

# University of Pretoria Yearbook 2021

## BSc extended programme - Mathematical Sciences (02130016)

**Department** Natural and Agricultural Sciences Dean's Office

**Minimum duration of study** 4 years

**Total credits** 144

**NQF level** 07

### Admission requirements

Candidates who do not comply with the minimum admission requirements of programmes in the Department of Mathematical Sciences, may be considered for admission to the BSc – Extended programme for the Mathematical Sciences. The BSc – Extended programme takes a year longer than the normal programmes to complete.

#### BSc — Extended programme — Mathematical Sciences

##### Minimum requirements

##### Achievement level

##### English Home Language or

##### English First Additional

##### Language

NSC/IEB

4

AS Level

D

##### Mathematics

NSC/IEB

5

AS Level

C

##### APS

**28**

This programme is not available for students who meet all the requirements for the corresponding mainstream programme.

**Note:** Only students who apply in the final year of their NSC or equivalent qualification, will be considered for admission into any of the BSc – Extended programmes.

Admissions from the BSc — Extended programmes to the BSc (Actuarial and Financial Mathematics) programmes will only be considered if students have passed all their first-year modules with a weighted average of at least 60%, passed IAS 111 and achieved a minimum mark of 60% for WTW 143 and WTW 153.

### Additional requirements

- Students in the BSc Extended: Mathematical Sciences programme must achieve a minimum GPA requirement of 65% in year 1, in order to progress from semester two to semester three.
- Students in the BSc Extended: Mathematical Sciences programme who pass all their modules in semester one and two, may be considered in other programmes in the Faculty of Natural and Agricultural Sciences as well as other faculties.
  - Students who are admitted to one of the BSc extended programmes register for one specific programme. Three extended programmes are available:

- BSc (extended programme) – Mathematical Sciences
  - BSc (extended programme) – Biological and Agricultural Sciences
  - BSc (extended programme) – Physical Sciences
- b. These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
  - c. Students who do not comply with the normal three-year BSc entrance requirements for study in the Faculty of Natural and Agricultural Sciences, may nevertheless be admitted to the Faculty by being placed on the BSc (extended programme). Generally the BSc (extended programme) means that the first study year in Mathematics, Physics, Biology and Chemistry is extended to take two years. After completing the BSc (extended programme) successfully, students join the second year of the normal BSc programme to complete their degrees. The possibility of switching over to other faculties such as Engineering, Built Environment and Information Technology, Veterinary Science and Health Sciences, after one or two years in the extended programme, exists. This depends on selection rules and other conditions stipulated by the other faculties.
  - d. Students who wish to follow one of the BSc extended programmes will be subjected to an Institutional Proficiency Test and will be considered for admission by the Admissions Committee. Information in this regard is available at the Client Services Centre.
  - e. Applications for admission to the BSc (extended programme) should be submitted before 30 September each year. Details are obtainable from the Student Administration at the Faculty of Natural and Agricultural Sciences.
  - f. The rules and regulations applicable to the normal study programmes apply mutatis mutandis to the BSc (extended programme), with exceptions as indicated in the regulations pertaining to the BSc (extended programme). For instance, students placed in the BSc (extended programme) must have a National Senior Certificate with admission for degree purposes.
  - g. An admissions committee considers applications for the BSc (extended programme) annually. Regarding subject choices, admitted students are individually placed on the BSc (extended programme) according to their prospective field of study. Students may NOT change this placement without the permission of the Chairperson of the admissions committee.

## Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to ascertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the alphabetical list of modules.

## Promotion to next study year

### Academic promotion requirements

It is expected of students who register for the first year of the BSc (extended programme) to pass all the prescribed modules of the first year.

It is expected of students accepted into the BSc (extended programme) to finish a complete corresponding BSc first year within the two years of enrolment in the BSc (extended programme). Students who do not show

progress during the first semester of the first year will be referred to the Admissions Committee of the Faculty.



## Curriculum: Year 1

### Minimum credits: 88

Fundamental = 24

Core = 56

Elective = 8

### Additional information:

- In the second semester, students register for PHY 143 or PHY 144.
- **NB Students may register for an extended module only once.**
- Admissions from the BSc -- Extended programmes to the BSc (Actuarial and Financial Mathematics) programmes will only be considered if students have passed all their first-year modules with an average of at least 60%, passed IAS 111 and achieved a minimum percentage of 60% for WTW 143 and WTW 153.

