AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER´S PROGRAMME IN COMPUTER SCIENCE (IT) 2017

MASTER OF SCIENCE (MSC)
AALBORG

MODULES INCLUDED IN THE CURRICULUM

TABLE OF CONTENTS

From Reality to Models 2018/2019 3
Programming Paradigms 2018/2019 5
From Models to Reality 2018/2019 7
Software Engineering 2018/2019 9
Pre-Specialisation in Computer Science 2018/2019 11
Entrepreneurship 2018/2019 13
Master's Thesis 2018/2019 15
Computability and Complexity 2018/2019 17
Advanced Topics in Databases 2018/2019 19
Machine Intelligence 2018/2019 21
Advanced Topics in Human-Computer Interaction 2018/2019 23
Data-intensive Systems 2018/2019 25
Advanced Topics in Distributed Systems 2018/2019 27
Real-Time Systems 2018/2019 29
Web Engineering 2018/2019 31
Web Intelligence 2018/2019 33
Advanced Algorithms 2018/2019 35
Mobile Software Technology 2018/2019 37
Advanced Programming 2018/2019 39
Software Innovation 2018/2019 42
Languages and Compilers 2018/2019 44
Principles of Operation Systems and Concurrency 2018/2019 46
Advanced Topics in Machine Intelligence 2018/2019 48
Test and Verification 2018/2019 50
Advanced Topics in Modeling and Verification 2018/2019 52
Specialisation Course in Database Technology 2018/2019 54
Specialisation Course in Distributed Systems 2018/2019 56
Specialisation Course in Human-Computer Interaction 2018/2019 58
Specialisation Course in Semantic and Verification 2018/2019 60
Specialisation Course in Machine Intelligence 2018/2019 62
Specialisation Course in Systems Development 2018/2019 64
Specialisation Course in Programming Technology 2018/2019 66

FROM REALITY TO MODELS

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Purpose:
The student should learn how using advanced models can help identifying and solving a problem of application or research in computer science and how analysis of problems can contribute to theory building in computer science

Reason:
A graduate in computer science should be able to apply advanced theory and model building to identify and contribute to solutions of problems in the area of computer science and in this context to reflect on the relevant theories and building of models.

LEARNING OBJECTIVES

KNOWLEDGE

- explain concepts, findings and theories in an advanced area of computer science

SKILLS

- apply knowledge from a theory in computer science to select and argue for a model within an advanced computer science field
- from such modeling provide a model of a computer science problem and apply this model to understand the problem

COMPETENCES

- identify a problem given a an open challenge in research or application of computer science
- contribute to solving the problem using their own modeling based on computer science theories
- analyze and evaluate the resulting contribution to the solution
- analyze and evaluate the applications of relevant computer science models to solve this problem

TYPE OF INSTRUCTION

Project work including

- an analysis and definition of a computer science problem
- establishment of an advanced computer science model that contributes to solving the problem

The project may include complete or partial implementation of a solution in the form of running software.

As an integrated part of the project work, the student must participate in the problem-based learning and project management workshop. Approved participation is required to register for the project exam.

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 450 hours

EXAM

EXAMS

Name of exam	From Reality to Models

Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Fra virkelighed til modeller
Module code	DSNCSITK101
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

PROGRAMMING PARADIGMS

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of Imperative Programming and Object Oriented Programming

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student will acquire knowledge of programming paradigms that are alternative and complementary to the imperative paradigm and the object oriented paradigm. Furthermore, students should acquire knowledge on advanced topics in design, implementation and use of programming languages and environments, including

- function-oriented programming
- programming language with dynamic types
- programming techniques in the field of one or more of the four main paradigms: the function-oriented, the imperative, the object-oriented and the logic programming paradigms

SKILLS

- be able to classify and explain the structures in programming languages in relation to the paradigms
- be able to relate language constructions that support different paradigms
- be able to assess the strengths and weaknesses of each paradigm in relation to specific tasks

COMPETENCES

- be able to use paradigmatic constructions in smaller programmes.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Programming Paradigms
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Programmeringsparadigmer
Module code	DSNDATFK105
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

FROM MODELS TO REALITY

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to knowledge obtained at CSIT7 and the mandatory course modules on CSIT8

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Purpose:
The student should gain further insight into how using computer science models can help identifying and solving a problem with computer science research and application.

Reason:
A graduate in computer science should be able to apply theory and model building to identify and to contribute to solutions of a computer science problem and in this context to reflect on the theories and building of models.

