



UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY

## **Department of Forest and Wood Science**

### **Academic Programmes for 2017**

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**Updated:** January 2017

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## Bachelor's Programme (BScFor)

### 1. Admission requirements

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.

This undergraduate (bachelor's) programme leads to the Bachelor of Science in Forestry and Wood Sciences (BScFor) degree. Within the programme there are two fields of study, namely *Forestry and Natural Resource Sciences* and *Wood & Wood Products Sciences*.

*In addition to the abovementioned school-leaving qualifications*

#### **For the field of study in Forestry and Natural Resource Science:**

- 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%).

**For the field of study in Wood & Wood Products Science:**

- 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 – 6 (70%); and
- Physical Sciences (Physics and Chemistry) – 5 (60%).

The prospective student is also required to take the National Benchmark Tests (NBT). All candidates write the Academic and Quantitative Literacy test (AQL). Students who take Mathematics as a subject also have to write the Mathematics (MAT) test.

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**

This bachelor's programme leads to the Bachelor of Science in Forestry and Wood Sciences (BScFor) degree. Within the programme there are two fields of study, namely:

- Forestry and Natural Resource Sciences; and
- Wood and Wood Products Sciences

A brief description of the two fields of study including the required practical work is given below.

**2.1 Forestry and Natural Resource Sciences – BScFor (FNR)**

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.

## **2.2 Wood and Wood Products Sciences – BScFor (WWP)**

For the field of study in Wood and Wood Products Sciences you take modules in the Faculties of AgriSciences, Science and Engineering from the first year of study. The Wood and Wood Products Sciences field of study includes a variety of modules concerned with not only the properties of wood as a material, but also with sawmilling, veneer manufacture, industrial furniture production and the construction and design of wood products. Wood and Wood Products Sciences modules are complemented by a series of engineering-based modules such as Industrial Ergonomics, Engineering Drawing, Engineering Mathematics, Industrial Management, and Quality Assurance. You have to participate in practical work during vacations from your first to your final year of study.

After successful completion of the field of study in *Wood and Wood Products Sciences* you will be able to:

- apply and convey the knowledge required to utilise the products emanating from natural resource ecosystems in a sustainable manner and process and reconstitute these into products useful to humanity;
- provide solutions based on solid experimental evidence and theoretical arguments, using creative and critical thinking, to concrete and abstract problems affecting production in sawmills, board mills, furniture factories, wood preservation plants, wood construction plants, lamination plants and other wood processing industries;
- work effectively in teams of peers to efficiently produce solutions to problems in the spheres of wood products science and technology;

- organise and manage time effectively, individually and in groups, in order to successfully meet deadlines associated with reports and submissions and manufacturing processes;
- effectively collect or retrieve and then process and critically analyse data in the specialised forest products domain in order to satisfy the demands of processing plant management or to further the requirements of forest product 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 into facets of the forest products domain;
- demonstrate a holistic view of the complex of forest products being produced around the world and the interdisciplinary interactions between the international role players in the field of forest products; and
- Apply professional training and social life skills within the context of forest products production and the utilisation of forest resources for the benefit of humankind.

### 3. 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 into 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.

#### **4. 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. 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.

##### *Minimum admission requirements for the EDP*

##### **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%

### **BScFor (Wood and Wood Products Sciences):**

- 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 (between 60% and 69,9%);
- Physical Sciences (Physics and Chemistry) – 4 (between 55% and 59,9%); 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.

The prescribed modules and elective modules of the various years of study for each field are set out below.

## **5. Programme content**

### **5.1 Bachelor's programme in Forestry and Wood Sciences (BScFor) Forestry and Natural Resources 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)

#### Biology 124 (16) – Cell Biology

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

*Presented by the Departments of Biochemistry, of Botany and Zoology and of Genetics*

*Home department: BOTANY AND ZOOLOGY*

#### Biology 154 (16) – Functional Biology

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



*Co requisite modules:*

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

Chemistry 124 (16) – Fundamental Principles of Chemistry I

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*

Chemistry 144 (16) – Fundamental Principles of Chemistry II

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.

*Co requisite module: Chemistry 124*

*Home department: Chemistry and Polymer Science*

Computer Skills 171 (4) – Computer Skills

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*

Forest Science 171 (24) - Introduction

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*

Mathematics (Bio) 124 (16) – Mathematics for the Biological Sciences

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*

### Physics (Bio) 134 (16) – Introductory Physics for Biological Sciences A

Selected topics, relevant to the biological sciences, from introductory mechanics, hydrostatics and optics.

