

Complex IT Systems – Theory

Title	Complex IT Systems – Theory
Semester	E2022
Master programme in	Computer Science
Type of activity	Course
Teaching language	English
Study regulation	Read about the Master Programme and find the Study Regulations at ruc.dk

REGISTRATION AND STUDY ADMINISTRATIVE

Registration	Sign up for study activities at STADS Online Student Service within the announced registration period, as you can see on the Study administration 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	15
Responsible for the activity	Troels Andreasen (troels@ruc.dk)
Head of study	Henrik Bulskov (bulskov@ruc.dk)
Teachers	
Study administration	IMT Studyadministration (imt-studyadministration@ruc.dk)
Exam code(s)	U60056

ACADEMIC CONTENT

Overall objective	Software engineering methods and principles, machine architecture and operating systems, distributed systems, databases and human to machine interactions. The course includes a presentation and critical discussion as well as testing of knowledge and understanding of the core areas in each of these subjects.
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Detailed
description of
content

This course will cover selected topics from theory on databases, networks and user interfaces and will in addition involve hands-on practical experience with special emphasis on development of responsive applications in a distributed environment.

Focus will be on client-server environments, a responsive application draws on functionality made available through web services, which in turn draws on data from one or more databases and possibly other sources.

The course is divided in three sections. In each of these, the theory and the related practice (covered in the Complex IT Systems – Practice course) will be linked such that the theory dominates in the beginning while the practice related work will be in focus at the end. The three sections will form a coherent whole.

The content of the three sections is outlined below.

Section 1: Data and Databases

In this section we will cover a number of key topics from database theory including the relational model, the relational language SQL, database design, normalisation theory, database indexing and query optimization as well as transaction management. We will also cover database programming, basically by two different approaches. One approach concerns implementation of functions, procedures and triggers to be stored directly in the database. The other approach concerns development of applications and services using the database – either through a simple database interface or by means of so-called Object Relational Mapping (ORM). In addition the database section will cover approaches to deal with unstructured data, more specifically noSQL databases. We will compare these to the relational approach and discuss strengths and weaknesses.

Section 2: Data communication and network with focus on web services

This section will include a general introduction to network architecture and distributed systems. There will be a special focus on web services, including context, technology, communications, languages, protocols and architecture related to these. The main development language for server programming will be the object-oriented language c# (similar to java). For the connection to the database we will look at an ORM framework and linq, which is an extension of c# specifically directed at simplifying the processing of relational data in an object-oriented context, and for the web services we will use asp.net web api, which is a framework specific for supporting restful web services interfaces.

Section 3: Development of responsive applications

Here we touch on general theory and practice related to user interfaces for human-machine interaction and the development of user interfaces. We will, as far as target applications are concerned, focus on so-called single-page applications (spa) with html5, css and javascript, and with emphasis on responsive applications that can adapt to a wide range of devices, including smartphones, tablets and desktops. In this context we will cover various aspects of advanced scripting, including asynchronous programming, event-driven programming and data binding. We will also introduce "hybrid apps" (mixture between native and web-based) and present approaches that, given an html5, css and javascript-based web app, can create dedicated (and thereby app-store-publishable) versions for devices such as smartphones and tablets.

