

MATH0101 Linear Algebra for Data Science

<i>Year:</i>	2021–2022
<i>Code:</i>	MATH0101
<i>Level:</i>	5 (UG)
<i>Value:</i>	15 credits (= 7.5 ECTS credits)
<i>Term:</i>	2
<i>Assessment:</i>	The final weighted mark for the module is given by: 80 % examination, 10% biweekly homework, 5% mid-term problem sheet
<i>Normal Pre-requisites:</i>	Grade A in A-level Mathematics
<i>Lecturer:</i>	Dr Luciano Rila

Course Description and Objectives

The aim of this course is to provide an introduction to vectors, matrices, and least square methods, all basic topics in linear algebra, in the context of data science.

Recommended Texts

The recommended texts are: Stephen Boyd and Lieven Vandenberghe, *Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares* (Cambridge University Press, 3rd edition) and Gilbert Strang, *Introduction to Linear Algebra* (Wellesley Cambridge Press, 5th edition).

Detailed Syllabus

Vectors: addition, scalar multiplication, inner product.

Linear functions: linear functions, Taylor approximation and regression model.

Clustering: norm, distances, clustering, the k -means algorithm.

Linear independence: linear dependence, basis, orthonormal vectors.

Matrices: matrix operations, inverse matrices, simultaneous linear equations, eigenvalues and eigenvectors

Least squares: least square problem, least square data fitting.

Discrete Fourier series: diagonal matrices in Fourier basis, applications.