

STATISTICS

Professor and Head of Department

SE Radloff, PhD(Rhodes)

Associate Professor

I Szyszkowski, PhD(Maria Curie-Skłodowska)

Senior Lecturers

JS Baxter, MSc, PGDHE(Rhodes)

I Garisch, PhD(UFS)

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Lecturers

A Chinomona, MSc(UKZN)

T Maqubela, MSc(West Virginia University)

M Chinyamakobvu, MSc(Rhodes)

Junior Lecturer

S Izally, BSc Hons(Rhodes)

Mathematical Statistics (MST) and Applied Statistics

(AST) are four-semester subjects which may be taken as major subjects for the degrees of BSc, BSc(InfSys), BA, BSocSc, BCom, BBusSc and BEcon.

To major in Mathematical Statistics a candidate is required to obtain credit in the following courses: MAT 1C or MAT 1C1 + MAT 1C2; MST 2; MST 3. See Rule S.23.

To major in Applied Statistics a candidate is required to obtain credit in the following courses: MAT 1C or MAT 1C1 + MAT 1C2; MST 2; AST 3.

The availability of both MST 3 and AST 3 in any year is subject to adequate staffing.

A pass in Mathematics (level 4 or greater) on the NSC is a prerequisite for admission to all first-year courses in the Department.

If a candidate obtains a pass in a semester-course offered by the Department, but fails to gain an aggregate pass for the full course in the following ordinary or supplementary examination, then that candidate is required to pass the semester-course failed in order to gain the full-credit.

Besides the major courses, the department offers various other courses in Statistics.

Statistics (STA 1) is a two-semester first-year course which may be taken for degree/diploma curricula in the Faculties of Humanities, Commerce and Science.

Biostatistics (PC301) is a one-semester course taken for degree curricula in the Faculty of Pharmacy.

Theory of Finance (TOF 1) and **Statistics 1D (STA 1D)** are one-semester courses taken for degree curricula in the Faculty of Commerce.

Theory of Finance (TOF 1F) is a course in which the contents of TOF 1 are covered over a full year.

The attention of students who hope to pursue careers in the field of Bioinformatics is drawn to the recommended curriculum that leads to postgraduate study in this area, in which Mathematical Statistics is a recommended co-major with Biochemistry, and for which two years of Computer Science and either Mathematics or Mathematical Statistics are prerequisites. Details of this curriculum can be found in the entry for the Department of Biochemistry and Microbiology.

See the Departmental web page

<http://www.ru.ac.za/academic/departments/statistics/> for further details, particularly on the content of courses.

First-year level courses in Statistics

There are two first-year courses in Statistics. STA 101 is held in the first semester and STA 102 in the second semester. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two credit course STA 1, provided that a candidate obtains the required sub-minimum in each component. Supplementary examinations may be recommended in either course, provided that a candidate achieves a minimum standard specified by the Department. Adequate performance in STA 101 is required before a candidate may register for STA 102.

STA 101 (One paper of 3 hours)

Numerical descriptive statistics; simple classical probability theory; basic discrete and continuous distributions; expected values and moments; correlation and linear regression; point and interval estimation; modern univariate statistical inference; ANOVA; categorical data analysis.

STA 102 (One paper of 3 hours)

Multiple linear regression; Non-parametric

procedures; design and analysis of questionnaires; contingency tables; factorial analysis of variance designs; computer based analysis.

PC301 Biostatistics (One paper of 3 hours)

Numerical descriptive statistics; simple classical probability theory; basic discrete and continuous distributions; expected values and moments; correlation and linear regression; point and interval estimation; modern univariate statistical inference; ANOVA; design and analysis of questionnaires; categorical data analysis; survival analysis.

Other first-year courses offered in the Department are as follows:

STA 1D Statistics 1D (One paper of 3 hours)

Collection and tabulation of statistical data; graphs and diagrams; frequency distributions; measures of central tendency and dispersion; shapes and parameters of classical distributions (normal, binomial, Poisson); simple classical probability theory; conditional probability; analysis of time series; index numbers; correlation and simple linear regression; sampling distributions; point and interval estimation; hypothesis testing.

