
1. Objectives

There is nowadays an almost universal recognition of the need for evidence based decision making. Decisions need to be based on optimum use of all relevant available information. Furthermore, decisions almost always have to be made in the face of uncertainty. Analysing data to provide support for informed decision making and for addressing uncertainty is the business of statistical science. In recent years, a number of specialised statistical tools and techniques have evolved to respond to the needs of industry, business, finance, insurance, social and economic planning. There has also been a shift in the perspective on uncertainty with increased emphasis on an approach that integrates prior information, experience or expert knowledge with data and information on the costs of alternative decisions as opposed to the classical approach that relies exclusively on data.

The objectives of the MSc Applied Statistics are:

(i) To consolidate the statistical and quantitative skills previously acquired by students so as to provide them with a solid general foundation and a mastery of statistical and quantitative techniques applicable in a wide variety of fields.

(ii) To develop competencies and skills relevant in specialised application areas of statistical science.

(iii) To develop competencies in the application of technology to identify solutions though the use of computers, software and computer programming.

(iv) To provide a solid basis for research in Statistics.

2. General Entry Requirements

Successful completion of an undergraduate degree with

- at least a Second Class or 50%, whichever is applicable or
- a GPA not less than 2.5 out of 4 or equivalent, from a recognised higher education institution

OR alternative qualifications acceptable to the University of Mauritius

3. Programme Requirements

A degree in Statistics, Mathematics or Economics with strong coverage of statistics/econometrics

Or equivalent qualifications acceptable to the University of Mauritius.
4. General and Programme Requirements - Special Cases

The following may be deemed to have satisfied the general and programme requirements for admission:

(i) Applicants who do not satisfy any of the requirements as per Regulations 3 above but who submit satisfactory evidence of having passed examinations, which are deemed by the Senate to be equivalent to any of those listed.

(ii) Applicants who do not satisfy any of the requirements as per Regulations 3 above but who in the opinion of Senate submit satisfactory evidence of the capacity and attainments requisite to enable them to pursue the programme proposed.

(iii) Applicants who hold a full practising professional qualification obtained by examination.

5. Programme Duration

The programme will be offered on a part-time basis.

<table>
<thead>
<tr>
<th></th>
<th>Normal (Yrs)</th>
<th>Maximum (Yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s Degree:</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Postgraduate Diploma:</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

6. Credits per Year

Minimum credits per year – 6 (or as presented by the faculty).

7. Minimum Credits Required for Awards

<table>
<thead>
<tr>
<th></th>
<th>Core Modules</th>
<th>Dissertation</th>
<th>Electives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s Degree</td>
<td>18 credits</td>
<td>6 credits</td>
<td>12 credits</td>
<td>36 credits</td>
</tr>
<tr>
<td>Postgraduate Diploma</td>
<td>18 credits</td>
<td>-</td>
<td>6 credits</td>
<td>24 credits</td>
</tr>
</tbody>
</table>

8. Assessment

Students are required to register for modules, which they intend to follow in a given semester/year.

Each yearly module will be assessed over 100 marks and each semester module will be assessed singly over 100 marks.

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2 hour duration for modules carrying less or equal to three credits, 2½ hour paper for modules carrying 3.5–4.5 credits and 3 hour paper for modules carrying five-six credits) and on continuous assessment done during the semester or year.

Written examinations for modules, whether taught in semester 1 or in semester 2 or both will be conducted at the end of the academic year.

The continuous assessment will count for 10-40% of the overall percentage mark of the module(s), except for a Programme of Studies where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and/or assignments and should include at least one class test.
A minimum of at least 30% should be attained in each of continuous assessment and written examination with an overall total of 40% for a candidate to pass a module (unless otherwise specified). Special examinations (e.g. class test) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

Students are required to submit work for continuous assessment by due dates. Failure to do so will normally incur penalties.

All modules carry their own credit value.

**Submission Deadlines for Dissertation**

- First Draft: End of July in the Final Year
- Final Copy: Last working day of August in the Final Year

9. **Repeat and Termination of Registration**

If the CPA of a student is < 40 for an academic year, s/he will have to repeat the entire academic year, and retake modules as and when offered. However, s/he will not be required, if s/he wishes, to retake module(s) for which Grade C or above has been obtained.

