6202 (Mathematics for Physics and Astronomy)

Year:	2014–2015
Code:	MATH6202
Level:	Intermediate
Value:	Half unit (= 7.5 ECTS credits)
Term:	2
Structure:	3 hour lectures and 1 hour problem class per week. Weekly assessed coursework.
Assessment:	90% examination, 10% coursework
Normal Pre-requisites:	PHAS1245, PHAS1246 and PHAS2246
Lecturer:	Mr R Webb
Problem class teacher:	Prof JG Esler

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 or more dependent variables. Problems with integral constraints.

Group Theory. The group axioms. Examples of symmetries for finite groups. Subgroups and Equivalence classes. Representations of finite groups. Similarity transformations. Reducible and irreducible representations. Characters. Orthogonality relation.