



UNIVERSITY
of
TECHNOLOGY,
MAURITIUS

School of Innovative Technologies and Engineering

Department of Applied Mathematical Sciences

BSc (Hons) DATA SCIENCE WITH INTERACTIVE MARKETING

PROGRAMME DOCUMENT

VERSION 1.1

BDSIM v 1.1

May 2017

A. Programme Information

In this digital and increasingly automated era, much data is produced through customer behavior and preferences, social networking sites, and machinery amongst others. As compared to structured data, generally accessed through a relational database, big data- as the concept is often coined, comes in huge volumes (Terabytes or Exabytes), variety and at customarily frequencies. This makes the conventional statistical analysis of the data impractical. Data science with Interactive Marketing deals with the conversion of big data into intelligence so that well-advised decisions and hands-on digital marketing plans may be established. The phenomena of big data is ever growing and studies report that hundreds of thousands of data experts will be required in the foreseeable three to four years.

Full time students will be expected to complete a work placement as partial fulfilment of the requirements for a BSc (Hons) Data Science with Interactive Marketing.

B. Programme Aims

The BSc (Hons) Data Science with Interactive Marketing programme is designed to offer deep rooted mathematical/statistical and analytical/computational skills to students, in view of empowering them with the necessary competencies required for volumetric data analysis in the context of digital marketing. The programme has been designed with a hands-on approach so that the skills and attributes inculcated may easily and practically be transferable to the industry.

C. Programme Objectives

After successful completion of the programme, the graduates should be able to

- demonstrate appropriate knowledge and analytical techniques to analyze big data;
- make effective and efficient use of open source platforms such as Apache Hadoop;
- display skills in using state-of-the-art software;
- show algorithm design and software engineering skills;
- refurnish a business puzzle into an analytics task;
- understand digital marketing communications;
- manage digital customer experience;
- skilfully employ social media as a profitability pathway.

Part 1 – 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

'A'-level in Mathematics or Statistics.

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 ,Assignments and Project;
- Structured Discussions and Self-Directed Study;
- Workshops and Seminars;
- Case Study of Real World Problems;
- Work Placement (full time mode only);
- Mini Project (part 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 36 credits are required;
- a Diploma, a minimum of 69 credits are required;
- an Ordinary Degree, a minimum of 96 credits are required;
- an Honors Degree a minimum of 105 credits are required.

K. Student Progress and Assessment

The programme is delivered mainly through lectures, tutorials, and practical laboratory sessions. Students will be 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;
- Modules 'Programming for Data Science I', 'Spreadsheet Modelling for Business Intelligence', 'Marketing Management', 'Programming for Data Science II', 'Web Data Mining and Business Intelligence', 'User-Centered Web Design', 'Digital and Social Media Management', 'Data Warehousing', 'Strategic Online Marketing' and 'Data Science Tools' will be assessed by 100% coursework. The coursework must consist of at least one class test and one assignment.
- Modules 'Communication and Team Working' will be assessed by 100% coursework. The coursework must consist of at least two assessments.
- For the Mini Project in the part time version of the programme structure, the student are required to work on a project with significant mathematical/statistical content geared towards digital marketing.

Upon completion of the Mini Project, the student must submit a report. Moreover, each student must present his/her work in an oral presentation, with opportunity for questions from the examiner(s).

Module grading structure:

Grade	Marks (x) in %
A	$70 \leq x \leq 100$
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**

Overall weighted mark (y) in %

$$70 \leq y \leq 100$$

$$60 \leq y < 70$$

$$50 \leq y < 60$$

$$45 \leq y < 50$$

$$40 \leq y < 45$$

$$y < 40$$

Classification

1st Class Honors

2nd Class 1st Division Honors

2nd Class 2nd Division Honors

3rd Class Honors

Pass Degree

No Award

N. **Programme Organisation and Management**

Programme Director: Dr. Aslam Aly El-Faïdal SAIB

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PART II - Programme Structure

