UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Department of Forest and Wood Science

Academic Programmes for 2016

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Contents:

This document is an extract from the Faculty of AgriSciences Calendar for 2015

Undergraduate Programmes

Bachelor's Programme

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.

Admission Requirements for BScFor

For university admission, a prospective student is required to be in possession of a National Senior Certificate (NSC) or an IEB (Independent Examinations Board) school-leaving certificate as certified by Umalusi, with admission to bachelor's degree studies, which requires that a mark of at least 4 (50-59%) be obtained in each of four designated university entrance subjects, or an exemption certificate issued by the South African Matriculation Board to students with other school qualifications.

In addition to the above:

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;
- Afrikaans or English (Home Language or First Additional Language) 4 (50%)
- Mathematics 5 (60%)
- Physical Sciences 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;
- Afrikaans or English (Home Language or First Additional Language) 4 (50%)
- Mathematics 6 (70%)
- 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 an Quantitative Literacy test (AQL). Students who take Mathematics as a subject also have to write the Mathematics (MAT) test.

1. Forestry and Natural Resource Sciences (BScFor)

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.

Forestry and Natural Resource Sciences students participate in a week-long practical exposure session during vacations in each of the first three years of study. In the fourth year students undertake a tour to the summer rainfall regions. An integral part of this programme consists of the compilation of an extensive management plan or report that must be submitted by all students.

Upon successful completion of the programme in *Forestry and Natural Resources Sciences* the graduate 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 foresters 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 an 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 investigation 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 an 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.

Bachelor's programme in Forestry and Wood Sciences (BScFor)
Forestry and Natural Resource Sciences

First Year (128 credits)
Compulsory Modules

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 144 (16) – Biodiversity and Ecology
Classification of organisms. Diversity of microorganisms, plants and animals. Ecological principles and global changes.

Presented by the Department of Botany and Zoology and of Microbiology

C Biology 124 and C Chemistry 124, 144

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.

Presented by the Department of Botany and Zoology and of Genetics
C Biology 124 and C Chemistry 124, 144 (not applicable to Stream Biomathematics, option 2: Ecology)

Home department: BOTANY AND ZOOLOGY

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.
C 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: MATHEMATICAL SCIENCES

Forest Science 171 (12) - 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 September is to be completed satisfactorily as part of this module.

Subject to continuous 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: MATHEMATICAL SCIENCES

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

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

Home department: PHYSICS

Second Year (125 credits)

Compulsory Modules

Biometry 212 (8) – Introductory Biometry

Methods of tabulation and graphical representation of data; descriptive measures of locality, variation and association; simple linear regression; the elementary principles of randomness, distributions, sampling and estimation; contingency tables and chi-square tests; calculation of standard errors; F-test for heterogeneity of variance.

P Mathematics (Bio) 124 or P 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 regressions.

PP 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.

Continuous assessment
P Computer Skills 171

Home department: MATHEMATICAL SCIENCES

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 savannas 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 for non-timber forest products.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 254 (16) – Forest mensuration and inventory

Determination of diameter, height, volume, form and density of trees, stands of timber and forest products. Production of volume and taper equations; quantitative description of forest structure, sampling techniques and their application in forest inventory.

Subject to continuous assessment.
P Mathematics (Bio) 124

Home department: FOREST AND WOOD SCIENCE

Forest Science 274 (16) – Forest Botany

Taxonomy; commercially important taxa of forest tree species; tree morphology terminology; description of the diagnostic characteristics of commercially important forest tree species that are useful to identify trees with the aid of keys; silvicultural characteristics of the most important commercial species of the genera *Pinus*, *Eucalyptus* and *Acacia*, as well as selected tropical and temperate hardwood and softwood species.

Subject to continuous assessment.

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 cartographical visualisation with a GIS; GIS applications.

Continuous assessment
P Geo Environmental Science 124
C Mathematics 114 OR C Mathematics (Bio) 124

Home department: GEOGRAPHY AND ENVIRONMENT STUDY

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.

