Course information 2025-26

MT1173 Algebra

General information

MODULE LEVEL: 4

CREDIT: 30

NOTIONAL STUDY TIME: 300 hours

MODE: Locally Taught, Independent Learner Route and Online Taught

Summary

This unit develops a student's proficiency in working with the mathematical methods of algebra and develops the student's understanding of the theoretical concepts (such as vector space) behind these methods.

Conditions

Please refer to the relevant programme structure in the EMFSS Programme Regulations to check:

- where this course can be placed on your degree structure; and
- details of prerequisites and corequisites for this course.

You should also refer to the Exclusions list in the EMFSS Programme Regulations to check if any exclusions apply for this course.

Aims and objectives

The objectives specifically include:

- to enable students to acquire skills in the methods of algebra, as required for their use in further mathematics subjects and economics-based subjects
- to prepare students for further units in mathematics and/or related disciplines

Learning outcomes

At the end of the course and having completed the essential reading and activities students should be able to:
- use the concepts, terminology, methods and conventions covered in the unit to solve mathematical problems in this subject
- solve unseen mathematical problems involving understanding of these concepts and application of these methods
- see how algebra can be used to solve problems in economics and related subjects
- demonstrate knowledge and understanding of the underlying principles of algebra.

Employability skills

Below are the three most relevant employability skills that students acquire by undertaking this course which can be conveyed to future prospective employers:
1. Complex problem solving
2. Decision making
3. Adaptability and resilience

Essential reading

For full details, please refer to the reading list.

Anthony, M. and M. Harvey. Linear Algebra: Concepts and Methods. (Cambridge University Press, 2012) [ISBN: 978-0521279482]

Anthony, M. and N. Biggs Mathematics for Economics and Finance. (Cambridge: Cambridge University Press, 2024) [ISBN 978-1108459433].

Assessment

This course is assessed by a three-hour and fifteen-minute closed-book written examination.

Syllabus

This unit develops basic mathematical methods and concepts of algebra and will include their applications to problems in economics, management and related areas

Matrices, vectors and their geometry: Vectors and matrices, the algebra of vectors and matrices; Cartesian and vector equations of a straight line; normal vectors and planes; the Cartesian and vector equations of a plane; extension to higher dimension.

Systems of linear equations: Systems of linear equations and their expression in matrix form; Solving systems of linear equations using row operations; consistent and inconsistent systems; systems with free variables; range and rank of a matrix; general solution of linear systems.

Matrix inversion and determinants: finding inverses using row operations; determinants; matrix inversion using cofactors; Cramer's rule; input-output analysis.

Sequences, series and difference equations: Arithmetic and Geometric Progressions; sums of numbers, squares and cubes; solving first-order difference equations; application of first-order difference equations to financial problems; the cobweb model; Second-order difference equations.

Vector spaces and related concepts: Vector spaces; subspaces, including those associated with matrices; linear span; linear independence and dependence; bases and dimension; coordinates; linear transformations.

Diagonalisation of matrices: eigenvalues and eigenvectors; diagonalisation of a matrix and its connection with eigenvectors; finding powers of matrices using diagonalisation;

Applications of diagonalisation: Markov chains; using diagonalisation to solve systems of differential equations.