## Fundamental modules

### Academic information management 111 (AIM 111)

Module credits	4.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Information Science
Period of presentation	Semester 1

#### Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.

### Academic information management 121 (AIM 121)

Module credits	4.00
NQF Level	05

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
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**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

**Language of tuition** Module is presented in English

**Department** Informatics

**Period of presentation** Semester 2

### Module content

Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

## Language, life and study skills 133 (LST 133)

**Module credits** 8.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Economic and Management Sciences

**Prerequisites** Admission into BSc Four-year programme and BCom Four-year programme

**Contact time** 4 discussion classes per week, Foundation Course

**Language of tuition** Module is presented in English

**Department** Unit for Academic Literacy

**Period of presentation** Semester 1

### Module content

In this module students use different information and time management strategies, build academic vocabulary, revise basic grammar concepts and dictionary skills, examine learning styles, memory and note-taking techniques, practise academic reading skills and explore basic research and referencing techniques, learn how to use discourse markers and construct definitions, and are introduced to paragraph writing. The work is set in the context of the students' field of study.

## Language, life and study skills 143 (LST 143)

**Module credits** 8.00

**NQF Level** 05



<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
<b>Prerequisites</b>	LST 133
<b>Contact time</b>	4 discussion classes per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Unit for Academic Literacy
<b>Period of presentation</b>	Semester 2

#### Module content

In this module students learn how to interpret and use visual literacy conventions. Students write more advance paragraphs, and also learn how to structure academic writing, how to refine their use of discourse markers and referencing techniques and how to structure their own academic arguments. Students' writing is expected to be rational, clear and concise. As a final assignment all aspects of the LST 133 and LST 143 modules are combined in a research assignment. In this project, students work in writing teams to produce a chapter on a career and to present an oral presentation of aspects of the chapter. The work is set in the context of the students' field of study.

### Academic orientation 120 (UPO 120)

<b>Module credits</b>	0.00
<b>NQF Level</b>	00
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Humanities Deans Office
<b>Period of presentation</b>	Year

### Core modules

#### Physics 133 (PHY 133)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	Admission to the relevant programme.
<b>Contact time</b>	2 discussion classes per week, 2 lectures per week, 2 practicals per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physics
<b>Period of presentation</b>	Semester 1



## Module content

Heat: temperature and scales, work, energy and heat, calorimetry, specific heat, expansion, heat transfer. Measurements: SI-units, measuring error and uncertainty, (graphs), significant figures, mathematical modelling. One-dimensional kinematics. Geometrical optics: reflection, refraction, dispersion, mirrors, thin lenses.

## Mathematical statistics 133 (WST 133)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	At least 4 (50-59%) in Mathematics in the Grade 12 examination; BSc and BCom numeric stream students must be take WTW 133 concurrently.
<b>Contact time</b>	1 practical per week, 2 tutorials per week, 4 lectures per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Statistics
<b>Period of presentation</b>	Semester 1

## Module content

Descriptive statistics – Univariate:

The role of Statistics, various types of data. Sampling, probability and non-probability sampling techniques and the collection of data. Frequency, relative and cumulative distributions and graphical representations. Additional concepts relating to data processing: sigma notation, factorial notation. Descriptive measures of location, dispersion and symmetry. Exploratory data analysis.

Probability:

Introductory probability theory and applications. Set theory and probability laws. Introduction to random variables. Assigning probabilities, probability distributions, expected value and variance in general. Specific discrete probability distributions (Uniform, Binomial). Report writing and presentation. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

## Mathematical statistics 143 (WST 143)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	BSc students: WST 133 and WTW 135. BCom Extended programme students who wish to transfer to BCom (Econometrics): WST 133 and WTW 135. BCom students who wish to transfer to BCom (Economics): WST 133 and WTW 133.
<b>Contact time</b>	1 practical per week, 2 tutorials per week, 4 lectures per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Statistics

**Period of presentation** Semester 2

### Module content

Probability and inference:

Probability theory and theoretical distributions for continuous random variables (Uniform, Normal and t).

Sampling distributions (means and proportions). Estimation theory and hypothesis testing of sampling averages and proportions (one- and two-sample cases).