LEARNING OBJECTIVES

KNOWLEDGE

- explain the concepts, findings and theories in an advanced area of computer science

SKILLS

- apply knowledge from a theory in computer science to select and argue for a model within an advanced computer science field
- from such modeling provide a model of a computer science problem and apply this model to understand the problem

COMPETENCES

- identify a problem in research or application of computer science
- contribute to solving the problem using their own modeling based on theories
- analyze and evaluate the resulting contribution to the solution
- analyze and evaluate application of relevant models to solve the problem

TYPE OF INSTRUCTION

- an analysis and description of a computer science problem
- establishment of an advanced computer science model that contributes to solving the problem

The project may include complete or partial implementation of a solution in the form of running software.

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 450 hours

EXAM

EXAMS

Name of exam	From Models to Reality

Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Fra modeller til virkelighed
Module code	DSNCSITK201
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SOFTWARE ENGINEERING

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Course modules Systems Development and Design and Evaluation of User Interfaces.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student should gain knowledge of leading paradigms (e.g. traditional and agile) in professional development of software. The student should also gain knowledge of theories, methods and techniques involved in these paradigms (e.g. process modelling, management of requirements, design, project management, testing, process improvement) as well as an overview of theory of science for software engineering.

SKILLS

- the ability to explain course concepts precisely using the terminology of the discipline, and be able to distinguish between and compare the software engineering paradigms
- Be able to explain accurately and using the terminology of the discipline, the theories, methods and techniques of software engineering paradigms and their application in the professional development of software intensive systems

COMPETENCES

- be able to select, justify and use appropriate paradigms, theories, methods and techniques in their own development contexts.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Software Engineering
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Software Engineering
Module code	DSNIDAFK203
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

PRE-SPECIALISATION IN COMPUTER SCIENCE

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to knowledge obtained in CSIT7 and CSIT8 project and course modules. A course module from CSIT9 is followed simultaneously with project work.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Purpose:
The student should gain insight into a current research problem in computer science and be able to communicate this problem so that the student can make the thesis on this basis.

Reason:
University educations are research-based educations. On the master programmes, all students must achieve in-depth insight into current research issues and methods.

LEARNING OBJECTIVES

KNOWLEDGE

- demonstrate in-depth knowledge and overview of a current problem within the research area of computer science.

SKILLS

- use and reason about relevant concepts and techniques within the discipline
- use and create theories within the discipline in the formulation and analysis of a problem within the research area
- communicate a current computer science problem as well as the related concepts in the framework of the research area

COMPETENCES

- apply concepts and reasoning within the discipline to formulate and analyse a current open challenge within the research area

TYPE OF INSTRUCTION

Project work, including:
• formulation and analysis of a problem in the research area

• reasoned reflection on solving this problem

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 600 hours

EXAM

EXAMS

Name of exam	Pre-Specialisation in Computer Science

Type of exam	Oral exam based on a project
ECTS	20
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Forspecialisering i datalogi
Module code	DSNCSITK301
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	20
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ENTREPRENEURSHIP

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Academic maturity corresponding to the level of bachelor in a software-related discipline.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student should achieve knowledge about entrepreneurship and business development related to software (information and communication technologies) including typically:

- different scientific approaches to entrepreneurship, including effectuation
- intra-/entrepreneurship
- competition and market conditions
- business models and business plans
- intellectual property rights
- market development and marketing
- growth strategies
- open entrepreneurship

SKILLS

- the ability to explain course concepts precisely using the professional terminology of the discipline
- the ability to use those concepts to explain practical and empirical (case based) contexts

COMPETENCES

- should be able to formulate, develop and present their own software-related business ideas to a qualified audience.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Entrepreneurship
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination

Criteria of assessment	As indicated in the Faculty evaluation criteria

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Entreprenørskab
Module code	DSNDATFK302
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

MASTER'S THESIS

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Purpose:
That students are able to formulate, analyse and help solve a current research problem in computer science in an independent, systematic and critical manner through the use of scientific theory and methodology.

Reason:
University educations are research-based educations. On the master programmes, all students must achieve in-depth insight into current research issues and methods in a way that this insight can be brought to use in solving research problems.