O. BSc (Hons) DATA SCIENCE WITH INTERACTIVE MARKETING – Full-Time (Version 1.1)

YEAR 1 (Level 1)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk	Credits	Code	Modules	Hrs/Wk	Credits
		L+T/P				L+T/P	
STAT 1220C	Applied Probability and Statistics I	2 + 1	3	STAT 1221C	Applied Probability and Statistics II	2 + 1	3
MATH 1344C	Linear Algebra and Matrix Theory	2 + 2	4	ISM 1128C	Information Management for Businesses	2 + 1	3
MATH 1345C	Mathematical Reasoning	2 + 2	4	MKTG 1102C	Marketing Management	2 + 1	3
COMM 1118C	Communication and Team Working	1 + 1	2	STAT 1341C	Quantitative Methods for Marketing	2 + 2	4
COMP 1112C	Programming for Data Science I	1 + 2	3	COMP 1114C	Programming for Data Science II	1 + 2	3
COMP 1113C	Spreadsheet Modelling for Business Intelligence	2 + 2	4				

YEAR 2 (Level 2)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk	Credits	Code	Modules	Hrs/Wk	Credits
		L+T/P				L+T/P	
DBT 1114C	Database Modelling	2 + 2	4	WAT 2130C	User-Centered Web design	2 + 2	4
MATH 2346C	Computational Linear Algebra	2 + 2	4	STAT 2343C	Multivariate Statistical Modelling	2 + 2	4
MATH 2347C	Web Data Mining and Business Intelligence	1 + 2	3	PROJ 2119C	Work Placement		4
MKTG 2103C	Digital and Social media Management	2 + 1	3				
STAT 2342C	Supervised Learning	1 + 2	3				
UTM 2101	Life Skills and Good Practices	2 + 2	4				

YEAR 3 (Level 3)							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk	Credits	Code	Modules	Hrs/Wk	Credits
		L+T/P				L+T/P	
MATH 3348C	Optimization Techniques	2 + 2	4	STAT 3345C	Applied Stochastic Processes	2 + 2	4
MKTG 3104C	Strategic Online Marketing	2 + 1	3	MATH 3349C	Computational Intelligence	2 + 2	4
STAT 3344C	Time Series Modelling	2 + 2	4	COMP 3115C	Data Science Tools	2 + 2	4
DBT 3115C	Data Warehousing	2 + 2	4				
PROJ 3110C	Project						9

P. BSc (Hons) DATA SCIENCE WITH INTERACTIVE MARKETING – Part-Time (Version 1.1)

YEAR 1							
→ Start of Level 1							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 1220C	Applied Probability and Statistics I	2 + 1	3	STAT 1221C	Applied Probability and Statistics II	2 + 1	3
MATH 1344C	Linear Algebra and Matrix Theory	2 + 2	4	ISM 1128C	Information Management for Businesses	2 + 1	3
COMP 1112C	Programming for Data Science I	1 + 2	3	COMP 1114C	Programming for Data Science II	1 + 2	3
COMM 1118C	Communication and Team Working	1 + 1	2	MATH 1345C	Mathematical Reasoning	2 + 2	4

YEAR 2							
				→ Start of Level 2			
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
STAT 1341C	Quantitative Methods for Marketing	2 + 2	4	DBT 1114C	Database Modelling	2 + 2	4
COMP 1113C	Spreadsheet Modelling for Business Intelligence	2 + 2	4	MATH 2346C	Computational Linear Algebra	2 + 2	4
MKTG 1102C	Marketing Management	2 + 1	3	MATH 2347C	Web Data Mining and Business Intelligence	1 + 2	3
				UTM 2101	Life Skills and Good Practices	2 + 2	4
				PROJ 2118C	Mini Project	-	-
End of Level 1 →							

