Modelling of Biological Systems

Title	Modelling of Biological Systems
Semester	E2023
Master programme in	Mathematical Bioscience
Type of activity	Course
Teaching language	English
Study regulation	Read about the Master Programme and find the Study Regulations at ruc.dk Læs mere om uddannelsen og find din studieordning på ruc.dk

REGISTRATION AND STUDY ADMINISTRATIVE

Registration	Sign up for study activities at stads selvbetjening within the announced registration period, as you can see on the Studyadministration homepage. When signing up for study activities, please be aware of potential conflicts between study activities or exam dates. The planning of activities at Roskilde University is based on the recommended study programs which do not overlap. However, if you choose optional courses and/or study plans that goes beyond the recommended study programs, an overlap of lectures or exam dates may occur depending on which courses you choose.
Number of participants	
ECTS	10
Responsible for the activity	Jesper Schmidt Hansen (jschmidt@ruc.dk)
Head of study	Jesper Schmidt Hansen (jschmidt@ruc.dk)
Teachers	
Study administration	INM Registration & Exams (inm-exams@ruc.dk)
Exam code(s)	U60161

ACADEMIC CONTENT

Overall objective	The overall objective of the course is to give the student a fundamental understanding of and experience with modelling biological systems using mathematics and what is achieved by this.
Detailed description of content	During the course, the student will explore examples of mechanism-based mathematical models of biological systems. This can include population dynamics, epidemics, disease spreading in the human body, and resource competition. The exploration includes mathematical and numerical analysis, validation through biological data, and the models' limitations and possible extensions are discussed. The course seeks to give the student an integrated understanding of the modelling process. This can, for example, be supported by guest lectures with different scientific backgrounds and research focus areas.
Course material and Reading list	The course syllabus is composed of teacher's notes, selected book chapters, possible relevant scientific papers, etc. During the course computer code will also be available; this code is not necessarily complete and the students must be able to extent and modify the code for specific purposes. The material will be made available to the students before and during the semester, depending on the nature of the material.
Overall plan and expected work effort	The teaching format is based on a scientific dialogue between the students and the course teacher, working with exercises, student presentations, etc. The teacher will, of course, highlight relevant points. For the dialogue to be fruitful, the student must prepare for each class; this includes careful reading the text material, finish exercises, and other home work suggested by the teacher. As a rule of thumb, the student should use 1-2 hours of preparation for every hour in class. - Total (minimum): 280 hours ● In class: 80-90 hours ● Preparation for class: 160-180 hours ● Preparation for exam: 35-50 hours ● Exam: 4 hours
Format	
Evaluation and feedback	The course includes formative evaluation based on dialogue between the students and the teacher(s). Students are expected to provide constructive critique, feedback and viewpoints during the course if it is needed for the course to have better quality. Every other year at the end of the course, there will also be an evaluation through a questionnaire in SurveyXact. The Study Board will handle all evaluations along with any comments from the course responsible teacher. Furthermore, students can, in accordance with RUCs 'feel free to state your views' strategy through their representatives at the study board, send evaluations, comments or insights form the course to the study board during or after the course.

Programme	Depending on the specific topic, the teacher, and the student group, the students will engage in a dialogue with the teacher and from this do exercises in groups or individually. The exercises will be based on pure mathematical analysis, computer-aided analysis, discussion in groups, with teacher, and so forth.

ASSESSMENT

Overall learning outcomes	After the course the student will be able to • discuss and apply classic mechanism-based mathematical models of selected areas within biology, for example, populations, epidemics, disease spreading in the human body, and competition. • apply the modelling cycle in order to develop mathematical models of biological systems from experimental data. • reflect on and argue how modelling is used to gain fundamental new biological insight through model analysis. • reflect on and argue how the models can be used to predict and control biological systems and processes. • critically and analytically explore the limitations and validity of different models. • perform numerical explorations of the mathematical models using relevant programme language(s) like e.g. Python
Form of examination	Individual written invigilated exam. The duration of the exam is 4 hours. Permitted support and preparation materials for the exam: All. Assessment: 7-point grading scale. Moderation: External examiner.
Form of Re-examination	Individual oral exam with time for preparation. Time for preparation including time to pick a question by drawing lots: 45 minutes. Time allowed for exam including time used for assessment: 45 minutes. Permitted support and preparation materials: Course material and own notes. Assessment: 7-point grading scale. Moderation: External examiner.
Type of examination in special cases	
Examination and assessment criteria	Individual written invigilated exam; duration of the exam is 4 hours. The evaluation is based on the student's skill to apply and analyze mechanistic models for biological data. This skill is founded in knowledge and understanding of previous models, their limitations and extensions through the modelling cycle.

In the model analyses it is evaluated whether the student can derive novel biological insight from the model output, which can be on the form of mathematical expressions, graphs, numerical data, and so forth.

Exam code(s) Exam code(s) : U60161

Course days:

Hold: 1

Modelling of Biological Systems (MATHBIO)

time 05-09-2023 08:15 til
05-09-2023 12:00

location 27.2-054 - lokale 3 (40)

Teacher Jesper Schmidt Hansen (jschmidt@ruc.dk)

Modelling of Biological Systems (MATHBIO)

time 08-09-2023 12:15 til
08-09-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 13-09-2023 08:15 til
13-09-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 15-09-2023 12:15 til
15-09-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 20-09-2023 08:15 til
20-09-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 22-09-2023 12:15 til
22-09-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO) - Note: Tuesday due to NATDAG

time 26-09-2023 08:15 til
26-09-2023 12:00

location 27.1-089 - teorirum 27 (66)

Modelling of Biological Systems (MATHBIO)

time 29-09-2023 12:15 til
29-09-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 04-10-2023 08:15 til
04-10-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 06-10-2023 12:15 til
06-10-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 11-10-2023 08:15 til
11-10-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 13-10-2023 12:15 til
13-10-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 18-10-2023 08:15 til
18-10-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 20-10-2023 12:15 til
20-10-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 25-10-2023 08:15 til
25-10-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 01-11-2023 08:15 til
01-11-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	03-11-2023 12:15 til 03-11-2023 14:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-064 - pc lokale (40)

Modelling of Biological Systems (MATHBIO)

time	08-11-2023 08:15 til 08-11-2023 12:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	10-11-2023 12:15 til 10-11-2023 14:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	15-11-2023 08:15 til 15-11-2023 12:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	17-11-2023 12:15 til 17-11-2023 14:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	22-11-2023 08:15 til 22-11-2023 12:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 24-11-2023 12:15 til
24-11-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 29-11-2023 08:15 til
29-11-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 01-12-2023 12:15 til
01-12-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 06-12-2023 08:15 til
06-12-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 08-12-2023 12:15 til
08-12-2023 14:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time 13-12-2023 08:15 til
13-12-2023 12:00

location 27.1-052 - lokale 2 (20)

Modelling of Biological Systems (MATHBIO)

time	15-12-2023 12:15 til 15-12-2023 14:00
location	27.1-052 - lokale 2 (20)

Modelling of Biological Systems - Exam (MATHBIO)

time	05-01-2024 10:00 til 05-01-2024 14:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	44.3-40 - teorilokale (50)

Modelling of Biological Systems - Reexam (MATHBIO)

time	21-02-2024 12:15 til 21-02-2024 16:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt