



Masters in Business Statistics (MBS) - 2014/2015

Department of Mathematics  
Faculty of Engineering  
University of Moratuwa  
Moratuwa

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**CURRICULUM AND SCHEME OF EVALUATION**

**Compulsory Modules**

Code	Compulsory Module	Credits	Evaluation (%)	
			Continuous Assignment	Final Exam
MA 5210	Probability and Statistics	3	40±10	60±10
MA 5202	Statistical Modeling in Business	4	40±10	60±10
MA 5203	Time Series Analysis for Business Forecasting	4	40±10	60±10
MA 5211	Quantitative Analysis for Management	3	40±10	60±10
MA 5212	Survey Samplings for Business	3	40±10	60±10
MA 5213	Statistical Quality Control	3	40±10	60±10
MA 5207	Applied Multivariate Techniques in Business	5	40±10	60±10
MA 5214	Operational Research Techniques	3	40±10	60±10
MA 5238	Financial Derivatives	2	40±10	60±10
MA 5215	Analysis of Categorical data in Business	3	40±10	60±10
MA 5239	Investment and Portfolio	2	40±10	60±10
MA 5290	Project on Business Statistics for Diploma	4	-	100
MA 5291	Research Project for M Sc	20	-	100

Elective Modules (One module has to be selected)

Code	Elective Modules	Credits	Evaluation (%)	
			Continuous Assignment	Final Exam
MA 5231	Computer Software in Business and Management	3	40±10	60±10
MA 5232	Principles of Marketing	3	40±10	60±10

## SYLLABI OF COURSE UNITS

### **MA 5210 Probability and Statistics (3 Credits)**

#### **Learning Objectives:**

The aim of this course is to train students to carry out explanatory data analysis using descriptive statistics and interpret results.

#### **Outline Syllabus:**

Probability distribution theory, conditional probability, Bayes theorem, discrete and continuous random variables, estimations, bias and unbiased estimators, confidence intervals under different conditions, properties of common probability distributions (Binomial, Normal, Poisson, Exponential, Gamma), sample and population properties, testing statistical hypothesis, decision theory and utility theory, describing data sets using various statistical indicators, summarizing data, methods of presenting variability in data series, use of MINITAB softwares for explanatory data analysis.

#### **Learning Outcome:**

- Able to understand a working knowledge of basic techniques in probability
  - Able to analyse data using descriptive statistics and interpret findings in a scientific manner
  - Able to look at data more logically, analytically, critically and creatively
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### **MA 5202 Statistical Modeling in Business (4 Credits)**

#### **Learning Objectives:**

The aim of this course is to introduce statistical linear methods for analyzing quantitative response data in business environment.

#### **Outline Syllabus:**

**Regression Analysis:** Introduction to simple linear regression, parameter estimation using least square methods, coefficient of determination, properties of the parameters, inferences in regression, matrix approach to linear regression, lack of fit tests, multiple linear regression, model selection procedures in multiple regression, residuals and influence diagnostics, detecting and combating multicollinearity, linear and non linear transformations, Box-Cox transformation, non-linear regression, comparison of regression models and use of dummy variables in regression.

**Experimental Designs:** Basic concepts of experimental design, Completely Randomized Design, Randomized Complete Block Design, Latin Square Design, Incomplete Block Design, factorial experiments; concept of confounding, confounding in  $2^n$  factorial experiments, partial confounding, fractional replication; response surface designs.

**Data Analysis:** Real data sets are analyzed using SAS, SPSS and Minitab

#### **Learning Outcome:**

- Able to appreciate the importance of statistical analysis and skills in business and management
  - Able to use statistical software with confidence
  - Able to apply statistical models to solve business problems
  - Able to interpret statistical inferences to understand the business people
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### **MA 5203 Time Series Analysis for Business Forecasting (4 Credits)**

#### **Learning Objectives:**

The purpose of this course is to provide students various statistical tools for forecasting of production and financial time series data.

#### **Outline Syllabus:**

Introduction of time series, concept of autocorrelation and partial autocorrelation, causal models in forecasting, decomposition analysis in forecasting, smoothing techniques in forecasting, concept of stationary time-series data, Box-Jenkins models in forecasting, use of seasonal ARIMA models, filtering techniques, heteroskedasticity in

financial time series, ARCH and GARCH models, concept of multivariate time series, co-integration modeling, Dickey-Fuller test.

**Data Analysis:** Real data sets are analyzed using SAS, SPSS and Minitab

**Learning Outcome**

- Able to understand the various times series forecasting models
  - Able to select the best fitted forecasting model for a given set of data series
  - Able to understand the difference between normal time series and financial time
  - Able to develop ARCH/GARCH models for financial time series data
  - Able to use software such as Eviews, Minitab and SPSS with confident
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**MA 5211 Quantitative Analysis for Management (3 Credits)**

**Learning Objectives:**

The objective of this course is to introduce the use of mathematical approaches to solve managerial problems.