*Method of assessment: Flexible assessment.*

*Co requisite 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)

### Biometry 212 (8) – Introductory Biometry

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*

### Biometry 242 (8) – Applications in biometry

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*

Computer Skills 272 (5) – Computer Skills

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*

Forest Science 212 (8) – Natural forest ecosystems

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*

Forest Science 254 (16) – Forest mensuration and inventory

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*

Geography and Environmental Studies 214 (16) – Geographical Information Systems

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 BScForc (NHB) students)*

*Corequisite module:*



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

*Home department: Geography and Environmental Studies*

Soil Science 214 (16) – Introduction to Soil Science

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*

Wood Product Science 224 (16) Wood anatomy and identification

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*

Wood Product Science 244 (16) – Wood chemistry and preservation

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*

Wood Product Science 264 (16) Wood physics and drying

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)

**Biometry 312 (8) – Biometrical Inference**

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*

**Forest Science 334 (16) Forest growth and yield science**

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*

**Forest Science 355 (16) – Forest finance, economics, policy and marketing**

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*



### Forest Science 356 (16) Silviculture I

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*

### Forest Science 364 (16) – Timber harvesting

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*

### Genetics 214 (16) – Introductory Genetics

#### 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*

### Soil Science 314 (16) – Genesis, morphology, classification and uses of soil

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*

### Wood Product Science 335 (16) Wood adhesives and composite products

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)

### Forest Science 414 (8) – Silviculture II

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*

### Forest Science 424 (16) – Forest management and planning

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*

### Forest Science 434 (16) – Forest roads and transport

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.*



*Co requisite module: Food Science 364*

*Home department: Forest and Wood Science*

Forest Science 435 (8) – Silviculture III

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.*

*Co requisite module: Genetics 214*

*Home department: Forest and Wood Science*

Forest Science 442 (1) – Forestry Practical Work

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*

Forest Science 468 (32) – Management plan

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*

Industrial Psychology 354 (12) – Industrial Psychology (Special)

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*

Wood Product Science 414 (16) – Wood products manufacturing I

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*

Wood Product Science 444 (12) – Bio-energy

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*

## **5.2 Bachelor's programme in Forestry and Wood Sciences (BScFor) Wood and Wood Products Sciences**

### **First Year (123 credits)**

#### *Compulsory Modules*

Applied Mathematics B	124(15)
Computer Programming	143(12)
Engineering Chemistry	123(15)
Engineering Drawings	123(15)
Engineering Mathematics	115(15), 145(15)
Forest Science	171(24)
Strength of Materials	143(12)

Applied Mathematics B 124 (15) – Statics

Vectors; forces; sum of forces at a point; direction cosines and direction angles; components and component vectors; scalar products; vector products; moment of a force; force systems on rigid bodies; equivalent force systems; couples; line of action of the resultant; equilibrium of a rigid body; friction; centre of mass; centroid; volumes; definite integration; moment of inertia of areas.

*Method of assessment: Flexible assessment.*

*Home department: Applied Mathematics*

Computer Programming 143 (12) – Computer Programming

Introduction to computer systems. Introduction to a programming environment; expressions; conditional statements; iterative structures; data types; static and dynamic data structures; file handling; abstract data types; objects; structured program design. Emphasis is placed on modular programming for engineering applications.

[Presented by the Department of Electrical and Electronic Engineering (75%) and by the Department of Mechanical and Mechatronic Engineering (25%)]

#### *Examination*

Formula for Final mark:  $P=0,4K + 0,6E$

*Home Department: Electrical and Electronic Engineering*

Engineering Chemistry 123 (15) – Chemistry for Engineering Students

Basic concepts, units and dimensions, significant figures, conversion between unit systems; components of matter, atomic structure, the periodic table and chemical bonding; stoichiometry; chemical reactions (acid-base, precipitation and redox); properties of mixtures and solutions; chemical equilibrium; electrochemistry; gas laws, state functions and (T,P,V) relationships; thermodynamics and thermochemistry; introduction to basic engineering applications.

*Method of assessment: Examination.*

*Co requisite module: Engineering Mathematics 115*

Formula for Final mark:  $P=0,4K + 0,6E$

*Home department: Processing Engineering*

Engineering Drawings 123 (15) – Orthographic Drawings

Projection planes; points, lines and planes in space; trace points of lines and trace lines of planes; true lengths and true angles between lines and planes; true angles between planes; new projection planes; interpenetrations; developments; isometric projections. Works drawings: 1st- and 3rd-angle projections; line alphabet; dimensioning; scale; three-view drawing layout; auxiliary views; hidden detail; introduction to sections and cross-hatching. Introduction to 2D CAD and 3D parametric CAD.

