**MSc Business Analytics Modules**

## Statistics for Business

### Overview

Knowledge of the theory and application of probability and statistics is an essential component of business analytics. Statistical methods make up part of the set of tools required in business analytics, and form the basis for more advanced topics such as machine learning and artificial intelligence.
In this module, students will focus on descriptive and inferential statistics using the R programming language. This provides the necessary statistical foundation for business analytics as well as introducing R programming.

Topics may include but are not limited to:
• Descriptive statistics
• Correlation
• Probability
• Distributions
• Hypothesis testing and confidence intervals
• Linear regression with two variables
• Multiple regression
• Assessing performance and assumptions
• Logistic regression
• R programming

### Learning Outcomes

Upon successful completion of the module students should be able to:

• Critically evaluate the appropriateness of a range of statistical tests in solving a variety of business and research problems
• Effectively implement statistical procedures manually and programmatically
• Interpret the output of statistical tests and explain their practical and theoretical implications

### Skills

This course provides opportunities for the students to enhance the following skills:
Application and interpretation of statistics
Data analysis
Communicating with data

R programming (and general good programming practice)
Analytical and problem-solving skills

## Human Resources Analytics

### Overview

The effective use of human resource (HR) data can enhance human resource management (HRM) and thus wider organisational performance. This module will consider the practical use of data in HRM, through applications such as monitoring and evaluating employee activity and performance, predicting future performance and predicting employee attrition. The module will also consider the theoretical basis for the use of data in HRM, thereby linking the practical side of people analytics with HRM theory.
Course content may include, but is not limited to:
Introduction and overview to HR analytics.
The strategic and operational role of HR analytics within an organisation.
Monitoring and enhancing the performance of human resources using data.
The applications of analytics to HRM, and the theoretical basis for these applications.
Descriptive and visual analytics with HR data.
Predictive analytics with HR data.
Ethical considerations with HR analytics.

### Learning Outcomes

On successful completion of this module students should be able to:
• Explain the value and limitations of HR analytics from both a theoretical and practical perspective.
• Appraise the antecedents and consequences of integrating HR analytics into human resource functions and the wider organisational implications.
• Use leading software tools to carry out HR analytics, including descriptive, visual, and predictive analytics.

### Skills

Subject-specific Skills
• Application of HR analytics to improve human resource functions
• The use of software for HR analytics
Cognitive Skills
• Problem solving
• Logical reasoning
• Independent enquiry

• Critical evaluation and interpretation
• Self-assessment and reflection

Transferable Skills
• Synthesise and evaluate information/data from a variety of sources
• The preparation and communication of ideas in written form
• Work both independently and in groups
• Organisation and time management
• Problem solving and critical analysis

## Artificial Intelligence in Business and Society

**Overview**

Artificial intelligence (AI) has already had a substantial impact on business and society, such as data driven business strategies, changes to the nature of work, the development of innovations which shape the behaviour of individuals and society, privacy and surveillance concerns, and recent ethical crises in the use of data.

With the fast pace of AI development, these trends seem likely to continue, making it essential to consider the wider implications of AI on business and society. This module will encourage students to engage with these issues, building a deeper understanding of the wider implications of AI, and how students can contribute to responsible development and use of AI in their future career.

Course content may include, but is not limited to:
• The strategic implications of AI innovations for business
• The wider economic and societal consequences of AI
• Changes in the nature of work due to AI
• Ethical use of data
• Surveillance and privacy considerations in the use of data
• Legal consideration in the use of data

**Learning Outcomes**

On successful completion of this module students should be able to:
• Critically evaluate the implications of AI for society
• Critically evaluate the implications of AI for businesses
• Explain the legal and ethical considerations of AI

**Skills**

This module aims to develop the following skills:

Cognitive
1. Problem solving
2. Logical reasoning
3. Independent enquiry
4. Critical evaluation and interpretation
5. Self-assessment and reflection

Knowledge and Understanding
1. Critically assess the transformative role of AI in business strategy and societal impact
2. Critically analyse and evaluate the ethical, legal, and cross- cultural implications of AI use

Subject-specific
1. Critical evaluation of the wider business, and societal consequences of AI

Transferable
1. Synthesise and evaluate information/data from a variety of sources
2. The preparation and communication of ideas in written form
3. Work both independently and in groups
4. Organisation and time management
5. Problem solving and critical analysis

## Data Management

**Overview**

The effective management of small and big data is a crucial component of all business analytics projects.
This module explores the theory and practice of managing data, including identifying and extracting data, data pre processing, data quality, data warehousing, relational databases, and big data solutions.

Course content may include, but is not limited to:
Structured and unstructured data
Data acquisition
Data extraction using SQL
Data storage (relational database management systems)
Big data solutions
Data preparation

Data quality
Security, legislation and ethical considerations

**Learning Outcomes**

Upon successful completion of the module students should be able to:
• Evaluate the usefulness of a range of data sources and types in business decision making
• Design a data management solution
• Critically evaluate the main security, legal, and ethical considerations in the management of information

**Skills**

This course provides opportunities for the students to enhance the following skills:
Database design
Data extraction and wrangling
Data storage
Data management, including SQL and other big data technologies

## Data Driven Decision Making

**Overview**

The analysis of data is only useful if it contributes to improvements in business decision making. This module explores how businesses use data for making business decisions. This includes a focus on gaining business insights from the effective management and analysis of data, data visualisation and storytelling, and prescriptive analytics techniques. Students will have the opportunity to work with advanced visualisation and optimisation software such as tableau, excel, and R. The module will also consider the people side of analytics, placing analytical techniques for decision making in a business context, considering the managerial and organisational factors involved in becoming a data driven organisation.

