



# University of Pretoria Yearbook 2017

## BCom Statistics (07130262)

**Duration of study** 3 years

**Total credits** 402

**Contact** Mr A Swanepoel [u02384132@tuks.co.za](mailto:u02384132@tuks.co.za) +27 (0)124203559

### Programme information

Statistics is an independent discipline with interdisciplinary applications. The aim of this qualification is to prepare the candidates in totality with methods that can be applied for the gathering and interpretation of data and empirical information. Statistics lay the foundation for scientific accountable conclusions, planning and estimation. Candidates are at the same time equipped with the necessary computer and communication skills. Statistics is commissioned by all disciplines where it can contribute towards scientific and technological progress.

### Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement; a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution; and a candidate who is a graduate of another faculty at the University of Pretoria.
- ??Life Orientation is excluded when calculating the APS.

Minimum requirements								APS
Afrikaans or English				Mathematics				
NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	
5	3	C	C	5	3	C	C	32

### Additional requirements

- General Regulations G.1 to G.15 (with the exception of Regulation G.11.2(c)) apply to a bachelor's degree.
- A student may not take more than the prescribed number of modules per semester unless the Dean decides otherwise.
- A student may take a module not listed as an elective module only if the prior approval of the Dean has been obtained.
- A student who is in possession of a bachelor's degree may not present any modules passed for that degree for another field of specialisation or degree in this Faculty. (See General Regulations G.8 and G.9)
- A module passed at 300-level shall only be recognised for degree purposes if the corresponding prescribed module(s) at 200-level has/have been passed, unless the Dean decides otherwise, with the proviso that the

following modules which are offered at 300-level only, are also considered "major subjects": Labour law 311 (ABR 311), Labour relations 320 (ABV 320) and International business management 359 and 369 (OBS 359 and 369); only two 14-week modules, or the equivalent thereof, that are not preceded by the 100- and 200-level modules, may be taken for degree purposes. In other words, at least four 14-week modules must be taken at 300-level that are preceded by the 100- and 200-level, except for modules offered on 200- and 300-level only.

- f. A module already passed may only be repeated with the approval of the Dean.
- g. A module passed may not be taken into account for more than one degree or field of specialisation.
- h. It remains the student's responsibility to ascertain, prior to registration, whether all the modules he/she intends taking can be accommodated in the class, test and examination timetables.
- i. The Faculty of Economic and Management Sciences supports an outcomes-based education system and places a high premium on the development of specific academic competences. Class attendance in all modules and for the full duration of all programmes is therefore compulsory for all students.
- j. The Dean has the right of authorisation regarding matters not provided for in the General Regulations or the Faculty Regulations.

## Other programme-specific information

- Total credits refer to minimum as required by the programme, but can be more, depending on the elective modules.
- Alternative credits as indicated in brackets are based on choosing WST as a specialisation module instead of STK, while all elective modules are selected within the Faculty of Economic and Management Sciences.
- **Only two 14-week modules on the 300-level, or the equivalent thereof, that are not preceded by the 100- and 200-level modules, may be taken for degree purposes.** In other words, at least four 14-week modules must be taken at 300-level that are preceded by the 100- and 200-level apart from the modules offered only at 200- and 300-level.
- The number of elective modules is influenced by the inclusion of modules from other faculties and their respective credit values.

### With regard to choosing elective modules:

For example: Students in Mathematical statistics who also want to be trained for the insurance industry, select, among others, the following modules as part of their core and elective modules:

WST	Mathematical statistics(1)	111, 121	211, 221	311, 321 312, 322
WTW	Mathematics(1)	114, 126(4) 128(4)	211, 220 218, 221	
COS	Computer science	132(6), 110		
FBS	Financial management	112, 122		
EKN	Economics	113, 123		
IAS	Actuarial mathematics		211, 282	382

For example: Students in **Mathematical statistics** who also want to be trained in the **Econometrics** field select, among others, the following modules as part of their core and elective modules:

WST	Mathematical statistics(1)	111, 121	211, 221	311, 321 312, 322
WTW	Mathematics(1)	114, 124(3)	211, 220 218, 221	



COS	Computer science	132(6), 110		
EKN	Economics		214, 234	310, 320 314, 325

Other students may select among others, modules from any other subject/faculty according to their own specific career requirements as part of their core and elective modules:

Note: See the alphabetical list of modules for prerequisites of all modules.

At least one of the two elective modules in which a candidate graduate must be selected from the available modules within the Economics and Management Sciences Faculty.

FRK 122 is a terminating module. Candidates will not be able to continue with Financial accounting in the second or third year.

(1) If WST modules are selected, notice must be taken of the relevant WTW prerequisites as stipulated in the yearbook.

(2) Informatics 281 is compulsory if Financial accounting 211 and 221 (FRK 211, 221) are chosen.

(3) WTW 124 is the equivalent of seven-week modules, with the exception of WTW 114 which is presented over a period of 14 weeks.

(4) Students who register for Agricultural economics at 200 and 300 level as electives will have to pass extra modules to make up the credits.

(5) It is recommended that COS 132 be taken as an elective by all students in this programme.

**Specialisation modules:** STK 310, 320 or WST 311, 312, 321, 322.

### "Major subject"

To be considered a "major subject" the equivalent of four 14-week modules, including two at 300-level, must be passed provided that:

- the following modules which are offered at 300-level only, are also considered "major subjects": Labour law 311 (ABR 311), Labour relations 320 (ABV 320), and International business management 359 and 369 (OBS 359 and 369);
- only two 14-week modules, or the equivalent thereof, that are not preceded by the 100- and 200-level modules, may be taken for degree purposes. In other words, at least four 14-week modules must be taken at 300-level that are preceded by the 100- and 200-level, except for modules offered on 200- and 300-level only.

