Introduction

The aim of this module is to make the students familiar with a Computer Algebra software package and to use this software to solve a number of problems from the area of Dynamical Systems. Computer Algebra systems are nowadays an important tool of applied mathematicians, both in research and industry/business.

Organisation

The MA21002 module is a Level 2 module that runs for 11 teaching weeks in the second semester, and is worth 20 SCQF credits (equal to 10 ECTS points). All organisation and teaching will be carried out by:

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Dr Pontin is the Module Leader.
In order to take this course you should have passed modules MA11001 and MA12001, or have an equivalent qualification. You should have also taken MA21001 and be taking MA22001.
You may 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 one of the level 2 courses will act as class representative to sit on the Staff–Student Committee; their name will be posted on BlackBoard.

Timetable

This course involves 6 contact hours per week, typically 3 lectures and 3 computer workshops.

Your Commitment

You should attend all lectures and workshops except on medical grounds or with the special permission of the lecturer concerned. If you are absent from a class test or cannot complete an assignment on account of medical problems, you have to submit a medical certificate to the School Office immediately.
About 13 hours per week of your study time, including timetabled hours, should be devoted to this module.

**Study Support**

If you are having difficulty with the course work you are encouraged to seek help at an early stage at the workshops.

**Syllabus**

An introduction to Maple

1) The Maple front end and syntax
2) Plotting
3) Integration/differentiation
4) Differential equations

An introduction to Dynamical Systems

1) Vector fields, the gradient field, integrals of motion, fixed points and their classification
2) Examples of dynamical systems, including mass on a spring, pendulum, Van Der Pol oscillator, non-linear oscillator
3) Conservation laws for a system of interacting bodies
4) Orbits in a gravitational field
5) Non-autonomous systems

**Assessment**

Assessment: 40% continuous assessment, consisting of regular assignments and an in-class test. The examination, which is a two-hour examination paper held in the April/May Examination diet counts for 60%.

To pass this module in April/May it is necessary to gain at least 40% in the overall assessment and obtain a mark of at least 30% in the exam.

For those who fail the module in December, there will be a two-hour examination paper at the August Examination diet. To pass this module in August it is usually necessary to gain at least 40% in the August examination.

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

**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 Books**

Lots of tutorials/materials for Maple can be found online. The following book is available as an e-book, and can be found by following the link on MyDundee. The content goes far beyond the scope of the course but Chapters 0-4 overlap with the material covered in the course.

*Dynamical Systems with Applications using Maple*
*by S Lynch*
*Publisher: Springer.*