



## **Course information 2020-21**

### **MT1173 Algebra**

#### **General information**

**COURSE LEVEL:** 4

**CREDIT:** 30

**NOTIONAL STUDY TIME:** 300 hours

#### **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**

None

#### **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.

Please consult the current EMFSS Programme Regulations for further information on the availability of a course, where it can be placed on your programme's structure, and other important details.

## 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, 1996) [ISBN 978-0521559133]

## Assessment

This full course is assessed by a three-hour unseen 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.

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