1401 (Mathematical Methods 1)

Year: 2017–2018
Code: MATH1401
Level: First
Value: Half unit (= 7.5 ECTS credits)
Term: 1
Structure: 3 hours lectures, 1 hour problem class per week. Weekly assessed coursework.
Assessment: The final weighted mark for the module is given by: 85% examination, 10% coursework, 5% calculus test. The coursework mark is obtained from exercise sheet marks, a test on vectors and the mid-sessional examination result. In order to pass the module you must have at least 40% for both the examination and the final weighted mark and must also pass the calculus test.

Normal Pre-requisites: A* in A-level Mathematics and Further Mathematics
Lecturer: Prof R Halburd
Problem class teacher: Dr H J Wilson

Course Description and Objectives

The aim of the course is to bring students from a background of diverse A-level syllabuses to a uniform level of confidence and competence in vectors, complex numbers, calculus and differential equations. The course covers vectors, complex numbers, standard functions of a real variable, methods of integration, ordinary differential equations and probability. Each topic is given a formal treatment and illustrated by examples of varying degrees of difficulty.

There are two tests which are part of this course: a vectors test and a calculus test. The vectors test takes place around weeks 5 or 6 of term 1 and counts as part of the course work. This test is offered once. On the other hand, the calculus test is offered several times during the term, consisting of 10 basic calculational questions; you must get at least 9 correct answers to pass. It is necessary to pass this test, which you may attempt several times, in order to pass the module.

Recommended Texts

(i) Safier, Precalculus.
(ii) Spiegel, Advanced Calculus.
(iii) Ayres, Differential Equations (all Schaum’s Outline Series).
(v) Riley, Hobson, and Bence, Mathematical Methods for Physics and Engineering (Cambridge University Press).

**Detailed Syllabus**

**Vector algebra:** Scalar and vector products including triple products. Cartesian components and direction cosines. Applications to 3-dimensional geometry: lines and planes.

**Complex numbers:** Argand diagram, loci, roots of unity, geometry.

**Revision of simple functions:** Powers, exponentials, trig, hyperbolic. Differentiation. Maclaurin and Taylor series. Elementary properties of plane curves, curve sketching.

**Systematic revision of integration:** Partial fractions, by parts, substitution. Definite and indefinite integrals. Improper integrals.

**Introduction to ordinary differential equations:** First order (linear and non-linear). Second order reducible to first order. Linear equations of second and higher order (particular integral and complementary function).


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