LEARNING OBJECTIVES

KNOWLEDGE

- demonstrate in-depth knowledge and overview of a current problem within the research area of computer science

SKILLS

- use and reason about relevant concepts and techniques within the discipline
- use and create theories within the discipline in the formulation and analysis of a problem within the research area
- communicate a current computer science problem as well as the related concepts in the research area framework

COMPETENCES

- apply concepts and reasoning within the discipline to describe and analyse a current problem within the research area

TYPE OF INSTRUCTION

Project work, including formulation, analysis and contribution to the resolution of a current research problem within computer science and usually follows the subject of the project module on the third semester (CSIT9).

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 900 hours

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Oral exam based on a project
ECTS	30
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	DSNCSITK401
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	English
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

COMPUTABILITY AND COMPLEXITY

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to knowledge obtained in Syntax and Semantics

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students should achieve knowledge on the following theories and methods:

Computability:

- deterministic and nondeterministic Turing machines; decidable and recognizable languages and their properties: Church-Turing thesis
- acceptance problem for Turing machines; other undecidable problems for Turing machines; reductions and their properties

Complexity theory:

- time complexity of deterministic and nondeterministic Turing machines; time complexity classes, polynomial reductions and their uses; NP-completeness; satisfiability problem (SAT); other NP-complete problems
- space complexity of deterministic and nondeterministic Turing machines; space complexity classes, the relationship between time and space complexity

The course will also involve one or more advanced topics that can be e.g. other models of computation, other results on undecidability or results about further complexity classes.

SKILLS

- the ability to explain course concepts precisely using the terminology and notations of the discipline for important achievements in the theory of computability and computational complexity, and how and to what extent these results can be used to classify computational problems
- the ability to make use of the necessary writing skills in these contexts

COMPETENCES

- be able to apply concepts and techniques from the theory of computability and computational complexity for the analysis of computational problems

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Computability and Complexity
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Beregnelighed og kompleksitet
Module code	DSNCSITK102
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED TOPICS IN DATABASES

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student will acquire knowledge on the following topics in advanced databases:

- concepts and techniques in multidimensional databases, such as data warehousing, On-Line Analytical Processing, and Data Mining
- concepts and techniques in spatial and spatiotemporal databases, including indexing and processing of queries
- concepts and techniques of complex data in databases, such as XML, Semantic Web, etc

There will also be one or more optional subjects within data-intensive systems, including (but not limited to):

- concepts and techniques in temporal databases

SKILLS

- able to explain concepts and techniques in advanced databases
- able to identify and discuss relevant concepts and techniques for a given problem in advanced databases
- able to apply relevant concepts and techniques for a given problem in advanced databases

COMPETENCES

- able to apply concepts and techniques from advanced databases, including the design and implementation of advanced databases

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Topics in Databases
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede emner inden for databaser
Module code	DSNDATFK102
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

MACHINE INTELLIGENCE

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of discrete mathematics, algorithms and data structures

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- basic techniques and methods in machine intelligence including their theoretical foundations and practical applications
- the use of correct technical notation and terminology

SKILLS

- use basic techniques presented in the course to solve a specific problem
- use correct technical notation and terminology in both writing and speech
- be able to explain the key principles and algorithms presented in this course

COMPETENCES

- able to evaluate and compare different machine intelligence techniques and methods based on a specific problem

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Machine Intelligence
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Maskinintelligens
Module code	DSNCSITK103
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED TOPICS IN HUMAN-COMPUTER INTERACTION

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student will gain knowledge in advanced topics in human-machine interaction in theory or practice. The items may include, but are not limited to:

- concepts, methods and techniques in advanced interaction design
- concepts, methods and techniques in advanced usability evaluation

SKILLS

The student must achieve the following skills within the course subject matter:

- able to explain issues, theory, methods, results and conclusions in an accurately and profound way
- be able to apply theories and methods to solve a specific problem
- have a critical approach to theories and methods in human-computer interaction

COMPETENCES

- be able to apply concepts, techniques and methods to understand a given problem and to design and evaluate a practical system.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Topics in Human-Computer Interaction
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede emner inden for menneske-maskine interaktion
Module code	DSNDATFK104
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

DATA-INTENSIVE SYSTEMS

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students should achieve knowledge on the following topics in data-intensive systems:

- concepts and techniques for analyzing large data volumes, such as data warehousing, On-Line Analytical Processing, and Data Mining
- concepts and techniques for handling spatio-temporal data, including indexing and processing of queries
- concepts and techniques for scalability for data-intensive systems, e.g., cloud computing

Topics will typically be exemplified by Internet-related application, such as web analytics, spatial web, and the like.

