Master in Applied Computer Science (120 ECTS)

# Study Plan for Master in Applied Computer Science (120 ECTS) (2022–2024)

### Facts about the program

ECTS Credits:
**120**

Study duration:
**2 years**

Teaching language:
**English**

Campus:
**Halden**

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## What do you learn?

### Degree/title obtained

Students that complete and pass the programme are awarded the degree of Master in Applied Computer Science.

Some students will also have the right to use the protected title sivilingeniør after graduation if they fulfil the following requirements:

- Completed a bachelor's degree in computer engineering based on the national curriculum regulations or an equivalent education that meets the minimum requirements of 25 ECTS mathematics, 7,5 ECTS physics and 5 ECTS statistics.

The additional title sivilingeniør will be stated in the diploma.

## Learning outcomes

Knowledge

The candidate has

- deep knowledge about research and development within the field of applied computer science;
- advanced knowledge about literature and methods used within the field of applied computer science.

Skills

The candidate is able to

- work independently with a problem statement over an extended period of time;
- analyze a situation, formulate a problem statement, and develop a plan for solving the problem;
- create models and implement them in a digital environment;
- make realistic and feasible plans by taking into account possibilities, limitations and use of time;
- collect and analyse relevant information with emphasis on source criticism

- present research and results clearly and unambiguous within the field of applied computer science;

- formulate his/her own and other people's reflections and solutions within the field of applied computer science.

General competence

The candidate

- has retained and further developed his/her academic curiosity, knowledge, openness and precision as well as the ability to distinguish between knowledge and opinions;

- is capable of critical reflection on ethical, scientific and philosophical issues within the field of applied computer science;

- has gained knowledge of scientific literature, methods and theories within the field of applied computer science;

- can communicate knowledge clearly in writing as well as orally.

# Admission

A bachelor's degree or an equivalent education of at least 180 ECTS credits,
and in addition or included at least 80 ECTS credits in informatics,
and in addition or included at least 20 ECTS credits in programming

To be admitted, the applicant must have an average grade value from the qualifying education of at least 25 (according to ECTS standards).
Proof of English proficiency is also required.

In addition, all applicants must pass both a written essay and an online entrance test.

Applicants from countries outside the EU/EEA must submit proof of funding when submitting their application.

# Structure and content

## The structure and content of the programme

The master programme in applied computer science is a natural extension of the department's bachelor studies and builds on the research activities of the department’s staff.

In the first semester, students select courses from two of the following four research areas:

Interaction Design

Machine Learning

Cyber-Physical Systems

Information Systems

In addition, all students have a common course in scientific methods.

In the second semester, students specialise in the research areas selected in the first semester. In addition, students work with an applied computer science project.

In the third and fourth semester, the students are given the possibility to choose between a long master’s thesis (60 ECTS) or a common course (10 ECTS), which focuses on the use of computer science in today’s digital society, an elective course (10 ECTS) and a short master’s thesis (40 ECTS).

In order to qualify for the master's thesis, students must have passed at least 50 ECTS from the first year of study.

# Teaching, learning methods and forms of assessment

Learning partly takes place through seminars and traditional lectures. Additionally it will take other forms:

student-led seminars

projects

Each student's benefit from this type of organisation will depend on the student's own efforts and interest. The student must show interest in his/her professional development, and must be able to work independently with theory, implementation and knowledge acquisition. The students are offered supervision in all courses of the master programme. Master students are expected to take initiatives and approach tutors, and be responsible for their own learning.

Most courses and assignments are ICT-based, using various IT tools for exchange of information, submission of assignments, tests, etc. Østfold University College may demand that the student has a laptop at his/her disposal.

Østfold University College's Makerspace, a well-equipped lab with tools, materials, components and kits, is available for the students 24 hours, 7 days a week. This is a playground for students who like to create something using technology. Makerspace is also an arena for lectures, courses and experiments.

A modern library is at the students' disposal. The library helps the students in developing their information competence, i.e. the ability to search, find, evaluate and use relevant information. In addition to personal service the students are offered library courses on international databases and evaluation of information quality. They are also offered courses in scientific referencing.

Compulsory assignments
Some of the courses have requirements for attendance and/or compulsory assignments, exercises and projects. These assignments have to be completed and approved before taking the final examination. More details regarding compulsory assignments are found in the course descriptions.

Academic writing
The students will be trained in academic writing throughout the study programme. This is done by emphasising content, structure, reliability, and referencing.

