Course ID 030464

Principles of Mathematical Modelling

MATH 20522

Credit rating 10
ECTS credits 5

Unit coordinator: Geoffrey Evatt

Semester 2

School of Mathematics
Undergraduate

Level 2

FHEQ level ' Middle part of Bachelors'

Marketing course unit overview
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.

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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.

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

Assessment methods

Other	40%
Written exam	60%

Project work: 40%Examination: 60% (1.5hr exam).

Feedback methods
Tutorials will provide an opportunity for students' work to be discussed and to provide feedback on their understanding.

Requisites
NONE

Available as free choice? N

Recommended 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)

Scheduled activity hours

Lectures	22
Tutorials	11

Independent study hours 67 hours