MD9A5-10 Mathematical Modelling of Biomedical Systems

20/21

Department
Warwick Medical School
Level
Taught Postgraduate Level
Module leader
Daniel Hebenstreit
Credit value
10
Module duration
10 weeks
Assessment
50% coursework, 50% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

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 unable 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:

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

Indicative reading list

1. R.L. Burden, Numerical Analysis, Brooks/Cole, 2001
2. J.H. Mathews, Numerical Methods Using Matlab, Pearson, 2004
3. P. Fall, Computational Cell Biology, Springer, 2002

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

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (20%)
Practical classes	25 sessions of 1 hour (25%)
Private study	55 hours (54%)
Assessment	2 hours (2%)
Total	102 hours

Private study description

Self-directed studies: 55 hours that include preparation for next session (e.g.; formative problem-solving exercises) and solving assessed coursework problems.

Students will be advised to dedicate 45% of their time towards the preparation of the assessed problem-solving coursework; 20% towards the preparation of the sessions and 35% towards the preparation (revision) of the assessed exam.

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 C1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Problem-solving assignments	50%	1 hour	Yes (extension)

To develop students’ analytical skills to solve biomedical problems using computational tools and

	Weighting	Study time	Eligible for self-certification

/or model experimental data using appropriate mathematical methods.
Each of the 2 problem-solving assignments will have the same weighting in the assessed coursework final average mark.

Reassessment component is the same

Assessment component

Examination	50%	1 hour	No

To demonstrate the student's ability to analyse a problem and develop biomedical models using the
appropriate mathematical methods and computational tools.

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. The written exam will be first marked and the Module Lead or Course Director will moderate marks and feedback. Any student failing an element of assessment will be offered an appointment with the module lead for face-to-face feedback.

Past exam papers for MD9A5

Availability

Courses

This module is Optional for:

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