

# University of Pretoria Yearbook 2017

## BSc Information and Knowledge Systems (12133213)

**Duration of study** 3 years

**Total credits** 468

### 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.
- Grade 11 results are used in the provisional admission of prospective students.
- A valid qualification with admission to degree studies is required.
- Minimum subject and achievement requirements, as set out below, are required. On first-year level a student has a choice between Afrikaans and English as language medium. In certain cases, tuition may be presented in English only, for example in electives, where the lecturer may not speak Afrikaans or in cases where it is not economically or practically viable.
- Should a candidate obtain an APS of 26 to 29, consideration for admission will be based on the results of the NBT, provided the quotas regarding student numbers have not been reached.

Minimum requirements								
Achievement level								
Afrikaans or English				Mathematics				APS
NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	
4	3	D	D	5	3	C	C	30 (26-29 admission based on the NBT)

### Promotion to next study year

#### General

- A student must pass all the modules of the first year of study, before he or she is permitted to register for any module of the third year of study. Module prerequisites remain applicable. Exceptions to this rule will be considered by the relevant Head of Department and the Dean.
- A student must pass all the modules of the second year of study, before he or she is permitted to register for any module of the fourth year of study (in the case of a four-year degree). Module prerequisites remain



- applicable. Exceptions to this rule will be considered by the relevant Head of Department and the Dean.
- A new first-year student, who has failed in all the prescribed modules of the programme at the end of the first semester, will not be permitted to proceed to the second semester in the School of Information Technology.
  - A student who has not passed at least 70% of the credits of the current year of study after the November examinations will not be re-admitted to the School of Information Technology.
  - Students who fail a module for a second time, forfeit the privilege of registering for any modules of an advanced year of study.
  - Students whose academic progress is not acceptable can be suspended from further studies.

### **Procedure: Exclusion from and re-admission to further studies in the School of Information Technology**

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations will be notified in writing by the Dean or admissions committee of the School of Information Technology at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the admissions committee of the School of Information Technology on level 6 in the Engineering building I for re-admission.
- Written applications for re-admission to the second semester must be submitted at least 7 days before lectures resume for the second semester.
- Written applications for re-admission to the new academic year must be submitted before 12 January.
- Late applications will be accepted only in exceptional circumstances after approval by the Dean.
- Should a student not be re-admitted to further studies by the admissions committee of the School of Information Technology, he/she will be informed in writing.
- A student who is not re-admitted by the admissions committee of the School of Information Technology has the right to appeal to the Appeals Committee: Admissions in the Administration building, room 3-13.
- Any decision taken by the Appeals Committee: Admissions is final.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- A student, who is repeating his or her year, may be permitted by the Dean, on recommendation of the relevant head(s) of department, to register for modules of the following year of study in addition to the outstanding modules he or she has failed, providing that he or she complies with the prerequisites of these modules and no timetable clashes occur. In no semester may the total credits for which a student registers, exceed the normal number of credits per semester by more than 16 credits, except with special permission from the relevant Head of Department.

### **Pass with distinction**

A degree (undergraduate) in the School of IT is conferred with distinction on a student who did not repeat any module of his/her final year, obtained a weighted average of at least 75% in all the prescribed modules for the final year, provided that a subminimum of 65% is obtained in each of these modules and provided that the degree is completed in the prescribed minimum period of time. Ad hoc cases will be considered by the Dean, in consultation with the head of the relevant department.



## Curriculum: Year 1

**Minimum credits: 140**

### Fundamental modules

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

**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.

**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

#### Academic literacy for Information Technology 121 (ALL 121)

**Module content:**

By the end of this module students should be able to cope more confidently and competently with the reading, writing and critical thinking demands that are characteristic of the field of Information Technology.

**Module credits** 6.00

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

**Prerequisites** No prerequisites.

**Contact time** 1 web-based period per week, 2 lectures per week

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

**Academic organisation** Unit for Academic Literacy

**Period of presentation** Semester 2



## Academic orientation 101 (UPO 101)

<b>Module credits</b>	0.00
<b>Prerequisites</b>	No prerequisites.
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Humanities Dean's Office
<b>Period of presentation</b>	Year

## Core modules

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

#### 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.

<b>Module credits</b>	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
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

### Introduction to computer science 151 (COS 151)

#### Module content:

This module introduces concepts and terminology related to the computer science discipline. General topics covered include the history of computing, machine level representation of data, Boolean logic and gates, basic computer systems organisation, algorithms and complexity and automata theory. The module also introduces some of the subdisciplines of computer science, such as computer networks, database systems, compilers, information security and intelligent systems. The module also focuses on modelling of algorithms.

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Education Faculty of Natural and Agricultural Sciences



<b>Prerequisites</b>	APS of 30 and level 5 (60-69%) Mathematics.
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 1

## Discrete structures 115 (WTW 115)

### 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.

**Module credits** 8.00

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

**Prerequisites** Refer to Regulation 1.2: A candidate must have passed Mathematics with at least 50% in the Grade 12 examination

**Contact time** 2 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

## Mathematics 134 (WTW 134)

### 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.

**Module credits** 16.00

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



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<b>Prerequisites</b>	Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination .
<b>Contact time</b>	4 lectures per week, 1 tutorial 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

## Imperative programming 132 (COS 132)

### 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.

**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

## Operating systems 122 (COS 122)

### Module content:

Fundamental concepts of modern operating systems in terms of their structure and the mechanisms they use are studied in this module. After completing this module, students will have gained, as outcomes, knowledge of real time, multimedia and multiple processor systems, as these will be defined and analysed. In addition, students will have gained knowledge on modern design issues of process management, deadlock and concurrency control, memory management, input/output management, file systems and operating system security. In order to experience a hands-on approach to the knowledge students would have gained from studying the abovementioned concepts, students will have produced a number of practical implementations of these concepts using the Windows and Linux operating systems.