*Method of assessment: Examination.*

Formula for Final mark:  $P=0,5K + 0,5E$

*Home department: Mechanical and Mechatronic Engineering*

Engineering Mathematics 115 (15) – introductory Differential and Integral Calculus

Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate or must have successfully completed the first year of a suitable extended degree programme.

Mathematical induction and the binomial theorem; functions; limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of simple functions.

*Method of assessment: Flexible assessment.*

*Home department: Mathematics*

Engineering Mathematics 145 (15) – Further Differential and Integral Calculus

Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

*Method of assessment: Flexible assessment.*

*Prerequisite module: Engineering Mathematics 115*

*Home department: Mathematics*



**Forest Science 171 (24) - Introduction**

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*

**Strength of Materials 143 (12) – Introduction: Mechanics of Deformable Bodies**

Introduction to mechanics, internal forces and stresses, deformations and strain, material response: material law, axially loaded elements, torsion elements with circular cross section, symmetrical bending of beams, thin walled pressure vessels. Introductory materials science: crystalline and amorphous solids, crystalline structures, defects and applications.

[Presented by the Department of Civil Engineering (80%) and by the Department of Mechanical and Mechatronic Engineering (20%)]

*Examination*

*Co requisite modules:*

- *Engineering Mathematics 115*
- *Applied Mathematics B 125*

Formula for Final mark:  $P=0,4K + 0,6E$

*Home department: Civil Engineering*

**Second Year (126 credits)*****Compulsory Modules***

Engineering Mathematics	214(15)
Forest Science	254(16)
Industrial Programming	244(15)
Production Management	212(8)
Professional Communication	113(8)
Wood Product Science	224(16), 234(16), 244(16), 264(16)

**Engineering Mathematics 214 (15) – Differential Equations and Linear Algebra**

Ordinary differential equations of first order; linear differential equations of higher orders; Laplace transforms and applications. Matrices: linear independence, rank, eigenvalues. Laplace transforms and applications.

*Method of assessment: Flexible assessment.*

*Prerequisite pass module: Engineering Mathematics 115 or 145*

*Co requisite module: Engineering Mathematics 145*

*Home department: Mathematics*

Forest Science 254 (16) Forest mensuration and inventory

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*

Industrial Programming 244 (15) – Industrial programming

Use of spreadsheets: data manipulation, numerical methods, graphs, basic financial calculations, planning and analysis of scenarios and optimising. Visual Basic for Applications for spreadsheet use. Basic computer communication. Theory and application of forecasting with emphasis on spreadsheet applications.

*Method of assessment: Flexible assessment.*

*Prerequisite module: Engineering Mathematics 145*

*Home department: Industrial Engineering*

Production Management 212 (8) – Production and Operations Management

Introduction to the operational environment; strategy and productivity; process flow analysis; service processes; lean operations management; facility location; scheduling techniques.

*Method of assessment: Flexible assessment.*

*Home department: Industrial Engineering*

Professional Communication 113 (8) – Professional Communication

Effective communication with various target audiences with specific objectives in mind; particular focus on the planning and writing of a technical report; other document types in the professional environment such as proposals and correspondence; text skills, such as coherence, appropriate style and text structure; appropriate referencing methods; introduction to oral presentation skills; written communication in teams.

*Project*

Formula for Final mark:  $P=K$

*Home department: Engineering (Admin)*

Wood Product Science 224 (16) Wood anatomy and identification

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*

**Wood Product Science 234 (16) Mechanics of wood products**

Analysis of beams, columns and axially loaded elements. Elastic behaviour and deformation of materials. Design and scaling. Timber as a structural material: Influence of moisture, long-term load, pressure treatment, load sharing. Strength grading of timber. The SABS timber design code.

*Prerequisite module: Strength of Materials 143*

*Home department: Forest and Wood Science*

**Wood Product Science 244 (16) Wood chemistry**

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

*Method of assessment: Flexible assessment.*

*Co requisite module:*

- *Engineering Chemistry 123 or*
- *Chemistry 144*

*Home department: Forest and Wood Science*

**Wood Product Science 264 (16) Wood physics and drying**

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 (124 credits)**

***Compulsory Modules***

Engineering Statistics	314(15)
Forest Science	334(16), 355(16), 356(16)
Industrial Management	354(15)
Operations Research (Eng)	345(15)
Quality Assurance	344(15)
Wood Product Science	335(16)

**Engineering Statistics 314 (15) – Engineering Statistics**

Applied probability theory; applications based on discrete and continuous random variables and their probability distributions, such as the normal, gamma, lognormal, log-Pearson type 3 (LP3), Gumbel (EV1) distributions; queuing processes; joint distributions; descriptive statistics and graphical presentations; moments, averages, median and standard deviations;

moment generating functions; variation coefficient; skewness coefficient; peaking coefficient; sampling theory; point and interval estimation; hypothesis testing;  $\mu^2$  and K-S testing; simple linear and non-linear regression and correlation analyses; introduction to multiple linear regression; introduction to analysis of variance and experimental design.

