



UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Department of Forest and Wood Science

Academic Programmes for 2013

Forestry and Natural Resource Management

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Updated:

November 2012

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This document is an extract from the Faculty of AgriSciences Calendar for 2013



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 and Wood Products Sciences.

Admission Requirements

The general minimum undergraduate admission requirements of the Stellenbosch University (SU) are:

- 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%) be obtained in each of four designated university entrance subjects.
- An average of at least 55% (excluding Life Orientation) for the NSC or IEB final examination.
- Write the compulsory National Benchmark Tests (NBTs).

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

- Afrikaans or English (Home Language or First Additional Language) 4 (50%)
- Mathematics 4 (50%)
- Physical Sciences 4 (50%) OR
- Physical Sciences 3 (40%), and Life Sciences 4 (50%) or Agricultural Sciences 6 (70%)

For the field of study in Wood Products Science:

- Afrikaans or English (Home Language or First Additional Language) 4 (50%)
- Mathematics 6 (70%)
- Physical Sciences 5 (60%)

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.

First Year (124 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 and phloem transport. 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 154 (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 -dynamics, oscillations, waves, optics.

Home department: PHYSICS

Second Year (133 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 234 (8) – Forest and environmental policy and law

Background to the forestry business environment in South Africa; South African forest policy terminology and semantics; policy cycle; policy objectives; forest history in South Africa; status of forests in South Africa (plantation, woodlands, natural forests); global environmental changes and political process; international treaties; national and international land resource and environmental policy and policy development; certification and sustainable development; interaction between land use and development policy; environmental law and regulations; environmental policy analysis; international forest policy and processes.

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 afro-montane 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 (140 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 422 (8) – Forest and environmental policy and law (Offered until 2013)
(Presented until 2013)

South African forest policy terminology and semantics; policy cycle; policy objectives; forest history in South Africa; status of forests in South Africa (plantation, woodlands, natural forests); global environmental changes and political process; international treaties; national and international land resource and environmental policy and policy development; certification and sustainable development; interaction between land use and development policy; environmental law and regulations; environmental policy analysis; international forest policy and processes.

Subject to continuous assessment.

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 (Offered from 2014)

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.

Subject 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) –

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) –

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

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.



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.

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 programmes offered at the Department of Forest and Wood Science, please visit the following links:

- Calendar 2013: <http://www.sun.ac.za/university/jaarboek/>
- Website of department: <http://www.sun.ac.za/forestry>