(BScFor) (Forestry and Natural Resource Science)

Contents

1. Admission requirements

1.1 School-leaving qualifications

For admission to the University, you need:

- A National Senior Certificate (NSC) or school-leaving certificate from the Independent Examination Board as certified by Umalusi with admission to bachelor's (which requires that you obtain a mark of at least 4 (50-59%) in each of four designated university admission subjects); or
- A university exemption certificate issued by the South African Matriculation Board to students with other school qualifications.

1.2 Minimum admission requirements

In addition to the abovementioned school-leaving qualifications:

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 5 (60%); and
- Physical Sciences (Physics and Chemistry) – 4 (50%).

As a prospective student you must also write the National Benchmark Tests (NBT). You must write the Academic and Quantitative Literacy test (AQL). If you take Mathematics as a subject you also have to write the Mathematics (MAT) test.

1.3 Admission to the Extended Degree Programme (EDP)

Background

The Extended Degree Programme (EDP) was introduced to assist students with proven potential but without adequate schooling in mastering their degree programmes. An additional year of study is added to a mainstream degree programme to form an EDP. During this extra year you will receive additional academic support as preparation for specific mainstream subjects and for university studies in general.

In all fields of study in the Faculty of AgriSciences except *Agribusiness Management* and *Agricultural Economic Analysis and Management*, the EDP includes an additional year of study before you start the first year of study of your chosen mainstream degree programme. The curriculum of this additional year is specifically designed to provide you with additional academic support and to facilitate the transition between school and university. You must pass all the modules of this year to gain admission to the first year of the mainstream programme.

For the EDP in the fields of study *Agribusiness Management* and *Agricultural Economic Analysis and Management* the first year of the mainstream degree programme is spread over two years, with the addition of the following compulsory modules: Introduction to Economics 141; Introduction to Financial Accounting 171 and Mathematics for Economic and Management Sciences 171. You must pass all prescribed modules for these two years to gain admission to the second year of the mainstream programme.

Even if you have been admitted to a mainstream programme you can apply for admission to your programme's EDP. Based on your school results and/or the results of any assessment or test, including the NBTs, prescribed by the University, you may be advised or compelled by the Faculty to follow the EDP route.

The minimum admission requirements for the EDP in the programmes BScFor (Forestry and Natural Resource Management):

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 4 (between 55% and 59,9%);
- Physical Sciences (Physics and Chemistry) – 3 (between 45% and 49,5%); and
- National Benchmark Tests between 33% and 47%

All necessary information on the structure and curriculum of the EDP will be supplied to you if you want to or are required to register for the EDP. You can also obtain the information from the Faculty Administrator at 021 808 9111.

More information is available on the following website:
http://www.sun.ac.za/english/faculty/agri/forestry (Department of Forest and Wood Science)

2. Programme Description and Outcomes

The first year of study in Forestry and Natural Resource Sciences consists of one Forestry module plus the first year of study in the Biological Sciences programme in the Faculty of Science. The second year of study consists of a study of the basic applied sciences such as Soil Science and Biometry, and students start to specialise in forestry disciplines. An integrated approach is taken with emphasis on Forest Management, Silviculture, Forest Engineering and Forestry Development. You have to participate in practical work during vacations from your first to your final year of study.

After successful completion of the programme in *Forestry and Natural Resource Sciences* you will be able to:

- employ and convey the knowledge required to safeguard and utilise, in a sustainable way, natural resource ecosystems, with particular reference to native forests and artificial plantations;
- provide solutions to concrete and abstract problems affecting the management or conservation of forests and plantations, based on solid evidence and theoretical arguments, using creative and critical thinking;
- work effectively in teams of peers to efficiently produce solutions to problems in the spheres of forestry and natural resource sciences;
- organise and manage time effectively, individually and in groups, in order to successfully meet deadlines associated with reports and submissions;
- effectively collect or retrieve and then process and critically analyse data in the specialised forestry domain in order to satisfy the demands of forest management or further the requirements of forestry research by presenting results in a usable format;
- communicate effectively with peers, superiors and subordinates, using information-technology support for oral or written discourse and the presentation of reports and submissions;
- apply scientific research methodology and state-of-the-art technology in order to effectively undertake a research project investigating any facet of the forestry domain;
- demonstrate a holistic view of the complex of forest ecotypes covering the globe and the interdisciplinary interactions between the biotic and abiotic components thereof; and
- apply professional training and social life skills within the context of forest conservation, management and sustainable utilisation for the benefit of humankind.