## Promotion to next study year

According to General Regulation G.3 students have to comply with certain requirements as set by the Faculty Board.

- a. A student must pass at least 4 core semester or 2 core year modules to be admitted to the subsequent year of study.
- b. If a student has passed less than the required minimum of 4 core semester or 2 core year modules, he/she will not be readmitted to the Faculty of Economic and Management Sciences. Such a student may apply in writing to the Faculty's Admissions Committee to be readmitted conditionally – with the proviso that the Admissions Committee may set further conditions with regards to the student's academic progress. The Faculty's Admissions Committee may deny a student's application for readmission.
- c. If a student has been readmitted conditionally, his/her academic progress will be monitored after the first semester examinations to determine whether he/she has complied with the requirements set by the Admissions Committee. If not, his/her studies will be suspended.



- d. A student whose studies have been suspended because of his/her poor academic performance has the right to appeal against the decision of the Faculty's Admissions Committee.
- e. A student may be refused promotion to a subsequent year of study if the prescribed tuition fees are not paid.
- f. A student may be refused admission to the examination, or promotion to a subsequent year of study or promotion in a module (if applicable) if he/ she fails to fulfil the attendance requirements. Class attendance in all modules and for the full duration of all programmes is compulsory for all students.

## Pass with distinction

- a. A degree may be awarded with distinction provided the candidate meets the following criteria:
  - i. Completes the degree within three years;
  - ii. Obtains a Cumulative Grade Point Average (CGPA) of 75%;
  - iii. Repeated passed modules will not be considered. The initial pass mark of module will be used when calculating the GPA.
- b. Transferees from other faculties and from other universities who still complete their bachelor degrees (including credits transferred and recognised from the degrees they registered for originally) within three years will be considered as exceptional cases by the Dean.
- c. The GPA will be not be rounded up to a whole number.
- d. Exceptional cases will be considered by the Dean.

## General information

### Minimum requirements for bachelor's degrees; semester and year modules; new regulations

1. Students who commenced their studies before 2015 must complete the programme in terms of the curriculum of the year in which they commenced their studies, or in terms of the curriculum of the year in which they switched to their current field of specialisation. Students who prefer to do so may, however, apply to change over to the latest curriculum, but then they should comply with all the requirements thereof and they may not revert to the regulations of an earlier year.
2. Students who are registering for a degree programme for the first time in 2015 must take the modules indicated under the particular field of specialisation.

**Please note:** Only two 14-week modules, or the equivalent thereof, that are not preceded by the 100- and 200-level modules, may be taken for degree purposes. In other words, at least four 14-week modules must be taken at 300-level that are preceded by the 100- and 200-level, except for modules offered on 200- and 300-level only. It is thus the responsibility of students to ensure before registration, that their curricula comply with all the requirements of the applicable regulations.



## Curriculum: Year 1

Minimum credits: 130

### Fundamental modules

#### Academic information management 101 (AIM 101)

**Module credits** 6.00

**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  
Faculty of Veterinary Science

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Information Science

**Period of presentation** Semester 1

#### Module content

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

#### Academic literacy for Economic and Management Sciences 124 (ALL 124)

**Module credits** 6.00

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

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

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

**Academic organisation** Unit for Academic Literacy

**Period of presentation** Semester 1 and Semester 2



## Module content

This module intends to equip students with the competence in reading and writing required in the four high impact modules: Business Management, Financial Accounting, Statistics and Economics. Students will also be equipped to interpret and draw figures and graphs and to do computations and manage relevant formulas. During Semester 1 students engage with the online computer program MyFoundationsLab individually in a flexible learning environment, and during Semester 2 they attend the scheduled contact sessions and do the coursework.

*Humanities.*

*This module is offered by the Faculty of*

## Academic orientation 107 (UPO 107)

**Module credits** 0.00

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** EMS Dean's Office

**Period of presentation** Year

## Core modules

### Economics 110 (EKN 110)

**Module credits** 10.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Humanities  
Faculty of Natural and Agricultural Sciences

**Prerequisites** No prerequisites.

**Contact time** 1 discussion class per week, 2 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Economics

**Period of presentation** 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)

**Module credits** 10.00



<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>	2 lectures per week, 1 discussion class per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</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 accounting 111 (FRK 111)

**Module credits** 10.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Law Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	4 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Accounting
<b>Period of presentation</b>	Semester 1

### 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.

## Financial accounting 121 (FRK 121)

**Module credits** 12.00





<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	FRK 111 GS
<b>Contact time</b>	4 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Accounting
<b>Period of presentation</b>	Semester 2

#### Module content

Property, plant and equipment; intangible assets; inventories; liabilities; presentation of financial statements; enterprises without profit motive; partnerships; companies; close corporations; cash flow statements; analysis and interpretation of financial statements.

### Business management 114 (OBS 114)

**Module credits** 10.00

<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>	May not be included in the same curriculum as OBS 155
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Business Management
<b>Period of presentation</b>	Semester 1

#### Module content

Introduction to business management as a science; the environment in which the enterprise operates; the field of business, the mission and goals of an enterprise; management and entrepreneurship. Responsible leadership and the role of a business in society. The choice of a form of enterprise; the choice of products and/or services; profit and cost planning for different sizes of operating units; the choice of location; the nature of production processes and the layout of the plant or operating unit.

