Module Definition Form (MDF)

Module code: MOD007890	**Version:** 2 **Date Amended:** 13/Jun/2024

1. Module Title
Analytical Techniques

2a. Module Leader
Silvia Cirstea

2b. School
School of Computing and Information Sciences at Anglia Ruskin University

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
30

4b. Study Hours
300

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	MSc Applied Data Science		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This module is intended to provide you a general introduction to the analytical techniques needed for data science and is tailored for you to develop core maths knowledge that data science is built upon. The module will enable you to assess your existing mathematical skills and sympathetically enable you to gain knowledge and skills and/or remedy any basic deficiencies.

The learning topics mainly cover four areas: Basic functions, variables, equations and graphs; Linear algebra; Probabilities and Statistics. These topics will enable you to have a solid grasp over the most essential maths concepts as a data analysist and to explore applying the core mathematical models in a real-life work environment.

The module is delivered by a mixture of classroom-based lectures and practical sessions. During and outside of scheduled class times you have remote access to a virtual learning environment where you will be able to access notes, participate in discussions, and experiment with some of the class material.

Undertaking this module will enhance your employability skills towards various careers that make use of data science as they evolve and modernise, such as: human resources, marketing, psychology, finance, business administration.

6b. Outline Content

The learning topics mainly cover four areas: Basic functions, equations and graphs; Linear algebra; Probabilities and Statistics.

The first area covers the basics including logarithms, exponentials, and basic trigonometric functions, graphing and plotting. The linear algebra introduces matrix decompositions, eigenvalues, singular values, and determinant. We introduce statistics concepts and the frequentist and the Bayesian approaches to probability: laws of probability, conditional probability, Bayes' formula, random variables, remarkable probability distributions and their properties. Regression methods are explored to solve problems related to experimental data and to generate mathematical models for decision-making.

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Computer with a processor speed of 1.8GHz (or better), at least 8GB RAM and 256MB hard disk. For Windows or Mac OSX a Linux VM should be installed and available.

Access to a computing environment for running R and RStudio. A reasonable specification workstation with a larger size monitor would be ideal for visualisation with R.

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Demonstrate understanding of the mathematical notation and analytical skills required for data science.
2	Knowledge and Understanding	Demonstrate critical understanding of probability, together with the appropriate statistical tests in order to be able to test data while correcting for biases and multiple-testing.
3	Knowledge and Understanding	Develop the knowledge required for modelling and classification methods, from linear models, to introductory machine learning.
4	Intellectual, practical, affective and transferrable skills	Develop competent core skills in applying mathematical methods to a wide variety of real-world practical situations. Solve scientific problems in a mathematical model, using algebraic, graphical and statistical techniques.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	36	1,2,3,4	3 hours lecture per week
Other teacher managed learning	24	1,2,3,4	2 hours tutorial per week
Student managed learning	240	1,2,3,4	Self-directed learning
TOTAL:	300		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Examination Cambridge	1 2 3 4	100 (%)	Fine Grade	40 (%)
Self-directed learning					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]