**Module credits** 16.00

**Prerequisites** COS 132



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<b>Contact time</b>	1 tutorial per week, 3 lectures per week, 1 practical per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

## Elective modules

### Marketing Management 120 (BEM 120)

#### Module content:

This module provides an overview of the fundamentals of marketing by considering the exchange process, customer value, marketing research and the development of a marketing plan. It also addresses the marketing mix elements with specific focus on the seven service marketing elements namely the service product, physical evidence, people, process, distribution, pricing and integrated marketing communication.

<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	BEM 110
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Marketing Management
<b>Period of presentation</b>	Semester 2

### Biometry 120 (BME 120)

#### Module content:

Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and twoway designs, randomised blocks. Multiple statistical analysis: Bivariate data sets: Curve fitting (linear and non-linear), growth curves. Statistical inference in the simple regression case. Categorical analysis: Testing goodness of fit and contingency tables. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.

<b>Module credits</b>	16.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
<b>Prerequisites</b>	At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123



<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

## Plant biology 161 (BOT 161)

### Module content:

Basic plant structure and function; introductory plant taxonomy and plant systematics; principles of plant molecular biology and biotechnology; adaptation of plants to stress; medicinal compounds from plants; basic principles of plant ecology and their application in natural resource management.

<b>Module credits</b>	8.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
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<b>Prerequisites</b>	MLB 111 GS
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<b>Contact time</b>	fortnightly practicals, 2 lectures per week
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<b>Language of tuition</b>	Separate classes for Afrikaans and English
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<b>Academic organisation</b>	Plant and Soil Sciences
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<b>Period of presentation</b>	Semester 2
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## Philosophy 110 (FIL 110)

### Module content:

Introduction to Philosophy

The two semester modules at first-year level introduce students to the four main subfields of Philosophy, namely epistemology and metaphysics, ethics and political philosophy. This module introduces students to two of these subfields. Students must contact the Department of Philosophy to ascertain which two subfields are covered in each semester as the choice may change from time to time due to availability of teaching staff. Students will become acquainted with the nature of philosophical reflection by exploring a number of classical philosophical themes in each subfield. Throughout the module there is an emphasis on developing those critical thinking, reading and writing skills that are required in Philosophy, while students become acquainted with the power of critique as critical judgment and discernment.

<b>Module credits</b>	12.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Law
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<b>Prerequisites</b>	No prerequisites.
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<b>Contact time</b>	3 lectures per week, 1 discussion class per week
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<b>Language of tuition</b>	Separate classes for Afrikaans and English
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<b>Academic organisation</b>	Philosophy
<b>Period of presentation</b>	Semester 1

## Philosophy 120 (FIL 120)

### Module content:

Introduction to Philosophy

The two semester modules at first-year level introduce students to the four main subfields of Philosophy, namely epistemology and metaphysics, ethics and political philosophy. This module introduces students to two of these subfields. Students must contact the Department of Philosophy to ascertain which two subfields are covered in each semester as the choice may change from time to time due to availability of teaching staff. Students will become acquainted with the nature of philosophical reflection by exploring a number of classical philosophical themes in each subfield. Throughout the module there is an emphasis on developing those critical thinking, reading and writing skills that are required in Philosophy, while students become acquainted with the power of critique as critical judgment and discernment.

<b>Module credits</b>	12.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Law
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<b>Prerequisites</b>	No prerequisites.
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<b>Contact time</b>	1 discussion class per week, 3 lectures per week
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<b>Language of tuition</b>	Separate classes for Afrikaans and English
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<b>Academic organisation</b>	Philosophy
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<b>Period of presentation</b>	Semester 2
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## Financial accounting 111 (FRK 111)

### 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.

<b>Module credits</b>	10.00
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<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>	Separate classes for Afrikaans and English
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**Academic organisation** Accounting

**Period of presentation** Semester 1

## Aspects of human geography 156 (GGY 156)

### Module content:

This module begins by fostering an understanding of human geography. Then follows with the political ordering of space; cultural diversity as well as ethnic geography globally and locally; population geography of the world and South Africa: and four economic levels of development. The purpose is to place South Africa in a world setting and to understand the future of the country.

**Module credits** 8.00

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

**Prerequisites** No prerequisites.

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

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

**Academic organisation** Geography, Geoinf + Meteor

**Period of presentation** Quarter 2

## Southern African geomorphology 166 (GGY 166)

### Module content:

Investigating southern African landscapes and placing them in a theoretical and global context. The geomorphological evolution of southern Africa. Introduction to the concepts of Geomorphology and its relationships with other physical sciences (e.g. meteorology, climatology, geology, hydrology and biology). The processes and controls of landform and landscape evolution. Tutorial exercises cover basic techniques of geomorphological analysis, and topical issues in Geomorphology.

**Module credits** 8.00

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

**Prerequisites** No prerequisites.

**Contact time** 4 lectures per week

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

**Academic organisation** Geography, Geoinf + Meteor

**Period of presentation** Quarter 3



## Cartography 110 (GMC 110)

### Module content:

Spherical trigonometry. Geometrical geodesy: Datum surfaces and coordinate systems in Geodesy, Calculations on the ellipsoid, Datum transformations. Map projections: Projection principles, distortion determination, and construction of conformal, equivalent and equidistant projections, the Transverse Mercator projection and UTM projection of an ellipsoidal earth, projection transformations. Space geodesy: Time systems, Celestial and observer coordinate systems, Global Navigation Satellite Systems (GNSS), Satellite orbits and orbital parameters, 3-D positioning. A project or assignments of at least 64 notional hours.

