the South African Council for Town and Regional Planners and prepares the student for admission to studies of the degree MArt et Scien(Plan.)

On completing this programme, the student should be able:

to demonstrate a broad and systematic knowledge base of urban and regional planning and techniques, and of other subject-specific contents that have been presented in the programme to bring about sustainable development in urban and rural environments;

to have the ability to identify, analyse and argue theoretically driven solutions to complex and real-life planning problems and issues in an ethically responsible way;

to demonstrate skills to collect, analyse critically, to process by computer, to integrate and evaluate results of current research and scientific and professional literature in the field of urban and regional planning, as well as quantitative and qualitative data, and to communicate his/her findings to peers and professional persons in writing and orally;

to act as entrepreneur by utilising knowledge and skills in planning consultation and development.

N.13.2 DURATION (MINIMUM AND MAXIMUM DURATION)

The minimum duration of the studies for this degree is four years and the maximum duration for completing the degree is five years.

N.13.3 ADMISSION REQUIREMENTS OF THE QUALIFICATION

a) The requirements of this qualification with regard to prior learning are described in N.1.7.

b) **Students are only admitted to the B.Art et Scien(Plan.) degree if they have been selected for admission. A maximum of 25 candidates, i.e. first-time university students, will be selected annually.**

N.13.4 FACULTY-SPECIFIC ADMISSION REQUIREMENTS

See paragraph N.1.6.

N.13.5 COMPLETION OF RESEARCH PROJECT (THESIS/ARTICLE)

a) Students must complete practical work for SBES 471 fulltime during first and second semester under supervision of personnel in the respective subject group. The following requirements are to be met:
b) An explanatory outline of the research project about a suitable topic within the subject group urban and regional planning should be sent to the school director to review before end of February for consideration.
c) On recommendation from subject group, a study leader will be appointed by the school director from joint personnel in the subject group. The student reserves the right to request that a specific personnel to supervise his/her studies. If deemed necessary the school director may with recommendation of subject group appoint a support- or assistant study leader from other subject groups and / or from the private or public sector.
d) Students are to submit monthly progress reports on the research project to the study leader. The progress report will consist of work completed in the previous month as well as work to be undertaken in the next month.

N.13.6 EXAMINATION OF THE PRACTICAL EXAM (SBPR421)

A date will be determined by the Subject Group when the practical exam will occur. The exam can consist of written and/or oral components and can include methodologies and practices that were dealt with during the programme.

N.13.7 COMPILATION OF CURRICULUM N183P: URBAN AND REGIONAL PLANNING WITH GEOGRAPHY AND ENVIRONMENTAL STUDIES

COMPILATION OF CURRICULUM N183P

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**			**YEAR LEVEL 4**		
First semester			**First semester**			**First semester**			**First semester**		
Module code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
SBES111	H	12	SBRS211	H	16	SBRS311	H	16	SBSS471*	H	48*
GGFS112	H	12	SBSS211	H	16	SBSS311	H	16	SBRS411	H	16
ECON111	X	12	GGFS212	H	16	GGFS312	X	32	SBSS412	H	16
WISN113	X	12	ECON211	X	16				SBSL412	H	16
STTN111	X	12	WVNS211	X	12						
Total 1ste semester		**60**	**Total 1ste semester**		**76**	**Total 1ste semester**		**64**	**Total 1ste semester**	**96**	

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**			**YEAR LEVEL 4**		
Second semester			**Second semester**			**Second semester**			**Second semester**		
Module Code	**Core**	**Cr**	**Module code**	**Core**	**Cr**	**Module Code**	**Core**	**Cr**	**Module code**	**Core**	**Cr**
SBES121	H	12	SBSL221	H	16	SBES321	H	16	SBES421	H	16
GGFS121	H	12	ECON321	X	16	SBRS321	H	16	SSBP421	H	16
ECON121	X	12	SBRS221	H	16	ECON322	X	16			
STTN124	X	12	SSBP221	X	16	SBSS321	H	16			
AGLE121	X	12	WVNS221	X	12	SECO321	X	16			
Total 2de semester		**60**	**Total 2de semester**		**76**	**Total 2de semester**		**80**	**Total 2de semester**	**32**	
Total Year level 1		**120**	**Total Year level 2**		**152**	**Total Year level 3**		**144**	**Total Year level 4**	**128**	
Credit Total of the curriculum										**544**	

*SBSS471 offered over two semesters (16 credits in first semester) and (32 credits in the second semester)

N.14 RULES FOR THE DEGREE BACCALAUREUS SCIENTIAE (INDUSTRIAL SCIENCE)

NB: Please note that this qualification has been closed for new entries from 2010. Students who are registered in this programme will be permitted to complete their studies within this curriculum until the end of 2014.

N.14.1 MINIMUM EN MAXIMUM DURATION

The minimum duration of studies for this degree is four years and the maximum duration for completing the degree is five years.

N.14.2 PROGRAMME: CHEMISTRY-CHEMICAL ENGINEERING

The Faculty of Natural Sciences has approved one curriculum that provides a good basic training in chemical sciences and technology. In compiling this curriculum, possible occupations and our country's need for human resources were also considered, and the curriculum was developed in close association with the chemical industry. Furthermore, this curriculum prepares the student for master's studies in Chemistry or Chemical Engineering. Having acquired appropriate experience the successful candidate may register with the South African Council for Natural Scientific Professions (SACNASP).

N.14.3 PROGRAMME OUTCOMES

On successfully completing this degree the student will be able to provide proof of his subject knowledge, skills and values regarding the exit level outcomes following below.

a) Knowledge

- Knowledge of fundamental, chemical, physical and mathematical subject-specific contents as indicated by the programme.
- Familiarity with scientific terminology and nomenclature.
- In-depth knowledge of the use of laboratory apparatus and techniques.
- Knowledge of industrial processes and operational methods.

b) Skills

- The ability to retrieve knowledge and information electronically and otherwise in preparation of lifelong learning.
- Familiarity with different learning strategies and management of time.
- The ability to process, evaluate and report on scientific information.

- The ability to identify relationships between structures (reagents), driving forces and processes.
- The ability to perform elementary and advanced problem solving.
- Control of basic laboratory skills.
- The ability to work in groups and where necessary to exercise or accept leadership.

c) Values, conduct and attitudes

- Understanding the impact of scientific actions.
- Awareness of scientific honesty and integrity.

d) Articulation possibilities

- On successfully completing the BSc(Ind.Sc.), the student will have direct admission to the master's degree in Chemistry and Chemical Engineering.
- Credits will be awarded for modules of other faculties and institutions, provided the outcomes and total credit requirements of this programme as a whole are met.
- The basic and applied skills in the mathematical and natural science disciplines the student has acquired by this qualification equip him to continue further learning in several specialist areas at other institutions.
- Students with credits from other tertiary institutions at levels 5a, 5b and 6 will be evaluated by the Dean for possible admission to further studies in the BSc(Ind.Sc.) curriculum.

N.14.4 CURRICULUM N139P: CHEMISTRY-CHEMICAL ENGINEERING*

NB: Please note that this qualification has been closed for new entries from 2010. Students who are registered in this programme will be permitted to complete their studies within this curriculum until the end of 2014.

This curriculum is compiled as follows:

YEAR LEVEL 1			**YEAR LEVEL 2**			**YEAR LEVEL 3**			**YEAR LEVEL 4**		
First semester			**First semester**			**First semester**			**First semester**		
Code	**Cr**	**T**	**Code**	**Cr**	**T**	**Code**	**Cr**	**T**	**Code**	**Cr**	**T**
CHEM111	12	H	CHEN211	8	H	CEMI311	16	H	CEMI315	8	X
FSKS111	12	X	CHEN212	8	H	CEMI313	16	H	CEMI411	16	H
ITRW112	12	X	TGWN211	8	X	CHEM311	16	H	CHEN611 or CHEN613	16	H
STTN111	12	X	TGWN212	8	X	CHEN312	16	H	CHEN612	16	H
WISN111	12	X	WISN211	8	X	TGWN312	16	H	CHEN671[#]	48	H
			WISN212	8	X						
			WVNS211	12	X						
Total 1st semester	**60**		**Total 1st semester**	**60**			**80**		**Total 1st semester**	**104**	
Second semester			**Second semester**			**Second semester**			**Second semester**		
Code	**Cr**	**T**	**Code**	**Cr**	**T**	**Code**	**Cr**	**T**	**Code**	**Cr**	**T**
CHEM121	12	H	CEMI222	16	H	CEMI322	16	H	CEMI321	16	H
FSKS121	12	X	CHEN222	8	H	CHEN321	16	H	CEMI323	16	H
TGWN121	12	X	CHEN223	8	H	CHEN322	16	H	KEUS62*	16	H
WISN121	12	X	TGWN222	8	X						
AGLE121	12	X	WISN221	8	X						
CEMI121	**16**	**H**	WVNS221	12	X						
Total 2nd semester	**76**		**Total 2nd semester**	**60**		**Total 2nd semester**	**48**		**Total 2nd semester**	**48[#]**	
Total year level 1	**120**		**Total year level 3**	**136**		**Total year level 3**	**128**		**Total year level 4**	**152**	
									Total for degree	**536**	

[#] The module CHEN671 is a year module so that the credits of this module are distributed over two semesters.

Select in consultation with the School Director TWO of the following elective modules:

Elective modules (KEUS62*) for N139P		
CHEN621	Homogeneous Catalysis	8
CHEN622	Coal Chemistry	8
CHEN623	Membrane Science and Technology	8
CHEN624	Molecule Modelling	8
CHEN625	Reactions Under Non-classical Conditions	8
CHEN626	Femto Chemistry	8
CHEM621	Polymer Chemistry	8
CHEM622	Advanced Structure Elucidation	8
CHEM623	Environmental Chemistry	8
CHEM624	Techniques of Organic Synthesis	8
CHEM625	Platinum Group Metal Chemistry	8

N.15 MODULE LIST

Module code	Descriptive name	Prerequisites	Credits
Accountancy			
ACCC111	Framework, foundations, cycle and financial reporting	Mathematics level 4 (50%-60%)	16
ACCC121	Accounting for different entities	ACCC111 (55%) **or** ACCF111 (65%)	16
ACCF111	Financial Accounting: Basic Concepts, Accounting Systems and Elementary Financial Reporting	Mathematics level 3 (40%-50%)	16
ACCF121	Financial Accounting: Elementary Financial Reporting, Partnerships, Close Corporations and Companies	ACCF111 (40%) **or** ACCC111 (40%)	16
ACCS111	Financial Accounting (Special) – Basic Concepts, Accounting Cycle and Accounting Systems		16
ACCS121	Financial Accounting (Special) – Bank Reconciliation, Elementary Financial Reporting and Analysis and Interpretation of Elementary Financial Statements	ACCS111 (40%)	16
FINM221	Financial Management: Introduction		12
Academic Literacy			
AGLE111	Introduction to Academic Literacy		12
AGLE121	Academic Literacy	AGLE111	12
Biochemistry			
BCHN213	Introductory Biochemistry	CHEM111 CHEM121	16
BCHN222	Metabolism	CHEN111 CHEN121 CHEN122	16
BCHS316	Enzymology	BCHN222 CHEN211 CHEN212 CHEN222 CHEN223	16

BCHS317	Molecular Biology	BCHN213 CHEN211 CHEN212 CHEN222 CHEN223	16
BCHS321	Analytical Biochemistry	BCHS317 CHEN211 CHEN212 CHEN222 CHEN223	16
BCHS322	Independent Project	BCHS316 BCHS317 CHEN211 CHEN212 CHEN222 CHEN223	16
Business Management			
BMAN111	Introduction to Business Management		12
Business Mathematics and Informatics			
BWIA111	Introduction to Financial Mathematics		12
BWIA121	Introduction to Actuarial Science	BWIA111; WISN111	12
BWIA271	Financial Mathematics (A201/CT1)	BWIN123 WISN121	32
BWIA311	Models: Survival Model s and Stochastic Processes (A202/CT4)	BWIA271 STTN221/225 TGWN222 WISN211 WISN222	24
BWIA313	Actuarial Statistical Models	BWIA271 STTN221/225 TGWN222 WISN211 WISN222	24
BWIA323	Actuarial Statistical Models – Time series analysis	BWIA271 STTN221/225 TGWN222 WISN211 WISN222	8
BWIA371	Contingencies (A203/CT5)	BWIA271 STTN221/225 TGWN222	32

		WISN211 WISN222	
BWIN321	BMI Project: Capital Markets Modelling and Analysis	STTN311	16
Chemistry			
CHEM111	Introductory Inorganic and Physical Chemistry		12
CHEM121	Introductory Organic Chemistry		12
CHEN211	Analytical Methods II	CHEM111 CHEM121	8
CHEN212	Physical Chemistry II	CHEM111 CHEM121 WISN111 WISN121	8
CHEN213	Organic Chemistry II Pharmacy/Biological Sciences	CHEM111 CHEM121	8
CHEN222	Inorganic Chemistry II	CHEM111 CHEM121 WISN111 WISN121	8
CHEN223	Organic Chemistry II	CHEM111 CHEM121	8
CHEM311	Analytical Methods III	CHEN211 CHEN212 WISN111 WISN121	16
CHEN312	Physical Chemistry III	CHEN212 WISN111 WISN121	16
CHEN321	Inorganic Chemistry III	CHEN222 CHEN212 WISN111 WISN121	16
CHEN322	Organic Chemistry III	CHEN223 CHEN212 WISN111 WISN121	16
Zoology			
DRKS111	Lower Invertebrates		12
DRKS121	Higher Invertebrates and Chordates		12
DRKN211	Developmental Biology	DRKS111; DRKS121	16
DRKS221	Comparative Animal Physiology	DRKS111; DRKS121	16

DRKS311	Ecology	DRKS221	32
DRKN321	Parasitology	DRKS311	16
DRKS322	Ethology	DRKS311 DRKN211	16
DRTS311	Ecology: Tourism	DRKS221	16
Economics			
ECON111	Introduction to Economics		12
ECON121	Basic Micro- and Macroeconomics		12
ECON211	Macroeconomics	ECON112 (40%) WISN112 (40%)/ WISN123 (40%)	16
Economics: Risk Management			
EKRP211	Introduction to Risk Management		16
EKRP221	Investment Management	ECON211 (40%)	16
EKRP311	Bank Risk Management	ECON211 (40%) EKRP211 (40%) EKRP221 (40%)	16
EKRP321	Financial Markets	EKRP221 (40%) WISN112 (40%)/ WISN 123 (40%)	16
Physics			
FSKS111	Mechanics, Oscillations, Waves and Theory of Heat.		12
FSKS113	Physics for Biology I		12
FSKS121	Electricity, Magnetism, Optics, Atomic and Nuclear Physics	FSKS111 WISN111	12
FSKS123	Physics for Biology II	FSKS113	12
FSKS211	Electricity and Magnetism	FSKS121 **&** TGWN121 **or** TGWN122 **or** WISN121	8
FSKS212	Optics	FSKS121 WISN121	8
FSKS221	Special Relativity	FSKS121 FSKS211 WISN121	8
FSKS222	Introductory Quantum Physics	FSKS121 FSKS211 WISN121	8
FSKS311	Electromagnetism	FSKS211 WISN211	16
FSKS312	Wave Mechanics	FSKS211 FSKS212 WISN211	16

		FSKS222	
FSKS321	Thermodynamics	FSKS121 WISN211	16
FSKS322	Nuclear Physics and Elementary Particles	FSKS312	16
FSKS323	Astro- and Space physics	FSKS211 FSKS221 FSKS222	16
Physiology			
FLGX113	Introductory Physiology		12
FLGX123	Membrane and Muscle Physiology	FLGX113	12
FLGX213	Endocrine System and Digestion	FLGX113	16
FLGX223	Physiological Defence Mechanisms	FLGX113	8
FLGX224	Metabolism	FLGX213	8
FLGX312	Excretion		8
FLGX313	Respiration		8
FLGX314	Cardiovascular Physiology		16
FLGX325	Neurophysiology		16
FLGX326	Reproductive and Environmental Physiology		16
Geography			
GGFS112	Introduction to Physical Geography		12
GGFS121	Introductory to Human Geography		12
GGFS212	Physical Geography	GGFS111/112 **&** GGFS121	16
GGFS222	Human Geography	GGFS111/112 **&** GGFS121	16
GGFS312	GIS and Remote Sensing	GGFS111/112 **&** GGFS121 **&** GGFS211/212 **&** GGFS221/222	32
GGFS322	Applied Geography	GGFS111/112 **&** GGFS121 **&** GGFS211/212 **&** GGFS221/222***** **&** GGFS311/312	32
***Prerequisites for Urban and Regional Planning students are unique and will be dealt with, within the Faculty.**			
Geology			
GLGN112	Geology and the Environment		12
GLGN122	South African Geology	GLGN112	12
GLGN211	Mineralogy and Igneous Petrology	GLGN112	16

		GLGN122	
GLGN221	Sedimentology, Structural Geology and Neotectonics	GLGN112 GLGN122 GLGN211	16
GDKN121	Introduction to Soil Science		12
GDKN211	Advanced Soil Science	GDKN121	16
GDKN221	Soil Degradation and Rehabilitation	GDKN211	16
GLGN311	Metamorphic Petrology and Geochemistry	GLGN112 GLGN211 GLGN221	32
GLGN321	Hydrogeology	GLGN112 GLGN211 GLGN221 GLGN311	32
Computer Science and Information Technology			
ITRW112	Introduction to Computers and Programming		12
ITRW115	Programming for Engineers I (C++)		12
ITRW123	Graphic Interface Programming I	ITRW112	12
ITRW124	Programming I	ITRW112 **or** ITRW115	12
ITRW126	Programming for Engineers (Visual Basic)	ITRW112	12
ITRW211	Graphic Interface Programming II	ITRW123	8
ITRW212	Programming II	ITRW124	16
ITRW213	Systems Analysis I	ITRW123 **or** ITRW124	16
ITRW214	Decision Support Systems I	WISN113 **or** WISN111	16
ITRW222	Data Structures and Algorithms	ITRW212	16
ITRW225	System Analysis and Design II	ITRW213	16
ITRW311	Databases I	ITRW222 **or** ITRW225	16
ITRW313	Expert Systems	ITRW211 **or** ITRW212	8
ITRW315	Communication Skills	ITRW222 (knowledge/experience of IT or Computer Science at 3rd year level)	8
ITRW316	Operating Systems	ITRW222	16