Optimisation techniques with economic applications:

Applications of differentiation in statistic and economic related problems. Integration. Applications of integration in statistic and economic related problems. Systems of equations in equilibrium. The area under a curve and applications of definite integrals in Statistics and Economics. Report writing and presentation. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

## Precalculus 135 (WTW 135)

**Module credits** 16.00

**NQF Level** 05

**Service modules** Faculty of Education  
Faculty of Economic and Management Sciences

**Prerequisites** BSc Extended prgm - Mathematical Sciences: 60% for Maths in Gr 12. Other BSc Extended prgms: 50% for Maths Gr 12. BCom Extended prgm students who wish to transfer to BCom (Econometrics) only: 50% for Maths in Gr 12. BEd prgms: 50% for Maths Gr 12.

**Contact time** 1 practical per week, 1 tutorial per week, 4 lectures per week, Foundation Course

**Language of tuition** Module is presented in English

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 1

### Module content

Real numbers, elementary set notation, exponents and radicals. Algebraic expressions, fractional expressions, linear and quadratic equations, inequalities. Coordinate geometry: lines, circles. Functions: definition, notation, piecewise defined functions, domain and range, graphs, transformations of functions, symmetry, even and odd functions, combining functions, one-to-one functions and inverses, polynomial functions and zeros. Sequences, summation notation, arithmetic, geometric sequences, infinite geometric series, annuities and instalments.

Degrees and radians, unit circle, trigonometric functions, fundamental identities, trigonometric graphs, trigonometric identities, double-angle, half-angle formulae, trigonometric equations, applications. Elements of Euclidean geometry.

This module is offered at the Mamelodi Campus to students from the BSc and BCom Extended programmes. At the Groenkloof Campus it is offered to BEd students.

## Calculus 143 (WTW 143)

**Module credits** 8.00

**NQF Level** 05



<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
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<b>Prerequisites</b>	BSc Extended programme and BEd programmes: WTW 135. BCom Extended programme students who wish to transfer to BCom Econometrics only: WTW 135
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<b>Contact time</b>	1 tutorial per week, 3 lectures per week, Foundation Course
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Mathematics and Applied Mathematics
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<b>Period of presentation</b>	Semester 2
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### Module content

Functions: exponential and logarithmic functions, natural exponential and logarithmic functions, exponential and logarithmic laws, exponential and logarithmic equations, compound interest. Limits: concept of a limit, finding limits numerically and graphically, finding limits algebraically, limit laws without proofs, squeeze theorem without proof, one-sided limits, infinite limits, limits at infinity, vertical, horizontal and slant asymptotes, substitution rule, continuity, laws for continuity without proofs. Differentiation: average and instantaneous change, definition of derivative, differentiation rules without proofs, derivatives of polynomials, chain rule for differentiation, derivatives of trigonometric, exponential and logarithmic functions, applications of differentiation: extreme values, critical numbers, monotone functions, first derivative test, optimisation.

## Mathematical modelling 155 (WTW 155)

<b>Module credits</b>	8.00
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<b>NQF Level</b>	05
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<b>Prerequisites</b>	50% for Mathematics in Grade 12
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<b>Contact time</b>	1 practical per week, 2 lectures per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Mathematics and Applied Mathematics
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<b>Period of presentation</b>	Semester 2
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### Module content

The module serves as an introduction to computer programming as used in science. Modelling of dynamical processes using difference equations; curve fitting and linear programming are studied. Applications are drawn from real-life situations in, among others, finance, economics physics and ecology.

This module is offered at the Mamelodi Campus to students from the BSc Extended programmes.

## Elective modules

### Physics 143 (PHY 143)

<b>Module credits</b>	8.00
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<b>NQF Level</b>	05
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	PHY 133
<b>Contact time</b>	2 discussion classes per week, 2 lectures per week, 2 practicals per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physics
<b>Period of presentation</b>	Semester 2

#### Module content

Vectors. Kinematics of a point: relative motion, projectile, circular motion. Dynamics: Newton's laws, friction. Work: point masses, ideal gas law, springs, power. Energy: kinetic energy, potential energy, conservative forces, spring, conservation of mechanical energy. Hydrostatics and dynamics: density, pressure, Archimedes' law, continuity, Bernoulli.