<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	3 lectures per week, 1 practical per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 2

## Introductory genetics 161 (GTS 161)

### Module content:

Chromosomes and cell division. Principles of Mendelian inheritance: locus and alleles, dominance interactions and epistasis. Probability studies. Sex determination and sex linked traits. Pedigree analysis. Extranuclear inheritance. Genetic linkage and chromosome mapping. Chromosome variation.

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Veterinary Science
<b>Prerequisites</b>	MLB 111 GS
<b>Contact time</b>	fortnightly practicals, 2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Semester 2

## Introduction to history of music 110 (IMG 110)

### Module content:

\*Closed – requires departmental selection

Know and understand the elements of music and apply this to the history of western and African music, both classical and popular.



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<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	Admission into relevant programme
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Music
<b>Period of presentation</b>	Year

### Informatics 154 (INF 154)

#### Module content:

Introduction to programming.

<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	Refer to Regulation 1.2(f): A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination
<b>Contact time</b>	2 practicals per week, 1 lecture per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Informatics
<b>Period of presentation</b>	Semester 1

### Informatics 164 (INF 164)

#### Module content:

Advanced programming, use of a computer-aided software engineering tool.

<b>Module credits</b>	10.00
<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 154; Regulation 1.2(f): A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination; AIM 101 or AIM 102 or AIM 111 and AIM 121
<b>Contact time</b>	1 lecture per week, 2 practicals per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Informatics



**Period of presentation** Semester 2

## Commercial law 110 (KRG 110)

### Module content:

General introduction.

General principles of the law of contract: introduction to the law of contract; consensus; contractual capacity; legality and physical possibility of performance; formalities; parties to the contract; conditions and related legal concepts; special terms and the interpretation of contracts; breach of contract and the termination of the contractual relationship.

**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, 1 tutorial per week

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

**Academic organisation** Mercantile Law

**Period of presentation** Semester 1

## Commercial law 120 (KRG 120)

### Module content:

Law of purchase and sale; law of lease; credit agreements; law of agency; law of security.

**Module credits** 10.00

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

**Prerequisites** Examination entrance to KRG 110

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

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

**Academic organisation** Mercantile Law

**Period of presentation** Semester 2

## Criminology 110 (KRM 110)

### Module content:

Part 1: Fundamental criminology

Introduction to criminology, definition of crime, crime tendencies, classical and positivistic explanations of crime.

Part 2: Violent crime

A brief analysis of causes, consequences and mechanisms to prevent and reduce violent crime within a South



African context. Define violent crime in terms of interpersonal violence, homicide, violent crimes within the criminal justice system and property-related violent crimes.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Law
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Social Work and Criminology
<b>Period of presentation</b>	Semester 1

### Introduction to microbiology 161 (MBY 161)

#### Module content:

The module will introduce the student to the field of Microbiology. Basic Microbiological aspects that will be covered include introduction into the diversity of the microbial world (bacteria, archaea, eukaryotic microorganisms and viruses), basic principles of cell structure and function, microbial nutrition and microbial growth and growth control. Applications in Microbiology will be illustrated by specific examples i.e. bioremediation, animal-microbial symbiosis, plant-microbial symbiosis and the use of microorganisms in industrial microbiology. Wastewater treatment, microbial diseases and food will be introduced using specific examples.

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	MLB 111 GS
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Microbiology and Plant Path
<b>Period of presentation</b>	Semester 2

### Molecular and cell biology 111 (MLB 111)

#### Module content:

Introductory study of the ultra structure, function and composition of representative cells and cell components. General principles of cell metabolism, molecular genetics, cell growth, cell division and differentiation.

<b>Module credits</b>	16.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science



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<b>Prerequisites</b>	Refer to Regulation 1.2: A candidate who has passed Mathematics with at least 50% 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>	Genetics
<b>Period of presentation</b>	Semester 1

## Music education 170 (MPE 170)

### Module content:

\*Closed – requires departmental selection

This module will cover a wide range of topics relevant for teaching music effectively and growing as a potential musician and music teacher. The teaching and learning experience will also include performing basic tasks in music technology that is required within a music career.

<b>Module credits</b>	10.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	Admission into relevant programme
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Music
<b>Period of presentation</b>	Year

## Business management 114 (OBS 114)

### 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).

<b>Module credits</b>	10.00
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<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

## Business management 124 (OBS 124)

### 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.

**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

## Psychology 110 (SLK 110)

### Module content:

This module is a general orientation to Psychology. An introduction is given to various theoretical approaches in Psychology, and the development of Psychology as a science is discussed. Selected themes from everyday life are explored and integrated with psychological principles. This module focuses on major personality theories. An introduction is given to various paradigmatic approaches in Psychology.

**Module credits** 12.00





<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 discussion classes per week, 2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Psychology
<b>Period of presentation</b>	Semester 1

## Psychology 120 (SLK 120)

### Module content:

This module introduces the student to a basic knowledge and understanding of the biological basis of human behaviour. The module addresses the key concepts and terminology related to the biological subsystem, the rules and principles guiding biological psychology, and identification of the interrelatedness of different biological systems and subsystems. In this module various cognitive processes are studied, including perception, memory, thinking, intelligence and creativity. Illustrations are given of various thinking processes, such as problem solving, critical, analytic and integrative thinking.

<b>Module credits</b>	12.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 lectures per week, 2 discussion classes per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Psychology
<b>Period of presentation</b>	Semester 2

## Statistics 110 (STK 110)

### 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.



<b>Module credits</b>	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

## Statistics 120 (STK 120)

### 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.

<b>Module credits</b>	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

## Mathematical statistics 111 (WST 111)

### 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.

**Module credits** 16.00

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

**Prerequisites** At least 5 (60-69%) in Mathematics in the Grade 12 examination

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 1

## Mathematical statistics 121 (WST 121)

### 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.

**Module credits** 16.00

**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 GS or WST 133, 143 and 153

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

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

**Academic organisation** Statistics

**Period of presentation** Semester 2

## Numerical analysis 123 (WTW 123)

### 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.

**Module credits** 8.00

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

**Prerequisites** WTW 114 GS



<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 2

## Mathematics 134 (WTW 134)

### 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.

<b>Module credits</b>	16.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Veterinary Science
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<b>Prerequisites</b>	Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination .
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<b>Contact time</b>	4 lectures per week, 1 tutorial per week
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<b>Language of tuition</b>	Separate classes for Afrikaans and English
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<b>Academic organisation</b>	Mathematics and Applied Maths
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<b>Period of presentation</b>	Semester 1
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## Mathematical modelling 152 (WTW 152)

### Module content:

Introduction to the modelling of dynamical processes using difference equations. Curve fitting. Introduction to linear programming. Matlab programming. Applications to real-life situations in, among others, finance, economics and ecology.

<b>Module credits</b>	8.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
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<b>Prerequisites</b>	Refer to Regulation 1.2
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<b>Contact time</b>	1 tutorial per week, 2 lectures per week
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<b>Language of tuition</b>	Module is presented in English
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**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 1

## Dynamical processes 162 (WTW 162)

### 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.

**Module credits** 8.00

**Prerequisites** WTW 114 GS

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

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

**Academic organisation** Mathematics and Applied Maths

**Period of presentation** Semester 2

## Financial accounting 122 (FRK 122)

### 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.

**Module credits** 12.00

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

**Prerequisites** FRK 111 GS or FRK 133, FRK 143

**Contact time** 4 lectures per week

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

**Academic organisation** Accounting

**Period of presentation** Semester 2

## Introduction to environmental sciences 101 (ENV 101)

### Module content:

Introducing the basic concepts and interrelationships required to understand the complexity of natural environmental problems, physical and human environment, human induced environmental problems, the ways in



which the natural environment affects human society and biodiversity, an introduction to major environmental issues in Southern Africa and sustainable development in the context of environmental issues.

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Quarter 1

### Informatics 171 (INF 171)

#### 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.

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	Regulation 1.2: A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Informatics
<b>Period of presentation</b>	Year

### Mathematics 124 (WTW 124)

#### 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.

<b>Module credits</b>	16.00
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<b>Prerequisites</b>	WTW 114
<b>Contact time</b>	4 lectures per week, 1 tutorial 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 2

## Linear algebra 146 (WTW 146)

### 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.

<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

## Calculus 148 (WTW 148)

### 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.

<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







## Curriculum: Year 2

**Minimum credits: 170**

### Core modules

#### Data structures and algorithms 212 (COS 212)

**Module content:**

Data abstraction is a fundamental concept in the design and implementation of correct and efficient software. In prior modules, students are introduced to the basic data structures of lists, stacks and queues. This module continues with advanced data structures such as trees, hash tables, heaps and graphs, and goes into depth with the algorithms needed to manipulate them efficiently. Classical algorithms for sorting, searching, traversing, packing and game playing are included, with an emphasis on comparative implementations and efficiency. At the end of this module, students will be able to identify and recognise all the classical data structures; implement them in different ways; know how to measure the efficiency of implementations and algorithms; and have further developed their programming skills, especially with recursion and polymorphism.

<b>Module credits</b>	16.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	COS 110
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 1

#### Software modelling 214 (COS 214)

**Module content:**

The module will introduce the concepts of model-driven analysis and design as a mechanism to develop and evaluate complex software systems. Systems will be decomposed into known entities, such as design patterns, classes, relationships, execution loops and process flow, in order to model the semantic aspects of the system in terms of structure and behaviour. An appropriate tool will be used to support the software modelling. The role of the software model in the enterprise will be highlighted. Students who successfully complete this module will be able to conceptualise and analyse problems and abstract a solution.

<b>Module credits</b>	16.00
<b>Prerequisites</b>	COS 212
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2



## Netcentric computer systems 216 (COS 216)

### Module content:

This module will introduce the student to netcentric systems by focusing on the development of systems for the web, mobile devices and the cloud. To lay the foundation on which the rest of the module can follow, traditional web-based programming languages such as HTML5, JavaScript, CSS and Python will be covered differentiating between client-side and server-side computation. Persistence of web-based data will be included for both client and server-based computation. These technologies will be extended and applied to mobile platforms where the availability of a connection, location-services and mobile device limitations play a role. For cloud platforms, aspects relating to task partitioning, security, virtualisation, cloud storage and access to the shared data stores, data synchronisation, partitioning and replication are considered. In order to practically demonstrate that a student has reached these outcomes, students will be required to use, integrate and maintain the necessary software and hardware by completing a number of smaller practical assignments where after integrating all these technologies into a comprehensive and practical programming project is required.

<b>Module credits</b>	16.00
<b>Prerequisites</b>	COS 110
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 1

## Introduction to database systems 221 (COS 221)

### Module content:

This module will expose students to the evolution of databases systems. They will be able to model data conceptually, in terms of models such as conceptual, relational, object oriented, graph-based and network and the mapping between models, in particular between the conceptual and relational model. Foundational concepts relating to the relational model will be considered, such as: entity and referential integrity, relational algebra and calculus, functional dependency, normal forms, Indexing of database systems and transaction processing will also form an integral part of the curriculum. The physical data representation of the databases system both in memory and within the file system of the operating system will be considered.

<b>Module credits</b>	16.00
<b>Prerequisites</b>	COS 110
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 1

## Concurrent systems 226 (COS 226)

### Module content:



Computer science courses mostly deal with sequential programs. This module looks at the fundamentals of concurrency; what it means, how it can be exploited, and what facilities are available to determine program correctness. Concurrent systems are designed, analysed and implemented.

