

# 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.

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.

## **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**

<b>Type</b>	<b>Required</b>
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**

	<b>Weighting</b>	<b>Study time</b>
Assignment 2	25%	
Assignment 3	25%	
Assignment 1	25%	
4 assignments, each involves answering approx. 30 questions		
Assignment 4	25%	

#### **Assessment group R**

	<b>Weighting</b>	<b>Study time</b>
Reassessment is not possible with this module	100%	

### **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)
- UMAA-GV17 Undergraduate Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
- UMAA-GV18 Undergraduate Mathematics and Philosophy with Intercalated Year
  - Year 1 of GV18 Mathematics and Philosophy with Intercalated Year
  - Year 1 of GV18 Mathematics and Philosophy with Intercalated Year

This module is Option list B for:

- UMAA-GV17 Undergraduate Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy
  - Year 1 of GV17 Mathematics and Philosophy