**Outline Syllabus:** Linear programming problems, graphical method, Simplex method, economic interpretation of LPP, transportation algorithms, balanced and unbalanced transportation problems, degeneracy, assignment problems, transshipment problems, network flows, maximal flow, minimal flow, minimum spanning tree, and shortest path algorithm in the network, labeling technique, connection between network flow and transportation, matrix solution, and inventory control.

**Learning Outcome:**

- Able to understand a working knowledge of basic techniques in operational research
  - Able to report and interpret findings in a scientific and concise manner
  - Able to solve problems independently and collaboratively as part of a team
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**MA 5212 Survey Samplings for Business (3 Credits)**

**Learning Objectives:**

This objective of this course is to provide sound knowledge in conducting and analyzing a survey for business/marketing project.

**Outline Syllabus:**

Basic ideas in sampling, simple random sampling, probability proportional sampling, systematic sampling, stratified sampling, cluster sampling, multistage-sampling, double sampling procedures, allocation of sample, estimation problems, ratio and regression estimators, questionnaire design, management of surveys, coding variables, computerizing data, preparing tables and figures, common techniques in analysis of survey data and writing survey reports.

**Data Analysis:** Real data sets are analyzed using SPSS

**Learning Outcome**

- Able to design a survey depending on the conditions
  - Able to design a questionnaire to acquire information for the survey
  - Able to analyze data from a survey and write a report
  - Able to interpret findings in a scientific and concise manner
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**MA 5213 Statistical Quality Control (3 Credits)**

**Learning Objectives:**

The objective of the course is to provide students statistical quality control techniques for producing affordable products that meet customer and consumer expectations.

**Outline Syllabus:**

Fundamental concepts of quality control, concepts of statistical quality control, quality improvement tools, systematic variation, random variation. chance and assignable causes, Standardization and Concepts on Total Quality Management, Quality Management Systems, Laboratory Management, Statistical Process Control in Production and Service Systems, Control charts for  $\bar{x}$ , R, and S, control charts for attributes, control charts for fractional rejected, control charts for nonconformities, accepting sampling

problem, operating characteristic curve, single sampling plan for attributes, double, multiple, and sequential sampling, the Dodge-Romig sampling plans (AOQL and LTPD plans), capable process, capability & performance indices, control charts for multiple assignable causes.

**Learning Outcome**

- Able to learn about many statistical methods commonly used by industry for quality controlling
  - Able to monitor and improve the quality of products resulting from industrial processes after statistical analysis
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**MA 5207 Applied Multivariate Techniques in Business (5 Credits)**

**Learning Objectives:**

The aim of the course is to focus on the analysis of multivariate data in business environment.

**Outline Syllabus:**

Types of measurement scales, geometric concept of multivariate data, multivariate plots and diagrams, basic concept of matrices and eigen values, introduction to data mining and warehousing, properties of multivariate normal distribution, multiple/multivariate regression techniques, principal component analysis, factor analysis, confirmatory factor analysis, cluster analysis, two group and multiple group cluster analysis, canonical correlation analysis, multivariate analysis of variance.

**Data Analysis:** Real data are analyzed using statistical software such as Minitab, SPSS and SAS

**Learning Outcome**

- Able to use various multivariate statistical data mining methods
  - Able to identify the most suitable multivariate techniques for a given data
  - Able to interpret the results and apply for decision making
  - Able to use Minitab, SPSS and SAS for multivariate data analysis
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**MA 5214 Operational Research Techniques (3 Credits)**

**Learning Objectives:**

The aim of the course is to introduce students the probabilistic approach to managerial decision-making.

**Outline Syllabus:**

Revised simplex algorithm, Dual Simplex Algorithm, sensitivity analysis, parametric programming, integer programming, Gomory's cutting plane, branch and bound, the Knapsack problem, delayed column generation, the cutting stock problem, decision theory, structuring the decision situations, decision making under uncertainty, utility theory, dynamic programming, waiting line theory, queue discipline, introduction to stochastic processes, Markov chains, Basics in game theory and introduction to simulation.

**Learning Outcome**

- Able to understand a working knowledge of advance techniques in operational research
  - Able to solve problems independently and collaboratively as part of a team
  - Able to write reports and interpret the findings in a scientific and concise manner
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**MA 5238 Financial Derivatives (2 Credits)**

**Learning Objectives:**

The purpose of this course is to provide skills and knowledge in understanding and analyzing financial derivative in the market.