Continuous feedback
The taught courses include exercises, assignments and projects, completed either individually or in groups. The students are given feedback on all exercises, assignments and projects.

Assessement
Final assessment takes several forms: written individual examination, portfolio assessment, project assessment, oral examination, or a combination of these. The grading scale normally used is the A - F scale although some courses may use the assessment "Bestått/Ikke bestått" (Pass/Fail).

Upon agreement with the instructor you may in some cases use Norwegian for your handins and/or exams.
More details regarding assessment are found in the course descriptions.

Plagiarism control/ cheating
Bachelor's and Master's theses are subject to electronic plagiarism control, as may also be the case with other courses and required coursework. Exam papers that are partly or entirely identical will not be approved and will be regarded as cheating. For further information please see Exam regulations for Østfold University College.

## Research and development work

The master programme is based on research activities at the department, but is also contributes to our research. All courses in the first year are directly related to the research performed at the department. This implies that our courses are continually developed and always up to date.

The master theses are always based on research and development performed at the department or at one of our partners. The students become part of the R&D-groups, and the theses have on several occasions led to scientific publications.

## Internationalisation

The international aspect is taken care of by the use of international literature. In addition, several members of the academic staff have close contacts with foreign institutions and research environments. The language of instruction is entirely in English, and therefore accommodates the needs of foreign students.

## Programme evaluation

We are in need of feedback from our students, and that you participate in the different evaluations that we arrange.

To be able to offer a topical and relevant education of good quality, HiØ is dependent on feedback from the students and their participation in the evaluation. This study programme is regularly evaluated in order to assure and develop its quality.

- An annual national student survey is conducted among second year students on all bachelor's and master's degree programmes under the auspices of the Norwegian Agency for Quality Assurance in Education (NOKUT). The results of the survey are published on the website studiebarometeret.no.

- HiØ conducts periodical programme evaluations.

- Evaluations are carried out in the individual courses; see the individual course descriptions for more details.

## Reading list

See separate course descriptions.

Course literature is subject to change until 15th of May for autumn courses, and 15th of November for spring courses.

# Studies abroad

Students may take their second semester of their studies at a university abroad. Both the International Coordinator at the department as well as HiØ's International Office help accommodate studies abroad, and the department have exchange agreements with several

universities in Europe, USA, Canada and Australia. Detailed information on exchange opportunities at universities abroad can be found on HiØ's international pages.

# Work and future studies

The master's programme qualifies for PhD-studies in Norway and abroad. Different admission requirements may apply at different universities.

A master degree from us provides opportunities for leading positions within application development, web development, consulting and project management in leading IT companies in Norway and abroad. It also qualifies for work in the public sector, for instance in the fields of research, health and education.

# The study plan is approved and revised

## The study plan is approved

Dean Harald Holone, 27.October 2020

## The study plan is revised

Head of Department, Monica Kristiansen Holone, October 22, 2021

## The study plan applies to

The programme description applies to the period 2022-2024 (master’s programme starting in Autumn 2022)

## Programme Coordinator

Faculty of Computer Science, Engineering and Economics.
Head of Department, Monica Kristiansen Holone

# Study model

## Autumn 2022

### Choose specialisation

- ◯ Machine Learning and Interaction Design
- ◯ Machine Learning and Cyber-Physical Systems
- ◯ Machine Learning and Information Systems
- ◯ Interaction Design and Information systems
- ◯ Interaction Design and Cyber-Physical Systems
- ◯ Cyber-Physical Systems and Information Systems

### Core courses

| | |
|---|---|
| ITI41020<br>Scientific Methods in Computer Science | **10** stp |

## Spring 2023

### Core courses

| | |
|---|---|
| ITI41120<br>Applied Computer Science Project | **10** stp |

## Autumn 2023

### Choose Master's Thesis 40 ECTS og 60 ECTS

- ◯ Choose a long master’s thesis (60 ECTS)
- ◯ Choose short master’s thesis (40 ECTS).

### You may apply for a Business project (10 ECTS)

| | |
|---|---|
| ITI42420 / Valgbart emne<br>Business Project | **10** stp |

## Spring 2024

Choose specialisation to view courses

Last updated from FS (Common Student System) June 28, 2024 2:34:59 AM

# ITI41020 Scientific Methods in Computer Science (Autumn 2022)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Cathrine Linnes**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Mandatory course in the master programme in applied computer science full-time and part-time.

# Lecture Semester

First semester (autumn) in the full-time and part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- has advanced knowledge of research design
- has knowledge of qualitative, quantitative and mixed methods
- has knowledge of relevant data collection techniques
- has knowledge of relevant data analysis techniques
- is familiar with publishing channels relevant to applied computer science, different types of publications, their roles and functions

Skills

The student is able to

- search for and assess scientific literature within the field of applied computer science
- use scientific references
- construct a problem statement or research question and evaluate its soundness
- select relevant methods to address a research problem
- use relevant techniques for data collection
- use relevant techniques for data analysis

General competence

The student

- is able to write a scientific paper
- is able to orally present a scientific project for specialists within the field, as well as the general public
- has competence in critical reading and reflection

# Content

- Research design in the field of computer science
- Qualitative, quantitative and mixed methods
- Scientific writing and peer-review
- Publishing channels relevant to applied computer science, different types of publications, their roles and functions

# Forms of teaching and learning

Lectures, presentations, and lab exercises.

# Workload

Approx. 280 hours.

# Examination

Portfolio and individual written exam.

The exam consists of both a portfolio and an individual written exam. The portfolio counts 60% and consists of:

- Two research projects
- One idea paper

The individual written exam counts 40% and is based on the course curriculum. Duration 2 hours. No supporting materials permitted.

Both parts of the exam must be passed to pass the exam as a whole.

The student will get an individual joint grade for the entire course. Grades: Assessment on the A - F grading scale.

# Examiners

External and internal examiner, or to internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

Last updated from FS (Common Student System) June 28, 2024 2:32:54 AM

# ITI41720 Machine Learning (Autumn 2022)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Roland Olsson**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science full-time and part-time.

# Recommended requirements

Knowledge in:

- Statistics and statistical programming
- Mathematics
- Programming
- Algorithms and data structures

# Lecture Semester

First or third semester (autumn) in the full-time programme.

First, third or seventh semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- is familiar with both the possibilities and advantages of employing the machine learning methods in the course, as well as possible problems that may be encountered and how to overcome them.
- knows how the algorithms presented in the course work and their characteristics, for example which problems they work best for, overfitting, expected accuracy and computational requirements, for example how much benefit that accelerators may provide.

Skills

Given a machine learning application, the student is able to

- determine which theory and which methods that are presented in the course that are relevant and also how to apply them.
- perform hyperparameter tuning or in some cases even perform modifications of the source codes.
- use at least one implementation for each of the major machine learning techniques that are taught in the course.

General competence

The student

- is able to independently read machine learning papers and other literature and evaluate what works well and what does not for new problems.
- knows the terminology of machine learning and is familiar with the mathematics that is common in the field.
- knows the general behaviour of machine learning methods for example regarding how much data that is required, how to preprocess the data and ensure that its quality is sufficient.

# Content

This course gives an advanced insight into the main methods used in machine learning. The topics covered in this course are:

- Concepts related to basic types of learning (supervised, unsupervised, reinforcement): preprocessing, feature extraction, overfitting, error functions.
- Decision and regression trees, random forest and XGBoost
- Artificial neural networks, deep learning.
- Optimization (evolutionary algorithms and other search methods)
- Bayesian inference / classification.

Ethics and privacy in machine learning is also mentioned.

Additionally, the course contains up to date topics that are not known when this text is being written.

## Forms of teaching and learning

The students will learn by attending lectures, read the books, papers and online material in the course reading list and above all by working on two projects. The project work is supervised each week and results in a 10 pages report for each project. These reports are part of the examination in the course.

## Workload

Approx. 280 hours.

## Examination

Portfolio and individual written exam

The exam consists of both a portfolio and an individual written exam.

The portfolio (determines 65% of the final grade) consists of two projects. The projects can be carried out individually or in groups of two students. The students will get an individual grade.

The individual written exam determines 35% of the final grade and focuses on theory. Duration 3 hours. No supporting materials allowed.

Both parts of the exam must be passed to pass the exam as a whole. The student will get an individual joint grade for the entire course. Grades: A - F.

## Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee of the faculty of Computer Sciences.

# Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

Last updated from FS (Common Student System) June 28, 2024 2:32:54 AM

# ITI41520 Interaction Design (Autumn 2022)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leaders:
- **Juan Carlos Torrado**
- **Susanne Koch Stigberg**

Teaching language:
**English**

Duration:
**½ year**

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# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Recommended requirements

The student should have some experience on investigating or creating interactive systems evidenced through the completion of relevant courses in software and hardware prototyping, data science, cyber-physical systems, interaction design, design methods, or human computer interaction.