2.1 Practical work in Forest and Wood Sciences

- You must do compulsory practical work in your first three years of study:
  - In your first year, this practical work can take place during either the June or September vacation. If you have completed your first year of study at another university and you are enrolling in the second year, you still have to complete this practical.
  - During your second and third years of study, you will be required to complete a one-week period of prescribed practical work for each year. This one week of practical work can also be done before the beginning of the academic year.
- You must submit reports of all your practical work to the satisfaction of your lecturers.
- You are responsible for all costs regarding demonstrations and practical work.
- It can be expected of you to do practical work during other vacations in addition to the ones already mentioned.
- In your final year you will:
  - undertake a study tour of approximately two weeks during the winter vacation to the forest regions of South Africa.
  - submit a complete report at the beginning of the second semester as prescribed by the tour leader.
  - collect data during vacations for your management plan or project.
  - complete a comprehensive management plan or project during the second semester that is based on the data you collected during the winter vacation (or an earlier extended vacation).

- hand in the completed project or management plan before 1 November of the year in which you intend to graduate.
- obtain a final mark of at least 50 to pass the project or management plan.
  - If you obtain a final mark of 40 to 49 in November you can submit a modified project or management plan before the January examinations of the following year. That will allow you to receive your degree during the supplementary graduation ceremony in March.
  - If you obtain a final mark of less than 40 in November or you fail to obtain a final mark of at least 50 in January you must repeat the practical work for the project or management plan.
  - *Please note:* The University is not liable for any injury that you may sustain during practical work or tours or for any claims that may result from such injury.

The prescribed modules and elective modules of the various years of study for each field are set out below. The module contents are given in the chapter "Subjects, Modules and Module Contents" of this Calendar part.

2.2 Curriculum

Bachelor's programme in Forestry and Wood Sciences (BScFor): Wood and Wood Products Sciences

First Year (124 credits)

Compulsory Modules

Biology	124(16), 154(16)
Chemistry	124(16), 144(16)
Computer Skills	171(4)
Forest Science	171(24)
Mathematics (Bio)	124(16)
Physics (Bio)	134(16)

124 (16) Cell biology (3L, 3P)

Origin and early history of life. Cytology. Cell chemistry, biological membranes and cellular respiration. Fixation, transfer and expression of genetic information. Evolution.

Responsible departments: Biochemistry, Botany and Zoology, and Genetics

Home department: Botany and Zoology

154 (16) Functional biology (3L, 3P)

Plant anatomy and morphology; photosynthesis; water relations; transport in plants; plant mineral nutrition; growth and development; responses to the environment. Functional biology of animals. Introduction to biotechnology.

Responsible departments: Botany and Zoology and Genetics

Requisite modules:

- *Biology 124 and*
- *Chemistry 124, 144 (not applicable to the stream Biomathematics, option 2: ecology)*

Home department: Botany and Zoology

124 (16) Fundamental principles of chemistry I (3L, 3P)

Matter and its properties; chemical formulae; stoichiometry; solution stoichiometry and reactions in aqueous solution; thermodynamics: energy, enthalpy, entropy and Gibbs free energy; atomic structure and bonding; molecular geometry and structure according to Lewis and VSEPR; intermolecular forces; chemical kinetics.

Home department: Chemistry and Polymer Science

144 (16) Fundamental principles of chemistry II (3L, 3P)

Chemical equilibrium (both quantitative and qualitative), with applications in acid-base and precipitation reactions of aqueous solutions; an introductory study of organic compounds with a variety of functional groups; reaction mechanisms; stereochemistry; polymerisation.

Requisite module: Chemistry 124

Home department: Chemistry and Polymer Science

171 (4) Computer skills (1L)

Study load: 26 lectures in total, presented as 2L per week for 13 weeks, distributed over the year

Introduction to general computer usage with the focus on the development of skills in using software for word processing, skills in using spreadsheets to perform calculations in creating meaningful graphs and skills in using presentation software.

An optional test can be written during the first term to obtain exemption from the module.

The class mark will serve as the final mark.

Home department: Computer Science

171 (24) Introduction (2L, 2P)

Introduction to forest and wood products science, global forest resources, the forest and wood products industry locally and internationally, plantation systems; silvicultural systems and agroforestry; an introduction to, and terminology of, forestry engineering; forest management, forest economics and forest policy. Composition of wood, decay, preservation, processing, sawmill layout, wood defects, grading, wood products, pulp and paper. One week of practical work in June or September is to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

124 (16) Mathematics for the biological sciences (4L, 2T)

Functions and their inverses: polynomial functions, rational functions, power functions, exponential functions, trigonometric functions. Solution of trigonometric equations. Composition of functions. Limits. Definition of the derivative of a function. Continuity. Rules of differentiation, certain formulae. Higher order derivatives. Implicit differentiation. Applications of differentiation: processes of growth and decay, graph sketching, optimisation problems. Indefinite integrals. Techniques of integration: substitution, integration by parts. The definite integral as the limit of a sum. The Fundamental Theorem of Calculus. Definite integrals as areas. Solution and use of simple differential equations.

Home department: Mathematics

134 (16) Introductory physics for biological sciences A (3L, 3P)

Selected topics, relevant to the biological sciences, from introductory mechanics, hydro-statics and optics.

Method of assessment: Flexible assessment

Corequisite modules:

- *Mathematics (Bio) 124 or*
- *Mathematics 114*

Home department: Physics

Second Year (125 credits)

Compulsory Modules

Biometry	212(8), 242(8)
Computer Skills	272(5)
Forest Science	212(8), 254(16)
Geography and Environmental Studies	214(16)
Soil Science	214(16)
Wood Product Science	224(16), 244(16), 264(16)

212 (8) Introductory Biometry (2L, 1T or 1P)

Role of statistics in research; methods of tabulation and graphical representation of data; descriptive measures of locality, variation and association; the elementary principles of estimation, sampling, randomization, unbiasedness and distributions; simple linear and non-linear regression; calculation of standard errors; introduction to hypothesis testing; contingency tables and chi-square tests; tests for normality; F-test for homogeneity of variance. All data will be analysed using applicable software.

Method of assessment: Flexible assessment

Prerequisite module:

- *Mathematics (Bio) 124 or*
- *Mathematics 114*

Home department: Genetics

242 (8) Applications in Biometry (2L, 1T or 1P)

Treatment and experimental design; efficiency of estimation; analysis of variance; hypothesis tests for means and differences between means: F-test, t-test, Student's LSD; confidence intervals; non-parametric tests; multiple linear regression. All data will be analysed using applicable software.

Method of assessment: Flexible assessment

Prerequisite module: Biometry 212

Home department: Genetics

272 (5) Computer skills (2L)

Study load: 35 lectures in total

The main objective of this module is to equip the student with the relevant skills required to successfully and efficiently perform tasks identified as fundamental to the scientific process. Each topic is presented using an appropriate computer software package. Specific attention is given to the following topics: obtaining relevant literature, data capturing and analysis, creation and technical maintenance of electronic documents for reporting and presentation.

Method of assessment: Flexible assessment

Home department: Computer Science

212 (8) Natural forest ecosystems (2L, 2P)

The importance of natural forests and their functions, including products for livelihoods and industry and the management of woodlands and savannahs for sustainability; classification of forests based on structure and function; characterisation of natural forests based on structure and layering; species composition and diversity; succession concepts and theory; silvicultural systems and sustainable management of natural forests; the ecological and socio-economic sustainability methods of natural

tropical forests, including criteria and indicators for sustainable forest management; certification and management of non-timber forest products.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

254 (16) Forest mensuration and inventory (3L, 3P)

Measurement of diameter and height, and determination of volume, form and density of trees, stands of timber and forest products. Measurement and estimation of wood properties and product quality in standing trees; quantitative description of forest structure, sampling techniques and their application in forest inventory. Use of remote sensing for forest measurement and assessment.

Method of assessment: Flexible assessment

Prerequisite module:

- *Mathematics (Bio) 124 or Engineering Mathematics 115*

Home department: Forest and Wood Science

214 (16) Geographical information systems (3L, 3P)

Introductory overview and comprehension of GIS in the context of geo-information science; The nature of geographical data, data models, coordinate systems and map projections; GIS processes: data capturing, ordering and storage, manipulation and analysis; Map design and cartographic visualisation with a GIS; GIS applications.

