

# Fundamental Mathematical Structures

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|-------------------|---|
| Title             | Fundamental Mathematical Structures   |
| Semester          | F2024   |
| Master            | Matematik / Mathematical Physical Modelling / Mathematical Computer programme in Modelling / Mathematical Bioscience / Physics and Scientific Modelling   |
| Type of activity  | Course  |
| Teaching language | English   |
| Study regulation  | Read about the Master Programme and find the Study Regulations at <a href="https://ruc.dk">ruc.dk</a><br>Læs mere om uddannelsen og find din studieordning på <a href="https://ruc.dk">ruc.dk</a> |

## REGISTRATION AND STUDY ADMINISTRATIVE

|                              |  |
|------------------------------|--|
|                              | Sign up for study activities at <a href="https://stads.selvbetjening.ruc.dk">stads selvbetjening</a> within the announced registration period, as you can see on the <a href="https://ruc.dk/studyadministration">Studyadministration homepage</a> .   |
|                              | When signing up for study activities, please be aware of potential conflicts between study activities or exam dates.   |
| Registration                 | 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 ( <a href="mailto:jschmidt@ruc.dk">jschmidt@ruc.dk</a> )<br>Eva Uhre ( <a href="mailto:euhre@ruc.dk">euhre@ruc.dk</a> )  |
| Head of study                | Jesper Schmidt Hansen ( <a href="mailto:jschmidt@ruc.dk">jschmidt@ruc.dk</a> )   |
| Teachers                     |  |
| Study administration         | INM Registration & Exams ( <a href="mailto:inm-exams@ruc.dk">inm-exams@ruc.dk</a> )  |
| Exam code(s)                 | U60167   |

## ACADEMIC CONTENT

|                                       |  |
|---------------------------------------|--|
| Overall objective                     | <p>The overall objective of the course is to give the student an understanding of mathematical structures and proficiency in formulating mathematical logic, reasoning, and argumentation.</p> <p>The course aims at giving the students an understanding of the axiomatic deductive structure of mathematics by introducing the students to classical fundamental examples of axiomatic deductive structures.</p> |
| Detailed description of content       | <p>Examples are propositional logic, set theory, abstract algebra, general topology, Real analysis, Probability theory, Euclidean geometry, Differential geometry and more.</p> <p>The concrete incarnation of the course will discuss a number of selected such fundamental structures.</p>   |
| Course material and Reading list      | <p>The course will introduce to and enlarge on a number of selected fundamental structures e.g. such as presented in the lecture notes by prof. Mogens Niss, which are freely available upon request</p> <p>The course will be taught as a mixture of lectures, discussions and problem solving.</p>   |
| Overall plan and expected work effort | <p>The course load is 10 ECTS corresponding to approx. 270 hours of work. Of these approximately 84 hours will be classes, 80 hours should be preparations for classes, another 80 hours post processing of classes. The remaining time will be dedicated to preparing the portfolio elements for the final exam and the final exam.</p>   |
| Format                                | <p>The course includes formative evaluation based on dialogue between the students and the teacher(s).</p>   |
| Evaluation and feedback               | <p>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.</p>                        |

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 from the course to the study board during or after the course.

**Programme** The course will cover approximately 4 fundamental structures across approximately equal amounts of classes.

## **ASSESSMENT**

After the course the student will be able to

- Overall learning outcomes**
- present concrete mathematical structures in the field of set theory, topology, analysis and algebra
  - formulate proofs of common features and differences between such structures
  - exercise mathematical reasoning in relation to the subject
  - compare and differentiate between different types of mathematical arguments and proofs
  - critically and independently judge the validity of a mathematical proof

Individual oral exam based on a portfolio.

**Form of examination** The character limit of the portfolio is 1,200-120,000 characters, including spaces. Examples of written products are exercise responses, talking points for presentations, written feedback, reflections, written assignments. The preparation of the products may be subject to time limits.

The character limits include the cover, table of contents, bibliography, figures and other illustrations, but exclude any appendices.

Time allowed for exam including time used for assessment: 30 minutes. The assessment is an assessment of the oral examination. The written product(s) is not part of the assessment.