**Outline Syllabus:**

This discusses the basic derivatives such as, forward contracts, futures contracts, options and SWAPs, types of trades such as, hedgers, speculators and arbitrageurs, pricing methods such as, binomial models and Black-Scholes-Merton model, uses of derivatives such as, hedging, speculation and to make arbitrage profits, the market mechanism for various types of derivative trading and the lessons for users of derivatives in financial and non-financial firms.

**Learning Outcome**

On satisfactory completion of this course student will be able to:

- Understand various derivative securities available in financial markets
  - Understand characteristics and pricing of various derivatives
  - Understand the use of derivative securities
  - Understand the theories that explain the relationships between prices of underline assets and derivatives
  - Understand the lessons for users of derivatives
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**MA 5215      Analysis of Categorical Data in Business (3 Credits)****Learning Objectives:**

The purpose of this course is to provide an analytical skill in qualitative data often arises in business environment.

**Outline Syllabus:**

Data types, Analysis of ordinal data, analysis of binary data, analysis of count data, use of log linear and logistic models,

**Learning Outcome**

- Able to understand various statistical methods for categorical data analysis
  - Able to identify the most suitable methods for a given data
  - Able to interpret the results and apply for decision making
  - Able to use Minitab and SAS for multivariate data analysis
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**MA 5239      Investment and Portfolio (2 credits)**

The purpose of this course is to introduce the fundamental concepts of financial derivatives and portfolio risk measurement and management.

**Outline Syllabus**

Introduction to Portfolio Risk, Identifying and Classifying different kinds of Financial Risks such as market risk, credit risk, operational risk, political risks, Risk Measurement and Management, Market and liquidity risk measurement, Credit risk measurement (traditional and modern approaches), Value at Risk, Expected Shortfall, Managing Market Risk, Portfolio Management and Evaluation, Fixed-income portfolio, Equity portfolio , Evaluating Portfolio Performance

**Learning Outcome**

- Able to understand the basic concepts of the portfolio management
- Able to understand the portfolio performance evaluation method
- Able to identify several types of financial risks, such as market risk, credit risk and sovereign risk
- Able to apply risk measurement and management processes to a variety of portfolio risks

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## Elective Modules

### **MA 5231      Computer Software in Business and Management (3 Credits)**

#### **Learning Objectives:399**

The aim of this course is to make the students confident to use common statistical and spreadsheet computer packages in business environment

#### **Outline Syllabus:**

Data mangemnt, summarizing and analysis in Excel and use of macros in Excel, Use of various graphs in Excel, Data management in SPSS (data entry and definition, retrieving and saving SPSS files, transforming data and creating new variables), summarizing data in SPSS (graphical descriptions, tabular presentations, basic statistical indicators), Introduction to mathematical progamming in Matlab.

#### **Learning Outcome**

- Able to use Excel for data management in business
  - Able to develop simple macros for Excel
  - Able to use SPSS for data management in business
  - Able to write simple programming in Matlab
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### **MA 5232      Principles of Marketing (3 Credits)**

#### **Learning Objectives:**

The objective of the course is to introduce the principles of marketing management within a business context in nationally and internationally.

#### **Outline Syllabus:**

The role of marketing at the corporate and business level, marketing information and marketing research, marketing intelligence, marketing research process, junctions, consumer markets and buyer behavior, industrial markets and organizational buyer behavior, market segmentation, targeting and positioning, new product development, managing the product line, selecting and managing marketing channels, design of marketing communication and sales promotion, marketing services, international marketing, organization implementation and control of marketing programs.

#### **Learning Outcome**

- Able to understand the fundamental principles of response models in marketing
  - Able to understand the fundamental principles of choice models in marketing
  - Able to understand the fundamental principles of decision models in marketing
  - Able to understand a working knowledge of marketing management
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### **MA 5290      Project on Business Statistics for PG Diploma**

#### **Learning Objective:**

The aim of the project is to provide an opportunity of further practicing in analyzing a set of real data in the field of Business using statistical techniques and interpretation results in order to make the students more comfortable to tackle the analytical problem independently. The students have to write a short report on the data analysis of which consists of minimum of 20 pages.

**Assessment:** Report (60%) and Oral presentation (40%)

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**MA 5291     Research Project for M Sc****Learning Objective:**

This subject aims students in the development of research methodology appropriate to the practice of Business Statistics, and gives students the opportunity to work on problems of Business Statistics that have real significance value. The work should usually relates to the any subject area on Business Statistics, and requires knowledge and skill acquired in the course. A dissertation and an oral presentation are required upon completion of the project

**Assessment:** Thesis (70%) and Oral Presentation (30%)