

## Elective Course: Theoretical Computer Science

Title	Elective Course: Theoretical Computer Science
Semester	E2022
Master programme in	Datalogi / Informatik / Mathematical Computer Modelling / Computer Science / Digital Transformation
Type of activity	Course
Teaching language	English
Study regulation	Read about the Master Programme and find the Study Regulations at <a href="http://ruc.dk">ruc.dk</a>

### REGISTRATION AND STUDY ADMINISTRATIVE

Registration	Sign up for study activities at <a href="#">STADS Online Student Service</a> within the announced registration period, as you can see on the <a href="#">Study administration homepage</a> . 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	5
Responsible for the activity	Mads Rosendahl ( <a href="mailto:madsr@ruc.dk">madsr@ruc.dk</a> )
Head of study	Henrik Bulskov ( <a href="mailto:bulskov@ruc.dk">bulskov@ruc.dk</a> )
Teachers	
Study administration	IMT Studyadministration ( <a href="mailto:imt-studyadministration@ruc.dk">imt-studyadministration@ruc.dk</a> )
Exam code(s)	U60464

### ACADEMIC CONTENT

Overall objective	With an elective course, the student has the opportunity to specialize in a specific subject area where the student acquires knowledge, skills and competences in order to translate theories, methods and solutions ideas into their own practice in relation to software development. Examples of elective courses: Robotics, AI, internet technologies, programming language, parallel calculation, mobile computers, etc.
-------------------	---

Detailed description of content	<p>The aim of the course is cover central concepts in the foundation of computer science. These are topics which computer scientists are traditionally expected to be familiar with.</p> <ul style="list-style-type: none"> <li>● Hierarchy of languages: Different language classes and their relation to computational models. Formal languages, regular expressions, context-free grammars, the Chomsky hierarchy of languages. Parsing of formal lanuages and programming languages.</li> <li>● Computation: Finite state machines, pushdown automata, Turing machines, lambda calculus, universality of Turing machines. The Church-Turing thesis</li> <li>● Computability: What can and cannot be computed? The halting problem, complexity of algorithms, <math>P \neq NP</math> conjecture. NP complete problems. Uncountable and recursively enumerable sets.</li> </ul> <p>The course assumes programming skills corresponding to a bachelor degree in computer science.</p>
Course material and Reading list	<p>Recommended course textbook: Elements of the Theory of Computation, 2/E, Lewis &amp; Papadimitriou, ISBN-10: 0132624788   ISBN-13: 9780132624787. Slides and handouts.</p>
Overall plan and expected work effort	<p>The course will have a total workload of 135 hours with 40 hours of lectures and exercises, 70 hours of preparation over an 11 week course period and 25 hours for the exam and preparation before the course.</p>
Format	
Evaluation and feedback	<p>Written course evaluation form and verbal feedback during final course lecture. Open forum on course website.</p>
Programme	<p>Computer Science</p>
<b>ASSESSMENT</b>	
Overall learning outcomes	<p>After completing this course, students will be able to:</p> <ul style="list-style-type: none"> <li>● know and understand a specific subject area in computer science.</li> <li>● demonstrate knowledge and understanding of the area's techniques for designing and constructing software systems that meet specific requirements.</li> <li>● show knowledge and understanding of the general principles behind the subject area's theory, methods, and technological solutions.</li> <li>● work on computer science related issues, both independently and in teams, and proficient in new approaches to the subject area in a critical and systematic way and thereby independently take responsibility for one's own professional development.</li> </ul>
Form of examination	<p>Individual oral exam based on a written product</p> <p>The character limit of the written product is maximum 48,000 characters, including spaces.</p>

	<p>The character limits include the cover, table of contents, bibliography, figures and other illustrations, but exclude any appendices.</p> <p>Time allowed for exam including time used for assessment: 20 minutes. The assessment is an overall assessment of the written product(s) and the subsequent oral examination.</p> <p>Permitted support and preparation materials for the oral exam: All.</p> <p>Assessment: 7-point grading scale. Moderation: Internal co-assessor.</p>
Form of Re-examination	Samme som ordinær eksamen / same form as ordinary exam
Type of examination in special cases	
Examination and assessment criteria	The exam is based on an assignment consisting of a number of smaller exercises done during the course. At the exam we discuss some of the exercises and the assessment is based on the general understanding of the central concepts in the course as listed in the detailed description of the course.
Exam code(s)	Exam code(s) : U60464

Course days:

Hold: 1

## Theoretical Computer Science (COMP)

time 16-09-2022 12:15 til  
16-09-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 23-09-2022 12:15 til  
23-09-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 30-09-2022 12:15 til  
30-09-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 07-10-2022 12:15 til  
07-10-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 14-10-2022 12:15 til  
14-10-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 21-10-2022 12:15 til  
21-10-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 28-10-2022 12:15 til  
28-10-2022 16:00

location 11.1-047 - studiesal (40)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 04-11-2022 12:15 til  
04-11-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 11-11-2022 12:15 til  
11-11-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science (COMP)

time 18-11-2022 12:15 til  
18-11-2022 16:00

location 10.1-025 - teorirum (32)

Teacher Mads Rosendahl ( madsr@ruc.dk )

## Theoretical Computer Science - Hand-in written assignment (COMP)

time 25-11-2022 10:00 til  
25-11-2022 10:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

## Theoretical Computer Science - Oral examination (COMP)

time 09-01-2023 08:15 til  
09-01-2023 18:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 09.2-053 - mødelokale (12)

## Theoretical Computer Science - Reexam - Hand-in written assignment (COMP)

time 17-02-2023 10:00 til  
17-02-2023 10:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

## Theoretical Computer Science - Oral reexamination (COMP)

time 24-02-2023 08:15 til  
24-02-2023 18:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 09.2-063 - grupperum (12)