



UNIVERSITY  
of  
TECHNOLOGY,  
MAURITIUS

## School of Innovative Technologies and Engineering

Department of Applied Mathematical Sciences

# BSc (Hons) Business Statistics

## PROGRAMME DOCUMENT

VERSION 1.0

*BBSv1.0*

May 2017

### A. Programme Information

Business statistics is concerned with the use of several analysis strategies and decision rules to provide industrial managers with critical views of the operational and performance characteristics of the business. Through sophisticated techniques like data mining, exploratory and predictive models amongst others, business analytics experts proceed by examining available data to have a better understanding of a company's past and current positions, foresee prospect upshots and take efficient actions.

This honours programme help in providing the essential tools for an effective application of statistics in a wide range of industrial sectors including education, consulting firms, agriculture, medicine and healthcare sectors, offshore companies, financial institutions, government agencies, economics, marketing, engineering, IT, energy companies, meteorological services, investment firms, banks and insurance amongst others. Moreover, the students enrolled on the programme on full-time basis will be required to undergo a work placement at the second level of the course of study.

### B. Programme Aims

This programme is designed to equip students with both theoretical and practical statistical skills for industry. The programme covers aspects including computer science, education, economics and marketing amongst others.

### C. Programme Objectives

After successful completion of the programme, graduates will be expected to

- have acquired adequate statistical skills for data analysis and interpretation
- have gained a broad insight in statistical decision making for industrial problems
- demonstrate an understanding of statistical packages required for computational statistics
- show an ability to conduct surveys
- have developed a sense of critical statistical reasoning
- build the necessary confidence in working independently

## **PART I - Regulations**

### **D. General Entry Requirements**

As per UTM's Admission Regulations, and Admission to Programmes of Study at Degree Level or APL/APEL requirements.

### **E. Programme Entry Requirements**

EITHER

At least a grade B in ASqLevel in Mathematics

OR

At least a grade B in ASqLevel Mathematics

### **F. Programme Mode and Duration**

Full Time: Minimum 3 Years, Maximum 6 Years (Minimum 6 Semesters, Maximum 12 Semesters)

Part Time: Minimum 4 Years, Maximum 7 Years (Minimum 8 Semesters, Maximum 14 Semesters)

### **G. Teaching and Learning Strategies**

- Lectures, Tutorials and Practical Laboratory Sessions;
- Class Tests and Assignments;
- Structured Discussions and Self Directed Study;
- Workshops and Seminars;
- Case Study of Real World Problems;
- Work Placement (Full Time Mode Only).

### **H. Student Support and Guidance**

Each cohort of the programme is allocated a Programme Coordinator who acts as a liaison between the students and school management and provides support for academic management of the programme.

### **I. Attendance Requirements**

As per UTM's Regulations and Policy

### **J. Credit System**

For the award of a Certificate, a minimum of 35 credits are required.

For the award of a Diploma, a minimum of 68 credits are required.

For the award of an Ordinary Degree, a minimum of 95 credits are required.

For the award of a Degree, a minimum of 104 credits are required.

## K. Student Progress and Assessment

The programme is delivered mainly through lectures, tutorials, and practical laboratory sessions. Students are expected to be as autonomous as possible and activities may include reading research articles, delivering presentations, taking part in quizzes, case-studying amongst others. Each module carries 100 marks and unless otherwise specified will be assessed as follows:

- Written and/or practical examination, and continuous assessment carrying up to 40% of total marks.
- Continuous assessment can be based on a combination of assignments, field study, workshops, practical and class tests.
- For the mini-project in the part time version of the programme structure, the students are required to work on a project with significant mathematical/statistical content. Upon completion of the projects, the students must submit a report.

Module grading structure:

<b>Grade</b>	<b>Marks x (%)</b>
A	$70 \leq x < 100$
B	$60 \leq x < 70$
C	$50 \leq x < 60$
D	$40 \leq x < 50$
F	$x < 40$
A . D	Pass
F	Fail

## L. Evaluation of Performance

1. The % mark at Level 1 contributes a 20% weighting towards the degree classification.
2. The % mark at Level 2 contributes a 30% weighting towards the degree classification.
3. The % mark at Level 3 contributes a 50% weighting towards the degree classification.