ITRW317	Artificial Intelligence	ITRW222 (knowledge/experience of IT or Computer Science at 3rd year level)	16
ITRW321	Databases II	ITRW311	16
ITRW322	Computer Networks	ITRW316	16
ITRW324	IT Developments	ITRW311 **or** ITRW316 (knowledge/experience of IT or Computer Science at 3rd year level)	16
ITRW325	Decision Support Systems II	ITRW214	16
Microbiology			
MKPN111	Microbiology (for Pharmacy)		12
MKBN121	Microbiology for Nursing		12
MKBN211	Introductory Microbiology	CHEM111 CHEM121	16
MKPN211	Microbiology for Pharmacy		8
MKBX213	Microbiology for food and nutrition		8
MKBS221	Introductory Microbial Genetics, Virology and Immunology	MKBN211	16
MKBS313	Microbial Physiology	MKBN211	16
MKBS314	Recombinant DNA Technology and Industrial Microbiology	MKBN211 MKBS221	16
MKBS323	Microbial Ecology	MKBN211	16
MKBS324	Microbial Diversity	MKBN211	16
Botany			
PLKS111	Plant Structure – Cytology, Morphology and Anatomy		12
PLKS121	Biodiversity and Environmental Botany		12
PLKN213	Plant Genomics	PLKS111 PLKS121	16
PLKS221	Flora of South Africa (Plant Systematics and Phytogeography)	PLKS111 PLKS121	16
PLKS311	Plant Physiology: Energy Conversion and Metabolism	PLKN213	32
PLKN323	Plant Ecology	PLKN213	32

		PLKS221 PLKS311	
PLTN323	Plant Ecology: Tourism	PLKS221	24
Urban and Regional Planning			
SBES111	Historical development of Civilizations	Admission requirements as described in N.1.6	12
SBES121	Urban Morphology	SBES 111	12
SBSS211	Planning approaches and practice	SBES 111 SBES 121	16
SBSL221	Urban Design	SBSS211	16
SBRS211	Introduction to Regional planning	SBES 111 SBES 121 ECON111 ECON121	16
SBRS221	Regional Plans	SBRS211 ECON211	16
SBRS311	Regional economics	SBRS211 SBRS221 ECON321	16
SBSS311	Commercial planning and development	SBSS211 SBSL221	16
SBSS321	Transport planning and systems	SBRS311; SBSS311	16
SBRS321	Regional development and analysis	SBRS311 WISN113 STTN111 STTN121	16
SBES421	Strategic and project management for planners	SBRS411; SBSL412; SBSS412	16
SBES321	Engineering for Planning	SBSS311; SBSS211	16
SBRS411	Regional analysis and application	SBRS311; SBRS321; ECON322	16
SBSL412	Land use management and residential development	SBES321; SBSS321	16
SBSS412	Integrated Housing Development	SBES321; SBSS321; SBSS311	16
SBSS471	Research project	SBES321; SBSS321; SBRS321; SSBP221; SECO321	32
SSBP221	Private law for planners	SBSS211	16
SSBP421	Planning practice	SBES321; SBSS321; SBRS411; SBSL412; SSBP221; SECO321	16

SECO321	Urban ecology for planners	SBSS311; GGFS112; GGFS121; GGFS212; GGFS312	16
Statistics			
STTN111	Descriptive Statistics		12
STTN115	Descriptive Statistics and Inference		12
STTN125	Introductory probability theory	STTN115 WISN111	12
STTN121	Introductory Statistical Inference I	STTN111	12
STTN122	Introductory Statistics		12
STTN124	Practical Statistics	STTN111	12
STTN215	Probability and Sampling Theory	STTN125 WISN121	16
STTN225	Statistical Inference and Data Analysis	STTN215 (STTK211)	16
STTN311	Statistical Inference	STTN221/225	32
STTK312	Statistics for Engineers		16
STTK321	Linear Models	STTN311	24
STTK322	Statistics project	STTN311	8
Applied Mathematics			
TGWN121 (B.Eng.)	Statics and Mathematical Modelling	WISN111 FSKS111	12
TGWN122 (BSc)	Mathematical Modelling and Vector Algebra	WISN111 FSKS111	12
TGWN211	Dynamics I	WISN121 and (TGWN121 **or** TGWN122)	8
TGWN212	Differential Equations and Numerical Methods	WISN121	8
TGWN221	Dynamics II	TGWN212 **&** (TGWN121 **or** TGWN122)	8
TGWN222	Numerical Analysis	WISN121	8
TGWN311	Partial Differential Equations	WISN221	16
TGWN312	Partial Differential Equations (Numerical)	WISN221	16
TGWN321	Dynamics III	TGWN211	16
TGWN322	Optimisation	WISN211 WISN212	16
Mathematics			
WISN111	Introductory Algebra and Analysis I		12
WISN112	Mathematical Techniques		12

WISN113	Basic Mathematical Techniques		12
WISN121	Introductory Algebra and Analysis II	WISN111	12
WISN123	Mathematical Techniques		12
WISN211	Analysis III	WISN121	8
WISN212	Linear Algebra I	WISN121	8
WISN221	Analysis IV	WISN211	8
WISN222	Linear Algebra II	WISN212	8
WISN223	Discrete Mathematics	WISN111 **or** WISN113	8
WISN312	Combinatorics	WISN121	16
WISN313	Complex Analysis	WISN221	16
WISN322	Algebraic Structures	WISN121	16
WISN323	Real Analysis	WISN221	16
Understand the Economic and Natural Worlds			
WVES221	Understanding the economic world		12
WVES311	Business ethics		12
WVNS211	Understand the Natural World		12
WVNS221	Science and Society	WVNS211	12

N.16 MODULES

N.16.1 METHOD OF DELIVERING

All modules are offered full-time by means of contact teaching.

N.16.2 ASSESSMENT METHODS

Assessment will be communicated to students at the outset of each semester.

Assessment methods include:

a) Formative assessment methods (homework, class tests, semester tests, reports on practical sessions, assignments) and other appropriate methods.
b) Summative assessment methods, including a two or three hour examination paper.

N.16.3 MODULE OUTCOMES

ACCOUNTING

Module code: ACCC111	**Semester 1**	
Title**: Framework, foundations, cycle and financial reporting**		
Module outcomes: On completion of the module, the student should be able to: • demonstrate a basic knowledge of the principles of the accounting cycle, including the recording of transactions and adjustments from source documents in the subsidiary journals/ledgers and general ledger of an entity; • understand the accounting framework and the basic elements of financial statements, including their recognition and measurement criteria; • prepare a set of basic financial statements, in the correct format, based on the information in a trial balance or general ledger, including basic disclosure in the notes to the financial statements; and record transactions incurred by clubs and other non-profit enterprises in the subsidiary ledgers, general ledger and financial statements.		
Module code: ACCC121	**Semester 2**	
Title**: Accounting for different entities**		
Module outcomes: On completion of the module, the student should be able to: • apply the definitions, recognition and measurement criteria of the different elements of financial statements, as well as the principles regarding the presentation of financial statements to a given situation; • distinguish between different entity forms, including sole proprietors, partnerships, companies and closed corporations, and account for transactions in the records of each of these entity forms; • effectively use information technology in the recording of transactions in the records of an entity; and effectively work together with others as part of a team or group.		

Module code: ACCF111	Semester 2	

Title**: Financial Accounting – Basic Concepts, Accounting Systems and Elementary Financial Reporting**

Module outcomes:

On completing the module the student should be able:

- to explain the purpose and function of accounting;
- to demonstrate a clear insight into the accounting equation;
- to compile journals, ledgers, subsidiary ledgers and control account
- to design a accounting system that will comply with the requirements of a specific entity;
- to prepare bank reconciliations;
- to calculate claims against insurers for inventory losses;
- to record transactions and compile financial statements for sole traders and departmental accounts.

Module code: ACCF121	Semester 2	

Title: **Financial Accounting: Elementary Financial Reporting, Partnerships, Close Corporations and Companies**

On completing the module the student should be able:

- to record transactions in the accounting records;
- to record transactions in the statement of receipt and payments;
- to compile a statement of comprehensive income (income statement) and a statement of the financial position (balance sheet) for non-trading enterprises;
- to compile annual financial statements of partnerships and to compile annual financial statements for close corporations according to the requirements of Generally Accepted Accountancy Practice (GAAP);
- to demonstrate a clear insight into the different types of company shares, record transactions for issuing and redeeming shares and compile elementary financial statements for companies.

Module code: ACCS111	Semester 2	

Title: **Financial Accounting (Special) – Basic Concepts, Accounting Cycle and Accounting Systems**

Module outcomes:

On completing the module the student should be able:

- to explain the purpose and function of accounting;
- to record transactions in journals, ledger accounts and control accounts;
- to design an accounting system for a specific enterprise;
- to compile financial statements for a sole proprietor of an enterprise.

Module code: ACCS121	Semester 2	

Title: **Financial Accounting (Special) – Bank Reconciliation, Elementary Financial Reporting and Analysis and Interpretation of Financial Statements**

Module outcomes:

On completing the module the student should be able:

- to record transactions in the cash receipts and payment journal and to compile a bank reconciliation statement;

- to compile the statement of comprehensive income (income statement), statement of financial position (balance sheet) and statement of change in equity for a sole trader in a generally accepted format;
- to identify financial ratios and to be able to explain and apply their purpose in analysing and interpreting the liquidity, profitability and solvency of a sole trader.

Module code: FINM221	**Semester 2**	

Title**: Financial Management: Introduction**

Module outcomes:

On completing this module you should be able:

- Understand the role of financial management and the financial manager in a business organisation and identify the primary goal of financial management
- Understand the concept of the time value of money and perform calculations
- Understand the relationship between risk and return and evaluate the risk and return of organisations based on the necessary calculations.
- Understand the basic accounting statements and concepts and perform an evaluation of financial performance, using financial statement analysis to assess the current financial condition of the firm.
- Demonstrate a knowledge of the characteristics of the principle forms of finance used by companies and the ways in which they may be issued
- Demonstrate a basic knowledge of the characteristics of financial instruments and how they can be applied by companies to hedge against risk.
- Demonstrate a complete and systematic knowledge of the factors to be considered by a company when deciding on its capital structure
- Demonstrate the skills to calculate the cost of the different sources of finance and the weighted average cost of capital of a company.
- Understand and apply the various techniques in evaluating capital investment projects.

ACADEMIC LITERACY

Module code: AGLE111	**Semester 1**	**NQF: 5**
Title: **Introduction to Academic Literacy**		
Module outcomes: On completion of this module the student should be able to: • demonstrate basic knowledge of learning strategies, academic vocabulary and register as well as the reading and writing of academic texts in order to function effectively in the academic environment; • communicate effectively orally and in writing in an appropriate manner in an academic environment; • understand, interpret, and evaluate basic academic texts and write appropriate academic genres in a coherent manner by making use of accurate and appropriate academic conventions; • listen, speak, read and write accurately, fluently and appropriately in an ethical framework.		
Module code: AGLE121	**Semester 2**	**NQF: 5**
Title: **Academic Literacy**		
Module outcomes: On completion of this module, students should be able to: • demonstrate fundamental knowledge of appropriate computer programs, as well as apply learning, listening, reading and writing strategies, use academic language register and read and write academic texts, in order to function effectively in the academic environment; • as an individual and a member of a group communicate effectively orally and in writing in an ethically responsible and acceptable manner in an academic environment; • as an individual and a member of a group find and collect scientific knowledge in a variety of study fields, analyse, interpret, and evaluate texts, and in a coherent manner synthesise and propose solutions in appropriate academic genres by making use of linguistic conventions used in formal language registers.		

BIOCHEMISTRY

Module code: BCHN213	**Semester 1**	

Title: **Introductory Biochemistry**

Module outcomes:

Knowledge:

At the end of this module the student will have the knowledge and insight:

- to understand the scope and range of Biochemistry;
- to compare pro- and eukaryotic cells;
- to distinguish between the informative and non-informative macromolecule;
- to know the primary and higher-order structure of DNA;
- to describe DNA replication, as well as its accuracy;
- to know the structure and function of the different types of RNA;
- to explain the role of special nucleotide sequences and the proteins involved in transcription and translation;
- to be able to explain the role of special and the proteins involved in transcription;
- to give a description of the transcription and translation process;
- to be able to describe processes and their meaning, such as recombination, mutagenesis, transpositions, genetic implanting/infixion and non-amplification;
- to explain the structure and functioning of an operon with reference to examples.

Skills:

At the end of the module the students have to be able:

- to appreciate the fundamental nature of biochemistry, especially in biological sciences;
- to isolate and partially characterise nucleic acids;
- to decipher genetic information;
- to construct mind maps of the structure and the processes in which nucleic acids are involved.

Module code: BCHN222	**Semester 2**	

Title: **Metabolism**

Module outcomes:

Knowledge:

At the end of this module the student will have the knowledge and insight:

- to be able to give the substrates, products and role of the three phases of metabolism;
- to be able to describe interim electron carriers and give the role of each;
- to know the general structure of carbohydrates, lipids, amino acids and nucleotides;
- to be able to describe the processes involved in the catabolism of carbohydrates, lipids, amino acids and nucleotides;
- to be able to describe the processes involved in the anabolism of carbohydrates, lipids, amino acids and nucleotides
- be able to describe the role of the Krebs Cycle in the final oxidation of piruvate

and acetyl-CoA;

- to be able to describe the role of the electron transfer chain in the excitation of chemical-osmotic potential;
- to be able to defend hypotheses for oxidative phosphorylation;
- to be able to describe the mechanisms of detoxification by means of cytochrome-P_{450};
- to be able to describe tissue-specific reactions and their role in metabolism;
- to have a good insight into the interdependency of the different components of metabolism.

Skills:

At the end of the module the student will be able:

- to integrate the different metabolic pathways;
- to anticipate the consequences of metabolic defects;
- to perform and interpret metabolic screening tests.

Module code: BCHS316	**Semester 1**	

Title: **Enzymology**

Module outcomes:

At the end of this module the student will demonstrate:

- integrated knowledge and understanding of the structural-functional relationship of enzymes;
- the ability to describe and evaluate the concepts of catalysis and kinetics of single and multi-substrate enzyme-catalysed reactions and to process the kinetic investigations;
- understanding of the different types of inhibitions and the ability to process the kinetic investigations;
- identify and evaluate the properties of allosteric enzymes, sigmoidal behaviour of enzymes and to be able to interpret and understand their importance in metabolic reactions.
- the ability to analyze, evaluate and correctly apply enzyme kinetics for medical, industrial and biotechnical applications;
- optimising/problem solving with regards enzyme-catalysed reactions; and
- accurate and coherent written and verbal communication of tasks and related to the practice-requirements of the discipline with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism.

Module code: BCHS317	Semester 1	

Title: **Molecular Biology**

Module outcomes:

At the end of this module the student will demonstrate:

- integrated knowledge and a thorough understanding of the complexity of eukaryotic genomes and the different mechanisms of the regulation of eukaryotic gene expression;
- knowledge of and ability to use the methods for characterizing inherited genetic defects and the potential and advances of gene therapy;
- integrated knowledge of and insight into the molecular basis of cancer and HIV;
- the ability to communicate and apply the basic principles of genetic engineering and to isolate and characterize cloned genes;
- the ability to plan and execute cloning experiments;
- the molecular description of defects in gene structure and expression;
- an appreciation of the scope and applications of genetic engineering; and
- accurate and coherent written and verbal communication of tasks and related to the practice-requirements of the discipline with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism.

Module code: BCHS321	Semester 2	

Title: **Analytical Biochemistry**

Module outcomes:

Knowledge:

At the end of this module the student will have the knowledge and insight to be able:

- to describe the basic principles of the methods for generating recombinant DNA molecules;
- to know and apply the different methods for isolating and characterising cloned genes;
- to describe the complexity of eukaryotic genomes;
- to explain the different mechanisms for regulating eukaryotic non-expression
- to explain and apply the methods of characterising genetic defects;
- to describe the potential of and development in the field of non-therapy;
- to explain the molecular basis of cancer and AIDS.

Skills:

At the end of this module the student will be able:

- to plan and perform cloning experiments, to process and interpret the results;
- to give a molecular description of defects in non-structure and non-expression;
- to appreciate the scope and application of genetic engineering.

Module code: BCHS322	Semester 2	

Title: **Independent Project**

Module outcomes:

Knowledge:

At the successful completion of this module, the student should have acquired the following knowledge and insight:

- The student must be able to conduct independent study utilising information systems like libraries and the Internet;
- The student must be able to identify gaps in specific areas;
- The student must be able to demonstrate technologically feasible approaches

which will lead to problem solving;
- The student must be able to implement analytical techniques like radiometry, photometry, liquid chromatography, gas chromatography and mass spectrometry in the empirical analysis of the formulated problem;
- The student must be able to process and convey data on a scientifically acceptable way;
- The student must be able to critically evaluate data and suggest alternative approaches;
- The student must be able to prepare reports in the form of research reports, articles and presentations.

