



Module Specification

Mathematical Biology

Version: 2023-24, v2.0, 31 Jan 2023

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Part 1: Information

Module title: Mathematical Biology

Module code: UFMFJH-15-M

Level: Level 7

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Computer Sci & Creative Tech

Partner institutions: None

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: Dynamical Systems 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The overarching theme of the module is to apply techniques from dynamical systems theory to model, analyse, interpret and predict the behaviour of important phenomena in biology. No previous expertise in biology is assumed or required.

Features: Not applicable

Educational aims: See Learning Outcomes.

Outline syllabus: The following list of 'bio-themes' is intended to be indicative. These themes may change from year to year depending on current trends in research (e.g. evolution of bacterial resistance), topics of current national/international importance (e.g. outbreak of recent epidemics like Ebola or Foot and Mouth) or the specialisms of academic staff.

Population Genetics and Evolution:

Genotype, phenotype, alleles and frequency; Hardy-Weinberg Law; survival, selection, mutation, evolution; Fisher-Haldane-Wright Equation; fitness.

Ecological Population Dynamics:

Growth rate, environmental carrying capacity; competition, predation, cooperation; extinction, coexistence, permanence, diversity; sustainability.

Dynamics of Infectious Diseases:

SI, SIS, SIR, SIRS compartment models; epidemics, endemics; control, eradication, public health.

Part 3: Teaching and learning methods

Teaching and learning methods: The module syllabus is delivered by means of lectures, to introduce and develop new material and provide context.

Problems Classes/Workshops will be used to go through solutions to homework exercises or consolidate/contextualise material.

Tutorials will offer mathematical support, guidance and feedback. Students will have the opportunity to ask individual questions about problems they may be having with homework exercises, lecture material, assessment preparation, etc. This may also include some computer lab sessions.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Describe and interpret the structure of mathematical models used in a variety of biological contexts

MO2 Apply appropriate mathematical techniques to determine the qualitative behaviour of models used in a variety of biological contexts

MO3 Interpret the results of mathematical analyses in a variety of biological contexts

MO4 Critically describe and interpret the strengths and limitations of mathematical models used in a variety of biological contexts

MO5 Describe and critique the use of mathematical models in a biological context of current/recent interest or importance

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/index.html) via the following link <https://uwe.rl.talis.com/index.html>

Part 4: Assessment

Assessment strategy: The assessment will be a single 3 hour examination consisting of a combination of partially seen and unseen questions.

The learning outcome relating to the description and critique of the use of mathematical models in a biological context of current/recent interest or importance will be assessed using the partially seen question(s). Such question(s) will be based on reading/resources identified by the lecturer during teaching delivery and students

will have the opportunity to engage with this material well in advance of the examination. As an illustrative example, students might be asked to prepare a short essay on the predictions of particular mathematical model used by a government agency to model a recent epidemic; or provide a critique of several classes of models used in recent years to investigate the evolution of bacterial resistance.

The unseen question(s) will assess the learning outcomes relating to key mathematical (subject specific) skills involved in the analysis and interpretation of mathematical models in a variety of biological contexts (see Outline Syllabus). The assessment method (wholly by examination) will prevent plagiarism and is aligned with the programme's assessment strategy to enable students to manage coursework workloads effectively.

Assessment tasks:**Examination (First Sit)**

Description: Examination 3 hours

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Examination (Resit)

Description: Examination 3 hours

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mathematics [Sep][FT][Frenchay][4yrs] - Not Running MMath 2020-21

Mathematics [Sep][SW][Frenchay][5yrs] MMath 2019-20