There will also be one or more optional subjects within data-intensive systems, including but not limited to:

- concepts and techniques for managing web-related data such as XML, Semantic Web, and Web2.0 data
- concepts and techniques for search engines

SKILLS

- be able to explain concepts and techniques in data-intensive systems
- be able to select and apply relevant concepts and techniques for a given problem in data-intensive systems

COMPETENCES

- be able to apply concepts and techniques from data-intensive systems, including design and implementation of data-intensive systems.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Data-Intensive Systems
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Dataintensive systemer
Module code	DSNSWFK102
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED TOPICS IN DISTRIBUTED SYSTEMS

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student will gain knowledge of advanced theories and methods in distributed systems:

- advanced infrastructures and applications for example. grid, cloud, peer-to-peer, or parallel / multi-core systems
- System and Network software for embedded systems
- examples of distributed embedded systems, such as ad-hoc sensor networks, home automation
- Distributed algorithms such as algorithms for mutual exclusion, selection, consensus, replication and fault tolerance
- paradigms of programming
- techniques for analysis, such as monitoring, testing, verification, and benchmarking

SKILLS

- able to assess and explain precisely how and to what extent the results presented can be used using the appropriate subject terminology and notation,
- use appropriate writing skills in these contexts

COMPETENCES

- be able to apply concepts and techniques from distributed systems, and to design and analyze distributed and embedded systems.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Topics in Distributed Systems
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede emner inden for distribuerede systemer
Module code	DSNDATFK103
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

REAL-TIME SYSTEMS

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of computer architecture and principles of operating systems and parallelism

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Students should achieve knowledge on the following theories and methods:
- design: tasks, temporal scopes, file management strategies, mode, change, synchronous and asynchronous interaction
- Analysis: scheduling, response time analysis, modeling, verification and validation, priority protocols, hardware limitations
- implementation: programming language with support for realtime programming, hardware abstraction, and system near programming, synchronization, atomicity, deadlocks, error handling, communication

The course will also involve one or more advanced topics that can be e.g.other principles for implementing or reasoning about real-time systems.

SKILLS

- the ability to explain course concepts precisely using the terminology of the discipline and notation for overall design, analysis and implementation of simple real-time software systems
- the ability to apply relevant techniques to determine the possibility of scheduling a simple real-time application

COMPETENCES

The student should, in the synthesis of the concepts and techniques of the discipline:

- be able to design, analyze and implement a simple (embedded) real-time application
- be able to acquire new knowledge about the design, analysis and implementation of real-time systems

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Real-Time Systems
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale

Type of grading	Internal examination

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Tidstro software
Module code	DSNCSITK104
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

WEB ENGINEERING

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

The student should gain knowledge of developing web applications:

- types of web applications and their use (eg. Data-intensive, service-oriented collaboration, integration, social)
- types of web technologies
- methods for developing web applications
  - Requirements, design, implementation and testing techniques
  - Patterns for web applications
  - Development of web applications
- advanced topics in web development, for example.:
  - Service-oriented architecture
  - Semantic web
  - Rich Internet Applications
  - New trends

SKILLS

- demonstrate knowledge of web applications, web development and web architecture
- perform model-based analysis of web applications
- apply methods for developing web applications, including requirements, design, implementation and testing techniques

COMPETENCES

- be able to apply concepts and techniques from Web engineering, including web applications and development and architecture, requirements, design, implementation, and testing techniques.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Web Engineering
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Web engineering
Module code	DSNSWFK103
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

WEB INTELLIGENCE

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of discrete mathematics, algorithms and data structures

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

knowledge and skills within web intelligence techniques, such as:

- Application of web intelligence techniques
- Web agents and web services
- Web information retrieval
- Web navigation support
- Recommender systems
- Intelligence for social web
- Presentation of knowledge and semantic web
- User modelling, adaptation and personification
- Computational natural language processing for web

SKILLS

- Demonstrate knowledge about web intelligence methods and techniques
- Chose relevant concepts and techniques within a given web system problem
- Use correct notation and terminology for web intelligence.