Introduction to and overview of general management, especially regarding the five management tasks: strategic management; contemporary developments and management issues; financial management; marketing and public relations. Introduction to and overview of the value chain model; management of the input; management of the purchasing function; management of the transformation process with specific reference to production and operations management; human resources management and information management; corporate governance and black economic empowerment (BEE).

### Business management 124 (OBS 124)

**Module credits** 10.00





<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>	Admission to the examination in OBS 114
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Business Management
<b>Period of presentation</b>	Semester 2

### Module content

The nature and development of entrepreneurship; the individual entrepreneur and characteristics of South African entrepreneurs. Creativity and innovation, opportunity finding and exploitation. The business plan and resource requirements are explored. Getting started (business start up). Exploring different routes to entrepreneurship: entering a family business, buying a franchise, home-based business and the business buyout. This semester also covers how entrepreneurs can network and find support in their environments. Case studies of successful entrepreneurs - also South African entrepreneurs - are studied.

## Statistics 110 (STK 110)

**Module credits** 13.00

<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>	At least 5 (60-69%) in Mathematics in the Grade 12 examination. Candidates who do not qualify for STK 110 must register for STK 113 and STK 123
<b>Contact time</b>	1 tutorial per week, 1 practical per week, 3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Statistics
<b>Period of presentation</b>	Semester 1

### Module content

Descriptive statistics:

Sampling and the collection of data; frequency distributions and graphical representations. Descriptive measures of location and dispersion.

Probability and inference:

Introductory probability theory and theoretical distributions. Sampling distributions. Estimation theory and hypothesis testing of sampling averages and proportions (one and two-sample cases). Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

## Statistics 120 (STK 120)

**Module credits** 13.00



<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>	STK 110 GS or both STK 113 GS and STK 123 GS or both WST 133 and WST 143 or STK 133 and STK 143
<b>Contact time</b>	1 practical per week, 1 tutorial per week, 3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Statistics
<b>Period of presentation</b>	Semester 2

### Module content

Multivariate statistics:

Analysis of variance, categorical data analysis, distribution-free methods, curve fitting, regression and correlation, the analysis of time series and indices.

Statistical and economic applications of quantitative techniques:

Systems of linear equations: drafting, matrices, solving and application. Optimisation; linear functions (two and more independent variables), non-linear functions (one and two independent variables). Marginal and total functions. Stochastic and deterministic variables in statistical and economic context: producers' and consumers' surplus, distribution functions, probability distributions, probability density functions. Identification, use, evaluation, interpretation of statistical computer packages and statistical techniques.

This module is also presented as an anti-semester bilingual module.

## Mathematical statistics 111 (WST 111)

**Module credits** 16.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	At least 5 (60-69%) in Mathematics in the Grade 12 examination
<b>Contact time</b>	4 lectures per week, 1 practical per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Statistics
<b>Period of presentation</b>	Semester 1

### Module content

Characterisation of a set of measurements: Graphical and numerical methods. Random sampling. Probability theory. Discrete and continuous random variables. Probability distributions. Generating functions and moments.

## Mathematical statistics 121 (WST 121)

**Module credits** 16.00



<b>Service modules</b>	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>	Separate classes for Afrikaans and English
<b>Academic organisation</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.

## Financial accounting 122 (FRK 122)

**Module credits** 12.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Law Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	FRK 111 GS or FRK 133, FRK 143
<b>Contact time</b>	4 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Accounting
<b>Period of presentation</b>	Semester 2

### Module content

Budgeting, payroll accounting, taxation – income tax and an introduction to other types of taxes, credit and the new Credit Act, insurance, accounting for inventories (focus on inventory and the accounting entries, not calculations), interpretation of financial statements.

## Elective modules

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

**Module credits** 16.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	COS 132 , COS 151 and Maths level 5
<b>Contact time</b>	1 tutorial per week, 1 practical per week, 3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English



**Academic organisation** 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 113 (EKN 113)

**Module credits** 15.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** Reg. 1.2 (e)

**Contact time** 3 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Economics

**Period of presentation** Semester 1

### Module content

Introduction to economics and principles of microeconomics

The scope of economics; the basic theory of demand and supply; price, income and cross elasticity of demand; consumer utility, the utility function and case studies in terms of the utility function; the theory of the firm in the short and long run; market structures, namely the perfect market, monopoly, oligopoly and monopolistic competition; public sector finances; microeconomics versus macroeconomics and economic statistics.

## Economics 123 (EKN 123)

**Module credits** 15.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** Reg. 1.2 (e); EKN 113 GS

**Contact time** 3 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Economics

**Period of presentation** Semester 2



## Module content

National income and principles of macroeconomics

The mechanics of national income accounts, the Keynesian macroeconomic model, the money market, demand for money and money supply, money and credit creation and the role of the monetary authorities. The IS-LM model of macroeconomic equilibrium and monetary and fiscal policy applications. The aggregate demand and supply models with the debate between the classical school, the monetarists and the Keynesian school. The problems of inflation and unemployment. Macroeconomic issues, namely macroeconomic policy, international trade, the balance of payments and economic growth.

## Informatics 112 (INF 112)

**Module credits** 10.00

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

**Prerequisites** Refer to Regulation 1.2(e): A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination; or STK 113 60%, STK 123 60% or STK 110

**Contact time** 2 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Informatics

**Period of presentation** Semester 2

## Module content

Introduction to information systems, information systems in organisations, hardware: input, processing, output, software: systems and application software, organisation of data and information, telecommunications and networks, the Internet and Intranet. Transaction processing systems, management information systems, decision support systems, information systems in business and society, systems analysis, systems design, implementation, maintenance and revision.