Prerequisite module: Geo Environmental Science 124 (Not applicable to BScFor (NRM) students)

Corequisite module:

- *Mathematics 114 or*
- *Mathematics (Bio) 124*

Home department: Geography and Environmental Studies

214 (16) Introduction to soil science (3L, 3P)

Soil as a three-dimensional unit; soil formation factors: climate, parent material, relief, organisms and time; weathering processes and products; physical properties of soil: texture, structure, colour, air-water-temperature relationships; chemical properties of soil: soil colloids, clay minerals, cation adsorption and exchange, soil reaction; formation and properties of soil organic material; elementary interpretation and evaluation of physical, chemical and morphological soil characteristics for resource use.

Prerequisite module: Chemistry 144

Home department: Soil Science

224 (16) Wood anatomy and identification (3L, 3P)

Introduction to plant taxonomy and commercially important tree genera; introduction to tree growth; macroscopic and microscopic anatomy and identification of types of woods; descriptions of cell wall ultrastructure, wood variability; wood quality.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

244 (16) Wood chemistry (3L, 3P)

Introduction to the chemistry relating to wood and wood products. Chemical composition (lignin, cellulose, hemicelluloses, extractives) and chemical utilisation of wood. Biological degradation of lignocellulosics.

Method of assessment: Flexible assessment

Corequisite module:

- *Engineering Chemistry 123 or*

- *Chemistry 144*

Home department: Forest and Wood Science

264 (16) Wood physics and drying (3L, 3P)

The physics of water in and around wood, moisture content, the concept of humidity, equilibrium moisture content density, sorption, shrinkage and swelling of wood; electrical, thermal and acoustical properties of wood. The why and how of wood drying, description of various methods, kiln types and schedules, drying defects.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

Third Year (120 credits)

Organised excursion and/or practical assignment

Take note that you must undertake an organised excursion and/or do a practical assignment during short vacation(s) and/or weekends for the module Soil Science 314. Such organised excursion and/or assignment must take place for a period of time as determined by the Department of Soil Science in cooperation with the lecturers of the Department Forest and Wood Science. This necessary practical experience must be done during the relevant semester of the abovementioned module. You are responsible for the travel and accommodation costs involved.

Compulsory Modules

Biometry	312(8)
Forest Science	334(16), 355(16), 356(16), 364(16)
Genetics	214(16)
Soil Science	314(16)
Wood Product Science	335(16)

312 (8) Biometrical inference (1L, 1P, 1T)

Linear and multiple regression; statistical inference; prediction and calibration; testing the assumptions; diagnosis of outliers and influential observations; data transformations; data processing with Excel.

Method of assessment: Flexible assessment

Prerequisite module: Biometry 242

Home department: Genetics

334 (16) Forest growth and yield science (3L, 3P)

Theory of tree growth, site evaluation; development of site index equations; growing stock and stand density; developing volume and taper equations; prediction of current yield; tree and forest growth models; prediction of future yield, modelling wood property variation.

One week of practical work in September to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

355 (16) Forest finance, economics, policy and marketing (3L, 3P)

Background to the forestry business environment in South Africa; International forest policy and processes; Forestry finance; financial analysis and feasibility studies of forestry projects; Valuation of land and plantations; forest resource economics; Basic principles of forest product marketing;

international forestry marketing; timber and non-timber forestry products; forestry business environment.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

356 (16) Silviculture I (3L, 3P)

Environmental factors that influence tree and stand growth; species-site-market matching; site preparation; plantation establishment and regeneration; vegetation management (including coppice management, pruning and thinning); integrated pest and disease management.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

364 (16) Timber harvesting (3L, 3P)

Introduction to timber-harvesting; timber-harvesting nomenclature/terminology, equipment and systems; time study, time components, production, productivity and machine and harvesting systems costing; evaluation and system selection; operational and tactical harvest planning; ergonomics and forest work-science, health and safety in forest operations; impact of harvesting on the environment; harvesting of biomass.

One week of practical work (power-saw course) in September of the second year to be completed satisfactorily as part of this module.

Method of assessment: Flexible assessment

Corequisite module: Forest Science 254

Home department: Forest and Wood Science

214 (16) Introductory genetics (3L, 3P)

Part I: Principles of Heredity

Molecular basis of genetic diversity and heredity; the cell cycle; mitosis and meiosis; chromosomes, genes and heredity; Mendelian genetics; linkage and crossing over of genes on a chromosome; linkage analysis and gene mapping; sexual reproduction and sex determining chromosomes; mutations that affect chromosome number and structure and their phenotypic effects.

Part II: Population Genetics

Introduction to population genetics; population diversity and genotype and allele frequencies; Hardy-Weinberg principle; quantitative genetics and heredity.