Course material and Reading list	<p>Key references are the following:</p> <ul style="list-style-type: none"> • Database System Concepts 7th Edition Abraham Silberschatz, Henry Korth, S. Sudarshan ISBN: 9781260084504 • C# 6.0 IN A NUTSHELL Joseph Albahari and Ben Albahari ISBN: 978-1-491-92706-9 • Eloquent JavaScript https://eloquentjavascript.net/ <p>Additional course literature can be found on the Moodle page for the course</p>
Overall plan and expected work effort	<p>The course will have a total workload of 412 hours with 135 hours of lectures and exercises, 232 hours of preparation over a 15-week course period and 45 hours for the exam and preparation before the course.</p> <p>The activity's major teaching and learning activities are fleshed out • In class teaching • Exercises • Mandatory assignments on course topics • Homework individually/in study groups</p> <p>and these may be further developed with description of the processes involved, links to files with descriptions, etc.</p>
Format	
Evaluation and feedback	<p>Evaluation form to be filled out (anonymously) plus open discussion on the last course day.</p>
Programme	
ASSESSMENT	
Overall learning outcomes	<p>After completing this activity, students will be able to:</p> <ul style="list-style-type: none"> • demonstrate knowledge and understanding of key theories in the core subject areas and techniques for the design and construction of software systems meeting specific requirements. • show comprehensive overview of and understanding of the general principles behind the hardware and software systems that are part of modern computers and the users' interactions with these. • selecting and applying appropriate methods and techniques from the subject area for the analysis, design, and construction of software systems. • demonstrate competences in being able to work with IT issues, both independently and in teams, and in being able to critically and systematically learn new approaches to the subject area and thereby independently take responsibility for one's own professional development.
Form of examination	<p>Individual oral exam without time for preparation.</p> <p>Time allowed for exam including time used for assessment: 30 minutes.</p> <p>Permitted support and preparation materials: All.</p> <p>Assessment: 7-point grading scale.</p> <p>Moderation: External examiner.</p>

Form of Re-examination	Samme som ordinær eksamen / same form as ordinary exam
Type of examination in special cases	
Examination and assessment criteria	It will be assessed to which degree the student demonstrates knowledge and understanding of key theories in the core subject areas of the three sections (outlined above). Before the exam students will know the exam questions for each of the three sections. At the exam the student will pick a set of three questions, one from each section.
Exam code(s)	Exam code(s) : U60056

Course days:

Hold: 1

Complex IT Systems - Theory (COMP)

time	05-09-2022 13:00 til 05-09-2022 17:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
Location (when shared activity)	09.2-009 - teorilokale (60)
Teacher (when Shared Activity)	Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time	06-09-2022 09:00 til 06-09-2022 17:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	05.2-032 - teorirum (65)
Teacher	Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 08-09-2022 13:00 til
08-09-2022 17:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 05.1-032 - teorirum 05.1 (65)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 14-09-2022 08:15 til
14-09-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 16-09-2022 08:15 til
16-09-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 21-09-2022 08:15 til
21-09-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 23-09-2022 08:15 til
23-09-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 28-09-2022 08:15 til
28-09-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 30-09-2022 08:15 til
30-09-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 03-10-2022 09:00 til
03-10-2022 12:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 05-10-2022 08:15 til
05-10-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 07-10-2022 08:15 til
07-10-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 12-10-2022 08:15 til
12-10-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreassen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 14-10-2022 08:15 til
14-10-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreassen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 19-10-2022 08:15 til
19-10-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreassen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 21-10-2022 08:15 til
21-10-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreassen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 26-10-2022 08:15 til
26-10-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreassen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 28-10-2022 08:15 til
28-10-2022 12:00

location 05.1-032 - teorirum 05.1 (65)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 02-11-2022 08:15 til
02-11-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 04-11-2022 08:15 til
04-11-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 09-11-2022 08:15 til
09-11-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 11-11-2022 08:15 til
11-11-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 16-11-2022 08:15 til
16-11-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 18-11-2022 08:15 til
18-11-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 23-11-2022 08:15 til
23-11-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 25-11-2022 08:15 til
25-11-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 30-11-2022 08:15 til
30-11-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 02-12-2022 08:15 til
02-12-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 07-12-2022 08:15 til
07-12-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 09-12-2022 08:15 til
09-12-2022 12:30

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 14-12-2022 08:15 til
14-12-2022 16:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems - Theory (COMP)

time 16-12-2022 08:15 til
16-12-2022 12:00

location 10.2-049 - teorirum (58)

Teacher Troels Andreasen (troels@ruc.dk)

Complex IT Systems – Theory - Oral examination (COMP)

time	23-01-2023 08:15 til 25-01-2023 18:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	09.2-053 - mødelokale (12)

Complex IT Systems – Theory - Oral reexamination (COMP)

time	23-02-2023 08:15 til 23-02-2023 18:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	09.2-053 - mødelokale (12)