Permitted support and preparation materials for the oral exam: All.

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| <p>Form of Re-examination</p> <p>Type of examination in special cases</p> | <p>Assessment: 7-point grading scale.</p> <p>Moderation: Internal co-assessor</p> <p>Samme som ordinær eksamen / same form as ordinary exam</p>   |
|   | <p>The exam is a 30 min oral exam including grade decision. At the exam the student draws a portfolio element to present without further preparation. The presentation should be timed to 10 min. In order to leave am-le time for further questions across the entire course curriculum.</p> <p>The students are offered to have their portfolio elements commented prior to the exam by the course professor after hand-in times decided by the course professor.</p> <p>Handing-in of portfolio elements for commenting is highly advised, but is not obligatory.</p>  |
| <p>Examination and assessment criteria</p>                                | <p>The assessment criteria for the written part of the exam</p> <ul style="list-style-type: none"> <li>• present concrete mathematical structures in the field of set theory, topology, analysis and algebra</li> <li>• formulate proofs of common features and differences between such structures</li> <li>• exercise mathematical reasoning in relation to the subject</li> <li>• compare and differentiate between different types of mathematical arguments and proofs</li> <li>• critically and independently judge the validity of a mathematical proof</li> </ul> |
|   | <p>The assessment of the oral exam is based on the student's ability to meet the criteria mentioned above and their ability to</p> <ul style="list-style-type: none"> <li>• clearly present and communicate the scientific content of the portfolio</li> </ul>  |

- engage in a scientific dialogue and discussion with the assessor and co assessor

Furthermore, whether the performance meets all formal requirements in regard to both for the written og oral exam

Exam code(s) Exam code(s) : U60167

## Course days:

**Hold: 1**

### **Fundamental Mathematical Structures (MathBio)**

time 06-02-2024 12:15 til  
06-02-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio) - Note: Building 12**

time 08-02-2024 10:15 til  
08-02-2024 12:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 12.1-073 - teorilokale i 12.1 (30)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 13-02-2024 12:15 til  
13-02-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 15-02-2024 10:15 til  
15-02-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 20-02-2024 12:15 til  
20-02-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 22-02-2024 10:15 til  
22-02-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 27-02-2024 14:15 til  
27-02-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 29-02-2024 10:15 til  
29-02-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 07-03-2024 10:15 til  
07-03-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 12-03-2024 12:15 til  
12-03-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 14-03-2024 10:15 til  
14-03-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 19-03-2024 12:15 til  
19-03-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 21-03-2024 10:15 til  
21-03-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 26-03-2024 12:15 til  
26-03-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 02-04-2024 12:15 til  
02-04-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 04-04-2024 10:15 til  
04-04-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 09-04-2024 12:15 til  
09-04-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 11-04-2024 10:15 til  
11-04-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 16-04-2024 12:15 til  
16-04-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 18-04-2024 10:15 til  
18-04-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 23-04-2024 12:15 til  
23-04-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )



### **Fundamental Mathematical Structures (MathBio)**

time 25-04-2024 10:15 til  
25-04-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 30-04-2024 12:15 til  
30-04-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 07-05-2024 12:15 til  
07-05-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 14-05-2024 12:15 til  
14-05-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 16-05-2024 10:15 til  
16-05-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

### **Fundamental Mathematical Structures (MathBio)**

time 21-05-2024 12:15 til  
21-05-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures (MathBio)**

time 23-05-2024 10:15 til  
23-05-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures - Hand-in of portfolio (MathBio)**

time 12-06-2024 10:00 til  
12-06-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt

## **Fundamental Mathematical Structures - Exam (MathBio)**

time 21-06-2024 08:15 til  
21-06-2024 16:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )

## **Fundamental Mathematical Structures - Hand-in of portfolio (reexam) (MathBio)**

time 28-06-2024 10:00 til  
28-06-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt

## **Fundamental Mathematical Structures - Reexam (MathBio)**

time 07-08-2024 08:15 til  
07-08-2024 12:00  
location 27.1-052 - lokale 2 (20)  
Teacher Eva Uhre ( euhre@ruc.dk )