<b>Module credits</b>	16.00
<b>Prerequisites</b>	COS 122 and COS 212
<b>Contact time</b>	1 practical per week, 4 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

## Computer organisation and architecture 284 (COS 284)

### Module content:

This module provides the foundations on which other modules build by enabling a deeper understanding of how software interacts with hardware. It will teach the design and operation of modern digital computers by studying each of the components that make up a digital computer and the interaction between these components. Specific areas of interest, but not limited to, are: representation of data on the machine-level; organisation of the machine on the assembly level; the architecture and organisation of memory; inter- and intra-component interfacing and communication; data paths and control; and parallelism. Topic-level detail and learning outcomes for each of these areas are given by the first 6 units of 'Architecture and Organisation' knowledge area as specified by the ACM/IEEE Computer Science Curriculum 2013.

The concepts presented in the theory lectures will be reinforced during the practical sessions by requiring design and implementation of the concepts in simulators and assembly language using an open source operating system.

<b>Module credits</b>	16.00
<b>Prerequisites</b>	COS 212 GS
<b>Contact time</b>	4 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

## Discrete structures 285 (WTW 285)

### Module content:

Setting up and solving recurrence relations. Equivalence and partial order relations. Graphs: paths, cycles, trees, isomorphism. Graph algorithms: Kruskal, Prim, Fleury. Finite state automata.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education



<b>Prerequisites</b>	WTW 115
<b>Contact time</b>	1 tutorial per week, 2 lectures 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

## Theoretical computer science 210 (COS 210)

### Module content:

This module introduces students to a framework for investigating both computability and complexity of problems. Topics include, but are not limited to: finite-state machines, regular expressions and their application in a language such as awk, the Halting problem, context-free grammars, P vs NP problem, NP-complete class, reduction techniques, regular languages, DFAs and NFAs, Lattices, Church-Turing thesis.

<b>Module credits</b>	8.00
<b>Prerequisites</b>	COS 110 and COS 151
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 1

## Elective modules

### Introductory geographic information systems 283 (GGY 283)

#### Module content:

Introduction to Geographic Information Systems (GIS), theoretical concepts and applications of GIS. The focus will be on the GIS process of data input, data analysis, data output and associated technologies. This module provides the foundations for more advanced GIS and Geoinformatics topics.

<b>Module credits</b>	14.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities
<b>Prerequisites</b>	GMC 110
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 1



## Geographic data analysis 220 (GIS 220)

### Module content:

The nature of geographical data and measurement. Application of statistics in the geographical domain. Probability, probability distributions and densities, expected values and variances, Central Limit theorem. Sampling techniques. Exploratory data analysis, descriptive statistics, statistical estimation, hypothesis testing, correlation analysis and regression analysis.

<b>Module credits</b>	14.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	GMC 100 AND (STK 110 OR BME120)
<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>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 2

## Remote sensing 220 (GMA 220)

### Module content:

This module will provide a thorough introduction to the basic scientific principles involved in remote sensing, and some of the applications to studies of the Earth's surface. This includes examining the basic physics of electromagnetic radiation and the complex interactions of radiation with the surface and atmosphere (i.e. spectral signatures). In addition, basic concepts of photogrammetry will be discussed. The theoretical background laid out in the first half of the module will provide the tools for examining various remote sensing applications using data obtained in different parts of the electromagnetic spectrum. The applications will include uses of satellite remote sensing data for mapping and monitoring vegetation, soils and minerals, snow and ice, water resources and quality, and urban landscapes. The laboratory section will include hands-on experience with various satellite image data sets.

<b>Module credits</b>	14.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	GMC 110
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 1

## Molecular genetics 251 (GTS 251)

### Module content:

Chemical nature of DNA. Replication transcription, RNA processing and translation. Control of gene expression in prokaryotes and eukaryotes. Recombinant DNA technology and its applications in gene analysis and



manipulation.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	GTS 161 GS
<b>Contact time</b>	fortnightly practicals, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Semester 1

### Genetic diversity and evolution 261 (GTS 261)

#### Module content:

Chromosome structure and transposable elements. Mutation and DNA repair. Genomics and proteomics. Organelle genomes. Introduction to genetic analysis of populations: allele and genotypic frequencies, Hardy Weinberg Law, its extensions and implications for different mating systems. Introduction to quantitative and evolutionary genetics.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	GTS 251 GS
<b>Contact time</b>	2 lectures per week, fortnightly practicals
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Semester 2

### Introduction to history of music 210 (IMG 210)

#### Module content:

\*Closed – requires departmental selection

Know and understand the characteristics of music with special reference to 20th century genres, western and African, classical and popular.

<b>Module credits</b>	15.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	Admission into relevant programme
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class



**Academic organisation** Music

**Period of presentation** Year

## Multimedia 210 (IMY 210)

### Module content:

\*Closed – requires departmental selection.

Advanced Markup Languages 1. This module investigates XML and its related technologies (such as XSLT, XPath, XSL-FO, DTD, XML Schema, and namespaces) as a vital part of the web development process.

**Module credits** 16.00

**Prerequisites** IMY 110 or equivalent HTML knowledge

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

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

**Academic organisation** Information Science

**Period of presentation** Semester 1

## Multimedia 220 (IMY 220)

### Module content:

\*Closed - requires departmental selection.

Advanced Markup Languages 2. This module assumes knowledge of dynamic scripts and basic web based technologies such as PHP as well as the use of relational databases like MySQL. The module explores the interplay between scripting languages, databases, and current industry standard web technologies, from both the server-side and client-side perspectives. The module has a focus on developing hands-on practical skills.