*Method of assessment: Examination.*

*Prerequisite pass modules: Engineering Mathematics 115, 145*

Formula for Final mark:  $P=0,4K + 0,6E$

*Home department: Statistics and Actuarial Science*

### Forest Science 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*

### Forest Science 355 (16) Forest finance, economics, policy and marketing

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

### Forest Science 356 (16) Silviculture I

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*

### Industrial Management 354 (15) – Industrial management

Industry dynamics and the value chain, BPR (Business Process Re-engineering); SCM (Supply Chain Management) and logistics management, information technology and e-commerce within the framework of a formal ERP (Enterprise Resource Planning) system.

*Prerequisite module: Production Management 314*

*Home department: Industrial Engineering*

**Operations Research 345 (Eng) (15) Operations research (Deterministic Models)**

The systems approach to problem-solving; problems leading to linear programming, network, integer and non-linear programming models; algorithms for solving such models; tasks, including exercises with computer packages.

*Method of assessment: Flexible assessment.*

*Prerequisite module: Engineering Mathematics 214*

*Home department: Industrial Engineering*

**Quality Assurance 344 (15) – Quality Assurance**

Definition of quality, methods and techniques of quality assurance, statistical process design, sampling. Principles of robust design. Formulation of measures of system performance and quality. Identification of quality noise factors. Formulation and implementation of techniques to reduce effects of noise. Synthesis and selection of design concepts for robustness.

*Method of assessment: Flexible assessment.*

*Prerequisite module: Engineering Statistics 314*

*Home department: Industrial Engineering*

**Wood Product Science 335 (16) – Wood adhesives and composite production**

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	442(1), 468(32)
Industrial Ergonomics	414(15)
Operations Research (Eng)	415(15)
Quality Management	444(15)
Wood Product Science	414(16), 434(16), 444(12)

**Forest Science 442 (1) Experiential work**

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*

Forest Science 468 (32) Research or management project

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*

Industrial Ergonomics 414 (15) – Industrial Ergonomics

Operation analysis, work standards; reduction of setup times, training practices, remuneration, anthropometry, workstation and tool design, man/machine interfaces, work physiology and biomechanics, the work environment, cognitive work, shift work, aspects of occupational health and safety.

*Method of assessment: Flexible assessment.*

*Home department: Industrial Engineering*

Operations Research 415 (15) Operations research (Stochastic Models) (3L, 3T)

Analysis of problems leading to deterministic and stochastic dynamic programming models; Markov chains and waiting-line models; techniques for solving such models; decisions under uncertainty; Bayes' theorem; multi-criteria decision-making.

*Method of assessment: Flexible assessment.*

*Home department: Industrial Engineering*

Quality Management 444 (15) – Quality Management

Definition of reliability and maintainability; reliability management; methods and techniques for reliability modelling, allocation, prediction and maintainability assurance; fault tree analysis; failure mode analysis; quality management; history and background; ISO 9000; total quality management; leadership, 6-sigma; cost considerations; quality audits; experimental design with Statistica.

*Prerequisite module: Engineering Statistics 314*

*Home department: Industrial Engineering*

Wood Product Science 414 (16) – Wood products manufacturing I

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*

#### Wood Product Science 434 (16) Wood degradation and preservation

Degradation due to fungi, insects and weathering; Composition and properties of various surface finishes, including preservatives, surface preparation and coating application. Surface characterisation and performance testing, environmental aspects.

*Method of assessment: Flexible assessment.*

*Home department: Forest and Wood Science*

#### Wood Product Science 444 (12) – Bio-energy

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*

## **6. Application process:**

Prospective students can visit the following links for applications:

- Undergraduate studies: <http://www.maties.com/>
- Postgraduate studies: <http://www0.sun.ac.za/pgstudies/>

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

- Calendar 2017:  
<http://www.sun.ac.za/english/Documents/Yearbooks/Current/AgriSciences.pdf>
- Website of department: <http://www.sun.ac.za/forestry>