### Physics 144 (PHY 144)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Education
<b>Prerequisites</b>	PHY 133
<b>Contact time</b>	1 practical per week, 4 lectures per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physics
<b>Period of presentation</b>	Semester 2

#### Module content

The main topics covered in this module are Mechanics and Thermodynamics. Kinematics: Basic types of motion, one-dimensional motion, two- and three dimensional motion, linear momentum and its conservation, multi-object systems and the centre of mass.

Forces: Types of forces, Newton's Laws of Mechanics and applications, friction.

Energy: Work, heat, conservation of mechanical energy.

Thermodynamics: First law of thermodynamics, empirical gas laws, mechanical model of the ideal gas, energy of the ideal gas, basic thermodynamic processes.

## Curriculum: Year 2

### Minimum credits: 28

Core = 16

Elective = According to degree programme of choice

### Additional information:

**Possible third semester electives:** PHY 154, PHY 153

Students must register for the applicable third-semester modules (second year, first semester) and the second-semester, modules must be selected from the normal degree programme of the student's choice.

### Equivalent modules:

- Physics extended modules: PHY 133, PHY 143 and PHY 153: Equivalent to BSc module PHY 114
- PHY 133, PHY 144 and PHY 154: Equivalent to BSc module PHY 131
- Mathematics extended modules:
  - WTW 135, WTW 143 and WTW 153: Equivalent to BSc module WTW 114
  - WTW 155: Equivalent to BSc module WTW 114
  - WTW 135 GS, WTW 144 and WTW 154: Equivalent to BSc module WTW 134
  - WTW 133, WTW 144 and WTW 154: Equivalent to BSc module WTW 134
- Mathematical Statistics extended modules: WST 133, WST 143 and WST 153: Equivalent to BSc module WST 111

**Please note:** If FRK is selected as an elective, INF 183 has to be taken as well.

## Core modules

### Mathematical statistics 153 (WST 153)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	WST 133 and WST143 and WTW 143. Must be taken concurrently with WTW 153.
<b>Contact time</b>	1 practical per week, 2 tutorials per week, 4 lectures per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Statistics
<b>Period of presentation</b>	Semester 1

### Module content

Probability distributions:

Introductory distribution theory and special statistical distributions (Binomial, Geometric, Hypergeometric, Poisson, Uniform, Normal, Gamma). Generating functions and moments. Bivariate probability distributions. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.



## Calculus 153 (WTW 153)

**Module credits** 8.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Economic and Management Sciences

**Prerequisites** WTW 143

**Contact time** 1 tutorial per week, 3 lectures per week, Foundation Course

**Language of tuition** Module is presented in English

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 1

### Module content

Differential calculus of a single variable with proofs and applications. The mean value theorem, the rule of L'Hospital. Upper and lower sums, definite and indefinite integrals, the Fundamental theorem of Calculus, the mean value theorem for integrals, integration techniques, with some proofs.

## Elective modules

### Program design: Introduction 110 (COS 110)

**Module credits** 16.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** COS 132 , COS 151 and Maths level 5

**Contact time** 1 practical per week, 1 tutorial per week, 3 lectures per week

**Language of tuition** Module is presented in English

**Department** Computer Science

**Period of presentation** Semester 2

### Module content

The focus is on object-oriented (OO) programming. Concepts including inheritance and multiple inheritance, polymorphism, operator overloading, memory management (static and dynamic binding), interfaces, encapsulation, reuse, etc. will be covered in the module. The module teaches sound program design with the emphasis on modular code, leading to well structured, robust and documented programs. A modern OO programming language is used as the vehicle to develop these skills. The module will introduce the student to basic data structures, lists, stacks and queues.

### Economics 110 (EKN 110)

**Module credits** 10.00

<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	1 discussion class per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Economics
<b>Period of presentation</b>	Semester 1

### Module content

This module deals with the core principles of economics. A distinction between macroeconomics and microeconomics is made. A discussion of the market system and circular flow of goods, services and money is followed by a section dealing with microeconomic principles, including demand and supply analysis, consumer behaviour and utility maximisation, production and the costs thereof, and the different market models and firm behaviour. Labour market institutions and issues, wage determination, as well as income inequality and poverty are also addressed. A section of money, banking, interest rates and monetary policy concludes the course.