## Calculus 114 (WTW 114)

**Module credits** 16.00

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

**Prerequisites** Refer to Regulation 1.2. Mathematics 60% Grade 12.

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1



## Module content

\*This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218 and WTW 220). Students will not be credited for more than one of the following modules for their degree: WTW 114, WTW 158, WTW 134, WTW 165.

Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, evaluating definite integrals using anti-derivatives, the substitution rule.

## Mathematics 134 (WTW 134)

**Module credits** 16.00

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

**Prerequisites** Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination .

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1

## Module content

*\*Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 165, WTW 114, WTW 158. WTW 134 does not lead to admission to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 134 is offered as WTW 165 in the second semester only to students who have applied in the first semester of the current year for the approximately 65 MBChB, or the 5-6 BChD places becoming available in the second semester and who were therefore enrolled for MGW 112 in the first semester of the current year.*

Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration. Matrices, solutions of systems of equations. All topics are studied in the context of applications.

## Imperative programming 132 (COS 132)

**Module credits** 16.00

**Service modules** Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** APS of 30 and level 5 (60-69%) Mathematics

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Computer Science

**Period of presentation** Semester 1



## Module content

This module introduces imperative computer programming, which is a fundamental building block of computer science. The process of constructing a program for solving a given problem, of editing it, compiling (both manually and automatically), running and debugging it, is covered from the beginning. The aim is to master the elements of a programming language and be able to put them together in order to construct programs using types, control structures, arrays, functions and libraries. An introduction to object orientation will be given. After completing this module, the student should understand the fundamental elements of a program, the importance of good program design and user-friendly interfaces. Students should be able to conduct basic program analysis and write complete elementary programs.

## Financial management 112 (FBS 112)

<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	To be taken concurrently with WST 111
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Financial Management
<b>Period of presentation</b>	Semester 1

## Module content

\*Only for BSc (Actuarial and Financial Mathematics and Mathematical Statistics) and BCom (Statistics with option Mathematical Statistics) students.

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>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	FBS 112, to be taken concurrently with WST 121
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Financial Management
<b>Period of presentation</b>	Semester 2





## Module content

\*Only for BSc (Actuarial and Financial Mathematics; Mathematical Statistics) and BCom (Statistics with option Mathematical Statistics) students.

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.

## Informatics 171 (INF 171)

**Module credits** 20.00

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

**Prerequisites** Regulation 1.2: A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination

**Contact time** 2 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Informatics

**Period of presentation** Year

## Module content

General systems theory, creative problem solving, soft systems methodology. The systems analyst, systems development building blocks, systems development, systems analysis methods, process modelling.

## Mathematics 124 (WTW 124)

**Module credits** 16.00

**Prerequisites** WTW 114

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Mathematics and Applied Maths

**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, polar curves and quadratic curves.



## Linear algebra 146 (WTW 146)

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Education
<b>Contact time</b>	2 lectures per week, 1 tutorial per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Mathematics and Applied Maths
<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 124, WTW 146 and WTW 164. The module WTW 146 is designed for students who require Mathematics at 100 level only and does not lead to admission to Mathematics at 200 level.

Vector algebra, lines and planes, matrix algebra, solution of systems of equations, determinants. Complex numbers and polynomial equations. All topics are studied in the context of applications.

## Calculus 148 (WTW 148)

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Education
<b>Prerequisites</b>	WTW 114 GS or WTW 134
<b>Contact time</b>	2 lectures per week, 1 tutorial per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Mathematics and Applied Maths
<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 124, WTW 148 and WTW 164. The module WTW 148 is designed for students who require Mathematics at 100 level only and does not lead to admission to Mathematics at 200 level.

Integration techniques. Modelling with differential equations. Functions of several variables, partial derivatives, optimisation. Numerical techniques. All topics are studied in the context of applications.



## Curriculum: Year 2

Minimum credits: 141

### Core modules

#### Statistics 210 (STK 210)

**Module credits** 20.00

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

**Prerequisites** STK 110, STK 120

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 1

#### Module content

Counting techniques. Probability theory: Sample spaces, events, rules of probability, conditional probabilities, independent events and Bayes' theorem. Probability distributions and probability densities: cumulative distribution functions, marginal distributions, joint distributions, conditional distributions and independence. Expected values: Moments, Chebyshev's theorem, moment-generating functions, product moments, moments of linear combinations of random variables and conditional expectations. Transformation techniques of random variables. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

#### Statistics 220 (STK 220)

**Module credits** 20.00

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

**Prerequisites** STK 210 GS

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 2



## Module content

Special probability distributions: the discrete uniform distribution, Bernoulli distribution, binomial distribution, negative binomial and geometric distribution, the hypergeometric distribution, Poisson distribution and multinomial distribution. Special probability densities: Uniform distribution, gamma, exponential and chi-square distributions, the beta distribution, the normal distribution and the bivariate normal distribution. Functions of random variables. Sampling distributions, point estimation, interval estimation and hypothesis testing. Regression Analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

## Mathematical statistics 211 (WST 211)

**Module credits** 24.00

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

**Prerequisites** WST 111, WST 121, WTW 114 GS and WTW 124 GS

**Contact time** 2 practicals per week, 4 lectures per week

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

**Academic organisation** Statistics

**Period of presentation** Semester 1

## Module content

Set theory. Probability measure functions. Random variables. Distribution functions. Probability mass functions. Density functions. Expected values. Moments. Moment generating functions. Special probability distributions: Bernoulli, binomial, hypergeometric, geometric, negative binomial, Poisson, Poisson process, discrete uniform, uniform, gamma, exponential, Weibull, Pareto, normal. Joint distributions: Multinomial, extended hypergeometric, joint continuous distributions. Marginal distributions. Independent random variables. Conditional distributions. Covariance, correlation. Conditional expected values. Transformation of random variables: Convolution formula. Order statistics. Stochastic convergence: Convergence in distribution. Central limit theorem. Practical applications. Practical statistical modelling and analysis using statistical computer packages and the interpretation of the output.