P Chemistry 154

Home department: SOIL SCIENCES

Wood Product Science 144 (16) – Wood anatomy and identification

Introduction to tree growth; macroscopic and microscopic anatomy and identification of types of woods; descriptions of cell wall ultrastructure, wood variability; wood quality.

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. Wood preservatives and pressure impregnation procedures. Environmental aspects of preservatives and treated products.

C Engineering Chemistry 123 or Chemistry 154

Home department: FOREST AND WOOD SCIENCE

Third Year (136 credits)

Compulsory Modules

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.

P Biometry 242 or 274

Home department: GENETICS

Conservation Ecology 314 (16) – Biome Ecology

Introduction to biomes and ecosystem services; key drivers of dynamics and biome-level management issues; ecology of tropical and afromontane forests, woodlands, savannas, treeless vegetation types; wetlands; animal diversity/habitat interactions; patterns of endemism; biological invasion and its management.

Subject to continuous assessment.
PP Conservation Ecology 244

Home department: CONSERVATION ECOLOGY AND ENTOMOLOGY

Forest Science 314 (16) – Silviculture I

Silviculture systems; agroforestry, including dry or temperate and silvopastoral systems; site preparation; plantation establishment and regeneration; vegetation management; environmental factors that influence tree and stand growth; species-site-market matching; the eco-physiological basis for forest production.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 344 (16) – Forestry Development

Background to forestry development; knowledge, skills and attitudes for successful forestry developers; interaction, participation and facilitation with communities; development of participatory methods and tools for planning, monitoring and evaluation; land ownership and common-property resource management; socio-economic aspects of natural resources; conflict management in natural resource management; non-timber forest products; recreation and community ecotourism; case studies of contemporary issues in forestry development; introduction to urban forestry; definitions and terminology for land use and agroforestry (AF); different agroforestry management techniques; problem solving, development, sustainable management and monitoring of agroforestry projects; principles of soil rehabilitation and the advantage for commercial and community forestry; marketing of agroforestry products and economic sustainability.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 354 (16) – Forest growth and yield science

Theory of tree growth, site evaluation; development of site index equations; growing stock and stand density; prediction of current yield; prediction of future yield, growth modelling.
One week of practical work in June to be completed satisfactorily as part of this module.

Subject to continuous assessment.
P Forest Science 254

Home department: FOREST AND WOOD SCIENCE

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

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 364 (16) – Timber harvesting

Introduction to timber-harvesting techniques; timber-harvesting equipment and systems; evaluation and selection of timber-harvesting systems; introduction to logistics; harvest planning (operational and tactical); impact of harvesting on the environment; utilisation of biomass; introduction to work and time study; introduction to forest ergonomics and forest work-science; health and safety in forest operations. One week of practical work (power-saw course) in April to be satisfactorily completed as part of this module.

Subject to continuous assessment.
C 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.

P Biology 124 or 144 or 154

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.

PP Soil Science 214 and PP Chemistry 114 and 154

Home department: SOIL SCIENCES

Fourth Year (141 credits)

Compulsory Modules

Forest Science 414 (16) – Silviculture II

Effects of silvicultural practices (coppice management, pruning, thinning and fertilisation) and environmental factors on stand growth, timber and pulp quality; nutrition and nutrient cycles in forests; management of fire, climatic, biological and other risks to promote environmental, socio-political and economic sustainability.
Subject to continuous assessment.

C Forest Science 314

Home department: FOREST AND WOOD SCIENCE

Forest Science 424 (16) – Forest management and planning

Principles of business management; peculiarities in forest production systems; the institutional and economic environment of the forestry industry; organisation of the industry; decision-making and decision support in forest management; planning techniques; classification and subdivision of land; annual planning of operations; scheduling of logging operations.

