(BScFor) (Wood and Wood Product Science)

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1. Admission requirements

1.1 School-leaving qualifications

For admission to the University, you need:

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

1.2 Minimum admission requirements

In addition to the abovementioned school-leaving qualifications:

- An average performance level of 60% in the NSC or the IEB's school-leaving certificate (excluding Life Orientation), or other school qualification;
- English or Afrikaans (Home Language or First Additional Language) – 4 (50%);
- Mathematics – 6 (70%); and
- Physical Sciences (Physics and Chemistry) – 5 (60%).

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

1.3 Admission to the Extended Degree Programme (EDP)

Background

The Extended Degree Programme (EDP) was introduced to assist students with proven potential but without adequate schooling in mastering their degree programmes. An additional year of study is added to a mainstream degree programme to form an EDP. During this extra

year you will receive additional academic support as preparation for specific mainstream subjects and for university studies in general.

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

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

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

Minimum admission requirements for the EDP in 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.

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

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 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 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.

2.1 Practical work in Forest and Wood Sciences

- You must do compulsory practical work in your first three years of study:
  - In your first year, this practical work can take place during either the June or September vacation. If you have completed your first year of study at another university and you are enrolling in the second year, you still have to complete this practical.
  - During your second and third years of study, you will be required to complete a one-week period of prescribed practical work for each year. This one week of practical work can also be done before the beginning of the academic year.
- You must submit reports of all your practical work to the satisfaction of your lecturers.
- You are responsible for all costs regarding demonstrations and practical work.
- It can be expected of you to do practical work during other vacations in addition to the ones already mentioned.

- In your final year you will:
  - undertake a study tour of approximately two weeks during the winter vacation to the forest regions of South Africa.
  - submit a complete report at the beginning of the second semester as prescribed by the tour leader.
  - collect data during vacations for your management plan or project.
  - complete a comprehensive management plan or project during the second semester that is based on the data you collected during the winter vacation (or an earlier extended vacation).
  - hand in the completed project or management plan before 1 November of the year in which you intend to graduate.
  - obtain a final mark of at least 50 to pass the project or management plan.
    - If you obtain a final mark of 40 to 49 in November you can submit a modified project or management plan before the January examinations of the following year. That will allow you to receive your degree during the supplementary graduation ceremony in March.
    - If you obtain a final mark of less than 40 in November or you fail to obtain a final mark of at least 50 in January you must repeat the practical work for the project or management plan.
    - *Please note:* The University is not liable for any injury that you may sustain during practical work or tours or for any claims that may result from such injury.

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

2.2 Curriculum

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

First Year (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)

124 (15) Statistics (4L, 2T)

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

143 (12) Computer programming (3L, 2P)

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

Home Department: Electrical and Electronic Engineering

123 (15) Chemistry for engineering students (4L, 2T)

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: Flexible assessment

Corequisite module: Engineering Mathematics 115

Home department: Processing Engineering

123 (15) Orthographic drawings (1L, 3P, 3T)

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: Flexible assessment

Home department: Mechanical and Mechatronic Engineering

115 (15) Introductory differential and integral calculus (5L, 2T)

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

145 (15) Further differential and integral calculus (5L, 2T)

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

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

143 (12) Introduction: Mechanics of deformable bodies (3L, 2T)

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

Corequisite modules:

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

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

Home department: Civil Enineering

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)

214 (15) Differential equations and linear algebra (4L, 2T)

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

Corequisite module: Engineering Mathematics 145

Home department: Mathematics

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

Measurement of diameter and height, and determination of volume, form and density of trees, stands

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

Method of assessment: Flexible assessment

Prerequisite module:

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

Home department: Forest and Wood Science

244 (15) Industrial programming (2L, 3T)

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

212 (8) Production and operational management (2L, 2T)

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

113 (8) Professional communication (2L, 2T)

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)

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

234 (16) Mechanics of wood products (3L, 3P)

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

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

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

Method of assessment: Flexible assessment

Corequisite module:

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

Home department: Forest and Wood Science

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

Third Year (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)

314 (15) Engineering statistics (3L, 2.5T)

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.

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

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

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

354 (15) Industrial management (3L, 3T)

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

345 (15) Operations research (Deterministic Models) (3L, 3T)

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

344 (15) Quality assurance (3L, 3T)

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

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

Fourth Year (122 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)

442 (1) Experiential work (1P)

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

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

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

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

Or

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

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

Home department: Forest and Wood Science

414 (15) Industrial ergonomics (3L, 1.5T)

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

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

444 (15) Quality management (2L, 3T)

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

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

434 (16) Wood degradation and preservation (3L, 3P)

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

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

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

Method of assessment: Flexible assessment

Home department: Forest and Wood Science

3. Application process:

Prospective students can visit the following link for online applications:

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

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

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