WM260-15 Applied Maths - II

25/26

Department
> WMG

Level
> Undergraduate Level 2

Module leader
> Iyabo Adamu

Credit value
> 15

Module duration
> 14 weeks

Assessment
> 40% coursework, 60% exam

Study locations
> University of Warwick main campus, Coventry Primary
> Distance or Online Delivery

Description

Introductory description

Mathematics underpins the understanding, design and development of digital and technological solutions in many areas of business. This module provides the appropriate mathematical knowledge and skills base to illustrate key principles of data analysis relevant to digital technological problems. Students will study maths concepts and methods to develop a broad and solid foundation for more advanced topics taught in later years.

[Module web page](#)

Module aims

Students will gain an appreciation of the applications of differential calculus and linear algebra concepts in digital and technological systems. The module also equips students with mathematical skills to formulate and solve real-world problems using linear programming and dynamic programming. Students will also develop problem-solving techniques through the analysis of networks and the use of algorithms to model and solve problems in digital technologies and information systems.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Differential Calculus:

- Partial differentiation of functions of two or more variables;
- Differentiation Techniques;
- Applications of Differentiation (Optimisation – Stationary points, Maximum, Minimum and Saddle Points).

Linear Algebra:

- Lines, Planes, Distance.
- Vectors: Norms, Inner products, Angles and orthogonality, Linear independence, Span, Basis.
- Matrices: Linear Transformation, Matrix Algebra, Determinant, Solving system of linear equations (Cramer's method and Inverse matrix method), Eigenvalues and Eigenvectors, Trace, Rank, Eigen-decomposition and Diagonalisation.

Decision Mathematics:

- Linear Programming: Graphical method of solving linear programming problems; Minimisation & Maximisation. Simplex Method.
- Networks and Dynamic Programming: Floyd's Algorithm.

Learning outcomes

By the end of the module, students should be able to:

- Select and apply techniques in differential calculus to solve applied problems involving partial derivatives of multivariable functions. [AHEP:4 – C1, C2, C3][CITP: 2.1.9, 2.1.10]
- Apply concepts and methods of linear algebra to illustrate key principles of data analysis. [AHEP:4 – C1, C2, C3][CITP: 2.1.9, 2.1.10]
- Employ linear programming techniques to formulate and solve optimisation problems. [AHEP:4 – C1, C2, C3][CITP: 2.1.9, 2.1.10]
- Analyse networks and implement dynamic programming algorithms to solve shortest-path problems. [AHEP:4 – C1, C2, C3][CITP: 2.1.9, 2.1.10]

Indicative reading list

- Kuldeep, S. (2011) Engineering Mathematics Through Applications. Second edition. Bloomsbury Publishing Plc, ISBN: 9780230345980, 9780230274792.
- Hu, Q. (2017) Concise Introduction to Linear Algebra. First edition. Boca Raton, FL: CRC Press, EBOOK ISBN: 9781315172309.
- Rosen, K. (2019) Discrete Mathematics and its applications. Eighth edition. McGraw-Hill, ISBN:
  1260091996, 9781260091991
- Cormen, T. H. (2009) Introduction to algorithms. 3rd ed. Cambridge, Mass: MIT Press, ISBN:

0262033844.

Subject specific skills

This module covers the following Knowledge and Skills based on the latest published DTS DA standard:
S11: Determine and use appropriate data analysis techniques.
K13: Principles of data analysis for digital and technology solutions.
B1: Has a strong work ethic and commitment in order to meet the standards required.

Transferable skills

Problem solving;
Critical thinking;
Communicating mathematically.

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	10 sessions of 1 hour (7%)
Online learning (scheduled sessions)	(0%)
Online learning (independent)	8 sessions of 1 hour (5%)
Other activity	2 hours (1%)
Private study	50 hours (33%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Inclusive of:

- Pre-block and Post-block problem sets released on Moodle.
- Online Quiz for revision.
- Online forum for discussing queries with course peers and tutor.
- Online tutor-recorded videos.

Recapping of prior learning is expected where necessary. Reading around the topics covered will provide the depth of understanding required to complete the course to a good standard. This may

be both prior to and/or after the teaching and learning sessions. Support from teaching staff is available but students will be expected to increasingly develop their independent learning skills.

Other activity description

Support Sessions

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D3

	Weighting	Study time	Eligible for self-certification
Coursework	40%	24 hours	Yes (extension)

A collection of several problems based on the differential calculus and linear algebra topics outlined in the syllabus. Students are expected to solve with a full written solution.

	Weighting	Study time	Eligible for self-certification
Exam	60%	36 hours	No

This is an online examination focussing on the decision maths topics outlined in the syllabus.

Feedback on assessment

Feedback will be given as appropriate to the assessment type:

- summative cohort-level feedback on exam.
- individual feedback is provided for the coursework.

Past exam papers for WM260

Availability

Pre-requisites

To take this module, you must have passed:

- All of

  - WM160-15 Applied Maths I

Courses

This module is Core for:

- Year 2 of DWMS-H655 Undergraduate Digital and Technology Solutions (Cyber) (Degree Apprenticeship)
- Year 2 of DWMS-H652 Undergraduate Digital and Technology Solutions (Data Analytics) (Degree Apprenticeship)
- Year 2 of DWMS-H653 Undergraduate Digital and Technology Solutions (Network Engineering) (Degree Apprenticeship)
- Year 2 of DWMS-H654 Undergraduate Digital and Technology Solutions (Software Engineering) (Degree Apprenticeship)