Subject to continuous assessment.
P Forest Science 254

Home department: FOREST AND WOOD SCIENCE

Forest Science 434 (16) – Forest roads and transport

Introduction to secondary timber transport; transport terminology and legislation; transport systems; interactions between timber harvesting, the road and timber transport. Introduction to logistics; introduction to access development; introduction to surveying and road material and materials testing; levels of planning; forest road network planning and sequence of access suitability, influencing factors and road placement techniques. Road construction techniques; road maintenance and drainage; impacts of roads on the environment and forest certification; road network management systems.

Subject to continuous assessment.
C Forest 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.

S*ubject to continuous assessment.*
C Genetics 214

Home department: FOREST AND WOOD SCIENCE

Forest Science 442 (1) – Forestry Practical Work

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

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 468 (32) – Management plan

A study of the total industry or of a chosen or allocated management unit in the industry. This includes the collection of data on the following aspects: climate, soil, topography, growing stock, age classes, volumes, areas, tree species, products, markets, infrastructure, equipment, protection, ownership, organisation and staff. A visit of approximately three weeks to the management unit is essential.

The data collected at the management unit are analysed, processed and used for yield forecasting, yield regulation and financial, silvicultural, harvesting, roads and human resources planning. It will then be used for the compilation of a comprehensive management plan on the basis of which the module will be assessed.

C Forest Science 414, 424, 434

Home department: FOREST AND WOOD SCIENCE
No examination is written; class mark serves as final mark.

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

Human resources 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

Strategic Management 344 (12) – Strategic Management

Strategic management challenges in complex environments; business models and strategy; strategic environmental analysis; strategic resources and capability analyses; strategic leadership; strategy development; knowledge, innovation and complexity management; strategy implementation; performance measurement and change management.

C Business Management 113 (Not applicable to students in Forest Science)

Home department: BUSINESS MANAGEMENT

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 444 (12) – Bio-energy

Conversion of biomass into energy, 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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood and Wood Products Sciences (BScFor)

Wood and Wood Products Sciences modules are taken 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 not only with 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, Engineering Economics and Quality Assurance. Students in Wood and Wood Products Sciences participate in practical sessions during vacations from their first to fourth year.

Upon successful completion of the field of study in *Wood and Wood Products Sciences*, the graduate will be able to:

- Apply and convey the knowledge required to utilise the product emanationg 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 abstact 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 word 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.

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

First Year (130 credits)
Compulsory Modules

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; center of mass; centroid; volumes; definite integration; moment of inertia of areas.

Home department: MATHEMATICAL SCIENCES

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 programme 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

Home department: ELECTRIC 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.

Examination
C Engineering Mathematics 115

Home department: PROCESS 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.

Examination

Home department: MECHANICAL AND MECHATRONIC ENGINEERING

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

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.

Home department: MATHEMATICAL SCIENCES

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.

P Engineering Mathematics 115

Home department: MATHEMATICAL SCIENCES

Forest Science 171 (12) - 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 September is to be completed satisfactorily as part of this module.

Subject to continuous 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, Torsie of 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

C Engineering Mathematics 115
C Applied Mathematics B 124

Home department: CIVIL ENGINEERING

Wood Product Science 1*44* (*16*) – Wood anatomy and identification

Introduction to tree growth; macroscopic and microscopic anatomy and identification of types of woods; descriptions of cell wall ultrastructure, wood variability; wood quality.

Home department: FOREST AND WOOD SCIENCE

Second Year (122 credits)

Compulsory Modules

Engineering Economy 212 (8) – Engineering Economics

Introduction to accounting: financing, tax and growth of a business. Income, balance sheet and cash flow statements. Financial ratios.

Examination

Home department: INDUSTRIAL ENGINEERING

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.

PP Engineering Mathematics 115 or 145
P Engineering Mathematics 145

Home department: MATHEMATICAL SCIENCES

Forest Science 274 (16) – Forest Botany

Taxonomy; commercially important taxa of forest tree species; tree morphology terminology; description of the diagnostic characteristics of commercially important forest tree species that are useful to identify trees with the aid of keys; silvicultural characteristics of the most important commercial species of the genera *Pinus*, *Eucalyptus* and *Acacia*, as well as selected tropical and temperate hardwood and softwood species.

