

Course content for MT2500/MT3500, Scientific Programming

Prerequisites:

MT1720, MT1820

Aims:

This course will introduce mathematics students to the basics of computer programming (specifically, python) by building solutions to mathematics-based tasks. It is designed to encourage deeper understanding of the mathematics learned elsewhere in the degree, as well as developing general mathematical skills such as how to structure a solution and understand logical flow.

Learning outcomes:

- use the computing language python in order to program simple tasks;
- import, process, and plot data;
- write computer programs that demonstrate and apply mathematical concepts at an appropriate level;
- give a presentation and write a report, adapting to the audience and the medium;
- produce a professional CV and covering letter, tuned to a particular job advertisement.

Course content:

Variables, control structures (for, if, while, custom functions), lists, use of additional packages (numpy, matplotlib, pandas, mpmath), data import, graph plotting, numerical integration (Runge-Kutta methods).

There will be a variety of assessment methods, primarily based on the completion of certain tasks (problem sets and group project), and including additional features designed to improve report writing and to develop presentation and group work skills. The use of Jupyter as an interface to python provides access to a combined system for programming and presenting a report, including LaTeX. The length, depth, and content of presentations and reports will be judged according to level-appropriate criteria.

The main project will be require the application of mathematical material of an appropriate level (derived from, or associated with, Year 1 and 2 courses for MT2500, and Year 2 and 3 courses for MT3500).

Specific employability elements of the course are CV preparation, placement pitch, and career talks.

Possible further topics include test driven development, agile development techniques, game theory, and introduction to algorithm scaling.