

Aims

The course is designed to give the students the opportunity to:

- tackle a variety of problems involving elementary mathematics
- work as a member of a team
- produce written reports
- make presentations
- develop career planning skills
- use computer algebraic packages such as Maple as a tool for applying mathematics and performing mathematical experiments

Syllabus

Three hours per week will be used for problem solving or career planning activities and one hour per week will be spent in a computing laboratory working with Maple.

There will be two blocks of problem solving activities lasting six weeks in total, separated by one block of career planning activities which will last three weeks.

For the problem solving, students will be given regular assignments on which they will work in small groups. The purpose of the assignments is to develop problem solving skills in mathematics via a series of examples taken from pure and applied mathematics. Every two weeks the students will have to submit written reports with their solutions. The reports will be graded, with marks awarded for the quality of the solution and the clarity of the presentation.

For the career planning part of the course, students will have an introduction into career opportunities for mathematics students. They will carry out a consultancy or marketing exercise, working in groups and presenting their results to the other students.

The computer part of the course is divided into three sections, lasting approximately three weeks each:

1. Introduction. Maple as a calculator. Expressions. Plotting.
2. Algebra. Algebraic expressions. Solving equations. Matrices and linear algebra.
3. Calculus. Limits, differentiation and integration. Solving ordinary differential equations (ODEs) and recurrence relations.

Teaching and Assessment

Contact Hours: 3 problem solving classes and 1 hour computer lab per week

Assessment: 100% by class tests or other continuous assessment
0% by end of course 2-hour exam

Resit Type: 2-hour written exam, containing seen and unseen problems, 1-hour Maple test

F17GA2
2018/19

Learning Outcomes
Problem Solving

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By the end of the course, students should be able to:

- be familiar with basic solution strategies for mathematical problems, e.g. consideration of examples, numerical experimentation or generalisation
- evaluate the information contained in a problem and adopt a suitable solution strategy
- translate a problem into a form that allows for a mathematical formulation and, if possible, (partial) solution
- present mathematical arguments in a clear and precise way
- work in a small team
- discuss mathematical problems in a small group
- apply analytical and numeracy skills to real-life problems
- prepare and give a presentation in a team, using a computer
- use Maple as a calculator
- use Maple to solve equations and for matrix manipulations
- use Maple to compute limits, to differentiate and integrate
- use Maple to solve ODEs
- use Maple to perform mathematical experiments