## M. Award Classification

<b>Overall weighted mark y (%)</b>	<b>Classification</b>
$70 \leq y < 100$	1 <sup>st</sup> Class Honours
$60 \leq y < 70$	2 <sup>nd</sup> Class 1 <sup>st</sup> Division Honours
$50 \leq y < 60$	2 <sup>nd</sup> Class 2 <sup>nd</sup> Division Honours
$45 \leq y < 50$	3 <sup>rd</sup> Class Honours
$40 \leq y < 45$	Pass Degree
$y < 40$	No Award

## N. Programme Organisation and Management

Programme Director: Dr Kumar Dookhitram  
Contact Details:

- Telephone Number: 207 52 50 (Ext. 306)
- Email: kdookhitram@umail.utm.ac.mu

## PART II - Programme Structure

### O. BSc (Hons) BUSINESS STATISTICS – Full Time (Version 1.0)

YEAR 1 (Level 1)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
MATH 1305C	<i>Calculus Fundamentals</i>	2+1	3	MATH 1306C	<i>Matrices and Advanced Calculus</i>	2+1	3
ECON 1104C	<i>Business Economics</i>	2+1	3	STAT 1205C	<i>Statistical Consulting</i>	2+1	3
STAT 1202C	<i>Statistics Essentials</i>	2+1	3	STAT 1206C	<i>Multivariate Statistics</i>	2+1	3
ACCF 1101C	<i>Accounting</i>	2+1	3	STAT 1207C	<i>Statistical Reasoning</i>	2+1	3
COMP 1103C	<i>Statistical Computing I</i>	2+2	4	STAT 1308C	<i>Statistical Process Control</i>	2+1	3
				COMP 1104C	<i>Data Analysis and Visualization</i>	2+2	4
YEAR 2 (Level 2)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 1203C	<i>Statistical Models</i>	2+2	4	STAT 2310C	<i>Business Forecasting</i>	2+2	4
STAT 2208C	<i>Marketing Research</i>	2+1	3	MATH 2310C	<i>Management Science I</i>	2+1	3
MGMT 1103C	<i>Management Principles</i>	2+1	3	PROJ 2119C	<i>Work Placement</i>	-	4
MATH 2309C	<i>Numerical Linear Algebra</i>	2+2	4				
STAT 2309C	<i>Design and Analysis of Industrial Experiments</i>	2+2	4				
UTM 2101C	<i>Life Skills and Good Practices</i>	2+2	4				
YEAR 3 (Level 3)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 3313C	<i>Data Mining for Business Intelligence</i>	2+2	4	STAT 3316C	<i>Machine Learning</i>	2+2	4
COMP 3105C	<i>Statistical Computing II</i>	2+2	4	STAT 2306C	<i>Multivariate Analysis</i>	2+2	4
STAT 3314C	<i>Bayesian Inference and Decision Makings</i>	2+2	4	STAT 2311C	<i>Stochastic Models</i>	2+1	3
MATH 3311C	<i>Management Science II</i>	2+2	4				
PROJ 3112C	<i>Project</i>						9

**P. BSc (Hons) BUSINESS STATISTICS – Part Time (Version 1.0)**

YEAR 1							
→ <i>Start of Level 1</i>							
<i>Semester 1</i>				<i>Semester 2</i>			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
MATH 1305C	<i>Calculus Fundamentals</i>	2+1	3	STAT 1205C	<i>Statistical Consulting</i>	2+1	3
STAT 1202C	<i>Statistics Essentials</i>	2+1	3	STAT 1206C	<i>Multivariate Statistics</i>	2+1	3
ECON 1104C	<i>Business Economics</i>	2+1	3	MATH 1306C	<i>Matrices and Advanced Calculus</i>	2+1	3
COMP 1103C	<i>Statistical Computing I</i>	2+2	4	ACCF 1101C	<i>Accounting</i>	2+1	3
YEAR 2							
				→ <i>Start of Level 2</i>			
<i>Semester 1</i>				<i>Semester 2</i>			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 1207C	<i>Statistical Reasoning</i>	2+1	3	STAT 2208C	<i>Marketing Research</i>	2+1	3
STAT 1308C	<i>Statistical Process Control</i>	2+1	3	STAT 1203C	<i>Statistical Models</i>	2+2	4
COMP 1104C	<i>Data Analysis and Visualization</i>	2+2	4	MGMT 1103C	<i>Management Principles</i>	2+1	3
				MATH 2309C	<i>Numerical Linear Algebra</i>	2+2	4
				PROJ 2118 C	<i>Mini Project</i>	-	-
End of Level 1 →							
YEAR 3							
				→ <i>Start of Level 3</i>			
<i>Semester 1</i>				<i>Semester 2</i>			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 2309C	<i>Design and Analysis of Industrial Experiments</i>	2+2	4	STAT 3313C	<i>Data Mining for Business Intelligence</i>	2+2	4
STAT 2310C	<i>Business Forecasting</i>	2+2	4	COMP 3105C	<i>Statistical Computing II</i>	2+2	4
MATH 2310C	<i>Management Science I</i>	2+1	3	STAT 3314C	<i>Bayesian Inference and Decision Makings</i>	2+2	4
UTM 2101C	<i>Life Skills and Good Practices</i>	2+2	4				
PROJ 2118C	<i>Mini Project</i>	-	4				
End of Level 2 →							