**Module credits** 16.00

**Prerequisites** IMY 210

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

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

**Academic organisation** Information Science

**Period of presentation** Semester 2

## Informatics 261 (INF 261)

### Module content:

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

**Module credits** 7.00



<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 214
<b>Contact time</b>	1 practical per week, 1 lecture 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 2

## Informatics 272 (INF 272)

### Module content:

Use of computer-aided development tools; advanced programming.

<b>Module credits</b>	14.00
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<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 102 or AIM 111 and AIM 121, INF 163 and INF 164, Regulation IT.3(g)
<b>Contact time</b>	1 discussion class per week, 5 web-based periods 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>	Year

## Commercial law 200 (KRG 200)

### Module content:

Company law, law concerning close corporations, law of partnerships, labour law, law of arbitration and transport, law of insurance, law concerning negotiable documents, law of insolvency, law of succession and trusts.

<b>Module credits</b>	24.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
<b>Prerequisites</b>	KRG 120
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Mercantile Law
<b>Period of presentation</b>	Year





## Bacteriology 251 (MBY 251)

### Module content:

Growth, replication and survival of bacteria, Energy sources, harvesting from light versus oxidation, regulation of catabolic pathways, chemotaxis. Nitrogen metabolism, iron-scavenging. Alternative electron acceptors: denitrification, sulphate reduction, methanogenesis. Bacterial evolution, systematic and genomics. Biodiversity; bacteria occurring in the natural environment (soil, water and air), associated with humans, animals, plants, and those of importance in foods and in the water industry.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	MBY 161 GS
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Microbiology and Plant Path
<b>Period of presentation</b>	Semester 1

## Mycology 261 (MBY 261)

### Module content:

Organisation and molecular architecture of fungal thalli, chemistry of the fungal cell. Chemical and physiological requirements for growth and nutrient acquisition. Mating and meiosis; spore development; spore dormancy, dispersal and germination. Fungi as saprobes in soil, air, plant, aquatic and marine ecosystems; role of fungi as decomposers and in the deterioration of materials; fungi as predators and parasites; mycoses, mycetisms and mycotoxicoses; fungi as symbionts of plants, insects and animals. Applications of fungi in biotechnology.

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	MBY 161
<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>	Microbiology and Plant Path
<b>Period of presentation</b>	Semester 2

## Music technology 302 (MCS 302)

### Module content:

\*Closed – requires departmental selection

A foundation of music technology tailored towards the educational needs of the musician.

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology



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<b>Prerequisites</b>	Admission into relevant programme
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Afrikaans and English is used in one class
<b>Academic organisation</b>	Music
<b>Period of presentation</b>	Year

## Business management 210 (OBS 210)

### Module content:

Logistics management

The role of logistics in an enterprise; definition and scope of customer service; electronic and other logistics information systems; inventory management; materials management with special reference to Japanese systems; management of the supply chain. Methods of transport and transport costs; types and costs of warehousing; electronic aids in materials handling; cost and price determination of purchases; organising for logistics management; methods for improving logistics performance.

<b>Module credits</b>	16.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	OBS 114 or 124 with admission to the examination in the other
<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

## Business management 220 (OBS 220)

### Module content:

Project management: Introduction

Project management concepts; needs identification; the project, the project manager and the project team; types of project organisations; project communication and documentation.

Planning and control: planning, scheduling and schedule control of projects; resource considerations and allocations; cost planning and performance evaluation.

<b>Module credits</b>	16.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	OBS 114 or 124 with admission to the examination in the other
<b>Contact time</b>	3 lectures per week

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<b>Language of tuition</b>	Separate classes for Afrikaans and English
<b>Academic organisation</b>	Business Management
<b>Period of presentation</b>	Semester 2

## Statistics 210 (STK 210)

### 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.

<b>Module credits</b>	20.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
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<b>Prerequisites</b>	STK 110, STK 120
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<b>Contact time</b>	3 lectures 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>Academic organisation</b>	Statistics
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<b>Period of presentation</b>	Semester 1
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## Statistics 220 (STK 220)

### 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.

<b>Module credits</b>	20.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
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<b>Prerequisites</b>	STK 210 GS
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<b>Contact time</b>	3 lectures per week, 1 practical per week
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**Language of tuition** Module is presented in English

**Academic organisation** Statistics

**Period of presentation** Semester 2

## Consumer behaviour 212 (BEM 212)

### Module content:

Internal and external influencing factors of consumer behaviour, the consumer's decision process and application fields of consumer behaviour, consumerisms and social responsibility, buying behaviour of consumers in both product and service related industries, consumer psychology and the influence thereof on buying behaviour, psychology of pricing, influencing factors in consumer buying behaviour, the impact of various forms of marketing communication on buying behaviour.

**Module credits** 16.00

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

**Prerequisites** BEM 120 GS

**Contact time** 3 lectures per week

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

**Academic organisation** Marketing Management

**Period of presentation** Semester 1



## Curriculum: Final year

**Minimum credits: 144**

### Core modules

#### Software engineering 301 (COS 301)

**Module content:**

The module exposes students to problems associated with software development on an industrial scale. Overall goals of the module are: to become familiar with the latest trends in software engineering; to understand the software engineering process and to appreciate its complexity; to be exposed to a variety of methodologies for tackling different stages of the software lifecycle; to understand and apply the concepts of systems administration and maintenance; to complete the development of a fairly large object orientation-based software product. The focus of the module is on a project that lasts the whole year. The project is completed in groups of approximately four (4) students and teaches students to take responsibility for a variety of roles within a group, and to understand the different requirements for these; to experience the advantages and problems of working in a group; professionalism with regards to particularly colleagues and clients.

After the successful completion of this module, the student will be able to: understand the psychology of a client; work in groups; and have an appreciation for planning, designing, implementing and maintaining large projects. These qualities should place the students in a position in which they are able to handle software development in the corporate environment.

