MA112-6 Experimental Mathematics

20/21

Department
Warwick Mathematics Institute
Level
Undergraduate Level 1
Module leader
Andrew Brendon-Penn
Credit value
6
Module duration
5 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module consists of a series of 4 laboratory projects which combine physical or computer experiments with mathematical modelling and analysis. The projects will include work on symmetry breaking, catastrophe theory, nonlinear oscillators, period doubling, and coupled pendula.

Students work in groups on the experiments and a joint written report.

Module web page

Module aims

To demonstrate that mathematical ideas and techniques can be used to predict and explain `real life' phenomena and that, conversely, physical intuition can lead to mathematical insights.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

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experiments with mathematical modelling and analysis. The projects will include work on symmetry breaking, catastrophe theory, nonlinear oscillators, period doubling, and coupled pendula.

Learning outcomes

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

- To show how various aspects of mathematics seen in earlier modules can be applied to real-world situations, such as the application of differential equations to the study of coupled and nonlinear oscillators.
- To illustrate the use of simple group theoretical ideas in problems with symmetries.
- To provide an opportunity for students to learn the thought process used to solve long and complicated problems, by breaking them down into smaller, more manageable pieces.
- To provide an opportunity for students to develop report writing skills.
- To provide an opportunity for students to develop the ability to work in groups.

Indicative reading list

As this module follows on from several core first year modules, you are recommended to check the recommended texts for those modules.

Subject specific skills

Students gain an understanding of how various aspects of mathematics seen in earlier modules can be applied to real-world situations, such as the application of differential equations to the study of coupled and nonlinear oscillators, and the use of simple group theoretical ideas in problems with symmetries.

The module provides an opportunity for students to learn the thought process used to solve long and complicated problems, by breaking them down into smaller, more manageable pieces.

Transferable skills

- group work
- problem solving techniques
- scientific and mathematical rigour
- report-writing skills
- computer programming
- applying mathematics to real-world problems

Study

Study time

Type	Required
Supervised practical classes	4 sessions of 3 hours (20%)
Private study	48 hours (80%)
Total	60 hours

Private study description

Work on set exercises.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A2

	Weighting	Study time	Eligible for self-certification
Assignment 2	25%		No
Assignment 3	25%		No
Assignment 1	25%		No
4 assignments, each involves answering approx. 30 questions			
Assignment 4	25%		No

Assessment group R

	Weighting	Study time	Eligible for self-certification
Reassessment is not possible with this module	100%		No

Feedback on assessment

Marked coursework.

Availability

Courses

This module is Option list A for:

- Year 1 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- Year 1 of UMAA-GV17 Undergraduate Mathematics and Philosophy
- Year 1 of UMAA-GV18 Undergraduate Mathematics and Philosophy with Intercalated Year

This module is Option list B for:

- Year 1 of UMAA-GV17 Undergraduate Mathematics and Philosophy