YEAR 4							
<i>Semester 1</i>				<i>Semester 2</i>			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 3316C	<i>Machine Learning</i>	2+2	4	STAT 2306C	<i>Multivariate Analysis</i>	2+2	4
MATH 3311C	<i>Management Science II</i>	2+2	4	STAT 2311C	<i>Stochastic Models</i>	2+1	3
PROJ 3112C	<i>Project</i>						9
				<b>End of Level 3 →</b>			

## **Q. Module Outline**

### **MATH 1323C: CALCULUS FUNDAMENTALS**

Functions, limits, derivatives and Mean Value Theorem. Differentiation calculus, further differentiation of trigonometric and inverse trigonometric function. Taylor's Theorem. Indeterminate forms. Hyperbolic functions. First order differential equations: separable equations, homogeneous equations, integrating factors. Linear ordinary differential equations of second and higher order. Complex numbers. Polar coordinates.

### **ECON 1104C: BUSINESS ECONOMICS**

Goals of organisations and their stakeholders. Measuring returns to shareholders. Market systems. Economic systems (planned, market, mixed). Decision making (theory of choice, firms and supply). Competition (monopoly, oligopoly, perfect competition). Market structure. Market failures. Government intervention (government regulation, fiscal policy, monetary policy). Financial systems. The macroeconomic context of organisations. International trade and finance.

### **STAT 1215C: STATISTICS ESSENTIALS**

Data representation, group and ungrouped data. Measures of central tendency and dispersion. Kurtosis, skewness. Permutation and combination. Axioms of probability, conditional probability, total law of probability and independence. Bayes' theorem. Conditional expectations. Characteristic functions. Moment generating functions. Discrete and continuous distributions. Central limit theorem, sample and estimations.  $\chi^2$ , t- and F-distributions. Confidence intervals. Hypothesis testing

### **ACCF 1101C: ACCOUNTING**

Basic principles of accounting. The role of accounting standards. Different types of business entity. Basic structure of company accounts. Interpretation and limitation of company accounts. Principles of double entry book-keeping. Preparation of financial statements: final account and cash flow as per IAS1. Interpretation of financial statements. Management information for decision making. Cost classification. Cost control. Budget and budgetary control. Constructing flexible and cash budgets.

### **COMP 1104C: STATISTICAL COMPUTING I**

This course uses Excel and Access. Excel: worksheets, formulas, functions & formatting, what-if analysis, charting, visual basic programming and illustration of kurtosis. Access: database design, tables, sorting, searching & filtering, relationships, manipulating data & queries and printing reports.

### **MATH 1327C: MATRICES AND ADVANCED CALCULUS**

Matrices, determinants, inverse and rank. Solution to linear systems of equations. Eigenvalue problems and properties. Dot product, cross product, lines and planes. Directional derivatives, gradient, divergence and curl. Coordinates systems: polar, cylindrical and spherical. Partial differentiation. Multiple integrals.



### **STAT 1222C: STATISTICAL CONSULTING**

Introduction to statistical consulting. Stages of consulting process: establishing rapport, identifying the research problem, setting goals, agreeing on a division of responsibilities and reviewing what occurred. Effective consulting principles. Meeting skills: ideal statistical consulting & the satisfied customer, communication essentials, literary communication, spoken communication and listening as communication. Non-verbal communication: report-writing, drafting of contracts and final presentation. Professional practice: difference between a statistician and statistical consultant, consulting role, interpersonal skills, asking good question and negotiation skills. Choice of statistical method based on the problem type. Dealing with difficult scenarios.

### **STAT 1223C: MULTIVARIATE STATISTICS**

Multivariate distributions. Jacobian transformation formula. Joint probability distributions. Fisher information. Sufficiency and completeness. Consistency and unbiasedness. Exact and asymptotic pivotal method. Likelihood ratio test. Neyman-Pearson lemma and weak law of large numbers. Statement of multivariate CLT and applications.

### **STAT 1224C: STATISTICAL REASONING**

Samples, good and bad. Experiments, good and bad. Experiments in the real world. Data ethics. Measuring. Do the numbers make sense? Organizing and displaying data. Describing relationships. The consumer price index and government statistics. Probability models. Simulation. Inference. Use and abuse of statistical inference. Two-way tables and the Chi-square test.

### **STAT 1325C: STATISTICAL PROCESS CONTROL**

Definitions and examples in sampling inspection. Categorization of inspection. Acceptance sampling, method of choosing sampling plans. Control charts. Moving average charts. Equal weight moving average charts. Process capability analysis.

