

# 6403 (Mathematics for Students of Economics, Statistics and Related Disciplines 3)

<i>Year:</i>	2014–2015
<i>Code:</i>	MATH6403
<i>Level:</i>	Intermediate
<i>Value:</i>	Half unit (= 7.5 ECTS credits)
<i>Term:</i>	1
<i>Structure:</i>	3 hours lectures per week. Assessed coursework.
<i>Assessment:</i>	90% examination, 10% coursework
<i>Normal Pre-requisites:</i>	MATH6401 and MATH 6402 and/or ECON1004 and ECON1008
<i>Lecturer:</i>	Dr I Strouthos

## *Course Description and Objectives*

In this course, we will aim to develop aspects of the theory of matrices with real number entries and give an introduction to the theory of real vector spaces. During the course, we are also due to see examples of techniques which illustrate the use of matrices.

## *Recommended Texts*

There is a large number of textbooks covering the subject area(s) studied in this course. We will aim to make the course self-contained, but please feel free to contact the lecturer if you would like to obtain some further clarification or information regarding suitable textbooks for the course.

## *Detailed Syllabus*

**Matrices:** A description of some of the basic ideas and conventions present in the theory of (real) matrices, including an introduction to ‘subscript notation’.

**Linear equations:** A description of systems of (real) linear equations, including the use of matrices to solve such systems of equations. This will involve the study of elementary row operations and elementary matrices, and their use in techniques designed to solve (systems of real) linear equations, e.g. via the Gaussian elimination process or via the computation of matrix inverses (where appropriate).

**Determinants:** An introduction to the notion of the determinant of a (real) matrix, and its usefulness in problems involving systems of (real) linear equations. This will include a description of various ways of computing determinants of (real) matrices, e.g. using elementary row operations and cofactor expansion along a row or column, as well as a study of how determinants are connected with matrix invertibility and the solutions of systems of (real) linear equations.

**Real vector spaces:** An introduction to the setting of real vector spaces, including the notions of inner products and norms of vectors, and, subsequently, the Cauchy-Schwarz inequality and related results. A description of real vector subspaces, as well as a study of the notions of linear independence, span, basis, and dimension, in the setting of real vector (sub)spaces.

**Linear maps:** A description of (real) linear maps, including the notions of the kernel and image (and rank and nullity) of a linear map, and their connection to some of the ideas introduced earlier. An introduction to the notions of eigenvectors and eigenvalues, and matrix diagonalisability, as well as a description of the Gram-Schmidt orthonormalisation process.