# Lecture Semester

First or third semester (autumn) in the full-time programme.

First, third or seventh semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

By participating in the theoretical modules the student learns to:

- identify and describe contemporary trends in interaction design and classify IxD projects accordingly
- formulate research questions and hypotheses for interaction design projects
- understand and reflect on choosing a design methodology for a specific project and appropriate documentation techniques
- explain and reflect on the results of interaction design projects

Skills

The student is able to

- perform a scientific literature review
- apply appropriate methods for designing new and existing technology for interaction between humans and machines
- prototype interaction design ideas at an appropriate level of fidelity using contemporary tools and techniques
- design, conduct, and analyse surveys, interviews, or experiments as appropriate
- document the findings in a way appropriate for scientific publication and present appropriately

General competence

The student gains

- competence in critical reading and reflection
- group-work skills

# Content

The theoretical modules investigate contemporary trends in interaction design and design methods. Presentations demonstrate multimodal interfaces, virtual and augmented reality, mobile and wearable, as well as tangible, embodied, and sonic interaction design. Design methods from user-centred and participatory design as well as designing for specific user groups and research through design are discussed.

In project work, the student applies appropriate methods to investigate interaction between humans and machines. Projects may survey specific use contexts, create an interactive artifact or system, perform an empirical study, or a meta-analysis of a literature review. Projects are structured based on deadlines which offer the student several opportunities to get formative feedback during supervision. The results of the project should be documented in a way that is appropriate for scientific publication and may be submitted to an international academic conference.

# Forms of teaching and learning

The Interaction design course is an advanced course in Interaction Design which consists of theoretical and project work modules. The following methods are used:

- Presentations
- Supervision
- Workshops
- Reading Circle
- Project Work

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must during the semester:

- present at least one paper from the reading list (individual or in a group) and lead a plenary discussion based on this.
- complete and present at least one approved group project.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Individual written exam and scientific documentation in groups

The exam is divided into two parts:

- Individual written exam (50%) based on the course curriculum. Duration 4 hours. No supporting materials allowed.
- Scientific documentation in groups (50%) based on the group project.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the course. The student will get an individual joint grade for the entire course.

## Examiners

External and internal examiner, or two internal examiners.

## Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

## Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

## Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

Last updated from FS (Common Student System) June 28, 2024 2:32:54 AM

# ITI41920 Hands-On Introduction to Cyber-Physical Systems (Autumn 2022)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Maben Rabi**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Lecture Semester

First or third semester (autumn) in the full-time programme.

First, third or seventh semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The students has knowledge of

- examples of Cyber-physical systems, arising in industry and society
- basic Sensing, Communication, Control, and Computing elements in a typical Cyber-physical system
- techniques for modelling Cyber-physical systems from their components
- the challenges of simulating, designing, testing a verifying cyber-physical systems
- basic simulation methods

Skills

The student is able to

- decompose any given Cyber-physical system into its Sensing, Communication, Control, and Computing elements

- apply basic modelling methods to capture the dynamic behaviour
- predict dynamic behaviour using simulation tools
- predict performance from approximate modelling and analysis
- perform simulation and testing of simple Arduino or Raspberry-Pi based mechatronic Cyber-physical systems

General competence

The student

- knows the way of abstracting device and embedded software details, and extracting the overall functional behaviour, in concrete examples of cyber-physical systems
- is familiar with the terminology of the area of cyber-physical systems

# Content

- Introduction to embedded computing devices
- Introduction to basic sensing, actuating and other physical devices
- Common communication protocols for real-time applications
- Modelling of continuous and discrete dynamics
- Challenges in specification, verification, and systems engineering

# Forms of teaching and learning

Lectures, seminar/workshops, and project work with software tools and mechatronic hardware.

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must:

- deliver up to 5 mandatory assignments
- finish their final project work

These assignments require working with software packages, hardware implementation and programming, as well as reading and summarizing papers from the research literature. The final project also involve similar activities.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Oral exam and project report in groups

The exam is divided into two parts:

- Oral exam in groups (50%): Based on the course curriculum. Duration 30 min. No supporting materials allowed. The students will get an individual grade.
- Project report in groups (50%): Based on the project work.The students will get an individual grade.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the exam as a whole.The students will get an individual joint grade for the entire course.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

# Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

Last updated from FS (Common Student System) June 28, 2024 2:32:54 AM

# ITI42120 Advanced Topics in Information Systems (Autumn 2022)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Ricardo Colomo-Palacios**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Recommended requirements

Knowledge about:

- DevOps tools and frameworks
- Machine learning

# Lecture Semester

First or third semester (autumn) in the full-time programme.

