On-line course materials

MATH20522 - Principles of Mathematical Modelling

Year: 2 - **Semester:** 2 - **Credit Rating:** 10

Aims

The aims of this course unit are to help students

- achieve a broad understanding of the objectives of mathematical modelling;
- gain a working knowledge of core techniques behind mathematical modelling;
- develop a basic ability to quantify certain phenomena associated with the physical sciences; and control certain systems associated with the social and engineering sciences.

Brief Description

The Principles of Mathematical Modelling course is designed to provide students with a core and implementable knowledge of how mathematics can be used at the interdisciplinary interface.

The course is split into two complementary halves: Part I: Quantifiable Understanding; Part II: Control.

Every two weeks, the students will have attended: three lectures that provide students with the formal background to mathematical modelling; one demonstration lecture where a modelling problem is dissected; and two problem classes, where group work shall sometimes be required.

Learning Outcomes

On successful completion of this course unit students will be able to

- understand the core principles of mathematical modelling;
- begin to model the observable world in terms of a mathematical language;
- have a working knowledge of some of the key model creation tools;
- be able to communicate their modelling in the form of a oral and/or written presentations.
- have a working knowledge of some of the key mathematical modelling solution tools

Syllabus

- Week 1: Introduction to the course
- Weeks 2-6: Introduction to conservation, stability and model reduction,
- Week 7: Overview of free boundary problems
- Weeks 8-11: Introduction to optimal control and decision under uncertainty
- Week 12: Completion of projects and revision

Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
22	11	0	67	100

Assessment and Feedback

Project work: 40%

Examination: 60% (1.5hr exam).

Further Reading

- Acheson, D From Calculus to Chaos (Oxford, 1985)
- Pinch, E Optimal Control and the Calculus of Variations (Oxford 1995)
- Tayler, A. Mathematical Model in Applied Mechanics (Oxford, 1984)
- Beek, W. J. Transport Phenomena (Wiley, 2000)

Staff Involved

Dr Geoffrey Evatt - Lecturer

Data source is EPS system
Back To Top