Skills:

At the end of this module, the student must be able to:
- Study independently by utilizing information systems like the Internet;
- Formulate a hypothesis;
- Decide on and implement a specific experimental technique;
- Critically evaluate data;
- Prepare reports (in the form of articles) and presentations.

BUSINESS MATHEMATICS AND INFORMATICS

Module code: BWIA111	**Semester 1**
Title: **Introduction to Financial Mathematics**	
At the end of this module, the student will have acquired knowledge and insight into the calculation of interest, time value of money, present and future values, nominal and effective interest rates and annuities and loans. In this module, the student acquires skills to handle vaguely defined problems and to integrate concepts from the financial-economic world that can be quantified with the aid of mathematical models and solved by means of computer spreadsheet-based implementation. Specific attention is given to playing off simulation versus the analytical, as well as to discrete versus stochastic modelling of such problems.	

Module code: BWIA121	Semester 2
Title: **Introduction to Actuarial Science**	

Module outcomes:

On completion of the module the student will demonstrate a knowledge and understanding of:

(i) the calculation of interest;
(ii) time value of money;
(iii) present and future values;
(iv) nominal and effective rates;
(v) annuities;
(vi) loans;
(vii) using a generalised cash flow model to describe financial transactions;
(viii) taking into account the time value of money using the concepts of compound interest and discounting;
(ix) showing how interest rates or discount rates may be expressed in terms of different time periods;
(x) real and money interest rates;
(xi) calculating the present value and the accumulated value of a stream of equal or unequal payments using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation;
(xii) the definitions and use of more important compound interest functions including annuities certain;
(xiii) life insurance and specifically about general life insurance products and their associated risks;
(xiv) general/short-term insurance and specifically about general short-term insurance products and their associated risks;
(xv) medical care and specifically about medical aid funds and medical insurance and their associated risks; and
(xvi) banking and financial institutions and their associated risks.

The first 6 concepts ((i) to (vi)) are presented in the form of a self-created project.
In this module, the student acquires skills to handle vaguely defined problems and to integrate concepts from the financial-economic world that can be quantified with the aid of mathematical models and solved by means of computer spreadsheet-based implementation.
Specific attention is given to playing off simulation versus the analytical, as well as to discrete versus stochastic modelling of such problems.

Module code: BWIA271	Year module
Title: **Financial Mathematics (A201/CT1)**	

Module outcomes:

On completion of the module the student will demonstrate a sound knowledge and understanding of:

(i) using a generalised cash flow model to describe financial transactions.

(ii) taking into account the time value of money using the concepts of compound interest and discounting.
(iii) showing how interest rates or discount rates may be expressed in terms of different time periods.
(iv) real and money interest rates.
(v) calculating the present value and the accumulated value of a stream of equal or unequal payments using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation.
(vi) the definitions and use of more important compound interest functions including annuities certain.
(vii) the definition of an equation of value.
(viii) describing how a loan may be repaid by regular instalments of interest and capital.
(ix) using discounted cash flow techniques in investment project appraisal.
(x) describing the investment and risk characteristics of the following types of asset available for investment purposes:
  (a) fixed interest government borrowings
  (b) fixed interest borrowing by other bodies
  (c) shares and other equity-type finance
  (d) derivatives
(xi) analysing elementary compound interest problems.
(xii) calculating the delivery price and the value of a forward contract using arbitrage free pricing methods.
(xiii) the term structure of interest rates.
(xiv) simple stochastic models for investment returns.

The student will also as an individual or as a member of a group demonstrate the ability to:
(a) solve well-defined but unfamiliar problems using correct procedures and appropriate evidence
(b) perform a critical analysis and synthesis of information
(c) present information using basic information technology
present and communicate information reliably and coherently, using academic/professiona formats appropriately through integrated assessment of objectives (i) to (xiv) in the fo

Module code: BWIA311	**Semester 1**

Title: **Models: Survival Models and Stochastic Processes (A202/CT4)**

Module outcomes:
On completion of the module the student will demonstrate a well-rounded and systematic knowledge and coherent and critical understanding of:
(i) the principles of actuarial modelling.
(ii) the general principles of stochastic processes, and their classification into different types.
(iii) the definition and application of a Markov chain.
(iv) the definition and application of a Markov process.
(v) the concept of survival models.
(vi) the estimation procedures for lifetime distributions.
(vii) the derivation of maximum likelihood estimators for the transition intensities in models

of transfers between states with piecewise constant transition intensities.

(viii) the Binomial model of mortality inclusive of the derivation of a maximum likelihood estimator for the probability of death and the comparison of the Binomial model with the multiple state models.

(ix) how to estimate transition intensities depending on age, exactly or using the census approximation.

(x) how to test crude estimates for consistency with a standard table or a set of graduated estimates.

(xi) the process of graduation.

The student will also as an individual or as a member of a group demonstrate the ability to:

(a) deal with unfamiliar concrete and abstract problems and issues using evidence-based solutions and theory-driven arguments

(b) use well-developed information retrieval skills

(c) perform a critical analysis and synthesis of quantitative and/or qualitative data

(d) use appropriate IT skills to present results using prescribed formats

(e) present and communicate information and their own ideas and opinions in well-structured arguments

(f) show an awareness of audience and using academic/professional discourse appropriately through integrated assessment of objectives (i) to (xi) in the form of project(s).

Module code: BWIA313	**Semester 1**

Title: **Actuarial Statistical Models (A204/CT6)**

Module outcomes:

On completion of the module the student will demonstrate a well-rounded and systematic knowledge and coherent and critical understanding of:

(i) the concepts of decision theory and the application of them;

(ii) the calculation of probabilities and moments of loss distributions both with and without limits and risk-sharing arrangements;

(iii) the fundamental concepts of Bayesian statistics and using these concepts to calculate Bayesian estimators;

(iv) the concept and general properties of stationary, I(0), and integrated, I(1), univariate time series;

(v) the concept of a stationary random series;

(vi) the concept of a filter applied to a stationary random series;

(vii) the notation for backwards shift operator, backwards difference operator, and the concept of roots of the characteristic equation of time series;

(viii) the concepts and basic properties of autoregressive (AR), moving average (MA), autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) time series; and

(ix) the concept and properties of discrete random walks and random walks with normally distributed increments, both with and without drift.

(x) the construction of risk models involving frequency and severity distributions and the calculation of the moment generating function and the moments for the risk models both with and without simple reinsurance

arrangements;

(xi) the concept of ruin for a risk model. This will include the calculation of the adjustment coefficient and being able to state Lundberg's inequality. This also include the effect on the probability of ruin of changing parameter values and of simple reinsurance arrangements; andthe concepts of decision theory and the application of them;

(xii) techniques for analysing a delay (or run-off) triangle and projecting the ultimate position through applying the techniques;

(xiii) the fundamental concepts of a generalised linear model (GLM) and describing how a GLM may be applied

(xiv) the basic concept of a multivariate autoregressive model;

The student will also as an individual or as a member of a group demonstrate the ability to:

(a) deal with unfamiliar concrete and abstract problems and issues using evidence-based solutions and theory-driven arguments

(b) use well-developed information retrieval skills

(c) perform a critical analysis and synthesis of quantitative and/or qualitative data

(d) use appropriate IT skills to present results using prescribed formats

(e) present and communicate information and their own ideas and opinions in well-structured arguments

(f) show an awareness of audience and using academic/professional discourse appropriately

through integrated assessment of objectives (i) to (xxiv) in the form of project(s).

Module code: BWIA323	**Semester 2**	

Title: **Actuarial Statistical Models – Time series analysis (A204/CT6)**

Module outcomes:

On completion of the module the student will demonstrate a well-rounded and systematic knowledge and coherent and critical understanding of:

(i) the concept of cointegrated time series;

(ii) certain univariate time series models having the Markov property and how to rearrange a univariate time series model as a multivariate Markov model;

(iii) the processes of identification, estimation and diagnosis of a time series, the criteria for choosing between models and the diagnostic tests that might be applied to the residuals of a time series after estimation;

(iv) other non-stationary, non-linear time series models;

(v) simple applications of a time series model, including random walk, autoregressive and cointegrated models as applied to investment variables;

(vi) the development of deterministic forecasts from time series data, using simple extrapolation and moving average models, applying smoothing techniques and seasonal adjustment when appropriate;

(vii) the concepts of "Monte Carlo" simulation using a series of pseudorandom numbers;

(viii) the concepts and properties of seasonal time series models;

(ix) the concepts and properties of testing for a unit root; and

(x) the concepts and properties of intervention analysis and outlier dectection.

The student will also as an individual or as a member of a group demonstrate the ability to:

(a) deal with unfamiliar concrete and abstract problems and issues using evi and theory-driven arguments

(b) use well-developed information retrieval skills

(c) perform a critical analysis and synthesis of quantitative and/or qualitative

(d) use appropriate IT skills to present results using prescribed formats

(e) present and communicate information and their own ideas and opinions i arguments

(f) show an awareness of audience and using academic/professional discou

through integrated assessment of objectives (i) to (xxiv) in the form of project(s).

Module code: BWIA371	**Year Module**

Title: **Contingencies (A203/CT5)**

Module outcomes:

On completion of the module the student will demonstrate a well-rounded and systematic knowledge and coherent and critical understanding of:

(i) simple assurance and annuity contracts, and the developing of formulae for the means and variances of the present values of the payments under these contracts, assuming constant deterministic interest.

(ii) practical methods of evaluating expected values and variances of the simple contracts defined in objective (i).

(iii) using ultimate or select mortality to calculate net premiums and net premium reserves of simple insurance contracts.

(iv) the calculation, using ultimate or select mortality, of net premiums and net premium reserves for increasing and decreasing benefits and annuities.

(v) the calculation of gross premiums and reserves of assurance and annuity contracts.

(vi) straightforward functions involving two lives.

(vii) methods which can be used to model cash flows contingent upon competing risks.

(viii) the technique of discounted emerging costs, for use in pricing, reserving, and assessing profitability.

(ix) the principal forms of heterogeneity within a population and the ways in which selection can occur.

The student will also as an individual or as a member of a group demonstrate the ability to:

(a) deal with unfamiliar concrete and abstract problems and issues using evidence-based solutions and theory-driven arguments

(b) use well-developed information retrieval skills

(c) perform a critical analysis and synthesis of quantitative and/or qualitative

data

(d) use appropriate IT skills to present results using prescribed formats

(e) present and communicate information and their own ideas and opinions in well-structured arguments

(f) show an awareness of audience and using academic/professional discourse appropriately through integrated assessment of objectives (i) to (ix) in the form of project(s).

Module code: BWIN321	**Semester 2**	

Title: **BMI Project: Capital Markets Modelling and Analysis**

Module outcomes:

After completion of the module the student should:

- demonstrate a well-rounded and systematic knowledge and coherent and critical understanding of and insight into the mathematical modelling and analysis of financial instruments;
- be able to derive and apply mathematical formulas to price and hedge linear claims such as futures contracts and swaps as well as derive and apply binomial pricing of options;
- be able to use the MS Excel software package (or SAS/IML) to practically implement basic numerical procedures to price vanilla options using binomial trees;
- as an individual or as a member of a group demonstrate the ability to plan and conduct research according to standard protocol and to employ appropriate processes, procedures and techniques to solve problems in the field of capital markets modelling and analyses, communicate results effectively, orally and in writing, and to make use of appropriate technologies in all communications. Act ethically sound in dealing with issues and people.

CHEMISTRY

Module code: CHEM111	**Semester 1**	

Title: **Introductory Inorganic and Physical Chemistry**

Module outcomes:

On completing the module the student should be able:

- to demonstrate fundamental knowledge and insight into the properties of matter and compounds, molecular interaction, aqueous solutions, chemical equilibriums, acids and bases, formation of precipitates and electron transfer reactions and to apply this knowledge to write and name chemical formulae;
- to balance reaction equations, to use stoichiometric and other calculations to determine an unknown quantity, and to explain tendencies and relationships according to the Periodic Table (main groups);
- to demonstrate skills in applying laboratory and safety regulations;
- to be competent to explain observed chemical phenomena, do calculations relating to these, communicate results scientifically and to understand applications of these in industry and the environment better.

Module code: CHEM121	**Semester 2**	

Title: **Introductory Organic Chemistry**

Module outcomes:

On completing the module the student should be able:

- to demonstrate knowledge and insight to classify and name organic compounds;
- to know the physical properties and chemical reactions of unsaturated carbohydrates, alkylhalides, alcohols, carbonyl compounds, carboxylic acids and their derivatives, as well as a few aromatic compounds;
- and to describe the mechanism of selected organic reactions.

Module code: CHEM311	**Semester 1**	

Title: **Analytical Methods III**

Module outcomes:

Knowledge:

The student will have acquired knowledge and insight to describe molecular spectrometric techniques (ultraviolet, infrared, nuclear magnetic resonance, mass spectrometry), X-ray spectroscopy, separation methods (liquid and supercritical fluid chromatography, electrophoresis), thermal methods (differential thermal analysis, differential scanning calorimetry and thermogravimetry, DMA and TMA), electrochemistry (potentiometry, coulometry, conductometry, voltammetry and amperemetry), radiochemistry, the basic measurement with analytical instruments and relevant sampling preparation techniques.

Skills:

The practical sessions enable the student to use the different analytical instruments responsibly in order to determine the structures of chemical compounds and to measure their properties experimentally; subsequently, to evaluate and communicate these measurements in a meaningful way; and to realise what role the analytical chemist has to play in the welfare of the community and environment.

Module code: CHEN211	**Semester 1**	

Title: **Analytical Methods II**

Module outcomes:

At the end of this module the student will have acquired knowledge and insight to describe analysis as a process (sampling, sample preparation, separation, quantifying, evaluating) to evaluate analytical data, to do analytical calculations and to describe gravimetric methods, volumetric methods (acid-base, complexiometric), atomic spectrometric methods (atomic absorption and emission spectroscopy, inductively coupled plasma), surface characterising methods (microscopy) and separation methods (extraction, column and thin-layer chromatography). The student will also have become familiar with general laboratory techniques and chemical analytical techniques with a view to quality control and control laboratories, and have developed the ability to learn 'classical' analytical methods him-/herself, to conduct chemical analyses in a responsible way and to evaluate analytical results.

Module code: CHEN212	**Semester 1**	

Title: **Physical Chemistry II**

Module outcomes:

The thermodynamic and kinetic methods of approach in studying chemical and/or biological processes are studied at an introductory level in this module. On completing this

module, the student (1) will have command of the conceptual background, theoretical knowledge and operational competency to determine and interpret thermodynamic quantities and (2) will be familiar with basic kinetic concepts and have the ability to calculate kinetic quantities from which he/she will also be able to make process-mechanistic deductions.

Module code: CHEN213	**Semester 1**	

Title: **ORGANIC CHEMISTRY II**

Module outcomes:

At the successful completion of this module, the student will have acquired the knowledge and insight of the naming, structure and chemical characteristics of a range of poly functional compounds, which include amide and esters, alkenes, carbonyls, alcohols and carboxylic acid, as well as five and six membered hetero cyclical compounds. Furthermore, the student will have obtained knowledge and understanding of the basic principles of aromaticity, the chemistry of diazo compounds and the reaction mechanisms of electrophilic and nucleophilic aromatic substitution reactions. The student will be able to predict synthesis routes for, and orientation and reactivity of, aromatic compounds by applying the permanent effects.

Module code: CHEN222	**Semester 2**	

Title: **Inorganic Chemistry II**

Module outcomes:

At the successful completion of this module, the student should be able to describe the atom structure of the s- and p-group elements and compound bond theories that apply to these elements; to know and understand the chemical reactions of the more important s- and p-elements and to apply the tendencies in the periodic table; to acquire proper laboratory skills in a range of different synthesis techniques for the s- and p-group compounds; and to behave responsibly in a laboratory.

Module code: CHEN223	**Semester 2**	

Title: **Organic Chemistry II**

Module outcomes:

Knowledge

At the end of this module the student will be familiar with:

- the basic principles and rules of aromaticity;
- drawing resonance and chemical structures;
- identifying permanent and temporary effects and applying them to predict the sequel of reactions;
- the principles of electrophilic and nucleophilic aromatic substitution reactions with special reference to orientation, reactivity and mechanism;
- illustrating general and name reactions of aromatic and heterocyclic compounds with appropriate examples and mechanisms;
- suggesting synthesis routes for preparing specific aromatic compounds.

Skills

At the end of this module the student will be familiar with:

- setting up appropriate glass apparatus;

- the correct and safe handling of chemicals;
- the dangers of chemicals;
- making scientific observations during experiments and noting these down in the correct way;
- obtaining pure compounds at the end of a synthesis;
- the theoretical background of the experiments;
- laboratory techniques and skills;
- doing appropriate scientific calculations and completing an experimental report.

Module code: CHEN312	**Semester 1**	

Title: **Physical Chemistry III**

Module outcomes:

On completing this module the student will have acquired the operational knowledge and practice-directed subject insight to use the framework of the three main chemical theories for non-ideal (real) process types as base a) to determine and interpret thermodynamic and electrochemical quantities; b) determine and mechanistically explain reaction-kinetic parameters and c) explain quantum-chemically the origin of molecular spectra and calculate molecular and spectroscopic quantities from these spectra. This three-fold process enables the student to have a better understanding of chemical applications in practice and to develop a feeling for strategies to find solutions for the industry and environment.

Module code: CHEN321	**Semester 2**	

Title: **Inorganic Chemistry III**

Module outcomes:

By means of this module the student acquires basic knowledge and insight into the principles and applications of coordinate compounds, becomes familiar with the use of transition elements in industry, get to know representative reactions and properties of d- and f-group elements and develops the ability to predict their properties and reactions; and learns to plan and carry out a practical project in the synthesis of transition metal complexes and present the results systematically.