Students will be allowed to repeat only once over the entire duration of the Programme of Studies.

Registration of a student will be terminated if

(i) the CPA < 40 at the end of an academic year and the student has already repeated one year of study; or  
(ii) the maximum duration allowed for completion of the Programme of Studies has been exceeded.

10. **Choice of Electives**

Students will be required to submit their choice of Electives in order of priority by the middle of Semester 1 of Year 1.

The University reserves the right not to offer a given elective module if the critical number of students is not attained and/or if there are resource constraints. Additional electives may also be offered, depending on availability of resources.

11. **List of Modules**

**CORE MODULES**

- STAT 5002(1) Survey Methods and Survey Data Analysis
- STAT 5010(1) Statistical Inference and Decision Theory
- STAT 5011(1) Applied Linear Models
- STAT 5012(1) Applied Multivariate Methods
- MATH 6045(1) Computational Statistics

**ELECTIVES**

- Application Area: Economic & Social Statistics
  - STAT 6009(1) Dynamic models and Forecasting
  - STAT 6011(1) Educational Statistics
STAT 6021(1) Demographic Methods and Population Analysis
STAT 6022(1) Experiments & Models in Social Research
STAT 6023(1) Measurement of Economic and Social Phenomena
ECON 6032(1) Quantitative Development Economics
SCDV 5101(1) Perspectives on Social Development
ECON 5118(1) Econometric Methods

Application Area: Industrial & Financial Statistics
MATH 6013(1) Financial Risk Analysis
MATH 6033(1) Operational Research
MATH 6051(1) Stochastic Processes
MATH 6053(1) Statistical Quality Control
MATH 6055(1) Actuarial Mathematics
MATH 6056(1) Simulation
MATH 6057(1) Medical Statistics
MATH 6058(1) Numerical Analysis
MATH 6059(1) Statistical Methods in Quantitative Finance
MATH 6060(1) Mathematics of Finance

12 Programme Plan

<table>
<thead>
<tr>
<th>Code Core</th>
<th>Module Name</th>
<th>Hrs/Wk L+P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT5002(1)</td>
<td>Survey Methods and Survey Data Analysis¹</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STAT5010(1)</td>
<td>Statistical Inference and Decision Theory¹²</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>STAT5011(1)</td>
<td>Applied Linear Models¹</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STAT5012(1)</td>
<td>Applied Multivariate Methods²</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6045(1)</td>
<td>Computational Statistics¹</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

¹: Taught in first semester  ²: Taught in the second semester  ¹&² Taught in both semesters

Year 2

<table>
<thead>
<tr>
<th>Code Electives</th>
<th>Module Name</th>
<th>Hrs/Wk L+P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four electives to be selected from the same Application Area (Three in semester 1 and One in Semester 2)</td>
<td>3 each</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Project

<table>
<thead>
<tr>
<th>Project</th>
<th>Module Name</th>
<th>Hrs/Wk L+P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project in Applied Statistics (To be submitted at end of Semester 2)</td>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

NOTE:

(i) Electives will be offered subject to availability of minimum number of students and Faculty resources.
(ii) Students will take 4 electives, a minimum of 3 should be from one of the same application areas.
(iii) Students will take three electives in the first semester and one elective in the second semester. All exams are held in the second semester.
(iv) Project will be handed in at the end of the second semester.
13. Outline Syllabus

CORE MODULES

STAT5002(1) - SURVEY METHODS AND SURVEY DATA ANALYSIS

STAT5010(1) - STATISTICAL INFERENCE & DECISION THEORY

STAT5011(1) - APPLIED LINEAR MODELS

STAT5012(1) - APPLIED MULTIVARIATE METHODS

MATH 6045(1)-COMPUTATIONAL STATISTICS
Use of packages (R/Matlab etc.) to illustrate the following: Input, Output data manipulation. Illustrate different statistical techniques. Monte Carlo experiments with applications in different fields. Function optimisation.