## Economics 120 (EKN 120)

<b>Module credits</b>	10.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	EKN 110 GS or EKN 113 GS and at least 4 (50-59%) in Mathematics in the Grade 12 examination or 60% in STK 113 and concurrently registered for STK 123
<b>Contact time</b>	1 discussion class per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Economics
<b>Period of presentation</b>	Semester 2

### Module content

This module deals with the core principles of economics, especially macroeconomic measurement the private and public sectors of the South African economy receive attention, while basic macroeconomic relationships and the measurement of domestic output and national income are discussed. Aggregate demand and supply analysis stands core to this course which is also used to introduce students to the analysis of economic growth, unemployment and inflation. The microeconomics of government is addressed in a separate section, followed by a section on international economics, focusing on international trade, exchange rates and the balance of payments. The economics of developing countries and South Africa in the global economy conclude the course.



## Financial management 112 (FBS 112)

<b>Module credits</b>	10.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	At least 6 (70-79%) in Mathematics in the Grade 12 examination or WTW 133 (60%), WTW 143 (60%), WST 133 (60%) and WST 143 (60%).
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Financial Management
<b>Period of presentation</b>	Semester 1

### Module content

\*Only for students in BSc (Actuarial and Financial Mathematics), BSc (Mathematics), BSc (Applied Mathematics), BSc (Mathematical Statistics), BSc Extended programme – Mathematical Sciences and BCom (Statistics) who comply with the set prerequisites.

Key principles of financial management. Company ownership. Taxation. Introduction to financial statements. Structure of financial statements. Depreciation and reserves. Preparing financial statements. Group financial statements and insurance company financial statements. Interpretation of financial statements. Limitation of financial statements. Issue of share capital.

## Financial management 122 (FBS 122)

<b>Module credits</b>	10.00
<b>NQF Level</b>	07
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	FBS 112 or WST 121 and 07130261 or 07130262 or 02133388 or 02133273 or 02133395 or 02133274 or 02130007 or 02130016
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Financial Management
<b>Period of presentation</b>	Semester 2

### Module content

Financial instruments. Use of financial derivatives. Financial institutions. Time value of money. Component cost of capital. Weighted average cost of capital. Capital structure and dividend policy. Capital project appraisal. Evaluating risky investments.

## Financial accounting 111 (FRK 111)

<b>Module credits</b>	10.00
<b>NQF Level</b>	05



<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Law Faculty of Natural and Agricultural Sciences
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<b>Prerequisites</b>	No prerequisites.
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<b>Contact time</b>	4 lectures per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Accounting
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<b>Period of presentation</b>	Semester 1
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### Module content

The nature and function of accounting; the development of accounting; financial position; financial result; the recording process; processing of accounting data; treatment of VAT; elementary income statement and balance sheet; flow of documents; accounting systems; introduction to internal control and internal control measures; bank reconciliations; control accounts; adjustments; financial statements of a sole proprietorship; the accounting framework.

## Actuarial and Financial Mathematics in practice 111 (IAS 111)

<b>Module credits</b>	6.00
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<b>NQF Level</b>	05
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<b>Prerequisites</b>	At least 6 (70-79%) in Mathematics and a APS score of 32 in the Grade 12 examination or WTW 133 (60%), WTW 143 (60%), WST 133 (60%) and WST 143 (60%).
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<b>Contact time</b>	1 lecture per week, 1 practical per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Actuarial Science
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<b>Period of presentation</b>	Semester 1
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### Module content

Professionalism, working in multicultural environments, self-development, propositional logic, financial needs.

## Actuarial and Financial Mathematics in practice 121 (IAS 121)

<b>Module credits</b>	6.00
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<b>NQF Level</b>	05
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<b>Prerequisites</b>	WTW 114 or WTW 153, WST 111 or WST 153, IAS 111.
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<b>Contact time</b>	1 lecture per week, 1 practical per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Actuarial Science
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<b>Period of presentation</b>	Semester 2
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## Module content

Financial service providers, investment examples including an introduction to mathematics of finance, life insurance examples including an introduction to contingencies, general insurance examples including an introduction to reserving using run-off triangles, personal self-development.

## Informatics 183 (INF 183)

**Module credits** 3.00

**NQF Level** 05

**Prerequisites** No prerequisites.

**Contact time** 1 practical per week

**Language of tuition** Module is presented in English

**Department** Informatics

**Period of presentation** Year

## Module content

Computer processing of accounting information.