TOF 1 Theory of Finance (One paper of 3 hours)

Simple interest and discount, compound interest and discounting, simple and complex annuities, loans, depreciation, securities, linear programming, elementary differentiation and integration.

Second-year level courses in Mathematical Statistics

There are two second-year courses in Mathematical Statistics. MST 201 is held in the first semester and MST 202 in the second semester. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two-credit course MST 2, provided that a candidate obtains the required subminimum in each component. No supplementary examinations will be offered for either course.

Credit in Mathematics and/or Statistics (MAT 1C and/or at least two semester credits of MAT 1C1 and either STA 1D or STA 101) is required before a student may register for MST 201 or MST 202. Adequate performance in MST 201 is required before a student may register for MST 202.

MST 201 (One paper of 3 hours)

Axiomatic probability theory; conditional probabilities; random variables and standard univariate distributions; expected values and moments; moment generating functions; jointly distributed random variables.

MST 202 (One paper of 3 hours)

A selection of topics from: distributions of functions of random variables; sampling distributions; point and interval estimation; tests of hypotheses; design and analysis of questionnaires; contingency tables; correlation and linear regression; time series analysis; econometrics.

Third-year level courses in Mathematical Statistics

There are two third-year courses in Mathematical Statistics. MST 301 is held in the first semester and MST 302 in the second semester. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two-credit course MST 3, provided that a candidate obtains the required sub-minimum in each component. No supplementary examinations will be offered for either course.

Credit in Mathematical Statistics (MST 2) and in Mathematics (MAT 1C or MAT 1C1 + MAT 1C2) is required before a student may register for MST 301 or MST 302. Note that full credit in Mathematics 1 is not required for entry into MST 201 or MST 202, but is required for entry into MST 301 and MST 302. An aggregated mark of at least 60% for MST 2 is required for entry into MST 3. Adequate performance in MST 301 is required before a student may register for MST 302.

MST 301 / AST 301 (Two papers of 3 hours each)

Distribution theory; normal sampling theory, multivariate normal distribution; the general linear model, analysis of variance; non-linear regression.

MST 302 (Two papers of 3 hours each)

A selection of topics from: limit theorems; stochastic processes; multivariate statistical procedures; nonparametric procedures; sampling techniques; quality control; Bayesian inference; financial statistics.

Third-year level courses in Applied Statistics

Applied Statistics 3 is comprised of the two third year courses MST 301 and AST 302.

MST 301 is held in the first semester and AST 302 in the second semester. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two-credit course AST 3, provided that a candidate obtains the required sub-minimum in each component. No supplementary examinations will be offered for either course.

Credit in Mathematical Statistics (MST 2) and in Mathematics (MAT 1C or MAT 1C1 + MAT 1C2) is required before a student may register for MST 301 or AST 302. Note that full credit in Mathematics 1 is not required for entry into MST 201 or MST 202, but is required for entry into MST 301 and AST 302. Adequate performance in MST 301 / AST 301 is required before a student may register for AST 302.

AST 302

(Two papers of 3 hours each)

A selection of topics from statistical quality and process control; elements of econometrics and time series analysis; Bayesian inference; financial statistics; sample survey theory and techniques.

Mathematical Statistics Honours

The course consists of four modules and a research project. The modules may be selected from the following topics: Bayesian statistics; data mining; econometrics; generalized linear models; multivariate analysis; probability theory; stochastic processes; time series analysis; survey methods and sampling techniques; stochastic calculus in finance; survival analysis; queueing theory and simulation; applied data analysis; pattern recognition.

Master's and Doctoral degrees

Suitably qualified students are encouraged to proceed to research degrees under the direction of the staff of the Department. Requirements for the MSc and PhD degrees are given in the General Rules. The Master's degree may be taken either by examination or by thesis, or by a combination of examinations and a thesis, or examinations and extended essays, as directed by the Head of the Department. A candidate may also be required to take an oral examination.