ELECTIVES

APPLICATION AREA: ECONOMIC AND SOCIAL STATISTICS

STAT6009(1) - DYNAMIC MODELS AND FORECASTING

STAT 6011(1) - EDUCATIONAL STATISTICS

STAT6021(1) - DEMOGRAPHIC METHODS AND POPULATION ANALYSIS
Sources of demographic data. The measurement and analysis of fertility and birth intervals, mortality, nuptiality, migration. Bongaarts' framework. Cohort and period approaches to measurement Standardised Rates. Construction and Interpretation of life tables. Stationary and Stable populations.

STAT6022(1) - EXPERIMENTS AND MODELS IN SOCIAL RESEARCH

STAT6023(1) - MEASUREMENT OF ECONOMIC AND SOCIAL PHENOMENA
Sources of social and economic data. Problems of data collection and interpretation. Principles of statistical measurement. Techniques for ensuring validity, reproducibility, comparability. Problems of measurement in specific areas such as productivity, poverty, crime etc. Gini coefficient: Properties, Uses, Limitations and disaggregation. Alternative Inequality measures. Price, Wage and other Indices. Methodology of Economic and Social Indicators, simple and composite: Construction, Interpretation and Uses. The measurement of emerging economic and social concerns such as the non observed economy, business confidence, pollution and environmental degradation, gender equity.

ECON 6032(1)- QUANTITATIVE DEVELOPMENT ECONOMICS

SCDV5101(1) - PERSPECTIVES ON SOCIAL DEVELOPMENT

ECON 5118(1) - ECONOMETRIC METHODS

APPLICATION AREA: INDUSTRIAL & FINANCIAL STATISTICS

MATH 6013(1)- FINANCIAL RISK ANALYSIS
Diversification, Immunization and Hedging and their Limits, Value at Risk, Risk Analysis of fixed income portfolios, Options and dynamic replication, Credit risk (ratings based models, structural models, reduced form models), Credit derivatives, Operational risk Models.

MATH 6033(1)- OPERATIONAL RESEARCH
Multiobjective programming problems, Network optimisation, Game theory, Case studies.

MATH 6051(1)-STOCHASTIC PROCESSES
Discrete-time Markov chains; Martingales, Brownian motion and renewal processes.

MATH 6053(1)- STATISTICAL QUALITY CONTROL
Modelling Process Quality, Statistical Process control, Control charts, Process capability analysis,
Acceptance sampling for attributes.

**MATH 6055(1) – ACTUARIAL MATHEMATICS**
The economics of insurance, Utility theory, Application of probability to problems of life and death, Determination of single premiums for insurances and annuities in both the discrete and continuous cases.

**MATH 6056(1)- SIMULATION**
Generation of uniform and non-uniform random numbers, Discrete event simulation, Input modelling, Simulation design, Statistical analysis of simulation output, Monte Carlo Methodologies.

**MATH 6057(1)- MEDICAL STATISTICS**
Clinical Trials – Concepts and design: controlled and uncontrolled clinical trials; historical controls; protocol; placebo; randomisation; blind and double blind trials; ethical issues; protocol deviations. Size of trials. Multiplicity and meta-analysis: interim analyses; multi- centre trials; combining trials. Cross- over trials. Binary response data: logistic regression modelling; McNemar’s test. Survival Data Analysis – Concepts: survivor function; hazard function; censoring. Single sample methods: lifetables; Kaplan-Meier survival curve; parametric models. Two sample methods: log-rank test; parametric comparisons. Regression models: inclusion of covariates; Cox’s proportional hazards model; competing risks.

**MATH 6058(1)-NUMERICAL ANALYSIS**
Arithmetic and well-posed computation, matrix inversion and solution of systems of linear equations, Computation of eigen values and eigen vectors.

**MATH 6059(1)- STATISTICAL METHODS IN QUANTITATIVE FINANCE**

**MATH 6060(1) - MATHEMATICS OF FINANCE**
Time Value of Money, NPV and IRR, Bonds, Yields, Bond Price Volatility, Duration, Convexity, Forward Rates, Forward Rate Agreements, Swaps, term structure of Interest Rates, Deterministic and Stochastic Interest Rates, Term Structure Models, Portfolio management, analysis of Equity Investments