YEAR 3							
				→ Start of Level 3			
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
MKTG 2103C	Digital and Social Media Management	2 + 1	3	MATH 3348C	Optimization Techniques	2 + 2	4
STAT 2342C	Supervised Learning	1 + 2	3	MKTG 3104C	Strategic Online Marketing	2 + 1	3
WAT 2103C	User-Centered Web Design	2 + 2	4	STAT 3344C	Time Series Modelling	2 + 2	4
STAT 2343C	Multivariate Statistical Modelling	2 + 2	4				
PROJ 2118C	Mini-project	-	4				
End of Level 2 →							

YEAR 4							
Semester 1				Semester 2			
Code	Modules	Hrs/Wk L+T/P	Credits	Code	Modules	Hrs/Wk L+T/P	Credits
DBT 3115C	Data Warehousing	2 + 2	4	STAT 3345C	Applied Stochastic Processes	2 + 2	4
MATH 3349C	Computational Intelligence	2 + 2	4				
COMP 3115C	Data Science Tools	2 + 2	4				
PROJ 3110C	Project						9
End of Level 3 →							

Q. Module Outline

STAT 1220C: Applied Probability and Statistics I

Probability –Axioms, Conditional Probability, Bayes’ Theorem, Discrete Probability Space and Distributions, Continuous Probability Space and Distributions, Chebyshev’s Inequality, Statistical Computing using R.

MATH 1344C: Linear Algebra and Matrix Theory

Matrices and Linear Systems, Vector Spaces, Linear Transformations, Linear Algebra and Matrix Theory, Cayley Hamilton Theorem.

MATH 1345C: Mathematical Reasoning

Differentiation and Partial Derivatives, Integration and Multiple Integrals, Graph Theory and Network: Social Distance, Connection and Connectivity, Local structures, Centrality and Power, Networks- Strong and Weak Ties, Network Relationship.

COMM 1118C: Communication and Team Working

Communication Cycle, Non-verbal Communication, Reflective Listening, Effective Confrontation, Team Role and Team Work Skills, Cooperation in Group Settings.

COMP 1112C: Programming for Data Science I

Introduction to Java/Python, Programming Constructs, Data types, Identifiers, Variables, Operators, Type Casting, Input/Output Statements, Branching statements, Iterative statements, Functions/Methods, Recursion, Arrays and String Manipulation.

COMP 1113C: Spreadsheet Modeling for Business Intelligence

Data Analysis with Spreadsheets: PivotTables, VLOOKUPS, Named Ranges, What-If Analyses, Spreadsheet Models for Business Problems, Graphs Making, Store and Analyze Data, Python for Analyzing and Manipulating Data in Spreadsheets.

STAT 1221C: Applied Probability and Statistics II

Independence of Random Variables, Joint and Conditional Distributions, Covariance, Cauchy Schwartz Inequality, Addition of Independent Random Variables –Convolutions, Generating Functions, Experimental Design, Essentials of Statistical Design using R.

ISM 1128C: Information Management for Businesses

Best Practices, Broad Legal and Regulatory Frameworks on Risk –Data Acquisition, Possession, Retention, Analysis, Intellectual Property Issues, Ethics –Professional, E-Business, Securing Information System.

MKTG 1102C: Marketing Management

Understanding of the Process of the Analysis, Planning, Implementation and Control of the Marketing Function in an Organization. The Marketing Concept- Understanding the Marketing Environment, Understanding Buyer Behavior, Marketing Research, Marketing Planning and Strategies, Managing the Marketing Mix-Products and Services, Pricing and Channels, Promotion, Marketing in Overseas Markets.

STAT 1341C: Quantitative Methods for Marketing

Advertising Research Applications, Analysis of Quantitative Data using R/Python, Confidence Intervals and Hypothesis –Means and Proportions, Regression Analysis using R, Practical Examples using R/Python.

COMP 1114C: Programming for Data Science II

File Input/Output, Reading and Writing in a Text/Excel file, Searching Algorithms, Linear Search, Binary Search, Sorting Algorithms, Bubble Sort, Shuttle Sort, Insertion Sort, Complexity of Algorithm, Complex Data Structures, List, Stack, Queue and Tree.