## Mathematical statistics 221 (WST 221)

**Module credits** 24.00

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

**Prerequisites** WST 211 GS

**Contact time** 4 lectures per week, 2 practicals per week

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

**Academic organisation** Statistics

**Period of presentation** Semester 2



## Module content

Stochastic convergence: Asymptotic normal distributions, convergence in probability. Statistics and sampling distributions: Chi-squared distribution. Distribution of the sample mean and sample variance for random samples from a normal population. T-distribution. F-distribution. Beta distribution. Point estimation: Method of moments. Maximum likelihood estimation. Unbiased estimators. Uniform minimum variance unbiased estimators. Cramer-Rao inequality. Efficiency. Consistency. Asymptotic relative efficiency.

Bayes estimators. Sufficient statistics. Completeness. The exponential class. Confidence intervals. Test of statistical hypotheses. Reliability and survival distributions. Practical applications. Practical statistical modelling and analysis using statistical computer packages and the interpretation of the output.

## Communication management 282 (KOB 282)

**Module credits** 5.00

**Contact time** 3 lectures per week

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

**Academic organisation** Div Communication Management

**Period of presentation** Quarter 1

## Module content

\*Module content will be adapted in accordance with the appropriate degree programme. Only one of KOB 281-284 may be taken as a module where necessary for a programme.

Applied business communication skills

Acquiring basic business communication skills will enhance the capabilities of employees, managers and leaders in the business environment. An overview of applied skills on the intrapersonal, dyadic, interpersonal, group (team), organisational, public and mass communication contexts is provided. The practical part of the module (for example, the writing of business reports and presentation skills) concentrates on the performance dimensions of these skills as applied to particular professions.

## Elective modules

### Economics 214 (EKN 214)

**Module credits** 16.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Humanities  
Faculty of Natural and Agricultural Sciences

**Prerequisites** EKN 110 GS and EKN 120 or EKN 113 GS and EKN 123 and STK 110 GS and STK 120 GS

**Contact time** 3 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Economics

**Period of presentation** Semester 1



## Module content

### Macroeconomics

From Wall and Bay Street to Diagonal Street: a thorough understanding of the mechanisms and theories explaining the workings of the economy is essential. Macroeconomic insight is provided on the real market, the money market, two market equilibrium, monetarism, growth theory, cyclical analysis, inflation, Keynesian general equilibrium analysis and fiscal and monetary policy issues.

## Introduction to moral and political philosophy 251 (FIL 251)

**Module credits** 10.00

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

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Philosophy

**Period of presentation** Quarter 2, 3 and 4

### Module content

In this module students are equipped with an understanding of the moral issues influencing human agency in economic and political contexts. In particular philosophy equips students with analytical reasoning skills necessary to understand and solve complex moral problems related to economic and political decision making. We demonstrate to students how the biggest questions concerning the socio-economic aspects of our lives can be broken down and illuminated through reasoned debate. Examples of themes which may be covered in the module include justice and the common good, a moral consideration of the nature and role of economic markets on society, issues concerning justice and equality, and dilemmas of loyalty. The works of philosophers covered may for instance include that of Aristotle, Locke, Bentham, Mill, Kant, Rawls, Friedman, Nozick, Bernstein, Dworkin, Sandel, Walzer, and MacIntyre.

## Financial accounting 211 (FRK 211)

**Module credits** 16.00

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

**Prerequisites** FRK 111 and FRK 121 or FRK 100/101

**Contact time** 4 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Accounting

**Period of presentation** Semester 1



## Module content

Preparation and presentation of company annual financial statements in compliance with the requirements of the Companies Act, the Framework and Statements of Generally Accepted Accounting Practice relating to the following: presentation of financial statements; revenue; investments; provisions, contingent liabilities and contingent assets; events after the balance sheet date; inventories; income taxes; leases; property, plant and equipment; impairment of assets; intangible assets; investment property, changes in accounting estimates and errors; introduction to financial instruments.

## Financial accounting 221 (FRK 221)

**Module credits** 16.00

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

**Prerequisites** FRK 211 GS

**Contact time** 4 lectures per week

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Accounting

**Period of presentation** Semester 2

## Module content

Preparation and presentation of company annual financial statements in compliance with the requirements of Statements of Generally Accepted Accounting Practice relating to the following: employee benefits; the effects of changes in foreign exchange rates; accounting policies; earnings per share; cash flow statements; interests in joint ventures. Branch accounting. Introduction to consolidations, including basic consolidation techniques for both wholly-owned and partly-owned subsidiaries. Introduction to public sector accounting.

## Actuarial mathematics 211 (IAS 211)

**Module credits** 12.00

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

**Prerequisites** Pass WTW 114 and (WTW 126 and WTW 128 or (WTW 124) and WTW 123 and WST 111 and WST 121)

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

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

**Academic organisation** Actuarial Science

**Period of presentation** Semester 1

## Module content

Accumulation functions, interest, time value of money, compounding periods, cash flow models, equations of value, annuities certain, continuous time application, loan schedules, performance measurement, valuation of fixed interest securities..





## Financial mathematics 282 (IAS 282)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Economic and Management Sciences
<b>Prerequisites</b>	IAS 211 60%
<b>Contact time</b>	3 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Actuarial Science
<b>Period of presentation</b>	Semester 2

### Module content

Generalised cash-flow model. The time value of money. Interest rates. Discounting and accumulating. Compound interest functions. Equations of value. Project appraisal. Investments. Simple compound interest problems. The "No Arbitrage" assumption and forward contracts. Term structure of interest rates. Stochastic interest rate models.