## Physics 153 (PHY 153)

**Module credits** 8.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology

**Prerequisites** PHY 143

**Contact time** 2 discussion classes per week, 2 practicals per week, 3 lectures per week, Foundation Course

**Language of tuition** Module is presented in English

**Department** Physics

**Period of presentation** Semester 1

## Module content

System of particles: centre of mass, Newton's laws. Rotation: torque, conservation of momentum, impulse and collision, conservation of angular momentum, equilibrium, centre of gravity. Oscillations. Waves: sound, intensity, superposition, interference, standing waves, resonance, beats, Doppler effect. Physical optics: Young-interference, coherence, thin layers, diffraction, gratings, polarisation.

## Mathematical statistics 121 (WST 121)

**Module credits** 16.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

<b>Prerequisites</b>	WST 111 GS or WST 133, 143 and 153
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Statistics
<b>Period of presentation</b>	Semester 2

#### Module content

Sampling distributions and the central limit theorem. Statistical inference: Point and interval estimation. Hypothesis testing with applications in one and two-sample cases. Introductory methods for: Linear regression and correlation, analysis of variance, categorical data analysis and non-parametric statistics. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

### Discrete structures 115 (WTW 115)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
<b>Prerequisites</b>	50% for Mathematics in Grade 12
<b>Contact time</b>	1 tutorial per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Mathematics and Applied Mathematics
<b>Period of presentation</b>	Semester 1

#### Module content

Propositional logic: truth tables, logical equivalence, implication, arguments. Mathematical induction and well-ordering principle. Introduction to set theory. Counting techniques: elementary probability, multiplication and addition rules, permutations and combinations, binomial theorem, inclusion-exclusion rule.

### Numerical analysis 123 (WTW 123)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	WTW 114
<b>Contact time</b>	1 practical per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Mathematics and Applied Mathematics
<b>Period of presentation</b>	Semester 2

### Module content

Non-linear equations, numerical integration, initial value problems for differential equations, systems of linear equations. Algorithms for elementary numerical techniques are derived and implemented in computer programmes. Error estimates and convergence results are treated.

## Mathematics 124 (WTW 124)

**Module credits** 16.00

**NQF Level** 05

### Service modules

Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Economic and Management Sciences

**Prerequisites** WTW 114

**Contact time** 1 tutorial per week, 4 lectures per week

**Language of tuition** Module is presented in English

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 2

### Module content

\*Students will not be credited for more than one of the following modules for their degree: WTW 124, WTW 146, WTW 148 and WTW 164. This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218, WTW 211 and WTW 220).

The vector space  $R^n$ , vector algebra with applications to lines and planes, matrix algebra, systems of linear equations, determinants. Complex numbers and factorisation of polynomials. Integration techniques and applications of integration. The formal definition of a limit. The fundamental theorem of Calculus and applications. Vector functions and quadratic curves.

## Mathematical modelling 152 (WTW 152)

**Module credits** 8.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology

**Prerequisites** 50% for Mathematics in Grade 12

**Contact time** 1 practical per week, 2 lectures per week

**Language of tuition** Module is presented in English

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 1

### Module content

The module serves as an introduction to computer programming as used in science. Modelling of dynamical processes using difference equations; curve fitting and linear programming are studied. Applications are drawn from real-life situations in, among others, finance, economics and ecology.

## Mathematics 154 (WTW 154)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Prerequisites</b>	WTW 144
<b>Contact time</b>	1 tutorial per week, 3 lectures per week, Foundation Course
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Mathematics and Applied Mathematics
<b>Period of presentation</b>	Semester 1

### Module content

Integration: Accumulated change, the definite integral, anti-derivatives, the definite integral as an area, interpretations of the definite integral.

Matrices and systems of linear equations: Matrix addition and scalar multiplication, matrix multiplication, systems of linear equations. All topics are studied in the context of applications.

## Dynamical processes 162 (WTW 162)

<b>Module credits</b>	8.00
<b>NQF Level</b>	05
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	WTW 114
<b>Contact time</b>	1 tutorial per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Mathematics and Applied Mathematics
<b>Period of presentation</b>	Semester 2

### Module content

\*Students will not be credited for more than one of the following modules for their degree: WTW 162 and WTW 264.

Introduction to the modelling of dynamical processes using elementary differential equations. Solution methods for first order differential equations and analysis of properties of solutions (graphs). Applications to real life situations.

The information published here is subject to change and may be amended after the publication of this information. The [General Regulations \(G Regulations\)](#) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the [General Rules](#) section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.