DBT 1114C: Database Modelling

Introduction and Overview, Relational Databases, Normalization, Entity-Relationship Modelling, SQL, Query Optimization, Accessing Database through Programs, NoSQL.

MATH 2346C: Computational Linear Algebra

Matrix Algorithms and Computational Complexity, Norms and Stability Analysis, Direct and Iterative Methods, Least Squares Problems, Eigenvalue Problems, Numerical Implementations in MatLab.

MATH 2347C: Web Data Mining and Business Intelligence

Information Retrieval and Web Search, Social Network Analysis, Web Data Extraction, Opinion Mining and Sentiment Analysis, Web Usage Mining, Cluster Analysis for Generating Pattern of Data and Structuring Business Intelligence.

MKTG 2103C: Digital and Social Media Management

Digital and Social Media Communications Strategy and Proposition Development, The Application of best Practices in Digital and Social Media Communications, Exploring the Capabilities of Digital Marketing Channels with Particular Focus on Exploiting Mobile Platforms and Emerging Technology, Evaluating and Improving the Effectiveness of Digital and Social Media Communications Components, Developing an Understanding of Customers and Stakeholders in the Communications Process, as well as Relationship Management.

STAT 2342C: Supervised Learning

Probabilistic and Bayesian Methods, Probabilistic Classification Methods –Logistic Regression, Naïve Bayes, Non-Probabilistic Classification Methods –Support Vector, K-Nearest Neighbors, Probability Density Estimation –EM Algorithm, Neural Networks, Support Vector Machine and Principal Component Analysis.

UTM 2101: LIFE SKILLS & 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.

WAT 2130C: User-Centered Web Design

Static Webpages –Mark -up Language, Multimedia Techniques, Usability and Accessibility Issues of Web Design, Internet Security Issues, Usage of Hybris, CQ5, HTML5 technologies.

STAT 2343C: Multivariate Statistical Modelling

General Linear Models, ANOVA and ANCOVA, Discriminant Analysis, Principal Component Analysis, Cluster and Factor Analysis, Practical Examples using R.

MATH 2119C: WORK PLACEMENT

As per the Work Placement Guideline 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 and Analyzing Findings, Writing a Research Report. The teaching strategies will include 45 hours of face-to-face contact hours spread over two semesters.

MATH 3348C: Optimization Techniques

Linear Programming, Dynamic Programming, Non-Linear Programming, Derivative-based optimization.

MKTG 3104C: Strategic Online Marketing

E-Marketing Techniques and Strategies, Key areas that promise to leverage the power of Internet, Customer Relationship Management (CRM), 1:1 Marketing; permission-based e-mail marketing, Viral Marketing, Attributes of a Good Website and Website Marketing Goals, Website Promotion/Search Engine Positioning/Ranking, Key Internet Technologies/Terminologies/Acronyms.

STAT 3344C: Time Series Modelling

Time Series –Models, Implementations in R, Stationarity and Box Jenkins Models, ARCH and GARCH Models, Economic Time Series.

DBT 3115C: Data Warehousing

Features and Capabilities of Warehousing, Transfer Source Business Databases to data Warehouses, Resolution of Data Quality Issues, Data Preprocessing and Cleaning, Oracle Data Warehousing Platform.

STAT 3345C: Applied Stochastic Processes

Poisson Processes, Renewal Processes, Markov Chains and Queuing Theory, Application of Stochastic Processes.

MATH 3349C: Computational Intelligence

Agents –Rational Agency, Logical Agents, Uninformed and Informed Search, Constraint Satisfaction Problems, Knowledge Representation –Logic, Rules, Frames Description Logic, Bayesian AI –Bayesian Reasoning, Derivative-Free Optimization.

COMP 3115C: Data Science Tools

Introduction to Cloud Computing –Cloud Architecture, Private and Public Clouds, Platform as a Service, Software as a Service, NoSQL Tools – Apache Hadoop Ecosystem, Cassandra, Query Tools –Map Reduce, Spark, Data Analytics Tools –R Studio.

PROJ 3110C: Project

- Project guidelines will be given in the Project Handbook