Module content may include but is not limited to:

The role of analytics in decision making, at both operational and strategic levels
Data Visualisation: visualisation of a variety of types of data such as numeric, text, and geospatial data.
Prescriptive analytics and optimisation
The role of data driven decision making in organisations
Benefits, barriers, and limitations of data driven decision making
Ethical considerations in the use of data in decision making

Appreciation of the cultural differences in the use of data, and the potential for data to be used in wider national and international decision making (e.g. sustainable development, disaster planning, corporate social responsibility)

**Learning Outcomes**

Upon successful completion of the module students should be able to:

• Critically evaluate the use of data and analytics for decision making in organisations
• Design advanced data visualisations to solve complex business problems
• Design solutions to carry out prescriptive analytics tasks such as automated decision making and optimization
• Critically evaluate the legal and ethical considerations in the use of data for decision making.

**Skills**

This course provides opportunities for the students to enhance the following skills:
Identifying opportunities for data driven decision making in organisations, and the ability to execute such approaches to improve organisational decision making.
The ability to present complex data in a format that is comprehensible to a wide range of technical and non-technical audiences.
Critically reflect on the role of data in business decision making
The ability to use tools to develop advanced and effective data visualisations
The ability to use analytical techniques to develop prescriptive solutions to business problems

## Data Mining

**Overview**

This module focuses on the application of data mining using python. The module will begin with core coding and data mining tasks in python, before focusing in on mining unstructured data. Much of the data produced today is unstructured, such as social media posts, textual documents, images and video. Mining this unstructured data provides businesses with the opportunity to gain substantial benefits through the development of new and improved products and processes and improved decision making. Extracting value from unstructured data requires additional tools and techniques, compared with those required to analyse smaller structured datasets.
This module covers the key analytics tools and techniques needed to gain value from unstructured data. The module will cover the variety of sources and uses of unstructured data, with a particular focus on the practical analysis of textual data. The module will be delivered using the python programming language, which is one of the most popular

coding languages in analytics. It therefore also serves to introduce students to this important coding language, complementing the R coding skills developed on other modules.

Course content may include, but is not limited to:
Python Coding
Applications of unstructured data analytics
Sources of unstructured data
Processing, exploring and visualising textual data
Supervised and unsupervised learning with unstructured data
Ethical considerations in the use of unstructured data

**Learning Outcomes**

Upon successful completion of the module students should be able to:
• Critically evaluate the role of data mining and unstructured data in organisations
• Develop and communicate data mining solutions using python
• Develop and communicate machine learning solutions using unstructured data

**Skills**

This course provides opportunities for the students to enhance the following skills:
Python coding skills
Exploration and visualisation of unstructured data
Supervised learning with unstructured data
Unsupervised learning with unstructured data

**Marketing Analytics**

**Overview**

The availability of data and analytics tools has resulted in substantial opportunities for companies to derive benefit from the application of marketing analytics. Marketing analytics has grown to be one of the key areas within business analytics, with most large companies deriving benefit. This module focuses on the application of analytics techniques to marketing problems, highlighting the operational and strategic benefit. In this module, students will learn how analytics can be applied to 4 strands of the marketing mix. The module will explore several methodologies that can be used for achieving analytics driven marketing decisions. The course will provide the necessary fundamentals and will serve as a strong foundation for aspirants aiming to explore the fast-evolving area of modern marketing.

Course content may include, but is not limited to:
• Overall scope and applicability of analytics to marketing decisions
• Applications to analytics (descriptive, predictive, and prescriptive) to selected specific aspects of marketing mix such as:
Unsupervised learning for Customer segmentation and product design
• Predictive and prescriptive analytics for pricing
• Supervised leaning for customer retention

**Learning Outcomes**

Upon successful completion of the module students should be able to:
• Critically evaluate the applications, benefits, and limitations of marketing analytics
• Design and develop solutions to marketing problems, drawing on various analytics techniques
• Implement and test the solutions
• Analyse the business implication of analytical approaches in marketing decision-making

**Skills**

This course provides opportunities for the students to enhance the following skills:
Design of analytics solutions to solve marketing problems
Supervised and Unsupervised learning techniques
Prescriptive analytics models

## Advanced Analytics & Machine Learning

**Overview**

Machine learning is the core technology underpinning predictive analytics and artificial intelligence, as well as many other analytical tasks.
This module will build on the skills developed in the statistics module in terms of both programming and more advanced statistical techniques, namely the application of machine learning algorithms.

Topics may include but are not limited to:
• The analytics process
• Analytics tools
• Feature selection
• Supervised learning
• Unsupervised learning
• Evaluating model performance
• Programming machine learning models

• Evaluation of the ethical implications of the use of algorithms e.g. the potential for reinforcing bias, security and privacy.

**Learning Outcomes**

Upon successful completion of the module students should be able to:

• Critically evaluate a range of analytics tools and algorithms
• Understand and apply key programming concepts as they pertain to machine learning
• Design a predictive analytics solution

**Skills**

This course provides opportunities for the students to enhance the following skills:

Application of advanced algorithms for business decision making
Programming skills
Problem solving