Subject to continuous assessment.

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.

Continuous
P Engineering Mathematics 214

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.

Examination

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

Home department: ENGINEERING (ADMIN)

Wood Product Science 234 (16) – Wood chemistry and preservation

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.

P Strength of Materials 143

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 244 (16) – Mechanics of wood products

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. Wood preservatives and pressure impregnation procedures. Environmental aspects of preservatives and treated products.

C Engineering Chemistry 123 or Chemistry 154

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Third Year (136 credits)

Compulsory Modules

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; μ2 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.

Examination

PP Engineering Mathematics 115, 145

Home department: Statistics and Actuarial Science

Forest Science 354 (16) – Forest growth and yield science

Theory of tree growth, site evaluation; development of site index equations; growing stock and stand density; prediction of current yield; prediction of future yield, growth modelling.

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

Subject to continuous assessment.
P Forest Science 254

Home department: FOREST AND WOOD SCIENCE

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

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 414 (16) – Silviculture II

Effects of silvicultural practices (coppice management, pruning, thinning and fertilisation) and environmental factors on stand growth, timber and pulp quality; nutrition and nutrient cycles in forests; management of fire, climatic, biological and other risks to promote environmental, socio-political and economic sustainability.
Subject to continuous assessment.

C Forest Science 314

Home department: FOREST AND WOOD SCIENCE

Industrial Management 354 (15) – Industrial management

Portfolio theory and portfolio management; the relationship between risk and return; the efficient market hypothesis; valuation and risk of fixed income securities; evaluation of share investments; properties of derivative instruments; derivative strategies; valuation of options and futures; measurement and evaluation of portfolio returns.

P Business Management 142
P Statistical Methods 176 or P Statistics 186 or P Probability Theory and Statistics 114 or 144

Home department: BUSINESS MANAGEMENT

Operations Research (Eng) 345 (15)

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.

Examination
P 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.

Continuous
P Engineering Statistics 314

Home department: INDUSTRIAL ENGINEERING

Wood Product Science 314 (*12*) – Surface finishing and wood preservation

Composition and properties of various surface finishes, including preservatives, surface preparation and coating application. Surface characterisation and performance testing, environmental aspects.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Fourth Year (121 credits)

Compulsory Modules

Enterprise Design 444 (15) – Enterprise Design

Systems engineering, approaches towards enterprise modelling and supply chain management. Concepts like knowledge management, innovation, and different life cycles will be applied through the complete design of an enterprise within formal information, manufacturing and organisational architectures.

Examination
Final-year enrolment

Home department: INDUSTRIAL ENGINEERING

Forest Science 442 (1) -

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.

Examination

Home department: INDUSTRIAL ENGINEERING

Operations Research (Eng) 415 (15)

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.

Examination
P Engineering Statistics 314

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.

Examination
P 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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 444 (12) – Bio-energy

Conversion of biomass into energy, 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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 468 (32) – Research project

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

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Postgraduate Programmes

Postgraduate programmes in Forestry and Wood Sciences may be taken after completion of the bachelor's programme. Students can, depending on their existing qualifications, enter a suitable postgraduate programme in one of their majors to obtain one of the following qualifications: Postgraduate Diploma in Forestry and Wood Sciences (PgDipFor), Master of Science in Forestry and Wood Sciences (MScFor), Doctor of Philosophy in Forestry and Wood Sciences [PhD (For)] or Doctor of Science in Forestry and Wood Sciences (DScFor) in the fields of Forestry and Natural Resource Sciences or Wood and Wood Products Sciences.

In order to pursue postgraduate studies in the Department of Forest and Wood Science, students must have achieved a minimum of 60% at the undergraduate level in all their modules or in the major module related to the intended postgraduate study direction. Deviations from this requirement are at the discretion of the chair of the Department.

