MATH0041 Mathematics for Science 2

Year:	2024–2025
Code:	MATH0041
Level:	4 (UG)
Normal student group(s):	UG: Students outside
Value:	15 credits (= 7.5 ECTS credits)
Term:	2
Assessment:	85% examination, 15% coursework
Normal Pre-requisites:	MATH0040 or NSCI0005
Lecturer:	Prof E Burman

Course Description and Objectives

The traditional title for this material is Advanced Calculus and Geometry. Building on the material covered in MATH0040, it provides a foundation course in 3-dimensional geometry, calculus of several variables, differential operators and eigenvalue problems.

Recommended Texts

There are many excellent textbooks covering this material. One particularly suitable one is Mary L Boas, *Mathematical Methods in the Physical Sciences.*

Detailed Syllabus

Introduction to matrices, matrix multiplication and addition, inverses and determinants.

Functions of several variables. Change of coordinates and Chain Rule. Critical points of functions of 2 variables; maxima, minima, saddle points.

Linear differential operators and Heisenberg (= commutator) bracket.

Vector fields. Normal and tangent fields to a surface. Div, grad, curl. Laplacian in spherical and cylindrical coordinates.

Row-Echelon Form, solving systems of linear equations, eigenvectors and eigenvalues. Diagonalisation of 3×3 symmetric matrices.

Orthonormal sets of vectors. Orthonormal sets of functions. Fourier series.