Prerequisite pass module: Biology 124 or 144 or 154

Prerequisite module:

- *Mathematics (Bio) 124 or*
- *Mathematics 114 or 144*

Home department: Genetics

314 (16) Genesis, morphology, classification and uses of soil (3L, 3P)

Development and classification of South African soils; terrain classification; soil and land mapping; methodology of soil and land suitability evaluation with special reference to crop suitability; soil use planning; soil erosion and its control.

Prerequisite modules:

- *Soil Science 214*
- *Chemistry 124 and 144*

Home department: Soil Science

335 (16) Wood adhesives and composite products (3L, 3P)

Adhesion; types and properties of adhesives. The manufacturing of particleboard, veneer, plywood, fibreboard, wood cement and wood plastic composites, laminated wood and paper. Processing methods, physical and chemical properties of the products and analysis methods.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

Fourth Year (121 credits)

Compulsory Modules

Forest Science	414(8), 424(16), 434(16), 435(8), 442(1), 468(32)
Industrial Psychology (Special)	354(12)
Wood Product Science	414(16), 444(12)

414 (8) Silviculture II (2L, 2P)

The eco-physiological basis for forest production; carbon cycling and carbon sequestration; effects of silvicultural practices and environmental factors on stand growth and environmental sustainability; nutritional management and nutrient cycles; integrated fire management.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

424 (16) Forest management and planning (3L, 3P)

Principles of business management; peculiarities in forest production systems; decision-making and decision support in forest management; planning techniques; classification and subdivision of land; annual planning of operations; scheduling of logging operations.

Method of assessment: Flexible assessment

Prerequisite module: Forest Science 254

Home department: Forest and Wood Science

434 (16) Forest roads and transport (3L, 3P)

Introduction to road construction materials and materials testing and pavement design. Road transport terminology/ nomenclature and applicable legislation; Introduction to access development; forest road network planning and management; influencing factors and road placement techniques. Road construction; road maintenance and drainage; impacts of roads on the environment. Introduction to secondary timber transport. Introduction to logistics.

Method of assessment: Flexible assessment

Corequisite module: Food Science 364

Home department: Forest and Wood Science

435 (8) Silviculture III (2L, 2P)

Genetic tree improvement of forestry species; principles and practices of tree propagation and nursery management; principles of sexual and asexual tree propagation; population genetics, quantitative traits and continuous variation within forestry species; developing, monitoring and evaluating nursery and tree improvement experiments.

Method of assessment: Flexible assessment

Corequisite module:Genetics 214

Home department: Forest and Wood Science

442 (1) Experiential work (1P)

Three weeks of practical work during the four years of study. Two-week study tour during the winter recess of the fourth year.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

468 (32) Research or management project (3L, 3P)

A study of a management unit in the forest and wood industry.

The data collected at the management unit are analysed, processed and used for the compilation of a comprehensive management plan on the basis of which the module will be assessed

Or

Independent execution of a theoretical and/or practical investigation in any forest science or wood science related field, and the submission of a comprehensive research report.

Method of assessment: No examination is written; class mark serves as final mark.

Home department: Forest and Wood Science

354 (12) Industrial psychology (Special) (2L, 1S)

Human resource management: human resource planning, recruitment, selection, induction, training and development, performance appraisal, compensation management, labour turnover, absenteeism, health and safety. Labour relations: field of study, organised labour, role of employers; labour legislation. Organisational behaviour: introduction and orientation, organisational design, the individual, groups and teamwork, motivation, leadership, organisational effectiveness.

Home department: Industrial Psychology

414 (16) Wood products manufacturing I (3L, 3P)

Basic wood products manufacturing with a focus on the primary manufacturing sector. Background to and economics of wood products manufacturing. Production of solid wood (industrial or furniture wood) in sawmills and further processing in secondary industries. Processing equipment; introduction to computer-based equipment.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

444 (12) Bio-energy (2L, 2P)

Renewable energy sources, conversion of biomass into energy, biorefinery, processing methods, determination of calorific values and other properties, comparison of different biofuels, environmental aspects, emissions and emissions reduction, introduction to life cycle analysis for biofuels and bio-energy.

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

3. Application process:

Prospective students can visit the following links for applications:

- Undergraduate studies: http://www.maties.com/

For more information on the programs offered at the Department of Forest and Wood Science, please visit the following link:

- Website of department: http://www.sun.ac.za/forestry