### **COMP 1105C: DATA ANALYSIS AND VISUALIZATION**

This course uses R and MATLAB. MATLAB: basic data types, control structures, selection and loops, functions, basis statistical indicators, data analysis and visualization techniques. R: vectors, factors, and uni-variate time series, graphics in R., data analysis, statistical models and inference

### **STAT 1216C: STATISTICAL MODELS**

Linear regression. Regression diagnostics. Multiple linear regression. Analysis of variance. Generalized linear models. Structural equation models. R practical.

### **STAT 2208C: MARKETING RESEARCH**

Marketing research process. Research design alternatives and quality research. Information types and sources. Survey sampling and data collection methods. Measuring scales. Designing data collection forms. Summarizing data. Analysing findings.

### **MGMT 1103C: MANAGEMENT PRINCIPLES**

An introduction to organization mission, vision and values. Organizational management (planning, leadership, organizing, controlling). Change management and strategic change management. Planning and strategic planning. Management information system.

### **MATH 2328C: NUMERICAL LINEAR ALGEBRA**

Floating point arithmetic, errors and error propagation. Interpolation and approximation. Linear independence, basis and dimension. Orthogonal and orthonormal bases. Givens rotations and Householder transformations. Iterative methods for linear system of equations. Least squares problems. Numerical solvers for eigenvalue problems; power method and its variants.

### **STAT 2327C: DESIGN AND ANALYSIS OF INDUSTRIAL EXPERIMENTS**

Analysis of covariance, factorial experiments. Respond surface design. Confounded, fractional factorial and split-plot designs. Repetitive measures. Change-over and incomplete block design. Use of R package.

### **UTM 2101C: LIFE SKILLS AND GOOD PRACTICES**

Employability development skills. Good governance. Prevention of corruption. Personal development skills and role of youth in addressing societal challenges. Coping skills. Addressing societal challenges including substance abuse, poverty, climate change, social media and family problems.

### **STAT 2328C: BUSINESS FORECASTING**

Time series. Stationary process, auto-covariance functions. Wold's decomposition theorem. Partial autocorrelation. Trend, seasonal and non-seasonal. ARMA and ARIMA Models. Exponential smoothing. Business analysis and forecasting. Use of R package

### **MATH 2329C: MANAGEMENT SCIENCE I**

Simplex method. Transportation and assignment. Integer programming. Nonlinear optimization. Quadratic programming, Lagrange multipliers. Conjugate gradient method. Preconditioning techniques.

### **PROJ 2119C: WORK PLACEMENT**

As per the work placement guidelines of the University.

### **PROJ 2118C: MINI PROJECT**

Demonstration of the ability to conduct rigorous research and reach to comprehensive conclusions for a specific problem. Topics to be covered: research process, ethics of research, research problems, developing research questions/hypotheses, choosing a research method, presenting & analysis findings and writing a research report. The teaching strategies will include 45 hours of face-to-face contact hours spread over two semesters.

### **STAT 3331C: DATA MINING FOR BUSINESS INTELLIGENCE**

Data mining process. Data exploration. Dimension reduction. Performance evaluation. Prediction and classification methods.

### **COMP 3106C: STATISTICAL COMPUTING II**

Random number generation. Random variable generation. Inverse transform technique. Acceptance rejection method. Variance reduction techniques. Monte Carlo simulation. Probability density estimation. R/MATLAB programming.

### **STAT 3332C: BAYESIAN INFERENCE AND DECISION MAKINGS**

Inference from observation. Monte Carlo approximation. Gibbs Sampling. Hierarchical Bayesian models. Hypothesis tests and Bayes factors. Bayesian regression. R practical.

### **MATH 3330C: MANAGEMENT SCIENCE II**

Introduction to operational research. Network optimization, shortest route problem. Travelling salesman and distribution problems. Project planning and implementation. Inventory. Use of statistical packages.

### **STAT 3334C: MACHINE LEARNING**

Inductive classification. Decision tree learning. Artificial neural networks. Evaluating hypotheses. Bayesian learning. Computational learning theory. Genetic algorithms. Artificial neural networks. MATLAB practical.

### **STAT 2320C: MULTIVARIATE ANALYSIS**

Multivariate and multi-normal distribution. Multivariate regression analysis. Principal component analysis. Factor analysis. Canonical correlation analysis. Discriminant analysis. Cluster analysis. Correspondence analysis. Multi-dimensional scaling. Directional data.

### **STAT 2329C: STOCHASTIC MODELS**

Conditional expectation. Generating functions. Probability generating functions. Random walk. Branching process. Discrete Markov chains. Poisson process. Continuous time Markov chains. Kolmogorov's equations. Elements of queuing theory.

### **PROJ 3112C: PROJECT**

Project guidelines will be given in the Project Handbook