COMPETENCES

- be able to apply web intelligence methods and techniques, including design and implementation of web systems.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Web Intelligence
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale

Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Web Intelligence
Module code	DSNSWFK104
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED ALGORITHMS

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to knowledge obtained in Computability and Complexity and knowledge of algorithms and data structures, principles of operating systems and parallel systems

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- algorithm design techniques such as divide-and-conquer, greedy algorithms, dynamic programming, back-tracking, Branch-and-bound algorithms and plane-sweep algorithms
- algorithm analysis techniques such as recurrences, amortized analysis, analysis of the expected complexity and experimentation with algorithms
- a set of core algorithms and data structures for solving problems from different computer science areas: algorithms for external memory, multi-threaded algorithms, text search , advanced graph algorithms, heuristic search and computational geometry

There will also be one or more optional subjects in advanced algorithms including, but not limited to: approximate algorithms, randomized algorithms, linear programming and number theoretic algorithms such as cryptosystems.

SKILLS

- ability to explain the principles behind the main algorithm design and algorithm analysis techniques
- select and apply the algorithm design and algorithm analysis techniques for a given problem
- recognize a number of problems from different computer science fields and select the most appropriate algorithms and data structures for solving them
- Argue about the correctness of selected algorithms, in particular, selected dynamic-programming, greedy, and approximation algorithms

COMPETENCES

When faced with a non-standard computer science problem, the student should be able to:

- develop efficient algorithms and data structures for solving the problem
- analyze the developed algorithms

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Algorithms

Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede algoritmer
Module code	DSNCSITK202
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

MOBILE SOFTWARE TECHNOLOGY

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge and skills in object oriented programming, algorithms and data structures, database systems and design and evaluation of user interfaces.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

within development of mobile software:

- issues relating to architecture and programming of mobile software, such as stand-alone, client / server and peer to peer
- positioning and tracking both indoors and outdoors
- mobile services and location-based services
- mobile databases
- interaction design for mobile technologies
- usability and user experience evaluation of mobile technologies

In addition, the following items may be included in the course:

- indoor / outdoor integration
- Middleware platforms for mobile services
- design sketching for mobile technologies
- paper prototype development for mobile technologies
- lab. vs. field-based evaluation of mobile technologies

SKILLS

- design software architectures for mobile applications
- use positioning and tracking techniques in various indoor and outdoor scenarios
- explain the principles for mobile databases
- explain the principles of moving object databases
- produce and refine the interaction design for mobile systems, services or devices
- evaluate the quality of an interaction design empirical

COMPETENCES

- learn typical technologies and interaction design principles for mobile software systems and be able to use these technologies and principles in various mobile application scenarios.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Mobile Software Technology
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Mobil softwareteknologi
Module code	DSNSWFK202
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED PROGRAMMING

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Programming experience and knowledge of imperative and object-oriented programming. Knowledge about language design and compiler construction.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

knowledge of advanced programming technologies and techniques, including elements of the programming language that supports these techniques. The course will focus on both new trends in programming, and on classic advanced themes. Possible topics include:

• advanced libraries

• library design

• syntactic abstraction (macros) and language extensions

• declarative programming

• generic programming

• concurrent, parallel and distributed programming

• reactive programming

• typed and typeless programming

• scripting

• module concepts

• different hardware platforms

• resource

• optimizations

• performance studies

SKILLS

- achieve skills in selecting appropriate programming tools for a given task.
- be able to write correct, efficient and maintainable programs.
- be able to assess use of resources and to perform optimizations and performance studies.

COMPETENCES

- be able to solve advanced programming tasks.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Programming
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avanceret programmering
Module code	DSNSWFK203
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SOFTWARE INNOVATION

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Thorough understanding of computer science principles that were presented in the previous semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

In this context, software innovation implies the wide definition of innovation related to software development. Emphasis is on innovation, products and processes but also leadership of innovative work and personal and organizational prerequisites for innovation are included in the course.

LEARNING OBJECTIVES

KNOWLEDGE

Software innovation theory:

- central theories about innovation and innovation processes
- personal and organizational conditions for innovation
- theories of software innovation

Innovation methods:

- general methods and techniques to support innovation
- specific methods and techniques for software innovation

Innovation practice:

- experience with methods and techniques in creative and innovative processes
- assessment of strengths and weaknesses of the methods and techniques for creative and innovative processes for software development

SKILLS

- able to explain theories accurately using professional concepts
- able to explain approaches to selection and management of innovative processes in software development
- able to discuss personal and organizational prerequisites for software innovation
- use own experience to explain and discuss tools and techniques supporting software innovation

COMPETENCES

- be able to assess the innovative potential of a software product or software-supported process.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Software Innovation
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As indicated in the Faculty evaluation criteria

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Softwareinnovation
Module code	DSNDATFK205
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

LANGUAGES AND COMPILERS

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Programming experience and knowledge of imperative and object-oriented programming

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students should acquire knowledge about essential principles of programming languages, and understand techniques for description and translation of languages in general, including:

- Abstraction principle, control and data structures, block structure and scope concept, parameter mechanisms and type equivalence
- Compiling, including lexical, syntactic and static semantic analysis and code generation
- Run Time settings, including storage allocation and structures to support procedures and functions
- Concepts and techniques for the description and implementation of object-oriented and function-oriented languages.