Postgraduate Diploma (PgDipFor)

Programmes in postgraduate diplomas in specific fields of study are followed after obtaining a related bachelor's degree or equivalent qualification from this or any other university approved by Senate for this purpose.

Programme Description
The postgraduate diploma programme in Forestry and Wood Sciences extends over one year and leads to the qualification PgDip in Forestry and Wood Sciences. Appropriate three-year BSc degrees and BTech degrees, as well as other qualifications approved by Senate for this purpose, give access to this programme. The PgDip programme consists of an approved curriculum which lays the foundation for specialisation in forestry disciplines. The postgraduate diploma allows access to the MScFor programme.

Compulsory Modules

Students must choose one of the compulsory modules

Forest Science 780 (24) – Forest Science Project
Research in the context of the forestry value chain; research design and methods; data capture and analysis; formulation of results and conclusions.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 784 (24) – Wood Products Science Project
Wood Products Science research project with a focus on any aspect of materials science, product development or manufacturing; research design and methods, data capture and analysis, formulation of results and conclusions.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Elective Modules:

Students must choose a total of 96 credits from the elective modules, of which 32 credits must be from 57584 Wood Product Science or 11290 Forest Science, but may not choose more than four of the 16-credit elective modules

Forest Science 724 (32) – Tree propagation

Plant propagation of forestry species; principles and practices of tree propagation and nursery management; principles of sexual and asexual tree propagation; seed management principles.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 766 (16) – Geo-information science for resource managers

The use of GIS in the context of natural resource research and management (agriculture, forestry, conservation); the nature of geographical data, data models, coordinate systems and map projections; sources of spatial data in Southern Africa; GPS and Remote Sensing technology use in GIS; GIS processes: data capture, ordering, storage and manipulation; specific emphasis on analysis of spatial patterns for natural resources; visual output for research publication.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 772 (32) – Silviculture

Basic forest eco-physiology; silvicultural systems; characteristics of commercially important species and hybrids; site-species-market matching; stand regeneration; site, vegetation and nutrient management; pruning; thinning; risk management and sustainability.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 773 (32) – Timber harvesting and transport logistics

Sustainable application of timber-harvesting operations and related logistics. This will include timber-harvesting techniques and nomenclature, harvesting methods and systems selection; harvest planning; optimal utilisation of forest biomass; work study and ergonomics; forest road network analysis and management and secondary transport operations and access development to satisfy sustainability principles.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 774 (32) – Forest inventory and yield prediction

Coverage of forest mensuration techniques to determine tree diameter, tree height, stem form and volume, stem weight, biomass and carbon content; quantitative characterisation methods of forest structure; layout and implementation of forest inventories in natural and plantation forests; consideration of spatial aspects as well as aspects of accuracy and efficiency of inventories; theories of tree growth; tree growth and its relation to wood quality; simulation of tree and stand growth with empirical models.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 775 (32) – Forest management

Forestry planning and planning systems, forestry business environment and levels of planning; forest finance and economic analysis, forest investments, trade in forest products, forestry markets, valuation of forests, land and services; international resource policies, REDD, carbon trade, renewable energy policies, forest certification.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 776 (32) –Tree improvement

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.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Forest Science 785 (32) – Forestry development

Agroforestry systems; community-based natural resource management; non-timber forest products; integrated land-use systems and green landscapes; land resources and productivity in forest systems, socioeconomic aspects of forest systems, planning for agroforestry diagnosis and design, management and sustainability of forest ecosystems.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

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. Focus on production of solid wood (industrial or furniture wood) in sawmills and further processing in secondary industries; Processing equipment; introduction to computer-based equipment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 754 (16) – Wood quality

Structural analyses of wood-based constructions; the design and scaling of beams, columns and axially loaded elements; durability, dimensional stability, load duration, moisture and load sharing in wood-based constructions; structural grading; timber design codes.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 781 (32) – Wood properties