Module code: CHEN322	**Semester 2**	

Title: **Organic Chemistry III**

Module outcomes:

At the end of this module, the student will have the knowledge and insight to predict stereochemical implications of the most important reaction types. Knowledge is acquired about the chemical properties of polyfunctional compounds containing carbonyl, as well as five- and six-member heterocyclic compounds. The student will be familiar with the most general rearrangement reactions found in organic chemistry and will be able to solve elementary synthesis problems. Laboratory skills and synthesis techniques in the laboratory are mastered.

ZOOLOGY

Module code: DRKS111	**Semester 1**	
Title: **Lower Invertebrates**		
Module outcomes: On completing the module the student ought to demonstrate a thorough knowledge of the systematics, classification, form and function of lower invertebrate animals; to identify and explain the relationships between the different phyla; to demonstrate a thorough knowledge of the most important parasites of humans, animals and plants; to demonstrate skills in the optimal use of different kinds of microscopes; in making accurate drawings with captions, drawing up tables and using dichtomous identification keys.		
Module code: DRKS121	**Semester 2**	
Title: **Higher Invertebrates and Chordates**		
Module outcomes: On completing module the student ought to demonstrate a thorough knowledge of the systematics, classification, form and function of animals; the relationships between the different phyla; the morphological building plan and adaptation of animals that enable them to survive and procreate; the most important parasites of humans and animals; the evolutionary development of chordates from lower chordates up to the human being; to have skills in using different types of microscopes; making accurate drawings with captions; drawing up tables and using dichtomous identification keys; to conduct research in Zoology, more specifically, to have the ability to see to it that Zoology plays a meaningful and ethically correct role in Environmental Sciences.		
Module code: DRKN211	**Semester 1**	
Title: **Developmental Biology**		
Module outcomes: On completing the module the student ought to demonstrate knowledge and informed insight into the structure of DNA and RNA, mutagenic impact of UV- and radioactive radiation, pesticide pollution of the environment, use of genetically manipulated food, the origin and extinction of species, Mendelian genetics and other hereditary patterns, evolution theory and evolutionism; to demonstrate skills to predict and mathematically calculate the results of cross-breeding experiments from a given genotype, to identify, draw and name the different embryonic development stages of selected chordate animals, to use the different types of microscopes optimally and to be able to conduct the experimental procedure for obtaining live *Xenopus*-embrios; to participate effectively in group work skills and use appropriate scientific language in order to communicate in writing and orally; to have an appreciation for the variety and unity in the created reality and the processes involved in the inception of a new life; to be aware of the ethical aspects regarding the treatment of live experimental animals (vertebrates) and to treat them with the necessary respect, and to be aware of the ethical aspects involved in cloning as well.		
Module code: DRKS221	**Semester 2**	
Title: **Comparative Animal Physiology**		
On completing the module the student should be able to demonstrate fundamental knowledge and informed insight into specialised breathing organs of different kinds of animals, as well as into several aspects of the physiology, including respiration,		

thermoregulation, energy metabolism, osmotic regulation and movement of different animal groups; to demonstrate skills to analyse and explain the physico-chemical properties of the environment, with reference to their bearing on the gas exchange in the specialised breathing organs of different animals; to demonstrate skills to set up and conduct laboratory experiments regarding ammoniac excretion, carbon dioxide respiration, upstream flow mechanisms, glomerular filtration and the measurement of soluble oxygen; to demonstrate the ability to complete laboratory projects as a member of a group and to communicate the results to peers in the format of a written report and as an oral talk.

Module code: DRKS311	**Semester 1**	

Title: **Ecology**

On completing the module the student should be able to demonstrate well-rounded and systematic knowledge and insight into ecology and all its consequences and to relate it to other aspects of zoology and other subject fields; to demonstrate skills to describe interactions between organisms, as well as their interactions with the abiotic environment, and to research and describe the impact of human activities on the ecology by making use of appropriate statistics and models; to demonstrate the ability as an individual and/or as member of a group, to identify and characterise ecological problems, to research relevant literature, to collect data and to communicate possible solutions to peers in an ethical and responsible way, in writing and orally

Module code: DRTS311	**Semester 1**	

Title: **Ecology: Tourism**

On completing the module the student should be able to demonstrate well-rounded and systematic knowledge and insight into aspects of ecology applicable to tourism, such as ecological concepts, resources and conditions, basic population dynamics and community ecology, and be able to demonstrate application of this knowledge in practice by relating it to other aspects of zoology and other subject groups; to demonstrate skills to research and describe interactions between organisms and their interactions with the abiotic environment, as well as the impact of human activities on the ecology by making use of appropriate methods, statistics and models; to demonstrate he/she has the ability as an individual or as a member of a group, to identify and characterise ecological problems, research relevant literature, collect data and to communicate possible solutions to peers in an ethical and responsible way, in writing and orally.

Module code: DRKN321	**Semester 2**	

Title: **Parasitology**

On completing the module the student should be able to demonstrate a well-rounded and systematic knowledge and insight into human and animal parasitology with regard to definitions and epidemiological concepts; to demonstrate skills in terms of identification and classification of parasites, as well as to explain their impact on the health of the human being; to demonstrate the ability to identify epidemiological problems with regard to parasitology, to provide information on ways of preventing contamination, to recommend drugs and treatment and ways to take measures of prevention; to demonstrate skills to identify factors responsible for spreading and transmission of parasites and apply the relevant findings to epidemiological investigation and control programmes..

Module code: DRKS322	Semester 2	
Title: **Ethology**		
On completing the module the student should be able to demonstrate a well-rounded and systematic knowledge and insight into ethology and all its consequences, and to relate it to other aspects of zoology and other subject fields; to explain the coherence of animal behaviour with other aspects of zoology in particular (ecology, evolution, physiology etc.), but also with other fields in general, such as botany, conservation, sociology and psychology; to demonstrate he/she has the ability as an individual and/or as a member of a group, to plan and carry out a project, to present a report in writing on the project, and to explain the project by means of a talk; to argue the context of animal behaviour in creation.		

ECONOMICS

Module code: ECON111	Semester 1	
Title**: Introduction to Economics**		
Module outcomes: On completing this module you should: • be able to demonstrate fundamental knowledge and insight into the basic functioning of the economy and its different components, the economic problem of scarcity, limited resources and unlimited needs, the way in which the different economic systems try to solve this problem and the ways in which fiscal, monetary and other policy measures are applied to reach specific economic objectives; • have skills as an individual and/or as a member of a group to interpret and analyse the behaviour of the most important economic agents, such as consumers and producers; • have skills as an individual and as a member of a group to interpret and analyse the economic data of the fiscal, monetary and other types of policy in South Africa; • have the ability to identify, evaluate and solve clear-cut routines and new economic problems (such as unemployment and high inflation rates) in the South African context by means of proven methods, procedures and techniques; • have the ability to collect information from given sources, to select information suitable to the task, to analyse, synthesise and evaluate that information, and to communicate the results and/or proposals in an ethically healthy manner in writing and in an oral demonstration by means of appropriate information technology.		
Module code: ECON121	**Semester 2**	
Title**: Basic Micro- and Macroeconomics**		
Module outcomes: On completing this module you should be able to demonstrate: • fundamental knowledge and insight into the principles and theories on which microeconomics, macroeconomics and the Simple Macroeconomic Model are based and also have the ability to apply concepts and terminology in answering well-defined problems and case studies; • fundamental knowledge of the interaction between and interdependence of economic participants and economic indicators;		

- skills to analyse and evaluate case studies, examples and problems of certain macro- and microeconomic phenomena, with reference to demand, supply, equilibrium, consumption, production, price elasticity and various forms of competition;
- fundamental understanding of the causes of inflation, unemployment and economic growth and knowledge to recommend policies in this regard;
- skills to apply the Simple Macroeconomic Model in economic analyses and predictions;
- information gathering and processing skills for writing assignments within the context of micro- and macroeconomics, individually and in groups;

Module code: ECON211	**Semester 1**	

Title**: Macroeconomics**

Module outcomes:

On completing this module you should be able:

- to analyse the interrelationships in macroeconomics between different economic variables in an open economy;
- to evaluate the effect of various policy steps on the functioning of the economy in the long and short run;
- to identify different policy measures to identify macroeconomic problems;
- to explain how these measures may be applied.

ECONOMICS: RISK MANAGEMENT

Module code: EKRP211	**Semester 1**	

Title: **Introduction to risk management**

Module outcomes:

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

- demonstrate a clear understanding of what risk entails and how to manage risk strategically in a corporate environment in South Africa;
- explain why risk management plays an important role in the business environment;
- identify and distinguish between various types of risks;
- demonstrate both theoretical knowledge and practical application of the risk management process, i.e. the identification, evaluation and control of risk in a variety of scenarios; and
- demonstrate a clear understanding of the various forms of risk financing strategies, the cost associated with the different strategies and the appropriateness thereof for different risks.

Module code: EKRP221	**Semester 2**	

Title: **Investment management**

Module outcomes:

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

- demonstrate a solid knowledge of the general principles of investment management;
- explain the required rate of return as investment criterion;
- discuss the fundamental principles of investment in terms of risk/return and the time value of money;
- explain diversification;
- discuss and analyse the investment management process;
- discuss the organisation and functioning of security markets;
- distinguish between and evaluate the different investment theories;
- discuss valuation principles and practices in investment management;
- explain and discuss fundamental analysis; and
- discuss portfolio management and portfolio evaluation from the perspective of the investment manager.

Module code: EKRP311	**Semester 1**	

Title**: Bank Risk Management**

Module outcomes:

On completing this module you should be able:

- to demonstrate a sound and systematic knowledge and understanding of how the Assets and Liabilities Committee (ALCO) manage their assets and liabilities to address banking risks, the role that the management of these financial assets and liabilities play in the South African economy, as well as to address the financial and other related risks in a financial institution;
- to demonstrate well developed skills to solve problems by strategic management of the process of minimising financial risks; of maximising the interest income and equity of financial institutions, and show thorough understanding of the regulatory environment in which banks operate;
- to use individual and group methods to communicate information effectively, coherently and in appropriate format.

Module code: EKRP321	**Semester 2**	

Title**: Financial Markets**

Module outcomes:

On completing this module you should be able:

- to demonstrate a well-rounded and systematic knowledge and understanding of the mechanics of the South African Money and Capital Markets, including SAFEX and the Bond Exchange (the Johannesburg Stock Exchange and shares were covered in EKRP211), and demonstrate an understanding of and the ability to use the mechanics of the products and instruments, including derivatives used in these markets and the regulatory environment;
- to demonstrate the ability to work as an analyst, a market dealer, stock broker and back office official in the banking and treasury environment;
- in unfamiliar concrete and abstract scenarios, to apply basic portfolio management using the products and instruments of the above mentioned markets;

- to work in groups and/or as an individual and to communicate information effectively in an ethically sound manner, using appropriate information technology.

PHYSIOLOGY

Module code: FLGX113	**Semester 1**	
Title: **Introductory Physiology**		
Module outcomes: On completing the module, the student will have basic knowledge regarding the structural and chemical composition of the human body, the cell structure, different membrane transport systems, homeostatic control systems, enzyme functioning, membrane potentials and cellular communication as a foundation for further studies in Physiology. The student will also be familiar with and be able to use relevant subject terminology.		
Module code: FLGX123	**Semester 2**	
Title: **Membrane and Muscle Physiology**		
Module outcomes: On completing the module, the student must: • have in-depth knowledge of the biophysical (potential differences, load, current) flow and biochemical character (chemical composition of ion channels, conformation changes of channel proteins, ligand receptor interactions) of membrane physiology; • have in-depth knowledge of the importance of membrane physiology in controlling physiological functions through change in membrane permeability; • have basic knowledge regarding cellular communication and information transfer as a necessary foundation for further studies; • be able to demonstrate fundamental knowledge of the functional anatomy of muscle tissue, the molecular mechanism of contraction, the processes associated with excitation contraction coupling and neuromuscular junction, as well as to discuss applications of these, for example to food poisoning; understand and be able to apply the principles of muscle mechanics, for example in using exercise apparatus; • be able to describe and apply the energy metabolism of muscle contraction, for example in exercise; • be able to distinguish between skeletal muscle, smooth muscle and heart muscle, and indicate the practical advantages of the differences; • be able to discuss the control and coordination of motor movement, using effective examples as illustrations; • demonstrate the ability to identify and analyse the causes and consequences of muscle defects, such as Myastenia Gravis, muscular dystrophy, rigor mortis, hypertrophy and atrophy.		

Module code: FLGX213	Semester 1	
Title: **Endocrine System and Digestion**		
Module outcomes: On completing the module , the student must: • demonstrate knowledge of the properties and functioning of hormones and endocrine glands; demonstrate insight into the chemical classes of hormones using examples, and physiological functions of hormones in every class; be able to apply hormones as chemical messengers in homeostatic control mechanisms; be able to demonstrate fundamental knowledge of hormone synthesis, secretion and the control of secretion, transport, metabolism, mechanisms of hormonal functioning and the hypothalamus-thyroid control system; be able to apply knowledge of endocrinology to explain endocrine abnormalities, such as among others diabetes mellitus and hypo- or hyperthyroidism; • be able to demonstrate fundamental knowledge of the functional anatomy, design, function and control (neural and hormonal) of the digestive tract and associated organs; be able to demonstrate the ability to identify and analyse the causes and consequences of defects of the digestive tract.		
Module code: FLGX223	**Semester 2**	
Title: **Physiological Defence Mechanisms**		
Module outcomes: On completing the module, the student should: • know and use the relevant subject terminology, demonstrate an in-depth knowledge of the defence mechanisms of the body, including the role of the skin as the first defence line, the non-specific and specific defence mechanisms of the body, as well as how the body fights the penetration of viruses, bacteria and also the formation of cancer cells; • have knowledge of the coagulation of blood and the mechanism to limit the loss of blood (blood loss may threaten the survival of the body); • be able to motivate the value of knowledge of the physiological defence mechanisms for human health and to argue and solve the relevant physiological defence mechanism problems in an integrated way.		
Module code: FLGX224	**Semester 2**	
Title: **Metabolism**		
Module outcomes: On completing the module the student must: • discuss the role of Adenosinetriphosphate (ATP), energy sources and metabolic tempo; • be able to draw and explain diagrams and schematic representations of the most important metabolic pathways, such as glycogenesis, glycogenolysis, Krebs Cycle and oxidative phosphorylation; • be able to communicate aspects of carbohydrate, lipid and protein metabolism; • to be able to discuss the properties, causes and consequences of metabolic defects, like ketosis and atherosclerosis.		

PHYSICS

Module code: FSKS111	**Semester 1**	
Title: **Mechanics, Oscillations, Waves and Theory of Heat**		
Module outcomes: **Knowledge:** At the end of this module, students will have formal mathematical knowledge of fundamental concepts like force, work, energy and momentum, elasticity, simple harmonic motion, waves, hydrostatics, hydrodynamics and theory of heat. **Skills:** For the first time, students are introduced to differential and integral calculus in natural science problems, and using these, they will have the skills at the end of the module to describe certain sections of the theory and to solve a variety of problems of the above-mentioned topics. In the accompanying practical sessions, students develop skills in measuring, processing and reporting natural science processes selected from an area wider than Physics only.		
Module code: FSKS113	**Semester 1**	
Title: **Physics for Biology I**		
Module outcomes: At completion of this module, the student should be able to demonstrate: • Knowledge and insight in how physics occurs in natural science phenomena that are selected mainly from biological sciences by explaining and discussing topics such as kinematics, Newtonian laws of motion, torques, work, energy and power, with applications to the human body, fluid mechanics, pressure, surface tension, viscosity, with applications to the flow of blood, theory of heat and thermodynamics; • Skills in measuring, processing and reporting natural science processes.		
Module code: FSKS121	**Semester 2**	
Title: **Electricity, Magnetism, Optics, Atomic and Nuclear Physics**		
Module outcomes: **Knowledge:** Students acquire a formal mathematical knowledge of electricity and magnetism, optics and topics from atomic and nuclear physics, such as introductory quantum theory, quantum theory of radiation, atomic spectra, X-rays, de Broglie waves and radioactivity. **Skills:** Students develop skills to describe physical processes and natural science problems by means of differential and integral calculus and to solve a variety of problems of the above-mentioned topics. In the accompanying practical sessions, they develop their skills in measuring, processing and reporting on natural science processes.		
Module code: FSKS123	**Semester 2**	
Title: **Physics for Biology II**		
Module outcomes: At completion of this module, the student should be able to demonstrate:		

- Knowledge and insight in how physics occurs in natural science phenomena so that he/she can explain and discuss electrostatics, electric potential, electric circuits, magnetism and electromagnetic waves, with applications to apparatus used in biological sciences, as well as waves, sound, optics and nuclear physics;
- Skills to solve problems in measuring, processing and reporting natural science processes.

Module code: FSKS211	**Semester 1**	

Title: **Electricity and Magnetism**

Module outcomes:

Knowledge:

At the end of this module, the students have been introduced comprehensively to the experimental laws of electrostatics and magnetostatics in vacuum and matter, and to introductory electrodynamics.

Skills:

Students learn to apply the laws to a variety of problems by calculating electrostatic potentials and fields and magnetostatic fields. In the practical sessions, they apply new knowledge to measure some of these phenomena, to investigate the laws governing them and to analyse and present their results and reports by means of computer methods.

