

# MATH0043 Mathematics for Physics and Astronomy

<i>Year:</i>	2021–2022
<i>Code:</i>	MATH0043
<i>Level:</i>	5 (UG)
<i>Normal student group(s):</i>	UG: Students outside Mathematics
<i>Value:</i>	15 credits (= 7.5 ECTS credits)
<i>Term:</i>	2
<i>Assessment:</i>	85% examination, 15% coursework
<i>Normal Pre-requisites:</i>	PHAS0025
<i>Lecturer:</i>	Dr E Louca

## *Course Description and Objectives*

This is a course of advanced mathematical methods for students of Physics and Astronomy who intend to proceed further with theoretical studies. It assumes a good understanding of basic mathematics and forms a natural precursor to the third year mathematics course. The emphasis is not on rigour, but on providing a good practical understanding of a selection of topics and the vital basics required for continuing theoretical work.

## *Recommended Texts*

Boas, *Mathematical Methods in the Physical Sciences* (Wiley).  
Wylie and Barrett, *Advanced Engineering Mathematics* (McGraw-Hill).

## *Detailed Syllabus*

**Functions of a Complex Variable.** Revision of complex numbers and power series. Elementary functions, logarithmic function and fractional powers, branch points and cuts. Continuity and differentiability, analytic functions, Cauchy-Riemann equations, harmonic functions. Types of singularities, Cauchy's Theorem, Residue Theorem. Cauchy's integral formulae, Evaluation of real integrals.

**Calculus of variations.** Euler's equation for extremal of a functional involving one dependent variable. Simple examples with one dependent variable. Problems with integral constraints.

**Group Theory.** The group axioms. Examples of symmetries for finite groups. Subgroups. Examples of representations of finite groups. Similarity transformations. Reducible and irreducible representations. Characters.