Tree growth; Bulk, macroscopic, cellular, cell wall, ultra-structural and molecular properties of wood; Tree to tree and within tree variability of the most important anatomical, physical and chemical properties; Wood quality.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 782 (32) – Primary wood processing

Theory of wood drying; drying technology: drying methods, kiln types and schedules; drying defects. Physical/chemical and biological degradation of wood; wood-protecting chemicals and treatment methods; environmental aspects of treatments, preservatives and preservative treated products. Adhesion; structure, types, properties and application of adhesives; manufacture and properties of composite products: particleboard, plywood, fibreboard, wood cement, wood plastic, laminated wood and paper; analytical methods.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Wood Product Science 783 (16) –Bio-energy

Testing and methods of analysis used to evaluate and grade structural timber; factors having an influence on the mechanical performance of the timber; conversion of wood into energy, processing methods, determination of calorific values and other properties, comparison of different biofuels, environmental aspects, emissions.

Subject to continuous assessment.

Home department: FOREST AND WOOD SCIENCE

Master's Programmes

Master's programs are taken in a particular major of the preceding bachelor's or Honours degree.

The MScFor degree are awarded to students who

- Hold an applicable bachelor's degree of this University or a bachelor's degree approved for this purpose by Senate, and who – on written application – have been admitted by Senate to the particular programme with a minimum study period of two years, or hold an applicable honours degree of this University of a similar honours degree approved for this purpose by Senate, and who - on written application – have been admitted by Senate to the particular programme with a minimum study period of one year;
- Have followed an approved curriculum of advanced study and/or research, which may include a period of study or research at some other place recognised by Senate;
- Have passed the prescribed examination(s);
- Have submitted a complete and well-written thesis or assignment which shows that independent scientific and technical investigations have been carried out and that the results have been interpreted satisfactorily;
- Included a statement in the thesis or assignment that the thesis or assignment has not been submitted to another university in order to obtain a degree and that it is the candidates' own work; and
- Have satisfactorily taken an oral examination.

  In certain cases supplementary study may be required.
  Candidates must also satisfy all other regulations regarding theses or assignments for master's degree. (See Higher Degrees in Part 1 (General) of the University Calender)

Programme Description
The master's programme in Forestry and Wood Sciences leads to the qualifications MScFor in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences. The programme consists of a one-year MScFor degree after the four-year BScFor degree. A relevant honours degree, the Postgraduate Diploma in Forestry and Wood Sciences, as well as other qualifications approved by Senate for this purpose give access to the programme.

The master's programme consists of a 100% research component (180 credits), but students in consultation with their supervisors could be requested to follow additional modules, including Biometry 881 (Postgraduate Biometry).

<u>Biometry 881 (6) – Postgraduate biometry</u>
Data processing with SAS Enterprise Guide. Simple descriptive statistics; T tests for single populations, combined t tests and paired t tests for two populations; Analysis of variance: completely random design, random blocks design, Latin square design, cross classification designs; repeated-measures analysis of variance; Multiple comparison procedures, Non-parametric tests: Mann-Whitney, Wilcoxon, Kruskal-Wallis and Friedman; Linear regression and correlation; Polynomial regression, Multiple regression; selection of independent variables with stepwise regression and all-subset regression; Analysis of covariance analysis; Categorical data analyses (χ2 tests); Logistic regression. This module is presented in two blocks of five half days each during the first semester.

Subject to continuous assessment.
P Biometry 212 and 242 or 274 or any other similar module
Home department: GENETICS

Students must choose between Forest Science 878 and Wood Product Science 878 (180 credits)

Doctoral Programmes

1. PhD programme in Forestry and Wood Sciences [PhD (For)]

This programme leads to the qualification PhD (For) in Forestry and Natural Resource Sciences or Wood and Wood Products Sciences. A dissertation containing original research is required. The programme focuses on research in various specialist fields of forestry and ensures that students become specialists in these fields. A relevant and practically oriented research project is undertaken in one of the said fields leading to innovation or the solving of a problem through high-level research in the discipline and in the industry concerned. This educates and prepares students on the highest academic level for entering the research or career market. Students thus become professionals who can, either as a member of a team or individually, play a meaningful role in national and international research, teaching and policy making in specialist fields in an environmentally friendly way.
Within the programme there are two fields of study, namely: Forestry and Natural Resource Sciences and Wood and Wood Products Sciences.