<b>Module credits</b>	27.00
<b>Prerequisites</b>	COS 212 and COS 214
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Year

#### Computer networks 332 (COS 332)

**Module content:**

The objective of this module is to acquaint the student with the terminology of communication systems and to establish a thorough understanding of exactly how data is transferred in such communication networks, as well as applications that can be found in such environments. The study material includes: concepts and terminology, the hierarchy of protocols according to the OSI and TCP/IP models, protocols on the data level, physical level and network level as well as higher level protocols. The practical component of the module involves programming TCP/IP sockets using a high level language. The emphasis throughout is on the technical aspects underlying the operation of networks, rather than the application of networks.

<b>Module credits</b>	18.00
<b>Prerequisites</b>	COS 216
<b>Contact time</b>	2 lectures per week, 1 practical per week



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

**Academic organisation** Computer Science

**Period of presentation** Semester 1

## Programming languages 333 (COS 333)

### Module content:

Programming languages are the backbone for software development. Each language has its own different syntax and semantics, but there are many common concepts that can be studied and then illustrated through the languages. The module concentrates on issues of object orientation, including delegation, iteration and polymorphism. It surveys how languages provide the basic building blocks for data and control, as well as exception handling and concurrency. At the end of the module, students will be able to appreciate the rich history behind programming languages, leading to independent principles that evolve over time. They will be skilled at using a variety of programming languages, including new paradigms such as functional, logical and scripting, and will know how to learn a new language with ease. From this experience, they will be able to apply evaluation criteria for choosing an appropriate programming language in a given scenario.

**Module credits** 18.00

**Prerequisites** COS 110

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

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

**Academic organisation** Computer Science

**Period of presentation** Semester 2

## Multimedia 310 (IMY 310)

### Module content:

\*Closed - requires departmental selection.

Human-computer Interaction. This module involves a study of human-computer interaction and human-information interaction; humans as computer and information users; and the ethical aspects relating to the creation of multimedia information products. A detailed study of the role, composition and functioning of an interface, underlying principles in the design and evaluation of interfaces, will also be undertaken.

**Module credits** 30.00

**Prerequisites** No prerequisites.

**Contact time** 3 lectures per week, 3 practicals per week

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

**Academic organisation** Information Science

**Period of presentation** Semester 1



## Computer security and ethics 330 (COS 330)

### Module content:

This module develops an appreciation of the fundamentals and design principles for information assurance and security. Students will develop a clear understanding of the basic information security services and mechanisms, enabling them to design and evaluate the integration of solutions into the user application environment. Emphasis will be placed on services such as authorisation and confidentiality. Students will acquire knowledge and skills of Security Models such as the Bell-LaPadula, Harrison-Ruzzo Ullman and Chinese Wall Model. Students will develop a detailed understanding of the confidentiality service by focusing on cryptology and the practical implementation thereof. The student will be introduced to professional and philosophical ethics. At the end of the module students will be able to engage in a debate regarding the impact (local and global) of computers on individuals, organisations and society. The professionalism of IT staff will be discussed against national and international codes of practices such as those of the CSSA, ACM and IEEE.

<b>Module credits</b>	18.00
<b>Prerequisites</b>	COS 110
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

## Elective modules

### Artificial intelligence 314 (COS 314)

#### Module content:

The main objective of this module is to introduce a selection of topics from artificial intelligence (AI), and to provide the student with the background to implement AI techniques for solving complex problems. This module will cover topics from classical AI, as well as more recent AI paradigms. These topics include: search methods, game playing, knowledge representation and reasoning, machine learning, neural networks, genetic algorithms, artificial life, planning methods, and intelligent agents. In the practical part of this module, students will get experience in implementing

- (1) game trees and evolving game-playing agents;
- (2) a neural network and applying it to solve a real-world problem; and
- (3) a genetic algorithm and applying it to solve a real-world problem.

<b>Module credits</b>	18.00
<b>Prerequisites</b>	COS 110
<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>	Computer Science
<b>Period of presentation</b>	Semester 1



## Database systems 326 (COS 326)

### Module content:

This module builds on a prior introductory module on database technology and provides more advanced theoretical and practical study material for managing large volumes of data, for example, noSQL database systems and MapReduce. The module will consider file system models, for example Hadoop, relevant for big data storage, manipulation at scale, mining and visualisation. Basic knowledge of parallel decomposition concepts will be included.

<b>Module credits</b>	18.00
<b>Prerequisites</b>	COS 221
<b>Contact time</b>	1 lecture per week, 2 practicals per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Computer Science
<b>Period of presentation</b>	Semester 2

## Computer graphics 344 (COS 344)

### Module content:

The aim of this module is to acquire a sound knowledge of the basic theory of interactive computer graphics and basic computer graphics programming techniques. The theory will cover graphics systems and models, graphics programming, input and interaction, geometric objects and transformations, viewing in 3D, shading, rendering techniques, and introduce advanced concepts, such as object-oriented computer graphics and discrete techniques. The module includes a practical component that enables students to apply and test their knowledge in computer graphics. The OpenGL graphics library and the C programming language will be used for this purpose.

<b>Module credits</b>	18.00
<b>Prerequisites</b>	COS 110 and WTW 124 or WTW 146
<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>	Computer Science
<b>Period of presentation</b>	Semester 1

## Geographic information systems 310 (GIS 310)

### Module content:

Advanced theory and practice of Geographic Information Systems; GIS applications; design and implementation of GIS applications.

<b>Module credits</b>	24.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology





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<b>Prerequisites</b>	GGY 283 or GIS 221
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 1

### Spatial analysis 320 (GIS 320)

#### Module content:

Construction of Raster Geovisualisations, spatial model construction and use, multi-criteria decision analysis. Factor analysis: Principle component analysis. Geostatistics: Spatial dependence modelling, ordinary kriging. Markov chains and cellular Automata, combined models. A project or assignments of at least 64 notional hours.