Module code: FSKS212	**Semester 1**	

Title: **Optics**

Module outcomes:

Knowledge:

At the end of this module, students will have acquired a formal mathematical knowledge of optics by having studied the topics of wave theory, interference, diffraction and polarisation of light, as well as laser physics.

Skills:

In the accompanying practical sessions, students describe and measure a number of concepts and phenomena from geometrical optics, and they investigate certain laws governing these phenomena. They do this amongst others by means of the optical telescope at Nooitgedacht. They use graphical modelling and presentation of the data to deliver a computerised report on their observations.

Module code: FSKS221	**Semester 2**	

Title: **Special Relativity**

Module outcomes:

Knowledge:

At the end of this module students have acquired a good insight into the meaning and historical development of the special relativity theory by having studied the nature and consequences of the Michelson-Morley experiment, why and in what way the Lorentz transformations were introduced, and how Einstein interpreted and used these in terms of his two postulates of special relativity. Students also have been introduced to the concepts and application of length contraction, time dilatation, Minkowski's space-time intervals, spectral shifts, Hubble's law, relativistic energy and its four-vector applications.

Skills:

In the theory, the emphasis is on formal and conceptual knowledge and applications. In the accompanying practical sessions, the emphasis is on the correct written and oral presentation of experimental results and project reports. Using computer graphic software and word processing are learnt.

Module code: FSKS222	**Semester 2**	

Title: **Introductory Quantum Physics**

Module outcomes:

Knowledge:

At the end of this module, students have been introduced to the extension of classical physics for the first time by having been exposed to energy quantisation for a few phenomena with reference to Planck's postulate. The phenomena include blackbodies, the photoelectric effect, the Compton Effect and X-rays. Students also have been exposed to Bohr's quantisation principles to develop the first workable model for the hydrogen atom.

Skills:

In the practical sessions, a few quantum mechanical phenomena are investigated. Specialised computer software is used for presenting data in a computerised report.

Module code: FSKS311	**Semester 1**	

Title: **Electromagnetism**

Module outcomes:

Knowledge:

In this module, which follows on FSKS211, the Maxwell equations are derived for vacuum and matter. By means of these equations, all electromagnetic phenomena can be described and explained mathematically. Students master solutions to these equations in vacuum, non-conductors and conductors, including wave-guides and optical fibres.

Skills:

In the practical sessions, some of these aspects are investigated experimentally. Students learn, for example, how to use an oscilloscope and other basic measuring apparatus.

Module code: FSKS312	**Semester 1**	

Title: **Wave Mechanics**

Module outcomes:

Knowledge:

At the end of this module, students have been introduced to the first principles of quantum physics in the form of wave mechanics as replacement of Newtonian mechanics.

Skills:

Students learn to do basic quantum mechanical calculations and to solve applicable differential equations. In the practical sessions, they study quantum mechanical phenomena and report on these by means of computerised reports and oral presentations.

Module code: FSKS321	**Semester 2**	

Title: **Thermodynamics**

Module outcomes:

Knowledge:

After the introduction in FSKS111, students receive formal education in the following topics: the zeroth, first, second and third laws of thermodynamics. The concepts entropy, Tds-equations, Helmholtz and Gibbs functions, potential functions, equilibrium and phase transitions are introduced by a simple statistical description of an isolated system with emphasis on the example of an ideal gas.

Skills:

Students learn how to develop and present abstract theory and to apply thermodynamic principles to systems, like the atmosphere, and to certain cyclic processes, like those of heat engines and refrigerators. Great emphasis is placed on problem solving as the outstanding method to apply physics practically. In the practical sessions accurate measurements are made on alternate stars, students learn how to measure heat capacity and they gain experience in applying their thermodynamic knowledge to astrophysical problems.

Module code: FSKS322	**Semester 2**	

Title: **Nuclear Physics and Elementary Particles**

Module outcomes:

Knowledge:

The course follows directly on FSKS312, which deals with introductory wave mechanics. At the end of FSKS322 students have knowledge of nuclear structures and reactions, nuclear decay and models, nuclear models, groups of elementary particles, laws of conservation and the standard quark model for elementary particles.

Skills:

In the theory, emphasis is placed on formal and conceptual knowledge and applications thereof. In the practical sessions, a talk on a popular topic is required, and projects on the contents of the course are discussed. Great emphasis is placed on the correct written and oral presentation of project reports. The use of computer graphic software and word processing is learnt.

Module code: FSKS323	**Semester 2**	

Title: **Astro- and Space Physics**

Module outcomes:

Knowledge:

At the end of this course, students have been introduced to distances, positions, motion, clarity, temperature, mass and colour of stars and the significance of these properties. Further topics are the Sun and heliosphere as prototype, magnetic field of stars and planets, pulsating stars and stellar explosions. Also of importance is the motions and acceleration of charged particles in astrospheres, as well as in astrophysical shocks.

Skills:

In the practical sessions, skills are acquired in photometric and spectral measurements with the optical telescope at Nooitgedacht.

GEOGRAPHY

Module code: GGFS112	**Semester 1**	
Title**: Introductory to Physical Geography**		
On completion of the module the student should have an understanding of earth and atmospheric processes. In particular the students will need to demonstrate knowledge of geomorphologic processes associated with landscape formation, which include macro scale tectonic processes and continental uplift, erosion and weathering, mass wasting and deposition. Students will be expected to understand the fundamentals of synoptic meteorology, including atmospheric composition and thermodynamics as well as climate variability and change. Important concepts will include the earth's energy budget and general circulation.		
Module code: GGFS121	**Semester 2**	
Title: **Introduction to Human Geography**		
On completing the module, the student should be able to demonstrate fundamental knowledge and insight into different political systems, the economic-geographical relations between the RSA and its neighbouring countries, aspects of demography, amongst others population growth, the South African population situation, the influence of population distribution on economic development, economic activities and systems, spatial interaction (potential model and gravitation model), types of transport; world urbanisation tendencies, the factors that influence the growth and location of urban settlements and different models of urban structure; to demonstrate skills by carrying out statistical operations with geographical data and presenting the results diagrammatically, as well as by interpreting them spatially; the ability to identify problems at higher cognitive levels and to present a holistic image of the earth in proposed solutions to problems, to appreciate and apply the integrated nature of environmental management and to embrace an attitude of conservation towards creation.		
Module code: GGFS212	**Semester 1**	
Title: **Physical Geography**		
On completing the module, the student should be able to demonstrate: - detailed knowledge and insight into South African Geomorphology, including controls on landforms, fluvial, peri-glacial and coastal geomorphology, the relationship between landscapes and environmental change; the dangers of the process of mass movement of weathering waste and rock material, the factors that control slope stability and slope profiles; stream channels, profiles and current flow; - in-depth knowledge and understanding of atmospheric processes the use of an adiabatic map, the role of climate in agriculture, tourism and housing, weather and climatic modification, weather patterns and the relationship between climate and pollution; - an ability to carry out weather measurements, processing and evaluating the data; constructing and interpreting tephigrams; performing and interpreting computer-assisted statistical operations, individually but also as member of a group.		
Module code: GGFS222	**Semester 2**	
Title**: Human Geography**		

On completing the module, the student should be able to demonstrate: - detailed knowledge and critical insight into the principles of economic Geography, including diffusion and different classes of economic activities, the principles of urban Geography, and the challenges of the urbanizing world and urban Geography in the third world; - the ability to effectively apply appropriate inter-comparison of global urban and economic landscapes, thereby demonstrating a sound grasp of the controls and modelling of such landscapes; - accurate and coherent written and verbal communication of relevant information with understanding of and respect for intellectual property conventions, copyright and rules on plagiarism. - ability to select, evaluate and effectively implement/apply with discernment those standard skills to solve fundamental problems in a defined environment in the field of Human Geography, with a view to providing appropriate solutions.

Module code: GGFS312	**Semester 1**	
Title: **GIS and Remote Sensing**		
On completing the module, the student should demonstrate: - detailed and systematic knowledge of and insight into the different data entities found in GIS, and be able to relate them to spatial issues in Geography and other disciplines; - skills in collecting, managing and applying basic analyses to geographical data by making use of appropriate GIS and image processing software; - the ability to apply the principles of image analysis and interpretation in terrain evaluation and land use mapping and effectively communicate GIS findings to appropriate audiences. - the ability to generate high quality and meaningful maps and reports as an individual and as member of a group.		

Module code: GGFS322	**Semester 2**	
Title: **Applied Geography**		
On completing the module, the student should be able to demonstrate: - detailed and systematic knowledge and insight into the "State of the Environment" which reflects the environmental influences associated with the interaction of the natural environment with human activities such as cities, industries, power supply, mining, agriculture and recreation, and be able to suggest and evaluate appropriate responses to such influences; - the ability, as an individual and/or as member of a group, to identify, describe and characterise problems in the field of Geography, to research relevant literature, collect and interpret data, analyse, evaluate and synthesise information and come to a meaningful conclusion, and communicate findings to peers orally and in written reports for a research project of appropriate scope.		

GEOLOGY

Module code: GLGN112	**Semester 1**	
Title: **Geology and the Environment**		
On completing the module, the student should be able to demonstrate a fundamental knowledge and informed insight into the internal and external geoprocesses; to have the		

ability to describe and identify the most common rock-forming minerals and rocks; to demonstrate the ability to communicate in writing and orally points of view and solutions regarding certain earth issues, such as global warming, exploitation of irreclaimable natural resources and pollution because of mining activities; to demonstrate development of skills in identifying, analysing and driven by theoretical arguments proposing solutions to geological problems or potential problems; to demonstrate an awareness of ethics connected to geology, as in the case of exploitation of mineral sediments at the expense of conservation of geo- and biodiversity.

Module code: GLGN122	**Semester 2**	

Title: **South African Geology**

On completing the module, the student should be able to demonstrate (a) a fundamental knowledge of the geological time scale and basic insight into the concept of geological time; (b) fundamental knowledge of stratigraphic principles and the different types of stratigraphic correlations; (c) fundamental knowledge of the primary South African stratigraphic units; the ability to interpret and understand geological development and structure in three dimensions; to demonstrate an insight into the issue of certain areas in South Africa being described as problem areas because of detrimental environmental impacts caused by human activities and the probable accompanying ethical aspects.

Module code: GLGN211	**Semester 1**	

Title**: Mineralogy en Igneous Petrology**

On completing the module, the student should (a) have a thorough knowledge and extensive understanding of a variety of rock-forming and economic minerals and (b) a variety of igneous rock associations and the accompanying rock-forming processes; (c) have an in-depth knowledge of chemical analyses of minerals and rocks; (d) have acquired a systematic review of the most important igneous rock associations; have the ability to critically analyse and synthesise tendencies in compositional changes of minerals and rocks.

Module code: GLGN221	**Semester 2**	

Title**: Sedimentology, Structural Geology and Neotectonics**

On completing the module, the student should be able to demonstrate thorough knowledge of the principles of structural geology; to demonstrate thorough knowledge of the general principles of deformation in brittle and ductile rocks and of the description of structures; to demonstrate thorough knowledge of sedimentology; to demonstrate knowledge of the South African stratigraphy; to demonstrate an understanding of how the subjacent structure and sedimentological properties of an area may give rise to problem areas and ethical issues.

Module code: GLGN311	**Semester 1**	

Title: **Metamorphic Petrology and Geochemistry**

On completing the module, the student should have well-rounded and systematic knowledge and coherent and critical understanding of the petrologic processes and products of metamorphosis; have acquired a systematic review of metamorphic fasies; have well-rounded and systematic knowledge and coherent and critical understanding of basic geochemical principles, their application and the distribution and movement of chemical elements in the geosystem.

Module code: GLGN321	**Semester 2**	

Title**: Hydrogeology**

On completing the module, the student should be able to demonstrate a well-rounded and systematic knowledge of the principles of hydrogeology and related ethical principles; and to demonstrate a well-rounded and systematic knowledge of the general geophysical principles as applicable to hydrogeology.

Module code: GDKN121	**Semester 2**	
Title: **Introduction to Soil Science**		
On completing the module, the student should have a basic understanding and knowledge of fundamental concepts in soil science; know and understand the different soil components and understand and be able to define the interaction between the components; be able to name, circumscribe and illustrate using examples the processes of soil genesis and soil-forming; be able to differentiate, identify and classify soil horizons, especially in the context of South African soils.		

Module code: GDKN211	**Semester 1**	
Title: **Advanced Soil Science**		
On completing the module, the student should know and understand geotechnical classification systems; know and explain the structure of primary and secondary minerals and be able to explain and define weathering products and interactions; to explain how soil reacts to mechanical forces, as well as to explain and illustrate soil-mechanical concepts and applications; to know and understand physical interaction between solid particles, water, organic material and earth gases; to understand and explain chemical reactions that take place in soils; to describe the different microbiological organisms and their contribution in soils; to explain and apply procedures of soil sampling; to understand and explain the theory of analytical analysis procedures; to know and understand the principles of manuring recommendations; to apply the principles of management, presentation and interpretation of information collected.		

Module code: GDKN221	**Semester 2**	
Title**: Soil Degradation and Rehabilitation**		
On completing the module, the student should be able to distinguish between natural and anthropogenetic soil degradation with regard to the origin and factors that lead to soil degradation; to identify pollution of soil on the basis of physical and chemical analyses in order to determine him-/herself which types of analyses are applicable in the case of field investigations; to explain what the influence of pollution and degradation is on the chemical, physical and mechanical properties and general uses of soil; to use remote sensing techniques to spot and identify soil degradation; propose remedial measures to counteract, prevent and remedy degradation; to identify implications of soil degradation and pollution in field context and to identify or develop potential rehabilitation programmes; to develop sustainable soil use management systems; to develop environmental risk analyses for different uses of soil; to carry out practical soil surveys in the field with emphasis on identifying soil degradation and pollution, and risk management.		

INFORMATION TECNOLOGY AND COMPUTER SCIENCE

Module code: ITRW112	**Semester 1**	
Title: **Introduction to Computers and Programming**		
Module outcomes: On completing this module, the students should be able to demonstrate fundamental knowledge of the different components of a computer and an information system, as well as programming languages and their uses. Furthermore, the student should be able to demonstrate the manipulation of spreadsheets by applying knowledge of tables, computations, transfer of data between different applications, functions and graphic presentations; to demonstrate the ability to solve problems by designing and implementing structured programming, by using data manipulation and data presentations and applying 'GUI' event-driven approaches in the development environment of a spreadsheet; to demonstrate insight into ethical issues related to the wider IT business and an awareness of the risks and dangers that threaten the business; to demonstrate the ability to communicate in writing by compiling a report after having completed a project.		
Module code: ITRW115	**Semester 1**	
Title: **Programming for Engineers I C++**		
Module outcomes: After successfully completing the module the student ought to have knowledge of and insight in the basic structure, data types, and functions, including structured problem solving and debugging, testing and execution of applications of the programming language C++. The student will have to demonstrate that he/she can apply the acquired the knowledge and insight to solve elementary problems in engineering, develop an algorithm to solve problems, codify the algorithm in C++, and to debug and test it on the computer.		
Module code: ITRW123	**Semester 2**	
Title: **Graphic Interface Programming I**		
Module outcomes: On completing the module, the student should demonstrate knowledge to be able to write a computer program that requires certain fundamental theoretical prescience have been mastered; demonstrate the ability to solve simple problems by applying fundamental theoretical prescience; demonstrate sufficient fundamental knowledge of and insight into the graphic interface environment to develop computerised systems in a visual object-based computer language; demonstrate the ability to implement repetitive, conditional and sequential structures, as well as aspects like graphic interface design, event-driven programming, procedural and object-based programming.		
Module code: ITRW124	**Semester 2**	
Title: **Programming I**		
Module outcomes: On completing this module the student should be able to demonstrate fundamental knowledge of the basic structures, data types, methods, classes and objects of an object-based programming language, and their use; to demonstrate the ability to solve unknown problems by designing and implementing object-based programming, debugging, testing and carrying out applications; to demonstrate insight into ethical issues that are related to the wider IT business and to be aware of the risks and dangers that threaten the business.		

Module code: ITRW212	Semester 1	
Title: **Programming II**		
Module outcomes: On completing this module students should have the ability to demonstrate an in-depth knowledge of search, sorting and recursive methods, as well as the use of an object-based programming language and concepts to solve basic problems; to apply in-depth knowledge of other numeric systems, like the binary numeric system, in order to carry out basic computations; to demonstrate skills in solving problems that require file management and exception handling by means of an object-based programming language; to demonstrate the ability to identify, analyse and solve problems by writing a structured, object-based program.		
Module code: ITRW214	**Semester 1**	
Title: **Decision support systems I**		
Module outcomes: At the end of this module the student ought to have acquired basic knowledge and insight into: decision-making, construction of decision-making systems, formulating simple linear models (break-even analysis, linear programming) and their solution with the aid of spreadsheets; carrying out sensitivity analysis and solving specific problems (transportation and assignment problems and networks). The above techniques will be used in modelling and solving simple operational problems.		
Module code: ITRW222	**Semester 2**	
Title: **Data Structures and Algorithms**		
Module outcomes: On completing this module successfully, students should be able to demonstrate in-depth knowledge and understanding of data structures (vectors, matrices, switched lists, stacks and queues) and the complexity of algorithms by setting up and manipulating data structures, to use object-orientated methods to create abstract data types for the above mentioned data structures and to solve different data handling problems.		
Module code: ITRW311	**Semester 1**	
Title: **Databases I**		
Module outcomes: On completing the module, the student should be able to demonstrate well-rounded and systematic knowledge and insight into entity relationship modelling; normalising of database tables and the ability to write and apply SQL and PL/SQL expressions and procedures in designing databases and retrieving information in order to solve unfamiliar concrete and abstract problems in the database environment.		
Module code: ITRW316	**Semester 1**	
Title: **Operating Systems**		
Module outcomes: On completing this module, the student should be able to demonstrate well-rounded and systematic knowledge of and insight into the principles according to which operating systems work, as well as the ways in which they are implemented; to demonstrate the ability to install operating systems on a computer; to demonstrate the ability to use Linux instructions and utility programs in carrying out assignments.		