Forest Science 978 (360) – Doctoral dissertation

Wood Product Science 978 (360) – Doctoral dissertation

2. DSc programme in Forestry and Wood Sciences (DScFor)

The degree DScFor is awarded to candidates who have held the PhD (For) degree of this University, or some other equivalent (in the opinion of the Senate) qualification for at least five years, or who have held the MScFor degree of this University, or some other adequate (in the opinion of the Senate) qualification for at least seven years, who have produced advanced original research and/or creative work in the Forestry and Wood Products Sciences and have submitted original and previously published work(s) of a high standard which indicate(s) that the candidate has made a real and high-quality contribution to the enrichment of the knowledge in a forestry discipline.
Within the programme there are two fields of study, namely: Forestry and Natural Resource Sciences and Wood and Wood Products Sciences.

Forest Science 998 (360) – DSc research collection

Wood Product Science 998 (360) – DSc research collection

Compulsory Practical Vacation Work

All students, for whom practical work is prescribed, must submit, in accordance with the instructions, reports of their practical work to the satisfaction of the lecturers concerned. Students must themselves bear any expenses incurred in respect of demonstrations and practical work. In addition to the above, students may also be expected to carry out other practical work during vacations.

Please note: **The University is not liable for any injury sustained during practical work or tours or for any claims arising from such injuries.**

1. Forestry and Natural Resource Sciences students

Study tours
All students following the BScFor degree programme must undertake, during the winter vacation of the fourth year of study, a study tour of approximately three weeks to the forest regions of South Africa. A complete report, as prescribed by the tour leader, must be handed in to the tour leader by the start of the following quarter.

Practical work
First-year students who take the BScFor programme must carry out compulsory vacation work for one week in the September vacation. Students, who have passed their first year at another university and join the second year of study at Stellenbosch University, must supplement the practical work of the first year. All students taking the BScFor programme, except students in the study field Wood and Wood Products Science, must carry out the prescribed compulsory vacation work for one week during the second and third year of study or during the week preceding the start of the academic year. It is also expected of students to collect data during vacations in their final year of study for their management plan.

Plans and reports
All students taking the degree BScFor in Forestry and Natural Resource Sciences must, during the second semester of the fourth year of study, hand in a complete management plan or project, based on data collected during the winter vacation (or an earlier long vacation). The completed project or management plan must be handed in before 1 November of the year in which the student expects to obtain the degree. A final mark of at least 50 is required in order to obtain a pass for the project or management plan. If the student obtained a final mark of 40 to 49 during November, a modified project or management plan may be submitted before the January examinations of the following year if the student wants to obtain the degree during the supplementary graduation ceremony in March. A student obtaining a final mark of less than 40 in November, or failing to obtain a final mark of at least 50 in January, must repeat the practical work for the project or management plan.

2. Wood and Wood Products Sciences Students

All students taking the BScFor (Wood and Wood Products Sciences) programme must complete two periods of practical vacation work and submit satisfactory reports to the Department Forest and Wood Science before the degree can be awarded. The compulsory practical work consists of the following:
Three weeks of practical work at Furntech, Cape Town, in the December/January holidays (end of the first year or beginning of second year). A satisfactory written report must be submitted to the Department within two weeks after completion of the work.
One week chainsaw course in the September holiday of the second year. A satisfactory certificate must be presented to the Department.

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 2015: http://www.sun.ac.za/university/jaarboek/
- Website of department: http://www.sun.ac.za/forestry