<b>Module credits</b>	22.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	GIS 220 and GGY 283
<b>Contact time</b>	3 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Geography, Geoinf + Meteor
<b>Period of presentation</b>	Semester 2

### Informatics 354 (INF 354)

#### Module content:

Advanced programming.

<b>Module credits</b>	15.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	INF 261, INF 225, INF 271 and INF 272
<b>Contact time</b>	2 practicals per week, 2 lectures 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

### Information and communications technology law 420 (KUB 420)

#### Module content:

\*For LLB

- (a) Introduction to the study of information and communications technology law:
- The place of information and communications technology law in the legal



system

- The nature and scope of information and communications technology law
- Sources of information and communications technology law
- Inception and influence of the Internet

(b) Regulation of the Internet:

- National/International
- Jurisdiction

(c) Aspects of intellectual property law and the Internet

(d) E-commerce activities and the Internet:

- Aspects of jurisdiction and signing of contracts
- Data protection and encryption
- Liability of Internet service providers

(e) Advertising and the Internet

(f) Criminal liability in information and communications technology law

(g) Constitutional aspects in information and communications technology law:

- The right to privacy/freedom of expression/information

**Module credits** 10.00

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

**Prerequisites** No prerequisites.

**Contact time** 5 practicals per week

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

**Academic organisation** Mercantile Law

**Period of presentation** Semester 2

## Capita selecta: Music 402 (MCS 402)

### Module content:

\*Closed – requires departmental selection

Aspects of music technology or African music.

**Module credits** 40.00

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

**Prerequisites** Admission into relevant programme

**Contact time** 2 lectures per week

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

**Academic organisation** Music

**Period of presentation** Year

## Business management 310 (OBS 310)

### Module content:



## Human resource management and development

The environment in which human resource management takes place; job analysis; strategic human resource planning; equal employment opportunities; planning and management of training; development and careers; functioning in a global environment.

## Negotiation and collective bargaining

The nature of negotiation; preparation for negotiation; negotiating for purposes of climate creation; persuasive communication; handling conflict and aggression; specialised negotiation and collective bargaining in the South African context.

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	OBS 114 or 124 with admission to the examination in the other
<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

## Business management 320 (OBS 320)

### Module content:

#### Strategic management analysis and formulation

Basic concepts; formulation of mission; policy and objectives; external evaluation of the business environment; internal evaluation of the enterprise; including intellectual assets; the formulation and development of a strategic plan.

#### Strategic management implementation

The role of management in strategy implementation; budgets as instrument in the implementation process; leading processes of change within enterprises; supporting policies, procedures and information systems for implementation in the various functional areas; evaluation and control of implementation.

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	OBS 114 or 124 with admission to the examination in the other
<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

## International business management 359 (OBS 359)

### Module content:



Introduction to international management

International business management; the process of internationalisation; growth in international trade and investment; the evolution of multinational enterprises; management perspectives on international trade and international trade theories; international trade regulation; economic integration; the formation of trading blocks, and free-trade areas.

The international business environment

The cultural environment of international business; the political and legal environments as well as the economic environment of international business; the international monetary system; the foreign exchange market; and international capital markets.

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	OBS 114 or OBS 124 with admission to the examination in the other
<b>Contact time</b>	2 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

## International business management 369 (OBS 369)

### Module content:

International financial management

Purpose, scope and principles of international financial management; international cashflow management; foreign exchange risk and foreign exchange risk management; international investment and financing decisions; import and export management; import and export financing, and international purchasing and sourcing.

International management, leadership and market entry

International management and leadership; dimensions of strategic international human resource management; international market entry and introduction to international marketing strategy, and future perspectives on Southern Africa as an emerging market.

<b>Module credits</b>	20.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	Admission to the exam in OBS 359
<b>Contact time</b>	2 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

## Genome evolution and phylogenetics 354 (GTS 354)

### Module content:



Mechanisms involved in the evolutions of genomes. Comparison of the molecular organisation of viral, archaea, eubacterial and eukaryotic genomes. Genome project design, DNA sequencing methods and annotation. Molecular evolution. Phylogenetic inference methods. Applications of phylogenetics and contemporary genome research.

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	GTS 251 GS and GTS 261 GS
<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>	Genetics
<b>Period of presentation</b>	Semester 1

### Population and evolutionary genetics 367 (GTS 367)

#### Module content:

Genetic and phenotypic variation. Organisation of genetic variation. Random genetic drift. Mutation and the neutral theory. Darwinian selection. Inbreeding, population subdivision and migration. Evolutionary quantitative genetics. Population genomics. Human population genetics. Levels of selection and individuality. Arms races and irreversibility. Complexity. Applied evolution.

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	GTS 251 and GTS 261
<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>	Genetics
<b>Period of presentation</b>	Semester 2

### Plant genetics and crop biotechnology 361 (BTC 361)

#### Module content:

Plant genetics and genomics: gene control in plants, epigenetics, co-suppression, forward and reverse genetics, structural and functional genomics. Plant development: signal perception, cell death, control of cell division. Plant-environment interactions. Crop genetic modification: food security, GMO regulation, plant transformation, whole-chromosome transformation, synthetic biology, homologous recombination. Crop molecular markers: marker types, genotyping, QTL mapping, marker-assisted breeding. Future of crop biotechnology: applications of genomics, biopharming, genetical genomics, systems biology

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology



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<b>Prerequisites</b>	GTS 251 and {GTS 261 GS or BOT 261} and {GTS 351 and GTS 352 are recommended}
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Academic organisation</b>	Genetics
<b>Period of presentation</b>	Semester 2

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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 each student to familiarise himself or herself 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.