Module code: ITRW321	Semester 2	
Title: **Databases II**		
Module outcomes: On completing this module, the student should have a well-rounded and systematic knowledge and insight into transaction management; should have the ability to apply control of simultaneous use, distributed database management systems and database administration to the administration of databases in order to solve, as an individual and as a member of a group, unfamiliar concrete and abstract computer problems in the database environment.		
Module code: ITRW322	**Semester 2**	
Title: **Computer Networks**		
Module outcomes: On completing this module students should be able to demonstrate well-rounded and systematic knowledge and insight into the operation of examples of networks, different frames of reference for networks, as well as the network protocols that play a role at the different levels of the frames of reference; to complete, as an individual and as a member of a group, a project that has basic network capabilities.		

MICROBIOLOGY

Module code: MKBN121	Semester 2	
Title: **Introductory Microbiology for nursing**		
After completion of the module, the student should be able to: • describe and compare prokaryotic and eukaryotic cell structure and function; • discuss various aspects regarding infectious diseases caused by the most important bacteria, fungi, viruses and protozoa and other selected parasites; • demonstrate expertise with regard to specific and non-specific mechanisms surrounding the host's protection against infectious diseases.		
Module code: MKBN211	**Semester 1**	
Title: **Introductory Microbiology**		
On completing the module the student should be able to demonstrate thorough knowledge and insight into Microbiology as science, electron microscopy, prokaryotic and eukaryotic cells, nutrients and micro-organisms, fermentation processes and a theoretical insight into monokinetics, the growth and reproduction of micro-organisms, as well as the influence of abiotic factors thereon, and the structural and physiological adaptations of different groups of bacteria; to demonstrate skills, as an individual and as member of a group, to use differently formulated culture mediums/methods to isolate a variety of micro-organisms from different environments, as well as to use aseptic techniques to sustain micro-organisms in pure cultures in the laboratory; to demonstrate skills in identifying micro-organisms on the basis of morphological, physiological and molecular properties, and in controlling them with physical methods and chemical preparations and the mortality of micro-organisms, and in communicating findings to peers in written reports and orally.		
Module code: MKPN211	**Semester 1**	
Title: Microbiology for Pharmacy		

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

- provide an overview of prokaryotic and eukaryotic cell structures and function, microbial diversity and the control of micro organisms through physical methods and chemical substances;
- demonstrate expertise with regard to microbial pathogenicity and epidemiology as well as the specific and non-specific mechanisms of the host's defense against infectious diseases;
- discuss clinical syndromes of specific microbial infectious diseases,
- discuss diagnosis, prevention and treatment of specific microbial infectious diseases..

Module code: MKBX213	**Semester 1**	

Title: Microbiology for food and nutrition

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

- demonstrate knowledge concerning microbiological aspects of laboratory techniques, preparation and storage of food and microbiological food safety in a selective way;
- apply basic laboratory techniques used in microbiological laboratories;
- demonstrate competency with regard to elementary research techniques, group work, writing of reports and problem solving by means of case studies;
- maintain strict ethical principles in all circumstances and show respect for life throughout..

Module code: MKBS221	**Semester 2**	

Title**: Introductory Microbial Genetics, Virology and Immunology**

On completing the module the student should demonstrate thorough knowledge and insight into selected aspects of microbial genetics, virology and immunology; demonstrate skills in the use of antibody tests to determine blood groups and the presence of viruses; the ability, as an individual and as member of a group, to demonstrate the isolation and characterisation of genomic and plasmid DNA, proteins and RNA, and the transfer of genetic material by transformation and transduction; the ability to communicate findings to peers in written reports and orally.

Module code: MKBS323	**Semester 2**	

Title: **Microbial Ecology**

On completing the module the student should demonstrate a well-rounded knowledge and insight into the principles of microbial ecology and the interaction between micro-organisms and the biotic and abiotic environment; demonstrate skills in applying more than the basic laboratory techniques and procedures; competency in identifying and analysing microbial ecological problems in industry and in solving them ethically and effectively, using suitable techniques, processes and procedures; demonstrate the ability as an individual and as member of a group to obtain and process information by means of cognitive and experimental research and to communicate findings to peers in written reports and orally.

Module code: MKBS324	**Semester 2**	

Title: **Microbial Diversity**

On completing the module the student should demonstrate a well-rounded knowledge of and insight into microbial diversity; the ability to use Bergey's Manual to organise bacterial diversity and to compile useful data for the identification of bacterial species; the ability as an

individual and as member of a group to undertake information searches and to analyse, evaluate and digest existing research literature in order to document findings in evidence-based reports and to communicate them orally to peers and professional persons by means of suitable IT.

Module code: MKBS313	**Semester 1**	
Title: **Microbial Physiology**		
On completing the module the student should be able to demonstrate a well-rounded knowledge and insight into microbial metabolism and physiology; to demonstrate the use of suitable resources to research ecological, industrial and diagnostic applications of microbial metabolism and to analyse and interpret them and to communicate findings; to demonstrate the ability as an individual and/or as member of a group to identify, describe and characterise microbial metabolism; to demonstrate the ability to research relevant literature and communicate findings to peers in written reports and orally.		

Module code: MKBS314	**Semester 1**	
Title: **Recombinant DNA Technology and Industrial Microbiology**		
On completing the module the student should be able to demonstrate a well-rounded knowledge and insight into recombinant DNA-technology in industrial microbiology; to demonstrate skills as an individual and/or as member of a group to undertake and complete laboratory projects; to demonstrate the ability to evaluate the implications and ethical aspects involved in the use of micro-organisms and recombinant DNA technology in different industrial processes, and to communicate findings to peers in written reports and orally.		

BOTANY

Module code: PLKS111	**Semester 1**	
Title: **Plant Structure – Cytology, Morphology and Anatomy**		
On completing the module the student should be able to demonstrate fundamental knowledge of plant structures, cytology and morphology in order to understand the importance of plants to sustain life on earth, the unique structure and properties of plants and their interaction with other organisms, and to relate these to the survival of plants and their interaction with other organisms; to demonstrate skills in preparing plant material for micro- and macroscopic analysis, and using the compound light microscope to draw scientific acceptable sketches of macro- and microscopic structures of plants.		

Module code: PLKS121	**Semester 2**	
Title**: Biodiversity and Environmental Botany**		
On completing the module the student should be able to demonstrate fundamental knowledge of (i) the pre- and post-Darwinian classification systems, (ii) the principal evolutionary mechanisms; (iii) the possible evolutionary origin of species; (iv) the morphology and propagation of main groups of non-vascular plants, seedless vascular plants and gymnosperms, as well as the biotic composition of ecosystems; demonstrate skills tin using the compound light microscope to identify organisms and to make accurate drawings of them; demonstrate the ability as an individual and as member of a group to identify and investigate the human impact on ecosystems, amongst others environmental		

problems such as water pollution, land degradation and increasing urbanisation, by researching scientific information, analysing and integrating information, and by communicating findings to peers in an ethically responsible way in written reports and orally.

Module code: PLKN213	**Semester 1**	

Title: **Plant Genomics**

On completing the module the student should be able to: (i) have a detailed knowledge of genomic structure of plant cells; plant gene expression and the regulation thereof, (ii) have an understanding of certain recombinant DNA technologies, (iii) be able to evaluate and select appropriate molecular methods for investigation within plant physiology/ plant systematics/ plant ecology, (iv) be able to demonstrate limited practical molecular skills, including an understanding of the generation, presentation and interpretation of data, as well as formation of theories about data, and (v) to exhibit sensitivity for the role that values play in biotechnology and to be able to evaluate relevant ethical issues in terms of a worldview.

Module code: PLKS221	**Semester 2**	

Title: **Flora of South Africa (Plant Systematics and Phytogeography)**

On completing the module the student should be able to demonstrate fundamental botanical knowledge and insight into: (i) the historical development, importance and essence of systematics, (ii) the meaningfulness of biodiversity studies and the uniqueness of South African flora, (iii) resources of variation in characteristics and use of these resources in classification systems, especially from a phylogenetic viewpoint, (iv) the basic principles of phytogeography and its patterns in South Africa, (v) the identification processes and principles to identify flower plant families, (vi) the rules that underlie plant nomenclature, and (vii) the practices followed in a herbarium and during plant collection; to demonstrate skills in the use of the necessary equipment to collect, press, dry, and mount plants and integrate them into the herbarium; to demonstrate the ability to compile and use a dichotomous key; to demonstrate the skills in using a stereomicroscope and dissection set to dissect flowers and to compile flower- diagrams and formulas; to have the ability to apply mathematical concepts in the analysis of diversity patterns; to demonstrate skills to analyse a data matrix and to represent it as an appropriate and representative cladogram; to demonstrate competency as an individual to investigate the taxonomy of a plant species by researching, analysing and integrating relevant scientific information, and to communicate findings creatively to peers in written reports and orally; to investigate, as a member of a group, biodiversity crises by researching, analysing and integrating relevant scientific information, and by communicating findings to peers in a ethically responsible manner in written reports and orally.

Module code: PLKS311	**Semester 1**	

Title: **Plant Physiology: Energy Conversion and Metabolism**

On completing the module the student should be able to demonstrate a well-rounded and systematic knowledge of the following: (i) energy conversion in living organisms, as well as the nature and dual role of sunlight, namely energy and information, (ii) the photobiology involved during the absorption of light energy, (iii) the construction and functioning of the photosynthesis apparatus in the thylakoids, as well as the control thereof and the mechanism to protect it against excessive light, (iv) the assimilation of CO_2 by the Calvin cycle, and the physiology and biochemistry of photorespiration, (v) the controlled transport of

photoassimilate from the chloroplast; (vi) the physiology and unlocking of energy stored in the assimilate and (vii) the biology of symbiotic hydrogen assimilation; demonstrate skills to (i) to demonstrate skills in studying the influence of environmental factors on the physiology of plants; (ii) in measuring the influence of environmental factors on various plant physiological and biochemical processes; (iii) in understanding the integration of plant processes and in interpreting data; to demonstrate the ability to identify plant physiological problems; to research, analyse and integrate relevant scientific information, and to communicate findings to peers in a ethically responsible manner in written reports and orally.

Module code: PLKN323	**Semester 2**	

Title: **Plant Ecology**

On completing the module the student should be able to demonstrate a well-rounded and systematic knowledge of: (i) concepts and interactions of ecological processes and plant growth dynamics in terrestrial ecosystems, (ii) functioning and use of inland aquatic environments (dams and rivers), especially with reference to the occurrence of different algae, as well as the physical, biological and chemical impact thereof on these systems, (iii) how algae, micro- and macrophytes are adapted to different habitats and the problems it causes in the use of water and the water purification; to demonstrate skills to apply the principles of landscape ecology and plant growth diversity, by using different plant growth surveying and multivariable data processing techniques; to demonstrate the ability to identify plant ecological problems and research, analyse and integrate relevant scientific information and data collected, and to communicate findings to peers in a ethically responsible manner in written reports and orally. A research project must be completed under the supervision of a study leader during the year. The mark for this project will contribute towards the participation mark for this module.

Module code: PLTN323	**Semester 2**	

Title: **Plant Ecology: Tourism**

On completing the module the student should be able to apply basic ecological principles; to discuss ecological interactions and examples thereof; to understand and apply basic principles with regard to plant growth dynamics and landscape ecology; to discuss resource conservation and utilisation, and the influence of aspects such as ecosystem management, degradation, restoration and rehabilitation, and urbanisation on resource conservation and utilisation, as specific case studies, also in the tourism industry; to integrate knowledge of the influence people and changing environmental conditions have on ecosystems; to master various data collecting techniques and apply multiple data analytical procedures on environmental data; to explain the water situation over a wide range in South Africa and the importance of utilising inland water as a limited resource, as well as to discuss the influence of human beings on water quality and the utilisation of inland waters, also in the tourism industry. A research project must be completed under the supervision of a study leader this year. The mark for this project will contribute towards the participation mark for this module.

URBAN AND REGIONAL PLANNING

Module code: SBES111	**Semester 1**	
Historical development of Civilizations		

On completing the module, the student should be able to demonstrate fundamental knowledge and insight into the settlement, origin and development of cities of different historical civilizations; to demonstrate skills, an individual and as a member of a group, in collecting, reading, interpreting, synthesising and presenting scientific information orally/in writing; the ability to act ethically in presenting his/her knowledge of the historical facts of planning cities and regions.		
Module code: SBES121	**Semester 2**	
Title**: Urban Morphology**		
On completing the module, the student should be able to demonstrate fundamental knowledge and insight into the implementation of the different manifestations of garden cities, as well as the ability to evaluate their value and impact; to demonstrate fundamental knowledge and understanding of the different modern and post-modern models, including those that apply to South Africa; to demonstrate skills, as an individual and as a member of a group, in collecting, reading, interpreting, synthesising and presenting appropriate scientific information orally/in writing; the ability to act ethically in presenting his/her knowledge of historical facts in planning cities and regions.		
Module code: SBRL211	**Semester 1**	
Title: **The Planning Space, Cities and their Regions**		
On completing the module, the student should be able to demonstrate in-depth knowledge and insight into the nature and characteristics of forces that determine urban morphology; to demonstrate skills in distinguishing independently underlying relations between forces that determine the forms and morphology of cities and regions; and, with a view to develop a project on spatial systems, to demonstrate skills, as an individual and as a member of a group, in identifying and applying forces that dictate urban settlement patterns and forces that lead to the establishment and development of service areas.		
Module code: SBSL212	**Semester 1**	
Title: **Planning Layout and Design**		
On completing the module, the student should be able to demonstrate in-depth knowledge and informed understanding of different types of layout, the layout process and qualitative and quantitative principles of planning layout and design, and to demonstrate the ability to apply this knowledge and understanding in analysing, evaluating and improving specific sites and layouts; to demonstrate the ability, as an individual and as member of a group, to analyse unfamiliar and somewhat complex problems of layout and design, to identify variables and formulate proposals to solve the problem/problems; to demonstrate the ability to communicate information and proposals regarding design orally, in writing and by means of drawing techniques in a coherent and trustworthy manner, using information technology where appropriate; to demonstrate the ability to approach layouts and design in an ethical and responsible manner, taking into consideration the specific needs of the community and the necessity of environmental conservation.		
Module code: SBSL221	**Semester 2**	
Title: **Urban Design**		
On completing the module, the student should be able to demonstrate an in-depth knowledge and informed understanding of basic principles of urban design, the origin of urban design, what it comprises, paradigm shifts in urban design theory and the		

challenges posed to urban design by the development of cities; to demonstrate the ability to find creative solutions to existing or new urban spaces by means of urban design precedents in order to transform these spaces into quality places for people, taking into consideration the environment; to demonstrate the ability to discover creative design solutions, independently as an individual and in close association with a group, and to communicate these solutions visually and orally to an audience.		
Module code: SBRL251	**Semester 2**	
Title: **Regional Plans and Formation of Metropolises**		
On completing the module, the student should be able to demonstrate in-depth knowledge and understanding of the different regional planning approaches in the world, of the physical and socio-economic characteristics and requirements of metropolises and world cities, and of the processes that led to the formation of structural elements in metropolises and regions; to demonstrate skills, as an individual and in close association with a group, to apply planning policy and instruments in solving well-formulated, but unfamiliar problems regarding metropolitan formation; to demonstrate the ability to conduct research, to collect and interpret appropriate information and present it in the form of a report.		
Module code: SBRL261	**Semester 2**	
Title**: The Location of Enterprises**		
On completing the module, the student should be able to demonstrate in-depth knowledge and understanding of forces that play a role in the establishment of businesses in and between cities in the urban system; to demonstrate skills in passing a balanced and ethical judgment on the necessity and desirability of locating commercial and industrial land uses within urban space; to demonstrate the ability to identify, analyse and propose solutions to problems regarding the viability of businesses within the economic space of cities and urban systems; to demonstrate the ability to evaluate these proposals and to propose and apply improvements based on scientific and ethical principles; to demonstrate, as an individual or as a member of a group, the ability to communicate solutions in writing and orally.		
Module code: SBRL311	**Semester 1**	
Title: **The Economic Development of Regions**		
On completing the module, the student should be able to demonstrate well-rounded knowledge and understanding of objectives of regional development in a regionally balanced and regionally unbalanced context; of the anatomy of the formal and informal urban economic urban sectors and the “top-down” and “bottom-up” development processes in local economic development; to demonstrate the ability, as an individual and as member of a group, to identify problems in economic development of regions, retrieve existing research on these problems, to analyse and evaluate them, and to explain the results of his/her/their findings orally and in written format at a seminar.		
Module code: SBRL351	**Semester 2**	
Title**: Regional Analysis Techniques**		