## Informatics 214 (INF 214)

<b>Module credits</b>	14.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	AIM 101 or AIM 111 and AIM 121
<b>Contact time</b>	2 lectures per week, 2 practicals per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Informatics
<b>Period of presentation</b>	Semester 1

### Module content

Database design: the relational model, structured query language (SQL), entity relationship modelling, normalisation, database development life cycle; practical introduction to database design. Databases: advanced entity relationship modelling and normalisation, object-oriented databases, database development life cycle, advanced practical database design.

## Informatics 225 (INF 225)

<b>Module credits</b>	14.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	INF 164 and INF 171; AIM 101 or AIM 102 or AIM 111 and AIM 121
<b>Contact time</b>	1 lecture per week, 3 practicals per week
<b>Language of tuition</b>	Afrikaans and English is used in one class



**Academic organisation** Informatics

**Period of presentation** Semester 2

**Module content**

An overview of systems infrastructure and integration.

**Informatics 261 (INF 261)**

**Module credits** 7.00

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

**Prerequisites** INF 214

**Contact time** 1 practical per week, 1 lecture per week

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Informatics

**Period of presentation** Semester 2

**Module content**

Database management: transaction management, concurrent processes, recovery, database administration: new developments: distributed databases, client-server databases: practical implementation of databases.

**Introduction to agricultural economics 210 (LEK 210)**

**Module credits** 12.00

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

**Prerequisites** No prerequisites.

**Contact time** 3 lectures per week

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Agric Econ, Ext + Rural Dev

**Period of presentation** Semester 1

**Module content**

Introduction to financial management in agriculture: Farm management and agricultural finance, farm management information; analysis and interpretation of farm financial statements; risk and farm planning. Budgets: partial, break-even, enterprise, total, cash flow and capital budgets. Time value of money. Introduction to production and resource use: the agricultural production function, total physical product curve, marginal physical product curve, average physical product curve, stages of production. Assessing short-term business costs; Economics of short-term decisions. Economics of input substitution: Least-cost use of inputs for a given output, short-term least-cost input use, effects of input price changes. Least-cost input use for a given budget. Economics of product substitution. Product combinations for maximum profit. Economics of crop and animal production.



## Agricultural economics 220 (LEK 220)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Economic and Management Sciences
<b>Prerequisites</b>	[LEK 210 ] or [EKN 113 and/or EKN 120]
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Agric Econ, Ext + Rural Dev
<b>Period of presentation</b>	Semester 2

### Module content

The agribusiness system; the unique characteristics of agricultural products; marketing functions and costs; market structure; historical evolution of agricultural marketing in South Africa. Marketing environment and price analysis in agriculture: Introduction to supply and demand analysis.

Marketing plan and strategies for agricultural commodities; market analysis; product management; distribution channels for agricultural commodities, the agricultural supply chain, the agricultural futures market.

## Linear algebra 211 (WTW 211)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
<b>Prerequisites</b>	WTW 124
<b>Contact time</b>	1 tutorial per week, 2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Mathematics and Applied Maths
<b>Period of presentation</b>	Semester 1

### Module content

This is an introduction to linear algebra on  $R^n$ . Matrices and linear equations, linear combinations and spans, linear independence, subspaces, basis and dimension, eigenvalues, eigenvectors, similarity and diagonalisation of matrices, linear transformations.

## Calculus 218 (WTW 218)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
<b>Prerequisites</b>	WTW 114 and WTW 124
<b>Contact time</b>	1 tutorial per week, 2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English



**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1

**Module content**

Calculus of multivariable functions, directional derivatives. Extrema and Lagrange multipliers. Multiple integrals, polar, cylindrical and spherical coordinates.

**Analysis 220 (WTW 220)**

**Module credits** 12.00

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

**Prerequisites** WTW 114 and WTW 124

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 2

**Module content**

Properties of real numbers. Analysis of sequences and series of real numbers. Power series and theorems of convergence. The Bolzano-Weierstrass theorem. The intermediate value theorem and analysis of real-valued functions on an interval. The Riemann integral: Existence and properties of the interval.

**Linear algebra 221 (WTW 221)**

**Module credits** 12.00

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

**Prerequisites** WTW 211

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

**Language of tuition** Separate classes for Afrikaans and English

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 2

**Module content**

Abstract vector spaces, change of basis, matrix representation of linear transformations, orthogonality, diagonalisability of symmetric matrices, some applications.

**Economics 234 (EKN 234)**

**Module credits** 16.00



<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 214, STK 120
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Economics
<b>Period of presentation</b>	Semester 2

### Module content

Macroeconomics

Application of the principles learned in EKN 214 on the world we live in. We look at international markets and dynamic macroeconomic models, and familiarise the students with the current macroeconomic policy debates. We also take a look at the latest macroeconomic research in the world. The course includes topics of the mathematical and econometric analysis of macroeconomic issues.

## Informatics 282 (INF 282)

**Module credits** 3.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	FRK 111, FRK 121 or FRK 100 or FRK 101
<b>Contact time</b>	2 practicals per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Informatics
<b>Period of presentation</b>	Semester 1 and Semester 2

### Module content

Computer processing of accounting information.