SKILLS

- Be able to explain the relevant techniques and concepts in language design and compiler construction using the terminology and notation for the description and implementation of programming languages
- Be able to explain how implementation techniques influence language design
- Be able to reason about concepts and techniques relevant for computer science

COMPETENCES

be able to describe, analyze and implement programming languages and be able to explain each step and the relationship between the phases of a compiler

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Languages and Compilers
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination

Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Sprog og oversættere
Module code	DSNCSITK203
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

PRINCIPLES OF OPERATION SYSTEMS AND CONCURRENCY

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- processes and threads: application, realization, state models, multi-threading programming with threads, creation of process or thread and scheduling
- filesystems: namespace, realization of file systems, strategies for space allocation
- memory management, allocation of primary storage: solid subdivision, virtual memory, paged memory, page replacement algorithms, shared storage, copy-on-write, demand paging, frame allocation
- operating system kernel: interrupts, realization of system calls, drivers for peripheral devices, I / O planning and execution, hardware support
- concurrency / parallelism: relative time synchronization, race conditions, mutex, semaphores, monitors, fairness, deadlocks, necessary and sufficient conditions for deadlock, strategies for deadlock handling, multi-core architectures, parallel programming, techniques and tools for simultaneous -/parallel programming, inter-thread/-process communication

SKILLS

- be able to explain the establishment, structure, functionality and operation of control systems accurately and using the correct terminology and notation
- be able to analyze simple programs which make use of parallelism and / or simultaneity
- be able to apply relevant techniques to ensure mutual exclusion, fairness and absence of deadlock in simple concurrent / parallel systems

One or more additional advanced topics may be included in the course, e.g. further principles for realization of parallelism or techniques applicable to operating systems.

COMPETENCES

Using the synthesis of the concepts and techniques, students should be able to develop system close simple programs that take advantage of parallelism and / or concurrency.

The student must be able to acquire new knowledge about operating systems and programming of concurrent and parallel systems

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Principles of Operation Systems and Concurrency

Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Principper for styresystemer og parallelitet
Module code	DSNCSITK204
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED TOPICS IN MACHINE INTELLIGENCE

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

gain knowledge of advanced topics dealing with methods and application of machine intelligence, e.g.:

- advanced techniques in data mining
- advanced methods for reasoning and decision making under uncertainty
- agent-based design of intelligent systems
- intelligent web-based systems

SKILLS

- achieve skills to identify and use advanced techniques from machine intelligence for constructing intelligent systems

COMPETENCES

- be able to understand advanced methods for the design of intelligent systems and to analyze their applicability and efficacy in solving specific tasks.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Topics in Machine Intelligence
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede emner inden for maskinintelligens
Module code	DSNDATFK203
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

TEST AND VERIFICATION

2018/2019

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge and skills in computer architecture, principles of parallelism, concurrency and operating systems, and syntax and semantics.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

knowledge on the following theories and methods:

Testing:

- classical test techniques, models for formal testing, software tools for automated testing, test specification, test generation and test execution

verification:

- formal models of software systems behavior, software tools for verification

SKILLS

- explain accurately and using the subject's terminology and notation for properties and behavior of formal models of software systems
- apply relevant techniques to plan and conduct tests

COMPETENCES

The student should by synthesis of the concepts and techniques of the discipline be able to:

- describe key aspects of a software system using formal models
- assess the usefulness of various test techniques in a software system in a given context

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Test and Verification
Type of exam	Written or oral exam

ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Test og verifikation
Module code	DSNSWFK204
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

ADVANCED TOPICS IN MODELING AND VERIFICATION 2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Students should achieve knowledge of recent research on advanced mathematical models for the formal description and verification of programmes, software systems and programming languages. E.g. Binary Decision Diagrams (BDD), SAT-algorithms, predicate logic, Petri nets, temporal logician and mobile process calculi.