On completing the module, the student should be able: to demonstrate well-rounded and systematic knowledge and understanding of urban systems and planning approaches to regional systems in developed and developing countries; to demonstrate skills in determining scientifically the order of cities in a region; to apply, as an individual or in a group, regional analytical techniques to identify problems, to make calculations and to suggest creative solutions and to communicate solutions in writing and orally to an audience of peers.		
Module code: SBRL361	**Semester 2**	
Title: **Spatial Characteristics and Dynamics of Regions**		
On completing the module, the student should be able: to demonstrate well-rounded and systematic knowledge and understanding of the nature, characteristics and diversity of regions and the role of economic, physical and social processes in the formation of regions and in regional planning; to demonstrate skills in applying classification systems in the demarcation of regions; to demonstrate the ability to identify problems in the classification and formation of regions in South Africa and to propose possible solutions.		
Module code: SBSL311	**Semester 1**	
Title: **Transportation Planning**		
On completing the module, the student should be able to demonstrate well-rounded and systematic knowledge of intracity transportation and the resulting flow of traffic; to demonstrate the process of traffic planning and the relevant planning principles, as well as the Integrated Transport Plan; to demonstrate skills in applying the planning principles maintained in planning the network component of the urban traffic system tin order to solve transport problems identified; to demonstrate the ability to identify and analyse traffic problems at national, provincial and municipal level and to do traffic planning on the basis of applicable planning principles, and to draw up these plans using a computer, to submit a business plan, evaluate the plans and improve them; to demonstrate the ability to submit, as an individual or in group context, solutions in an ethical and responsible manner to an audience of peers and professional people.		
Module code: SBSL321	**Semester 2**	
Title: **Industrial and Commercial Planning**		
On completing the module, the student should be able to demonstrate well-rounded and systematic knowledge and understanding of types of industrial areas, hierarchal structure of retail trade in a town/city, policy regarding the informal trade sector, planning principles concerning different kinds of shopping centres, office spaces and wholesale businesses; to demonstrate skills, as an individual or as member of a group, in proposing development of industrial parks on the basis of the planning needs and principles relevant to businesses that settle in industrial parks; to demonstrate knowledge of the planning principles of the semi- and full mall, retail trader, informal trade sector, shopping centres and office spaces; to demonstrate the ability, as an individual or as member of a group, to identify and analyse problems in industrial and trade planning, to undertake the necessary research, collect, analyse and apply information in order to propose solutions that are ethically and scientifically sound; to demonstrate the ability to present planning proposals in report and oral format at a seminar with the aid of suitable IT.		
Module code: SBES321	**Semester 2**	

Title: **Engineering for Planning**		
On completing the module, the student should be able to demonstrate knowledge and understanding of policy and legislation that guide engineering services; to demonstrate skills in undertaking the planning of engineering services such as water supply, sewage systems, electricity supply and designing streets for vehicles, bicycles and pedestrians in town layouts; to demonstrate the ability to do cost accounting based on the theoretical knowledge acquired in the module; to demonstrate the development of the ability, as an individual or as a member of a team, to undertake the provision and planning of engineering services in town layouts and development, to gather, analyse, evaluate, and synthesise information with a view to formulate practical proposals to ensure the cost effectiveness and functionality in planning of project; to demonstrate the ability to write a report on practical, integrated planning and design of engineering services and to communicate it to those concerned.		
Module code: SBRL431	**Semester 1**	
Title: **Migration, Globalisation and Urban Development in the World**		
On completing the module, the student should be able to demonstrate knowledge and understanding of the influence of globalisation on the urban environment in the developed and developing world; to demonstrate skills in applying theory and theoretical principles in practice to solve unfamiliar problems regarding migration and urban development in a global context; to research the causes and implications of migration and urban development as found in different situations in a global context, to analyse and interpret information and present proposals based on applicable theories and principles with a view to sustainable development in an economic and social context.		
Module code: SBES471	**Semester 1 & 2**	
Title: **Planning Project**		
On completing the module, the student should be able to demonstrate knowledge and understanding of the influence of globalisation on the urban environment in the developed and developing world; to demonstrate skills to apply theory and theoretical principles in practice to solve unfamiliar problems regarding migration and urban development in a global context; to research the causes and implications of migration and urban development as found in different situations in a global context, to analyse and interpret information and present proposals based on applicable theories and principles with a view to sustainable development in an economic and social context.		
Module code: SBSS411	**Semester 1**	
Title: **Strategic Spatial Planning**		
On completing the module, the student should be: able to demonstrate extensive and systematic knowledge of the role of planning policy and housing policy in modernistic and post-modernistic spatial planning; to demonstrate skills to understand and solve real-life problems in socio-economic development by applying fundamental theories and principles of strategic and spatial planning; to demonstrate skills in researching the impact of policy changes from a development perspective, in interpreting and analysing findings and in facilitating changes.		
Module code: SBSL412	**Semester 1**	
Title: **Land Use Management and Residential Development**		

On completing the module, the student should be able to demonstrate extensive and systematic knowledge of residential types and the development thereof, the principles and processes of statutory planning that includes zoning and management of land use; to demonstrate the ability to explain and discuss subdivision of land and town establishment; to demonstrate skills in using planning instruments to undertake spatial residential development and land management in a professional and ethical manner; to demonstrate the ability to plan a quality residential development and promote sustainable land use; to demonstrate the ability to promote urban density by researching residential development within the framework of differentiation and affordability; to demonstrate the ability to process and interpret information, and to propose sustainable development orally and in writing.

Module code: SSBP221	**Semester 1**	

Title: **Private law for planners**

After completion of this module the student should be in a position to achieve the following outcomes, namely:

- General background to the law in general as well as the South African legal system;
- Knowledge of the constitutional dispensation in South Africa, as well as the role and place of the Bill of Human Rights;
- Understand Planning Law as a section of the South African legal system
- Basic knowledge of the most important planning legislation;
- Understand the place and function of planning law;
- Understand the role and function of environmental law;
- Understand the basic principles relating to ownership. Servitudes and contracts;
- Understand and have knowledge of the most important planning legislation and case law relating to planning issues and to utilise this in practise and interpret the implications thereof.

Module code: SECO321	**Semester 2**	

Title: Urban ecology for planners

After successful completion of this module, the student should:

- have refined, systematic knowledge and comprehension of;

(i) the development of the ecosystem concept,
(ii) biome and bio-regions of South- Africa,
(iii) the development of Urban Ecology as a science,
(iv) the uniqueness of urban ecosystems,
(v) application of ecological principals in urban planning and - design,
(vi) ecological questionnaires that influence planning of urban regions,

- demonstrate proficiency in application of basic ecological principles in the planning and design of urban open areas.
- be competent in identifying ecological questionnaires in urban planning and design, to research suitable scientific information, to analyze information and collected data, to integrate and communicate results in ethical responsible manner in writing and verbal to counterparts.

STATISTICS

Module code: STTN111	Semester 1	

Title: **Descriptive Statistics**

Module outcomes:

A student who has completed this module should be able to demonstrate the following knowledge:

Fundamental knowledge of the most important elementary statistical techniques used every day, such as sampling methods, determining sample size, graphical representation of data, descriptive measures of locality and scattering, least squares line fitting, predictions by means of least squares line fitting, correlation coefficients, time series data and movement components in order to predict future outcomes, practical considerations with regard to questionnaires and sampling sizes; fundamental knowledge of probabilities and probability distributions, the central limit theorem, for large sample sizes the estimation of population parameters by means of point and interval estimation, to demonstrate problem solving skills by solving familiar and unfamiliar problems; to implement the acquired knowledge to problems involving the above-mentioned skills and techniques.

Module code: STTN115	Semester 1	

Title: **Descriptive Statistics and Inference**

Module outcomes:

On completion of the module the learner should be able to:

a) demonstrate fundamental knowledge and understanding of the most important elementary statistical techniques that are used daily, such as sampling methods, graphical representation of data, descriptive measures of location and spread, least squares line fitting, prediction from least squares lines, the coefficient of correlation, multiple regression, time series data, movement components to predict future outcomes, practical considerations regarding sample surveys and sample sizes. Also demonstrate knowledge and understanding of the normal and t probability distributions, the central limit theorem, estimation of population parameters by the use of point and interval estimation, hypothesis testing for population means and proportions for one and two samples (parametric and non-parametric).

b) demonstrate skills to use statistical knowledge and techniques to solve known and unknown real world problems and to communicate methods, solutions and conclusions as an individual and/or part of a group, orally and in writing in an ethical, responsible and acceptable way.

Module code: STTN121	Semester 2	

Title: **Introductory Statistical Inference**

Module outcomes:

A student who has completed this module should be able to demonstrate the following:

Fundamental knowledge of probabilities and probability distributions, the central limit theorem, estimation of population parameters by means of point and interval estimation, hypothesis testing for population averages and proportions for one and two samples, one way analysis of variance (ANOVA) and categorical data analysis, contingency tables and basic tests on categorical data; problem solving skills by analyzing familiar and unfamiliar

problems, using acquired knowledge to solve simple probability problems, applying the knowledge gained above on data where applicable.

Module code: STTN122	**Semester 2**	

Title: **Introductory Statistics**

Module outcomes:

At the end of the module the student should demonstrate knowledge of the following concepts and the ability to apply it as described below:

i. statistical techniques used everyday, for example sampling methods, graphical representation of data and descriptive measures of locality and scattering;
ii. fitting linear regression curves to bivariate data and using the least squares method;
iii. making simple predictions by using appropriate curves, as well as by interpreting the correlation coefficient;
iv. handling time series data and calculating movement components in order to predict future outcomes;
v. carrying out simple probability calculations and using probability distributions;
vi. th**e** central limit theorem and applying it to practical problems;
vii. estimating p**o**pulation parameters by means of point and interval estimation;
viii. hypot**h**etical testing for population averages and population proporti**o**ns in one or two sampling cases.
ix. to identify the presence and applicability of the above statistical concepts in a practical situation, as well as to perform statistical methods using manual analysis or statistical software.

Module code: STTN124	**Semester 2**	

Title: **Practical Statistics**

Module outcomes:

At the end of the module the student should be able to demonstrate knowledge of the following concepts and to apply them as described below

i. correlation and its interpretation, the method of least squares fitting to a regression function, prediction by means of a regression function, multiple linear regression and selection of predictors;
ii. basic factor analysis and the interpretation of its results, interpretation of factor matrices and construct validity;
iii. the hypothesis testing procedure, probability calculations, the central limit theorem, level of significance and p values;
iv. one-way ANOVA testing procedures, the interpretation of results;
v. practical significance of effect sizes of differences in averages and proportions for one and two populations;
vi. categorical data analysis by means of contingency tables, chi-squared tests and independence tests;
vii. distribution-free methods: the difference between parametric and nonparametric methods of inference, as well as deciding which method to use in a specific situation.
viii. to identify the presence and applicability of statistical concepts in a practical situation, as well as to perform statistical methods using manual analysis or

statistical software.

Module code: STTN125	Semester 2	

Title: Introductory Probability Theory

Module outcomes:

On completion of the module the learner should be able to

- demonstrate knowledge and understanding of
  - concepts such as the sample space, events, probability measures, counting methods, random outcomes of events and the independence of events;
  - important probability theorems such as the law of total probability and the theorem of Bayes;
  - random variables, distribution functions and mass function, discrete random variables and the following distributions: binomial, geometric, negative binomial, hyper geometric, and Poisson as well as exponential, gamma and normal distributions and the functions of these variables;
  - one way analysis of variance (ANOVA) and apply it to practical problems with the use of computer output.
- demonstrate skills to use statistical knowledge and techniques to solve known and unknown real world problems and to communicate methods, solutions and conclusions as an individual and/or part of a group, orally and in writing in an ethical, responsible and acceptable way.

Module code: STTN215	Semester 1	

Title: **Probability and Sampling Theory**

Module outcomes:

On completion of the module the student should be able to:

- demonstrate knowledge of:
  - the probability structure of two or more random variables as well as their joint distributions;
  - copulas and their properties;
  - conditional distributions and the application of probability calculations on conditional distributions;
  - order statistics and the application thereof;
  - the expected value and variance of all the important discrete and continuous random variables that were discussed in earlier work;
  - the covariance and correlation of two random variables, in addition to conditional expected values and moment generating functions;
  - two of the most important theorems of Probability theory, the so-called Law of Large Numbers and the Central Limit Theorem.
  - distributions derived from the normal distribution;
  - various sampling methods, such as simple random sampling and stratified sampling, and their properties.
- demonstrate problem solving skills by analysing problems that had been previously encountered and problems that are new and unfamiliar.
- use the computer language SAS (PROC IML) to apply these concepts practically.

Module code: STTN225	Semester 2	

Title: **Statistical Inference and Data Analysis**

Module outcomes:

On completion of the module the student should be able to:

- demonstrate fundamental knowledge of the following statistical concepts: method of moments and the method of maximum likelihood to estimate parameters, efficiency of an estimator, sufficient statistics, the testing of hypotheses, the duality of confidence intervals and hypothesis testing, informal techniques for assessing goodness of fit, methods for summarizing data, measures of location and spread, density estimation, and the bootstrap.
- demonstrate problem solving skills by analysing familiar and unfamiliar problems, estimating parameters by means of the method of moments and maximum likelihood, determining if an estimator is efficient and finding sufficient statistics in a variety of problems.
- demonstrate the ability to construct complete and sufficient statistics, use the Neyman-Pearson paradigm to perform a hypothesis test, apply the connection between hypothesis testing and confidence intervals in the context of estimation, make conclusions using descriptive statistics, apply methods for summarizing data, calculate measures of location and spread, be able to use the bootstrap to (a) construct confidence intervals for a parameter and (b) estimate the variability of an estimator.
- apply these concepts to real-world data.
- use the computer language SAS (PROC IML) to apply these concepts practically.

Module code: STTN311	**Semester 1**	

Title**: Statistical Inference**

Module outcomes:

A student who has completed this module should demonstrate the following: fundamental knowledge of statistical concepts, such as complete and sufficient statistics, hypothesis testing, duality of confidence intervals and hypothesis testing, informal measure of fit techniques, methods of summarising data, measures of locality and scattering, comparison of two samplings, comparison of matched samplings, design of experiments, analysis of categorical data and Bayesian inference; should demonstrate the ability to construct complete and sufficient statistics, to use the Neyman-Pearson paradigm to perform hypothesis testing, to apply the relationship between hypothesis testing and confidence intervals in the context of estimation, to draw conclusions by using descriptive statistical methods, to apply methods of summarizing data, to calculate measures of locality and scattering, to implement methods to compare two samplings and matched samplings, to understand different designs of experiment, to analyze categorical data and to use Bayesian inference methods.

Module code: STTK321	**Semester 2**	

Title: **Linear Models**

Module outcomes:

A student having completed this module should be able to demonstrate an understanding of simple and multiple linear regression; understanding of the reasons for assumptions in the regression model and the derivation of the distributions of test statistics used in the inference that relates to linear regression models; to demonstrate the ability to derive the least squares and maximum acceptability parameters in a linear regression model; the ability to describe the linear regression model in matrix and vector notation; to demonstrate the ability to diagnose any deviation from the assumptions and to apply remedial measures to rectify the deviations. He/she should demonstrate an understanding of the concepts of simultaneous interference as applied in linear regression models; should demonstrate the ability to describe how qualitative and quantitative predictor variables are handled within the

frame of linear regression. He/she should demonstrate an understanding of the fundamental concepts of non-linear regression; the ability to describe the process of estimating parameters in non-linear regression models; the ability to describe the following models: logistic regression models and Poisson regression models; an understanding of the way in which these models relate to the general linear model; the ability to perform inferences that are associated with these models; the ability to implement linear regression models using simple calculations and computer software; the ability to diagnose models practically by applying diagnostic steps as discussed in the theory and to apply remedial measures in a practical context; and the ability to implement non-linear regression models using simple calculations and computer software.

Module code: STTK322	**Semester 2**	

Title: **Statistics Project**

Module outcomes:

A student having completed this module should be able to demonstrate the ability to carry out a successful statistical project, from design to analysis; to identify appropriate models for a given data system and to use SAS or R to implement the appropriate model; to identify the previously learnt theory on basic statistical analysis with the practical nature of the project and to apply the techniques; to compile appropriate documentation for the project; to develop skills in oral presentation to present the project in a professional set-up; to demonstrate the necessary computer skills needed to handle statistical analysis by means of SAS and R, but also to handle a greater variety of problems; to carry out computer-based simulations with the aid of SAS and R.

Module code: TGWN121	**Semester 2**	

Title: **Statics and Mathematical Modelling**

Module outcomes:

On completing this module, the students should be able to do the following: demonstrate fundamental knowledge of geometric vectors and their operational rules, vectors, forces, components, scalar and vector product, Cartesian forms, resultant of two- and three-dimensional systems of force through a point, the principle of propagation, moments, couples, reduction of systems of forces to a single force and a single couple, equilibrium in a plane and equilibrium in space, friction and moments rotating around axes, the modelling process, geometric similarity and proportionalities, dimensional analysis and the theorem of Buckingham; to demonstrate problem solving skills by analysing familiar and unfamiliar problems, by using knowledge of techniques to determine resultants of different types of systems of force, by solving equilibrium problems in two and three dimensions, by forming and solving models by means of proportionality relations and dimensional analysis, and by fitting models to data.

APPLIED MATHEMATICS

Module code: TGWN122	**Semester 2**	

Title**: Mathematical Modelling and Vector Algebra**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate fundamental knowledge of the steps in the mathematical modelling process, geometric

similarity, proportionalities, interpolation and fitting of a curve to data by means of least squares, the die L_1 norm and the Tsjebisjeff norm, dimensional analysis, the theorem of Buckingham, differential equations, separable differential equations, initial conditions, model ling of growth processes, including Malthus and logistic growth, cooling problems, mixing problems and chemical reactions, geometric vectors, operations with them and use of them, and applications of them to forces and equilibrium problems; demonstrate problem solving skills by analysing familiar and unfamiliar problems, using knowledge of techniques to build mathematical models, solve separable differential equations, fit models to data, modelling by means of dimensional analysis; building models using separable differential equations and modelling and solving geometrical and statics problems by means of vectors.

