



## COURSE OUTLINE

### 1. General specifications

**Module Title:** Advanced Business Mathematics

**Level:** IADB

**Credits** 15

#### **Overview of the module:**

Mathematical models and data analysis are foundational within numerous disciplines of management thought. Whether the focus is on understanding the broad economic environment, carrying out market research, optimising the supply chain, diversifying financial risk or another area of business practice, the requirement to be able to use analytical techniques is vital.

This module advances existing quantitative skills to a level in which students can formulate, use and interpret mathematical models within a business context. An appreciation of the use of computer software to support such models is also developed.

### 2. Module Delivery

#### **Contents**

CLASS SUBJECT
1 Introductory management statistics <ul style="list-style-type: none"><li>• Summary statistics</li><li>• Data types</li><li>• Index numbers</li></ul>
2 Probability distributions <ul style="list-style-type: none"><li>• Simple probability review</li><li>• Standard scores (Z-scores)</li><li>• Probability distributions</li></ul>
3 Inferential statistics 1 <ul style="list-style-type: none"><li>• Sampling distributions</li><li>• Point estimates and confidence intervals</li><li>• Introduction to hypothesis testing</li></ul>
4 Inferential statistics 2



<ul style="list-style-type: none"><li>• Hypothesis testing with a sample</li><li>• Sampling approaches</li><li>• Two sample t-test</li><li>• Significance, error types, power</li><li>• Frequency data and the X2 test</li></ul>
5 Differentiation 1 <ul style="list-style-type: none"><li>• Gradient and the derivative</li><li>• Rules of differentiation</li></ul>
6 Differentiation 2 <ul style="list-style-type: none"><li>• Partial differentiation</li><li>• The total derivative</li></ul>
7 Regression analysis 1 <ul style="list-style-type: none"><li>• Pearson correlation</li><li>• Simple linear regression</li><li>• Spearman correlation</li></ul>
8 Regression analysis 2 <ul style="list-style-type: none"><li>• Multiple regression analysis</li><li>• Further regression models</li></ul>
9 Time series analysis Preparing time series of analysis Time series decomposition <ul style="list-style-type: none"><li>- Additive and multiplicative models</li><li>- Centred moving averages</li><li>- Seasonal adjustment</li></ul> Forecasting with time series Exponential smoothing
10 Linear Programming <ul style="list-style-type: none"><li>• Formulating two variable linear programme</li><li>• Graphical solution of a linear programme</li><li>• Sensitivity analysis</li></ul>
11 Linear Programming with Solver routines <ul style="list-style-type: none"><li>• Multiple variable linear programmes</li><li>• Solving linear programmes with software</li><li>• Interpreting the output</li><li>• Extensions of linear programming: the integer programme</li></ul>
12 Decision tree analysis <ul style="list-style-type: none"><li>• Formulating decision trees</li><li>• Solving decision trees with rollback</li></ul>



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| <ul style="list-style-type: none"><li>• Posterior probabilities within decision trees</li><li>• Uncertainty</li></ul> |
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### **Indicative reading**

Statistics Explained: A Guide for Social Science Students

Hinton (2004), 2<sup>nd</sup> edition, Routledge

ISBN-10: 0415332850

ISBN-13: 978-0415332859

Rational Decision Making for Manager: An Introduction

Keast and Towler (2009), Wiley and Sons

ISBN-10: 0470519653

ISBN-13: 978-0470519653

### **3. Module Assessment**

#### **Module Learning Outcomes**

On completion of this module the student should be able to:

##### **1. Use summary and inferential statistics to inform business decisions**

- a. Calculate and interpret standard scores
- b. Use index numbers when reviewing data
- c. Compare and contrast sampling methods and techniques
- d. Use confidence intervals to indicate the reliability of estimates
- e. Apply significance testing to business hypotheses

##### **2. Analyse management decisions using optimisation techniques**

- a. Use differentiation in marginal analysis
- b. Formulate a linear programme
- c. Interpret the optimal and sensitivity results from the solution of a linear programme

##### **3. Understand and apply approaches to business forecasting**

- a. Use Pearson and Spearman correlation analysis
- b. Perform a simple regression analysis
- c. Evaluate results from a multiple regression analysis
- d. Use time series analysis to predict future business performance

##### **4. Evaluate sequential management decisions**

- a. Formulate a decision tree representation of a management decision
- b. Solve a decision tree



**Assessment Methods:**

**Number, Type and Weighting of Element**

100% Exam

\*Admission to the final assessment is subject to completion of all coursework assigned by Esei tutor for each module.