

## MA31002: Differential Equations Course Guide 2011 - 2012

### Organisation

The MA31002 module runs for 11 teaching weeks in the first semester. The module leader and lecturer is

Dr Antonia Wilmot-Smith,  
Mathematics Division, Room 1.43A  
Tel: (01382 3)84482

**email:** antonia@maths.dundee.ac.uk

You should make an appointment to see Dr Wilmot-Smith if you have a problem regarding the course. You may also bring matters of concern about the course to the attention of the Mathematics Division Staff-Student Committee, which meets once each semester. A volunteer from Level 3 will act as class representative to sit on the Staff-Student Committee.

### Timetable

There will be three classes each week, usually in the form of two lectures and one tutorial. Class tests will also be held during these hours.

A weekly sheet of problems will be made available for students to attempt before each tutorial class. The lecturer will then answer any questions that the students may have in the tutorial.

### Your Commitment

You are expected to attend all classes except on medical grounds or with the special permission of the lecturer.

If you are unable to sit a class test or attend an Examination due to medical problems you should submit a medical certificate to your Faculty Office no later than 7 days after the event to be taken into consideration.

The Head of Division may debar a student not performing at a satisfactory level in the continuous assessments from entering the Degree Examination.

### Syllabus

In order to take this course you should have passed modules MA21001 and MA22001, or have an equivalent qualification. This Module provides students with the opportunity to study differential equations beyond the introductory material contained in the Level 2 modules.

The course content is listed below:

#### *First Order Differential Equations*

Separable equations, Linear equations with constant coefficients, Linear equations with variable coefficients, integrating factors, Homogeneous equations, Exact equations and integrating factors.

### *Second Order Differential Equations*

Homogeneous equations with constant coefficients, Fundamental solutions of linear homogeneous equations, Linear independence and the Wronskian (including Abel's formula), Reduction of order and reduction to the normal form, Nonhomogeneous equations, Method of undetermined coefficients, Initial conditions.

### *Systems of First Order Linear Equations*

Transformation of an  $n$ th order equation to a system of  $n$  first order equations, Homogeneous linear systems with constant coefficients, Fundamental sets of solutions and fundamental matrices, the Wronskian and Abel's formula, The exponential of a matrix, Nonhomogeneous linear systems, Variation of parameters, Homogeneous linear systems of two first order equations with constant coefficients, Stability and the phase plane.

### *Partial Differential Equations and Fourier Series*

Fourier series of functions of one variable, Dirichlet's Conditions, Technique for determining Fourier coefficients (even/odd functions). Gibbs' phenomena. Introduction to Partial Differential Equations, Technique of separation of variables with application to initial and boundary value problems.

## **Assessment**

There will be two class tests during the semester which together count for 20% of the assessment. The remaining 80% will come from the degree examination, which will be held in the December diet of Degree Examinations.

To pass the module you must score 40% overall and usually an average of at least 30% in the two class tests.

If you do not pass the module at the first sitting you will be able to sit a resit Degree Examination in August. Usually 100% of the resit mark is from this examination. The pass mark will be 40% and in addition, for the purposes of Honours Classification, any pass achieved at the resit diet will be capped at 40%.

## **Feedback**

At the end of the module you will be asked to complete a confidential questionnaire regarding the content and presentation of the module. This is an important element in the University's Academic Standards procedures.

## **Recommended Book**

Differential Equations - An Introduction to Modern Methods and Applications  
by J.R. Brannan and W.E. Boyce (Wiley; ISBN 0471651419)

Many other textbooks covering the course material may be found in the University Library.