Module code: TGWN211	**Semester 1**	

Title: **Dynamics I**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate fundamental knowledge of kinematics (square, normal, tangential and cylindrical coordinates) and kinetics of a single particle (force, acceleration, work, energy, momentum, impulse), a system of particles (force, acceleration, work, energy, momentum, impulse) and a rigid body (force, acceleration, work, energy, momentum, impulse, moment of inertia, angular impulse and angular momentum), all moving along a straight line or a curved trajectory; demonstrate problem solving skills by analysing familiar and unfamiliar problems and using knowledge of kinematics and kinetics to calculate time duration, displacements, velocities, accelerations, forces, word done, energy, momentum, impulse, moment of inertia, angular impulse and angular momentum.

Module code: TGWN212	**Semester 1**	

Title: **Differential Equations and Numerical Methods**

Module outcomes:

On completing this module students should be able to do the following: demonstrate fundamental knowledge of first-order ordinary differential equations, the Laplace transform and the methods of Euler, Heun en Runge-Kutta for solving a single and a set of differential equations numerically, demonstrate problem solving skills by solving familiar and unfamiliar first order ordinary differential equations through separation of variables and conversion to exact differential equations, and by using them to model real phenomena, solving linear differential equations with constant coefficients using the Laplace transform, and solving any type of ordinary initial value problem numerically by using computers, and amongst others utilizing the MATLAB computer software.

Module code: TGWN221	**Semester 2**	

Title**: Dynamics II**

Module outcomes:

On completing this module students should be able to do the following: demonstrate fundamental knowledge of the theory of flexible cables, internal forces and deformation of simple beams, and the motion of satellites and planets, demonstrate problem solving skills by solving familiar and unfamiliar problems involving deformations in beams and cables acted on by forces, and determining the orbits and positions of satellites.

Module code: TGWN222	**Semester 2**	

Title: **Numerical Analysis**		
Module outcomes: On completing this module the student should be able to do the following: demonstrate fundamental knowledge and insight into the theory of basic numerical methods for general occurring mathematical problems, amongst which are the solving of non-linear equations, determining interpolation polynomials and the numerical determining of definite integrals, demonstrate problem solving skills by solving non-linear equations through iteration techniques, determining the interpolation polynomials of Lagrange and Newton, determining definite integrals by means of the trapezium method, Simpson's rule, Romberg integration and Gauss quadrature, and the computer application of these techniques, show a fondness for this field of study and demonstrate insight into the relation between reality and abstraction, model and solution; reveal a Christian or alternative perspective on the subject.		
Module code: TGWN311	**Semester 1**	
Title: **Partial Differential Equations**		
Module outcomes: On completing this module the student should be able to do the following: demonstrate fundamental knowledge of real-life problems where the mathematical model led to partial differential equations and the analytical solving of partial differential equations such as the wave, heat and potential equation and the electric charge problem, Fourier series, orthogonal functions and polynomial methods and the Sturm-Liousvile problem; demonstrate problem solving skills by analysing familiar and unfamiliar problems, applying knowledge of techniques that are used to solve differential equations with methods using power series, to determine Fourier series and chandelling standard problems with the Fourier method.		
Module code: TGWN312	**Semester 1**	
Title: **Partial Differential Equations (Numerical)**		
Module outcomes: On completing this module the student should be able to do the following: demonstrate fundamental knowledge and insight into the discretisation of ordinary and partial differential equations, the special properties of tridiagonal matrices, calculation problems caused by ill-conditioned and sparse systems of linear equations, convergence properties of iterative methods of systems of linear equations, solving parabolic, elliptical and hyperbolic differential equations numerically, performing iterative methods with MATLAB on a computer; demonstrate problem solving skills in numerically solving two point boundary value problems, the heat equation, the potential equation and the wave equation with the finite difference methods and in implementing these by computer; show a fondness of this field of study and demonstrate insight into the relation between reality and abstraction, model and solution; reveal a Christian or alternative perspective on the subject.		
Module code: TGWN321	**Semester 2**	
Title: **Dynamics III**		
Module outcomes: On completing this module the student should be able to do the following: demonstrate fundamental knowledge and insight into the kinematics and kinetics of a rigid body in space, the Lagrange formulation for dynamics and the basis of variation calculus; demonstrate skills in solving problems describing motion and the constraints on motion, modelling the three-		

dimensional motion of a rigid body, stationary curves for functionals formed through integrals; show a fondness of this field of study and demonstrate insight into the relation between reality and abstraction, model and solution; reveal a Christian or alternative perspective on the subject.

Module code: TGWN322	**Semester 2**	

Title: **Optimisation**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate fundamental knowledge of analytical and numerical optimisation techniques for functions of one or more variables, including problems with restrictions on unevenness and evenness; demonstrate problem solving skills by applying a variety of mathematical optimisation techniques to familiar and unfamiliar unrestricted and restricted problems and implementing these techniques by computer with MATLAB as computer language.

MATHEMATICS

Module code: WISN111	**Semester 1**	

Title: **Introductory Algebra and Analysis I**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate fundamental knowledge of the concept of functions, polynomials in one variable with factor theorem, remainder theorem and synthetic division, rational functions and partial fractions, absolute value function, circle measure and inverse functions, trigonometric and inverse trigonometric functions, hyperbolic and inverse hyperbolic functions, exponential and logarithmic functions, limits, continuity, differentiability and indefinite integrals of all the above mentioned functions, complex numbers; demonstrate problem solving skills by analysing familiar and unfamiliar problems, using the knowledge of techniques to develop powers of first degree polynomials, calculating the limits, derivatives and indefinite integrals of all the above mentioned functions and performing simple operations with complex numbers.

Module code: WISN112/WISN123	**Semester 1**	

Title: **Mathematical Techniques**

Module outcomes:

At the end of this module students have mastered the following topics at an introductory level: the concept of a mathematical function elucidated from examples that include exponential and logarithmic functions; the concepts differentiation and integration; a method to solve systems of linear equations; matrix algebra; linear programming problems in two variables; analysis of the rate of change of mathematical functions by using differentiation to investigate the characteristics of the function. The student has acquired skills to recognise the presence and applicability of mathematical concepts in an economic situation and to construct a mathematical model of the problem situation in order to reach a solution by applying differentiation techniques, arithmetic techniques or linear algebra.

Furthermore, the student have to be able to do simple and compound interest calculations, be able to do simple and complex annuity calculations, evaluate the number of payments, final payment and outstanding balance, be able to take the interest rate and changes in

sinking funds in consideration.		
Module code: WISN113	**Semester 1**	
Title: **Basic Mathematical Techniques**		
Module outcomes: At the end of this module, students have mastered the following topics at an introductory level: the concept of a mathematical function elucidated from examples that include exponential and logarithmic functions, the concept of differentiation, a method to solve sets of linear equations, matrix algebra, linear programming problems in two variables, analysis of the rate of change of mathematical functions by using differentiation to investigate the characteristics of the function. The student acquires skills to recognise the presence and applicability of mathematical concepts in a scientific situation and to construct a mathematical model of the problem situation in order to reach a solution by applying differentiation techniques, arithmetic techniques or linear algebra.		
Module code: WISN121	**Semester 2**	
Title**: Introductory Algebra and Analysis II**		
Module outcomes: On completing this module, students should be able to do the following: demonstrate fundamental knowledge of logic, the system of real numbers, mathematical induction, permutations and combinations and the binomial theorem, De Moivre's theorem and its applications, L'Hospital's rule and its applications, the fundamental theorems of differential and integral calculus, the use of derivatives in optimisation and curve sketching, basic concepts of power series and the basic theorems on the converging of series, Taylor series, the basic properties and applications of the definite integral, applications of integration to surfaces, lengths and volumes; demonstrate problem solving skills by analysing familiar and unfamiliar problems, using knowledge of techniques by applying logic to systems of numbers, proving theorems with mathematical induction, determining the number of arrangements and selections from a set, performing operations with complex numbers, judging convergence of power series, calculating Taylor series, determining limits using L'Hospital's rule, sketching functions, formulating optimisation problems mathematically and using knowledge of derivatives to solve them, by determining definite integrals and calculating surfaces, lengths and volumes.		
Module code: WISN211	**Semester 1**	
Title**: Analysis III**		
Module outcomes: On completing this module, students should be able to do the following: demonstrate a thorough knowledge and insight into all the aspects of the differential calculus of multivariate functions: partial and directional derivatives, the gradient function, optimisation problems, including Lagrange's method, the theory of multiple integrals to calculate partial derivatives, directional derivatives and gradients, and double and triple integrals; demonstrate problem solving skills by analysing familiar and unfamiliar problems, using knowledge of techniques to solve practical problems modelled with multivariate functions. Students should demonstrate the ability to use the geometric and physical meaning of the above-mentioned concepts to abstract the underlying mathematical structure of applied problems and to interpret the significance of the mathematical solution.		
Module code: WISN212	**Semester 1**	

Title: **Linear Algebra I**

Module outcomes:

On completing this module students should be able to do the following: demonstrate a thorough knowledge and insight into the solvability of systems of linear equations; the basic properties of Euclidic spaces and linear transformations, interdependency of general vector space concepts; demonstrate the ability to determine Eigen values and Eigen vectors; demonstrate problem solving skills by analysing familiar and unfamiliar problems, using knowledge of techniques to solve systems of linear equations in the context of a vector space; to perform matrix operations; to determine bases for subspaces; to calculate Eigen values and Eigen vectors; to execute these matrix calculations and interpret the results.

Module code: WISN221	**Semester 2**	

Title: **Analysis IV**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate a thorough knowledge and insight into line integrals of scalar valued and vector valued functions of two and three variable functions; the fundamental theorem and Green's theorem for line integrals and their applications; surface integrals of scalar valued and vector valued functions; the theorem of Stokes and the divergence theorem of Gauss and their applications; the theory of higher order linear differential equations and methods (of undetermined coefficients and the variation of parameters) to solve second order linear differential equations with constant coefficients; sequences and series of real numbers; tests for convergence (integral test, comparison test, limit comparison test) and tests for absolute convergence of series of real numbers (ratio and root tests); demonstrate problem solving skills by analysing familiar and unfamiliar problems; using knowledge of techniques to calculate line integrals of scalar valued and of vector valued functions and use them in solving practical problems (such as the calculation of surfaces and the calculation of word done by forces along curves); by calculating surface integrals of scalar valued and vector valued functions of two and three variables and use them to solve practical problems (such as calculating flow rates through surfaces); by using the Theorem of Stokes to calculate surface integrals by using line integrals along closed curves and vice versa; by using the theorem of Gauss to calculate surface integrals of vector fields over closed surfaces by evaluating triple integrals; by determining the solutions of homogeneous linear differential equations that have constant coefficients and by solving non-homogeneous linear equations using the methods of indeterminate coefficients and the variation of parameters; by using the different (relevant) tests for the convergence of series of real numbers to test for the convergence of these series.

Module code: WISN222	**Semester 2**	

Title**: Linear Algebra II**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate a thorough knowledge and insight into general vector spaces and bases; inner products; vector norms; linear transformations. The student acquires knowledge and insight into matrix and vector norms and stepwise orthogonal transformations on a matrix; learn to execute LU factorising and to calculate certain systems of differential equations; demonstrate problem-solving skills by analysing familiar and unfamiliar problems; by using knowledge of

techniques to determine inner products, vector norms and linear transformations.

Module code: WISN223	**Semester 2**	

Title**: Discrete Mathematics**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate a sound knowledge and understanding proportional- and predicate logic and logical argumentation; general proving techniques, including direct and indirect arguments and counter examples; basic notation and the properties of set theory and Boolean algebra; calculation of probabilities by basic counting techniques; properties of mathematical functions and the pigeonhole principle; the introductory graph theory; demonstrate the ability to solve well-defined, familiar and unfamiliar problems by using mathematical concepts; identify the applicability of the proportional- and predicate logic in practical situations, formulate a problem in mathematical symbols and obtain new information in the specific situation, to use suitable proving techniques in practical situations, recognise and apply the properties of set theory and Boolean algebra; basic counting and the pigeonhole principle and graph theory on practical problems; demonstrate the skills to recognise the presence and applicability of mathematical concepts in a practical situation and be able to program the concepts in the correct way.

Module code: WISN313	**Semester 1**	

Title: **Complex Analysis**

Module outcomes:

After completion of this module students ought to be able to do the following:

- Be able to define and determine the derivatives of complex and vector functions, demonstrate knowledge of the concept of differentiability and analiticity and be familiar with its use, demonstrate knowledge of the concept of a line integral and complex contour integral, be familiar with the theorems of Cauchy and their application in computing complex contour integrals.
- Be familiar with diverse consequences of Cauchy's theorem and their application, demonstrate knowledge of the theorems of Taylor and Laurent and their applications, demonstrate knowledge of singular points and residues of complex functions, be familiar with the description of singular points and the computation of residues, be familiar with Cauchy's Residue theorem and its use.

Be able to solve several improper integrals and other important real integrals by means residue theory, be able to calculate the maxima and minima of complex functions, be able to apply these theorems in other areas.

Module code: WISN312	**Semester 1**	

Title: **Combinatorics**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate a rounded and systematic knowledge and insight into the fundamental counting principles; the binomial theorem; the pigeon hole principle; generalised permutations and arrangements; recursion relations and their solutions, and generating functions; fundamental graph theoretical concepts; partition numbers; imbedding of graphs into surfaces; concept of connectedness; Menger's theorem; independence numbers; Hamilton cycles and Eulerian revolutions; colouring of graphs; demonstrate problem solving skills by interpreting familiar and unfamiliar combinatorial problems and using known techniques to solve them; by

formulating problems in terms of graphs; by applying and calculating generating functions; by recognising classical discrete probability problems and solving them; by understanding the arguments and their motivations in proving of theorems and being able to give own formulations of them, and applying these results to solve concrete or abstract problems.

Module code: WISN323	**Semester 2**	

Title**: Real Analysis**

Module outcomes:

After the completion of this module the students should be able to do the following

- demonstrate a fundamental knowledge of the theory of real numbers; the topology of finite dimensional vector spaces; compactness and connectedness; continuous and uniformly continuous functions; continuous images of compact and connected sets; convergence of sequences and Cauchy-sequences; convergence and uniform convergence of sequences of functions; Riemann- integration; differentiation of vector functions of several variables; implicit function theorem for such functions; bijections, diffeomorphisms and open mappings; extreme values with and without constraints; Lagrange's method; inequalities of Cauchy-Schwarz, Hölder and Minkowski.
- demonstrate the ability to solve problems in the area of real analysis; be able to test functions for their continuity and differentiability, be able to solve problems in integration and differentiation theory, be able to solve extreme value problems with and without constraints, be able to apply mathematical theorems in related areas such as probability theory.

Module code: WISN322	**Semester 2**	

Title: **Algebraic Structures**

Module outcomes:

On completing this module, students should be able to do the following: demonstrate a rounded and systematic knowledge and insight into general algebraic structures, for instance groups, rings and bodies, permutations, polynomials with integer coefficients and factor rings formed from polynomial rings; demonstrate skills to prove the fundamental theorems of the theory and apply the concepts amongst others to the integer numbers modulo 'n by means of logical, axiomatic arguments; to give a cyclical representation of permutations; to perform calculations with polynomials with integer coefficients (modulo n); demonstrate skills to apply the theory of factor rings formed from polynomial rings and to perform error correcting coding and decoding; to have the ability to solve in unknown contexts problems that relate to algebraic structures by applying relevant techniques.

UNDERSTANDING THE ECONOMIC AND NATURAL WORLDS

Module code: WVES221	**Semester 2**	
Title: Understanding the economic world		

Module outcomes:

Upon completion of this module, you should be able to:

- have a fundamental knowledge base of a selection of world views and ideologies;
- demonstrate their critical understanding through an ability to compare the nature and function, as well as different contemporary manifestations of these world views and ideologies;
- have the ability to understand the interrelatedness of phenomena such as occurs in natural and social systems, and from this vantage point, analyse and evaluate real life problems or case studies based on core issues of our time, such as poverty, constant change, human rights, HIV-AIDS, power abuse, corruption, racism, xenophobia, etc.;
- be able to articulate their personal world view and use it as a point of departure for arguing and communicating feasible solutions to core issues and problems of our time in a typical academic manner.

Module code: WVES311	**Semester 1**	

Title: **Business ethics**

Module outcomes:

After completion of this module you should:

- Possess knowledge of
  - selected ethical theories
  - moral decision-making strategies
  - selected socio-economic ethical issues
  - selected issues and approaches with regard to business ethics
  - the nature of organizations and management from an ethical perspective
- Possess the ability and skills to apply the above knowledge to case studies
- Possess the ability and skills to analyse and evaluate the abovementioned theories and issues from different philosophical and ideological perspectives.

Module code: WVNS211	**Semester 1**	

Title: **Understand the natural world**

Module outcomes:

After this module has been completed successfully, it will serve the student as a fundamental source of knowledge of the nature and function of worldviews and ideologies as they have developed historically from science, from antiquity to the post-modern era. The student will also understand the relation between norms and science, the influence of science and technology on the spiritual, cultural and material worldviews of the human being, his society and environment. The student must be able to understand and discuss the essential ideas in the development of science with reference to value systems that function in his worldview.

Module code: WVNS221	**Semester 2**	

Title**: Science and society**

Module outcomes:

After this module has been successfully completed, the student must be able to identify, demonstrate and react to basic issues in the contemporary discourse on science, technology and society, with special reference to science and technology systems in

South Africa. The student must also be able to identify some of the most important ethical issues in the subject matter of a programme and critically react to them according to a value-based orientation from a specific worldview. He/she must be able to form a well thought-out rational standpoint on the concept of sustainable development, including its socio-economic implications. The student must be able to discuss perspectives on different thought systems, and be able to view contemporary issues in science and technology within a systems perspective.