

# MD9A5-10 Mathematical Modelling of Biomedical Systems

**26/27**

**Department**

Warwick Medical School

**Level**

Taught Postgraduate Level

**Module leader**

Daniel Hebenstreit

**Credit value**

10

**Module duration**

10 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

The module aims to provide an introduction into the use of mathematical models and their implementation in Matlab to analyze typical problems in biomedicine.

### Module aims

Mathematical models play a central role in understanding mechanisms underpinning a wide range of biological systems. These models are used for the analysis and interpretation of large and varied biological data, but also for the prediction of the dynamic behaviour of these biological processes.

The module aims to:

1. Equip students with mathematical and computational methods/tools (e.g.; MATLAB and/or similar software) for analysing, modelling and predicting dynamic systems essentially related to biochemical problems.
2. To enable students to develop their problem-solving skills in particular areas of biomedical research, working in group.
3. Equip students with analytical skills by developing biomedical systems models from

experimental data.

## 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.

Students will learn to translate real-world problems in biomedical sciences into a mathematical framework and to derive a model from experimental data using different methods. This will be supported by key elements of the mathematical background material. Students will learn fundamental mathematical methods for solving single and multivariable ordinary and partial differential equations. They will decipher the use of numerical methods to solve particular biological problems. Students will also learn to solve problem using computational tools. Cognitive skills will be gained through computer sessions where material delivered by lectures will be directly applied and during self-study.

## Learning outcomes

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

- Translate a real-world problem in biomedical sciences into a mathematical context.
- Critically appraise the current practice in application of numerical methods to a wide range of problems at the interface of life and physical sciences
- Choose appropriate mathematical methods to interpret data
- Efficiently solve problems using computational tools.

## Indicative reading list

[Reading lists can be found in Talis](#)

## Subject specific skills

Sound understanding of subject

Critically evaluate

Reflection

## Transferable skills

Numeracy

Thinking and problem solving

written communication

oral communication

Teamwork

Organisation & time management

Use of tools and technology

Commercial awareness

Independence and initiative  
Adaptability/Flexibility

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## Study

### Teaching split

Provider	Weighting
Warwick Medical School	60%
Life Sciences	40%

### Study time

Type	Required
Lectures	10 sessions of 2 hours (20%)
Tutorials	10 sessions of 2 hours (20%)
Private study	20 hours (20%)
Assessment	40 hours (40%)
Total	100 hours

### Private study description

Self-directed studies: 20 hours that include preparation for next session (e.g.; formative problem-solving exercises)

### 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 A1

Assessment component	Weighting	Study time	Eligible for self-certification
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	<b>Weighting</b>	<b>Study time</b>	<b>Eligible for self-certification</b>
Problem-solving assignment 1	50%	20 hours	Yes (extension)
To develop students' analytical skills to solve biomedical problems using computational tools and /or model experimental data using appropriate mathematical methods.			

Reassessment component is the same

Assessment component

Problem-solving assignment 2	50%	20 hours	Yes (extension)
To demonstrate advanced analytical skills in solving biomedical problems using computational tools and /or model experimental data using appropriate mathematical methods.			

Reassessment component is the same

## Feedback on assessment

Staff teaching on the module will mark the coursework. Marks and individualized feedback on each coursework will be moderated by the Module Lead, in line with WMS assessment criteria (including submission for plagiarism). Feedback will be available to students on request throughout the module. Any student failing an element of assessment will be offered an appointment with the module lead for face-to-face feedback.

## Availability

### Courses

This module is Core optional for:

- Year 1 of TMDA-B91Z Postgraduate Taught Interdisciplinary Biomedical Research

This module is Optional for:

- Year 4 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)

This module is Option list A for:

- Year 4 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)