# MA356-10 Introduction to Mathematical Biology

## 26/27

**Department**
Warwick Mathematics Institute
**Level**
Undergraduate Level 3
**Module leader**
Samir Siksek
**Credit value**
10
**Module duration**
10 weeks
**Assessment**
Multiple
**Study location**
University of Warwick main campus, Coventry

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## Description

## Introductory description

In this module, we will develop simple models of biological phenomena from basic principles. We will introduce analysis techniques to investigate model dynamics in order to deduce biologically significant results. We will use (systems of) ordinary differential equations, difference equations, and partial differential equations to study population dynamics, biochemical kinetics, epidemiological dynamics, evolution, and spatiotemporal pattern formation. Throughout, we will discuss the biological implications of our results.

Module web page

## Module aims

Introduction to Mathematical Biology, frequently used model types and analysis techniques to study model dynamics.

## 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.

1. Mean-field Population dynamics
   a. Single-species population models
   b. Multi-species population models
2. Models of biochemical kinetics
3. Epidemiological models
4. Models of evolution
5. Spatio-temporal models of population dynamics
   a. Travelling waves
   b. Pattern formation

## Learning outcomes

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

- To develop models of biological phenomena from basic principles.
- To analyse models of biological phenomena using mathematics to deduce biologically significant results.
- To reproduce models and fundamental results for a range of biological systems.
- To develop an understanding of the biology of the biological systems introduced.

## Indicative reading list

Reading lists can be found in Talis

## Subject specific skills

Students will learn how to derive mathematical models describing biological phenomena from first principles. They will be exposed to different model types (ordinary differential equations, partial differential equations, difference equations) and gain experience in model choice depending on the underlying biological questions. Students will gain analysis skills to determine solution behaviour of model systems and learn how to interpret mathematical results from a biological viewpoint.

## Transferable skills

Students will learn about biological systems and the use of mathematical models to solve real world problems. This will be extremely valuable experience for those wishing to use mathematical models in the future in non-academic contexts.

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## Study

## Study time

| Type | Required |
|---|---|
| Lectures | 30 sessions of 1 hour (30%) |
| Seminars | 9 sessions of 1 hour (9%) |
| Private study | 61 hours (61%) |
| Total | 100 hours |

## Private study description

Homework, assignments, engagement with departmental support and feedback mechanisms, exam preparation.

## Costs

No further costs have been identified for this module.

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## Assessment

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

### Assessment group B1

| | Weighting | Study time | Eligible for self-certification |
|---|---|---|---|
| Centrally-timetabled examination (On-campus) | 100% | | No |

- Answerbook Pink (12 page)

### Assessment group R1

| | Weighting | Study time | Eligible for self-certification |
|---|---|---|---|
| In-person Examination - Resit | 100% | | No |

- Answerbook Pink (12 page)

### Feedback on assessment

Solutions to homework problems, support classes, solutions to exam papers.

Past exam papers for MA356

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# Availability

### Anti-requisite modules

If you take this module, you cannot also take:

- MA256-10 Introduction to Mathematical Biology

# Courses

This module is Core option list C for:

- Year 3 of UMAA-GV17 Undergraduate Mathematics and Philosophy
- Year 3 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations

This module is Option list A for:

- Year 4 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- Year 3 of UMAA-G100 Undergraduate Mathematics (BSc)
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 3 of G100 Mathematics
    - Year 3 of G103 Mathematics (MMath)
- Year 3 of UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
    - Year 3 of GF13 Mathematics and Physics
    - Year 3 of FG31 Mathematics and Physics (MMathPhys)
- Year 4 of UMAA-G101 Undergraduate Mathematics with Intercalated Year