University of Pretoria Yearbook 2024

BComHons *Mathematical Statistics* (07240244)

Department	Statistics
Minimum duration of study	1 year
Total credits	135
NQF level	08

Admission requirements

1. Bachelor's degree with mathematical statistics **or** relevant bachelor's degree
2. A weighted average of at least 65% for Mathematical Statistics at final-year level
3. An admission examination may be required

Note: Additional modules may be required in order to reach the desired level of competency

Other programme-specific information

Details of compilation of curriculum are available from the Head of the Department of Statistics as well as from the departmental postgraduate brochure.

A candidate must compile his/her curriculum in consultation with the head of department or his representative. It is also possible to include postgraduate modules from other departments. Refer to the Departmental website for further information.

Examinations and pass requirements

Subject to the provisions of General Academic Regulation G26, a head of department determines, in consultation with the Dean when the honours examinations in his/her department will take place, provided that:

- honours examinations which do not take place before the end of the academic year must take place before the closing date of the special exam period in the beginning of the following academic year, and all examination results must be submitted to Student Administration before the closing date of submission of marks; and
- honours examinations which do not take place before the end of the first semester may take place no later than the closing date of the exam period, and all examination results must be submitted to Student Administration on or before the closing date of submission of marks.

The head of the department determines:

- whether a candidate will be admitted to a supplementary examination, provided that a supplementary examination is granted, only once in a maximum of two prescribed semester modules or once in one year module.
- the manner in which research reports are prepared and examined in his/her department.

Supplementary examinations (if granted) cover the same subject matter as was the case for the examinations. A student may not enrol for the same module more than once, unless the dean has approved a second enrolment based on an application supported by a valid reason or motivation. Also refer to General Academic Regulation G18.3.

NB: Full details are published in each department's postgraduate information brochure, which is available from the relevant head of department. The minimum pass mark for a research report is 50%.

Subject to the provisions of G26, the subminimum required in subdivisions of modules is published in the study guides, which are available from the relevant head of department.

Curriculum: Final year

Minimum credits: 135

Choose five modules from the list of electives.

Core modules

Linear models 710 (LMO 710)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistic
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Projection matrices and sums of squares of linear sets. Estimation and the Gauss-Markov theorem. Generalised t- and F- tests.

Multivariate analysis 710 (MVA 710)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Matrix algebra. Some multivariate measures. Visualising multivariate data. Multivariate distributions. Samples from multivariate normal populations. The Wishart distribution. Hotelling's T^2 statistic. Inferences about mean vectors.

Research orientation 796 (STK 796)

Module credits	0.00

NQF Level	08
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to the relevant programme.
Contact time	Ad Hoc
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Module content

A compulsory bootcamp must be attended as part of this module – usually presented during the last week of January each year (details are made available by the department). The bootcamp will cover the basics of research to prepare students for the research component of their degree. The bootcamp should be done in the same year as registration for STK 795/WST 795. Each year of registration for the honours degree will also require the attendance of three departmental seminars. Students should ensure that their attendance is recorded by the postgraduate co-ordinator present at the seminars. The department approves the seminars attended. In addition, students are required to present their STK 795/WST 795 research in the department during the year of registration for these modules.

Research report: Mathematical statistics 795 (WST 795)

Module credits	30.00
NQF Level	08
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Module content

Refer to the document: Criteria for the research management process and the assessment of the honours essays, available on the web: www.up.ac.za under the Department of Statistics: postgraduate study.

Elective modules

Introduction to statistical learning 720 (EKT 720)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	RAL 780 or WST 311, 312, 321
Contact time	1 lecture per week, 1 web-based period per week
Language of tuition	Module is presented in English

Department	Statistics
Period of presentation	Semester 2

Module content

The emphasis is on the theoretical understanding and practical application of advances in statistical modelling. The following topics are covered: Single equation models: Nonparametric regression. Bootstrap procedures within regression analysis, k-nearest neighbour classification. Modelling categorical dependent variables - Logit/Probit models. Multiple outputs. Linear regression of an indicator matrix. Ridge regression. Non-linear regression modelling. Some new developments in regression and classification.
Simultaneous equation models: Specification, identification and estimation of simultaneous equation models.

Text and behavioural analytics 725 (EKT 725)

Module credits	15.00
NQF Level	08
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics or BScHons Statistics and Data Science or BComHons Statistics and Data Science
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Mixtures of distributions and regressions, frequentist and Bayes estimation. Latent components, soft allocation and belongings. Applications in unstructured data, including text data. Identification and interpretation of behavioural patterns.

Linear models 720 (LMO 720)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	LMO 710
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

The singular normal distribution. Distributions of quadratic forms. The general linear model. Multiple comparisons. Analysis of covariance. Generalised linear models. Analysis of categorical data.

Multivariate analysis 720 (MVA 720)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	MVA 710
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Discriminant analysis and classification. Principal component analysis. The biplot. Multidimensional scaling. Factor analysis. Probabilistic clustering.

Parametric stochastic processes 720 (PNP 720)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to statistical measure theory. Queueing processes: M/M/1; M/M/S; M/G/1 queues and variants; limiting distribution of the queue length and waiting times. Queuing networks. Some stochastic inventory and storage processes.

Sampling techniques 720 (SFT 720)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics or BScHons Statistics and Data Science or BComHons Statistics and Data Science
Contact time	1 lecture per week

Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Simple random sampling. Estimation of proportions and sample sizes. Stratified random sampling. Ratio and regression estimators. Systematic and cluster sampling. Introduction to spatial statistics. Spatial sampling – both model and design based approaches.

Simulation and computation 710 (STC 710)

Module credits	15.00
NQF Level	08
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics or BScHons Statistics and Data Science or BComHons Statistics and Data Science
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Efficient programming, Monte Carlo simulation, sampling of discrete and continuous probability models, General transformation methods, Accept-reject methods, Monte Carlo integration, importance sampling, numerical optimisation, Metropolis-Hastings algorithm, GIBBS sampling.

Capita selecta: Statistics 720 (STC 720)

Module credits	15.00
NQF Level	08
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics or BScHons Statistics and Data Science or BComHons Statistics and Data Science
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

This module considers specific topics from the diverse field of statistics as deemed supportive towards the training of the cohort of scholars.

Distribution-free methods 710 (VMT 710)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission to either BScHons Mathematical Statistics or BComHons Mathematical Statistics
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

A selection of: Nonparametric stochastic processes. Power and asymptotic power of distribution-free procedures. Theory and simulation. Asymptotic relative efficiency. Linear rank tests: Definition, properties and applications. Equal in distribution technique. Counting and ranking statistics. Introduction to one and two sample U-statistics. Permutation and distribution-free rank-like statistics. Multi-sample distribution-free tests, rank correlation and regression. Some nonparametric bootstrap and smoothing methods.

General Academic Regulations and Student Rules

The General Academic Regulations (G Regulations) and General Student Rules apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations. The G Regulations are updated annually and may be amended after the publication of this information.

Regulations, degree requirements and information

The faculty regulations, information on and requirements for the degrees published here are subject to change and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project

The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQSF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to

contact their faculties if they have any questions.