## Curriculum: Final year

Minimum credits: 132

### Core modules

#### Statistics 310 (STK 310)

**Module credits** 25.00

**Service modules** Faculty of Humanities

**Prerequisites** STK 210, STK 220

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 1

#### Module content

Regression analysis: simple and multiple regression; nonlinear regression; correlation and the use of dummy variables. Multivariate distributions: normal, multinomial and poisson distribution. Linear combinations of normal variables. Analysis of variance and covariance. Categorical data analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

#### Statistics 320 (STK 320)

**Module credits** 25.00

**Service modules** Faculty of Humanities

**Prerequisites** STK 310 GS

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 2

#### Module content

Regression analysis extensions: heteroscedasticity, serial correlation and lag structures. Time-series analysis. Applications of matrices, differentiation and integration in the economic and management sciences. Evaluation of simple economic models. Theory and applications of time-series models: univariate time series. Stationary and non-stationary time series. ARMA and ARIMA models. Regression models. Model identification and estimation. Spectrum and periodogram. Forecasting with time-series models. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. Student seminars.

#### The science of data analytics 353 (STK 353)

**Module credits** 25.00

**Service modules** Faculty of Natural and Agricultural Sciences



**Prerequisites** STK 210, STK 220 or WST 211, WST 221

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 2

### Module content

Sampling: basic techniques in probability, non-probability, and sampling methods. Designing experiments: experimental and control groups, different data types and relationships. Big and small data: exploring popular trends used in practice. Consultation practice: ethical considerations, study design, data collection and presentation, report writing and presentation. Hands-on application of statistical software and packages to real-life datasets.

## Multivariate analysis 311 (WST 311)

**Module credits** 18.00

**Service modules** Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** WST 211, WST 221, WTW 211 GS and WTW 218 GS

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 1

### Module content

Multivariate statistical distributions: Moments of a distribution, moment generating functions, independence. Multivariate normal distribution: Conditional distributions, partial and multiple correlations. Multinomial and multivariate Poisson distributions: Asymptotic normality and estimation of parameters. Distribution of quadratic forms in normal variables. Multivariate normal samples: Estimation of the mean vector and covariance matrix, estimation of correlation coefficients, distribution of the sample mean, sample covariance matrix and sample correlation coefficients. The linear model: Models of full rank, least squares estimators, test of hypotheses. The generalised linear model: Exponential family mean and variance, link functions, deviance and residual analysis, test statistics, log-linear and logit models. Practical applications: Practical statistical modelling and analysis using statistical computer packages and interpretation of the output.

## Stochastic processes 312 (WST 312)

**Module credits** 18.00

**Service modules** Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** WST 211, WST 221, WTW 211 GS and WTW 218 GS

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

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





**Academic organisation** Statistics

**Period of presentation** Semester 1

### Module content

Definition of a stochastic process. Stationarity. Covariance stationary. Markov property. Random walk. Brownian motion. Markov chains. Chapman-Kolmogorov equations. Recurrent and transient states. First passage time. Occupation times. Markov jump processes. Poisson process. Birth and death processes. Structures of processes. Structure of the time-homogeneous Markov jump process. Applications in insurance. Practical statistical modelling, analysis and simulation using statistical computer packages and the interpretation of the output.

## Time-series analysis 321 (WST 321)

**Module credits** 18.00

**Service modules** Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** WST 211, WST 221, WST 311 GS, WTW 211 GS and WTW 218 GS

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

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Statistics

**Period of presentation** Semester 2

### Module content

Stationary and non-stationary univariate time-series. Properties of autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) processes. Identification, estimation and diagnostic testing of a time-series model. Forecasting. Multivariate time-series. Practical statistical modelling and analysis using statistical computer packages.

## Actuarial statistics 322 (WST 322)

**Module credits** 18.00

**Service modules** Faculty of Economic and Management Sciences  
Faculty of Natural and Agricultural Sciences

**Prerequisites** WST 211, WST 221, WTW 211 GS and WTW 218 GS

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 2

### Module content

Decision theory. Loss distributions. Reinsurance. Risk models. Ruin theory. Credibility theory. Methods to forecast future claim numbers and amounts. Practical statistical modelling and analysis using statistical computer packages.



## Elective modules

### Economics 310 (EKN 310)

**Module credits** 20.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Humanities  
Faculty of Natural and Agricultural Sciences

**Prerequisites** EKN 214, EKN 234 or EKN 224, EKN 244

**Contact time** 2 lectures per week, 1 discussion class per week

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Economics

**Period of presentation** Semester 1

#### Module content

Public finance

Role of government in the economy. Welfare economics and theory of optimality. Ways of correcting market failures. Government expenditure theories, models and programmes. Government revenue. Models on taxation, effects of taxation on the economy. Assessment of taxation from an optimality and efficiency point of view. South African perspective on public finance.

### Economics 314 (EKN 314)

**Module credits** 20.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** EKN 234, EKN 244

**Contact time** 3 lectures per week

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

**Academic organisation** Economics

**Period of presentation** Semester 1

#### Module content

International trade/finance

International economic insight is provided into international economic relations and history, theory of international trade, international capital movements, international trade politics, economic and customs unions and other forms or regional cooperation and integration, international monetary relations, foreign exchange markets, exchange rate issues and the balance of payments, as well as open economy macroeconomic issues.

### Economics 320 (EKN 320)

**Module credits** 20.00



<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 310 GS
<b>Contact time</b>	1 discussion class per week, 2 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Economics
<b>Period of presentation</b>	Semester 2

### Module content

Economic analyses

Identification, collection and interpretation process of relevant economic data; the national accounts (i.e. income and production accounts, the national financial account, the balance of payments and input-output tables); economic growth; inflation; employment, unemployment, wages, productivity and income distribution; business cycles; financial indicators; fiscal indicators; social indicators; international comparisons; relationships between economic time series - regression analysis; long-term future studies and scenario analysis; overall assessment of the South African economy from 1994 onwards.