SKILLS

- the ability to explain course concepts and important theories precisely using the terminology and notation of the discipline
- apply methods for specification and verification based on formal models
- be able to make use of the necessary writing skills in these contexts

COMPETENCES

- be able to use formal models and associated verification tools for description, analysis and verification of software systems.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Advanced Topics in Modeling and Verification
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Avancerede emner inden for modellering og verifikation
Module code	DSNDATFK202
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN DATABASE TECHNOLOGY

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in database technology.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key issues, including its premises, problem(s), theory, methods, results and conclusions
- explain relevant / key theories, methods, and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods, and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Database Technology
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale

Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i databaseteknologi
Module code	DSNDATFK303
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN DISTRIBUTED SYSTEMS 2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in distributed systems.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key issues, including its premises, problem(s), theory, methods, results and conclusions
- explain relevant / key theories, methods, and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods, and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Distributed Systems
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale
Type of	External examination

gradin g	
Criteri a of assess ment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i distribuerede systemer
Module code	DSNDATFK304
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN HUMAN-COMPUTER INTERACTION

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in human-computer interaction

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key elements, including its premises, issue(s), theory, methods, results and conclusions
- explain relevant theories, methods and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Human-Computer Interaction
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale
Type of grading	External examination

Criteria of assessment	As indicated in the Faculty evaluation criteria

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i menneske-maskine interaktion
Module code	DSNDATFK305
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN SEMANTIC AND VERIFICATION

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in mathematical modelss for formal description and verification of programmes, software systems and programming languages.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key issues, including its premises, problem(s), theory, methods, results and conclusions
- explain relevant / key theories, methods, and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods, and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Semantic and Verification
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5

Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i semantik og verifikation
Module code	DSNDATFK306
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN MACHINE INTELLIGENCE 2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in machine intelligence, such as datamining and machine learning, graphical models, and intelligent web systems.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key issues, including its premises, problem(s), theory, methods, results, and conclusions
- explain relevant / key theories, methods, and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods, and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Machine Intelligence
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale

Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i maskinintelligens
Module code	DSNDATFK307
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN SYSTEMS DEVELOPMENT

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in systems development.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key elements, including its premises, issue(s), theory, methods, results and conclusions
- explain relevant theories, methods and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Systems Development
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale

Type of grading	External examination
Criteria of assessment	As indicated in the Faculty evaluation criteria

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i systemudvikling
Module code	DSNDATFK308
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design

SPECIALISATION COURSE IN PROGRAMMING TECHNOLOGY

2018/2019

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- achieve in-depth insight into key issues in contemporary research in programming technology.

SKILLS

Based on a scientific article in the course's central themes, the student should be able to:

- give a clear and understandable presentation of the article's key issues, including its premises, problem(s), theory, methods, results and conclusions
- explain relevant / key theories, methods, and arguments presented in the article

COMPETENCES

Based on a scientific article in the course's central themes, the student should be able to:

- relate the theories, methods, and results presented in the article to the course topics
- assess the proposed solutions, results and/or conclusions of the article as well as assess their qualities and practicality and put them into perspective.

TYPE OF INSTRUCTION

The teaching is organized according to the general teaching methods for the education, cf. chapter 3

EXTENT AND EXPECTED WORKLOAD

It is expected that the student uses 30 hours per ECTS, which for this activity means 150 hours

EXAM

EXAMS

Name of exam	Specialisation Course in Programming Technology
Type of exam	Oral exam The student gives a lecture of 30 minutes on a defined scientific subject area (typically in the form of an article) in relation to issues addressed in the course. The selection of subject area and the framing of the task to each student are made by the course lecturer, usually in consultation with the student's project supervisor. The student is given 7 days of preparation. After the lecture, the examiner and censor can ask questions related to the student's presentation of the theme. This does not normally exceed 10 minutes.
ECTS	5
Assessment	7-point grading scale

Type of grading	External examination
Criteria of assessment	Are stated in the Joint Programme Regulations

ADDITIONAL INFORMATION

Contact: The Study board for Computer Science at cs-sn@cs.aau.dk or 9940 8854

FACTS ABOUT THE MODULE

Danish title	Specialiseringskursus i programmeringsteknologi
Module code	DATDSNFK309
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Lone Leth Thomsen

ORGANISATION

Study Board	Study Board of Computer Science
Department	Department of Computer Science
Faculty	Technical Faculty of IT and Design