# Fundamental Mathematical Structures

## About the course

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|---|---|
| subject | Matematik |
| activitytype | master course |
| Teaching language | English |
| Registration | Engelsk: Please register via STADS-self-service within the annonced registration period, for more information see: https://intra.ruc.dk/en/students/student-hub/student-hub/ruc-uddannelsesjura-og-studieadministration/registration-periods/<br><br>Dansk: Tilmelding via STADS selvbetjening Indenfor den annonceret tilmeldingsperiode, for mere information se: https://intra.ruc.dk/for-studerende/student-hub/student-hub-sys-foldere/ruc-uddannelsesjura-og-studieadministration/tilmeldingsperioder/ |
| Learning outcomes/ Assessment criteria | Knowledge ● Knowledge of specific mathematical structures within set theory, topology, analysis and algebra. ● Knowledge of common features of and differences between such structures. ● Knowledge of different types of reasoning and proofs, and their importance. ● Construction and formalisation of such structures. Skills ● The ability to recognise fundamental mathematical structures. ● The ability to know and use symbols and other representations in accordance with the given formalism. ● Skills in reading, understanding and reproducing proofs in the context of the structures studied. Competencies ● Competency to apply mathematical thinking in relation to the fundamental structures of the subject. ● Competency to be able to follow, assess and carry out mathematical reasoning and proofs. ● Competency to decode, interpret, differentiate between and link different mathematical representations. ● Competency to be able to decode and apply mathematical symbolic language within a given formalism, and to assess the strengths and weaknesses of an axiomatic system. ● Competency to be able to read and understand mathematical texts concerning the basis of the subject and fundamental structures, and to communicate these both orally and in writing. |
| Overall content | ● Various fundamental, abstract mathematical structures and their interrelations. ● Introduction to formal logic, including the concept of a formal theory. ● Set theory, algebraic structures, metric and topological spaces, geometric structures and aspects of measure spaces. |
| Detailed description of content | The aim of the course is to buildup the students understanding of mathematical structures. What constitutes a mathematical structure? How is a structure formed? What are the properties? What are the general principles (to the extend such principles can be determined). The course has two parts. The first is a rather quick (re)-introduction of various mathematical structures. The second part is a comparative analysis of the structures encountered in the course and in other courses. What is the general pattern in structure formation etc. |
| Teaching and working methods | Lectures and solving of exercises with brief student presentations and discussions of the material. |
| Expected work effort (ECTS-declaration) | The course is a 10 ECTS course and the student is expected to work 250-260 hours with the course during the semester. Off these 60 hours (40 classes of 1h45m) are is a combination of lectures and students supervised exercise solving. The students are expected to spend an equal amount of time (60 hours) in preparation for the class and 1.5 times this amount (90 hours) for working with the material after class. The remaining time is preparation for the exam. |
| Course material and Reading list | Course notes written by Mogens Niss. The notes will be available from the Moodlepage of the course. The notes covers Formal logic Set Theory Algebraic structures Topological structures |
| Form of examination | The course is assessed through an oral examination. The oral examination relates to written assignments/tasks prepared during the course. The examination duration is 30 minutes, including assessment. |
| Form of re-examination | Re-examination takes the same form as the ordinary examination. |
| Examination type | Individual examination |

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| Exam aids | all |
| Assessment | 7-point grading scale |
| Moderation | Internal (i.e. course lecturer and an internal examiner assess) |
| Evaluation- and feedback forms | The course is evaluated according to the evaluation scheme developed by the study board for INM. This consists of a midterm evaluation and a final evaluation (both are discussions between the course professor and the class. The final evaluation is supplemented with a blinded written evaluation through survey exact.<br><br>The teaching will be dialog based with ample possibilities for feed back both personally and as a class. |
| Responsible for the activity | Carsten Lunde Petersen (lunde@ruc.dk) |
| teacher | Carsten Lunde Petersen (lunde@ruc.dk) |
| Administration of exams | INM Studieadministration (inm-studieadministration@ruc.dk) |
| STADS stamdata | master course<br>workload : 10 ECTS activitycode : U40275 / U40467<br>exam form : Mundtlig (ua) grading : 7-point grading scale censorship : Internal censor |

Course days:

## Hold: 1

# MATH: Fundamental Mathematical Structures - Lecture 1

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|---|---|
| time | 06-02-2018 13:15 til<br>06-02-2018 17:00 |
| location | 27.1-152 - lokale 2 (20) |
| Teacher | Carsten Lunde Petersen ( lunde@ruc.dk ) |
| Content | The course generally takes places Tuesdays 13:15-17 and Fridays 10:15-12 during the weeks 6-20 except week 15, where there are no classes and with the addition of Wednesday morning classes 8:15-10 during the weeks 12, 18, 19 and 20. An outline course plan will be available on moodle in mid January. The course plan will be detailed as the course progresses.<br><br>The last day of course i Friday May 18. During the period Friday February 16 - Friday March 2. the regular classes will be suspended and the students will work on mini projects.<br><br>Class 1 Introduction including the plot of the course followed by Introduction to formal logic Statement forms, logical connectives, tautologies. |
| Reading list | From the notes by Mogens Niss entitled Formal logic Introduction to the chapter & p.1-8 |

# MATH: Fundamental Mathematical Structures - Lecture 2

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|---|---|
| time | 09-02-2018 10:15 til<br>09-02-2018 12:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 3

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|---|---|
| time | 13-02-2018 13:15 til<br>13-02-2018 17:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 4

| | |
|---|---|
| time | 16-02-2018 10:15 til<br>16-02-2018 12:00 |
| location | 27.1-152 - lokale 2 (20) |
| Teacher | Carsten Lunde Petersen ( lunde@ruc.dk ) |
| Content | First day of the Self study in groups |
| Reading list | Solving exercises handed out in Class |

## MATH: Fundamental Mathematical Structures - Lecture 5

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|---|---|
| time | 20-02-2018 13:15 til<br>20-02-2018 17:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 6

| | |
|---|---|
| time | 23-02-2018 10:15 til<br>23-02-2018 12:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 7

| | |
|---|---|
| time | 27-02-2018 13:15 til<br>27-02-2018 17:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 8

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|---|---|
| time | 02-03-2018 10:15 til<br>02-03-2018 12:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 9

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|---|---|
| time | 06-03-2018 13:15 til<br>06-03-2018 17:00 |
| location | 27.1-152 - lokale 2 (20) |

## MATH: Fundamental Mathematical Structures - Lecture 10

time 09-03-2018 10:15 til
09-03-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 11

time 13-03-2018 13:15 til
13-03-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture

time 16-03-2018 10:15 til
16-03-2018 12:00

location 27.1-152 - lokale 2 (20)

Teacher Carsten Lunde Petersen ( lunde@ruc.dk )

## MATH: Fundamental Mathematical Structures - Lecture 12

time 20-03-2018 13:15 til
20-03-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 13

time 23-03-2018 10:15 til
23-03-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 14

time 27-03-2018 13:15 til
27-03-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 15

time 03-04-2018 13:15 til
03-04-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 16

time 06-04-2018 10:15 til
06-04-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 17

time 13-04-2018 10:15 til
13-04-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 18

time 17-04-2018 13:15 til
17-04-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 19

time 20-04-2018 10:15 til
20-04-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 20

time 24-04-2018 13:15 til
24-04-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 21

time 01-05-2018 13:15 til
01-05-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 22

time 04-05-2018 10:15 til
04-05-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 23

time 08-05-2018 13:15 til
08-05-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 24

time 15-05-2018 13:15 til
15-05-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 25

time 18-05-2018 10:15 til
18-05-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 26

time 22-05-2018 13:15 til
22-05-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 27

time 25-05-2018 10:15 til
25-05-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 28

time 29-05-2018 13:15 til
29-05-2018 17:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 29

time 01-06-2018 10:15 til
01-06-2018 12:00

location 27.1-152 - lokale 2 (20)

## Question time

time 04-06-2018 13:00 til
04-06-2018 17:00

location 27.1-189 - teorirum 27 (66)

Teacher Carsten Lunde Petersen ( lunde@ruc.dk )

## MATH: Fundamental Mathematical Structures - Examination

time 07-06-2018 08:15 til
07-06-2018 17:00

location 27.1-003 - grupperum (10)

Content This is an error. The examination takes place in June.

## MATH: Fundamental Mathematical Structures - Lecture 30

time 08-06-2018 10:15 til
08-06-2018 12:00

location 27.1-152 - lokale 2 (20)

## MATH: Fundamental Mathematical Structures - Lecture 31

time 12-06-2018 13:15 til
12-06-2018 17:00

location 27.1-152 - lokale 2 (20)

STADS stamdata master course

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|---|---|---|
| workload : 10 ECTS | activitycode : U40275 / U40467 | |
| exam form : Mundtlig (ua) | grading : 7-point grading scale | censorship : Internal censor |