## Economics 325 (EKN 325)

**Module credits** 20.00

<b>Service modules</b>	Faculty of Humanities Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	EKN 214, EKN 234
<b>Contact time</b>	1 discussion class per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Economics
<b>Period of presentation</b>	Semester 2

### Module content

Economic policy and development: Capita select

The course provides an introduction to growth economics and also to some topics on development economics. Firstly, historical evidence is covered and then the canonical Solow growth model and some of its empirical applications (human capital and convergence). Secondly, the new growth theory (the AK and the Romer models of endogenous growth) are covered. Some of the development topics to be covered include technology transfer, social infrastructure and natural resources.

## Financial accounting 311 (FRK 311)

**Module credits** 20.00

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	FRK 211, 221 and INF 281



<b>Contact time</b>	4 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Accounting
<b>Period of presentation</b>	Semester 1

#### Module content

Preparation and presentation of company annual financial statements in compliance with the requirements of Statements of Generally Accepted Accounting Practice relating to the following: income taxes; property, plant and equipment; impairment; non-current assets held for sale; intangible assets; investment property; borrowing costs; leases; accounting policies; changes in accounting estimates and errors; segment reporting; certain aspects of financial instruments.

### Financial accounting 321 (FRK 321)

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	FRK 311 GS and INF 281
<b>Contact time</b>	4 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Accounting
<b>Period of presentation</b>	Semester 2

#### Module content

Preparation and presentation of company annual financial statements in compliance with the requirements of Statements of Generally Accepted Accounting Practice relating to the following: the effects of changes in foreign exchange rates; earnings per share; related party disclosure; associates. Complex consolidation issues, including intra-group transactions; dividends; preference shares; revaluations; horizontal, vertical and mixed groups; insolvent subsidiaries; change of interest; consolidated cashflow statement.

### Actuarial modelling 382 (IAS 382)

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Economic and Management Sciences
<b>Prerequisites</b>	WST 312 60%
<b>Contact time</b>	1 practical per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Actuarial Science
<b>Period of presentation</b>	Semester 2



## Module content

Principles of actuarial modelling and stochastic processes. Markov chains and continuous-time Markov jump processes. Simulation of stochastic processes. Survival models and the life table. Estimating the lifetime distribution  $F_x(t)$ . The Cox regression model. The two-state Markov model. The general Markov model. Binomial and Poisson models. Graduation and statistical tests. Methods of graduation. Exposed to risk. The evaluation of assurances and annuities. Premiums and reserves.

## Agricultural economics 310 (LEK 310)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Economic and Management Sciences
<b>Prerequisites</b>	[LEK 210 or EKN 110] and [EKN 120]
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Agric Econ, Ext + Rural Dev
<b>Period of presentation</b>	Semester 1

## Module content

Historical evolution of South African agricultural policy. Agriculture and the state: reasons for government intervention. Theoretical aspects of agricultural policy. Introduction to agricultural policy analysis. Welfare principles, pareto optimality. Macroeconomic policy and the agricultural sector. International agricultural trade.

## Agricultural economics 320 (LEK 320)

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Economic and Management Sciences
<b>Prerequisites</b>	LEK 220, LEK 210
<b>Contact time</b>	3 lectures per week, 2 practicals per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Agric Econ, Ext + Rural Dev
<b>Period of presentation</b>	Semester 2

## Module content

The modern food and agribusiness system. Key drivers in the global context. Whole farm planning and budget development. The financial analysis of farm financial, financial modelling, the financing decision: capital acquisition, creditworthiness, different capital sources, capital structures. The investment decision and working capital management. Value chains in agribusiness. Risk management. Strategic management and marketing principles in agribusiness. Operational management and human resources management. Business planning for agribusiness.

## Analysis 310 (WTW 310)

<b>Module credits</b>	18.00
-----------------------	-------



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

**Prerequisites** WTW 220

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

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1

#### Module content

Topology of finite dimensional spaces: Open and closed sets, compactness, connectedness and completeness. Theorems of Bolzano-Weierstrass and Heine-Borel. Properties of continuous functions and applications. Integration theory for functions of one real variable. Sequences of functions.

### Financial engineering 354 (WTW 354)

**Module credits** 18.00

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

**Prerequisites** WST 211, WTW 211 and WTW 218

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

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1

#### Module content

Mean variance portfolio theory. Market equilibrium models such as the capital asset pricing model. Factor models and arbitrage pricing theory. Measures of investment risk. Efficient market hypothesis. Stochastic models of security prices

### Dynamical systems 382 (WTW 382)

**Module credits** 18.00

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

**Prerequisites** WTW 218 and WTW 286 or WTW 264

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

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1



### Module content

Matrix exponential function: homogeneous and non-homogeneous linear systems of differential equations. Qualitative analysis of systems: phase portraits, stability, linearisation, energy method and Liapunov's method. Introduction to chaotic systems. Application to real life problems.

### Numerical analysis 383 (WTW 383)

**Module credits** 18.00

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

**Prerequisites** WTW 114, WTW 124 and WTW 211

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

**Language of tuition** Afrikaans and English is used in one class

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 2

### Module content

Direct methods for the numerical solution of systems of linear equations, pivoting strategies. Iterative methods for solving systems of linear equations and eigenvalue problems. Iterative methods for solving systems of nonlinear equations. Introduction to optimization. Algorithms for the considered numerical methods are derived and implemented in computer programmes. Complexity of computation is investigated. Error estimates and convergence results are proved.

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.