First, third or seventh semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- knows the basics of Digital Transformation
- understands the role of Information Systems in Digital Transformation initiatives
- is familiar with principles of IT Governance
- is familiar with global trends in business software with regards to its deployment and development
- has a good overview of DevOps tools and approaches
- knows how to measure costs in software development in DevOps and traditional settings
- understands the role and importance of Software Engineering in Artificial Intelligence-based solutions

Skills

The student

- is able to place and articulate Information Systems function in a Digital Transformation initiative
- is able to identify and design a basic IT Governance plan
- knows the different approaches and trends in business software
- knows how to measure business value and costs in software developments
- is able to identify the need to use a set of DevOps software tools
- is capable of using a set of DevOps software tools for business needs
- knows how to use and justify the use of software engineering techniques in Artificial Intelligence-based solutions

General competence

The student is able to apply

- scientific theories and methodologies in a practical business setting.
- technologies in a practical business setting.

# Content

1. Digital Transformation and IT Governance
2. Trends in Business Software
3. DevOps and Continuous Software Engineering
4. Software Engineering for Artificial Intelligence

# Forms of teaching and learning

Teaching will be based on blended learning approaches. There will be recorded lectures of the topics of the course and in a weekly or bi-weekly basis, physical meetings will take place to mentor the development of the paper and guide students in the course.

# Workload

Approx. 280 hours.

# Examination

Scientific paper and individual oral exam

The students need to develop a scientific paper on a selected topic. The topic is chosen by the students and agreed with the course responsible. The paper can be developed individually or in groups two students. The students are given an individual tentative grade on the paper using the A - F grading scale. This grade can be adjusted up to 2 stages at the oral exam.

The individual oral exam is based on regular topics in the course, aspects of the paper developed and a case. Duration approx. 20-30 min. No supporting materials allowed.

If the student decides to challenge the assessment, the scientific paper must be re-assessed. If the new assessment affects the tentative grading of the paper, a new oral exam will be arranged.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken.

# Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

New updated reading list will be published in Leganto. (link will be published here)

The reading list below is from the last time the course was completed - and is not necessarily valid for the upcoming semester:

Last updated 21.10.2020. The reading list may be subject to changes before 15th of May 2022.

DIGITAL TRANSFORMATION & IT GOVERNANCE

Andriole, S. J. (2017). Five myths about digital transformation. MIT sloan management review, 58(3).

Ebert, C., & Duarte, C. H. C. (2018). Digital transformation. Ieee Software, (4), 16-21.

Hess, T., Matt, C., Benlian, A., & Wiesböck, F. (2016). Options for formulating a digital transformation strategy. MIS Quarterly Executive, 15(2).

Hinings, B., Gegenhuber, T., & Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. Information and Organization, 28(1), 52-61.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118-144.

De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. Information Systems Management, 26(2), 123-137.

Joshi, A., Bollen, L., Hassink, H., De Haes, S., & Van Grembergen, W. (2018). Explaining IT governance disclosure through the constructs of IT governance maturity and IT strategic role. Information & Management, 55(3), 368-380.

Mohan, K., Cao, L., Sarkar, S., & Ramesh, B. (2019). Adapting IT Governance Practices for the Changing IT Function. IT Professional, 21(1), 27-33.

Juiz, C., & Toomey, M. (2015). To govern IT, or not to govern IT?. Communications of the ACM, 58(2), 58-64.

Vejseli, S., Proba, D., Rossmann, A., & Jung, R. (2018). The agile strategies in IT Governance: Towards a framework of agile IT Governance in the banking industry. Twenty-Sixth European Conference on Information Systems (ECIS2018), Portsmouth,UK, 2018

https://www.pmi.org/disciplined-agile/process/it-governance

https://www.projectmanagement.com/blog-post/61871/What-is-Lean-IT-Governance-

TRENDS IN BUSINESS SOFTWARE

Berberat, S., & Baudet, C. (2019). Assessing a Business Software Application using Strategic IT Alignment Factors: A New Way for IS Evaluation?.

De Lauretis, L. (2019). From Monolithic Architecture to Microservices Architecture. In 2019 IEEE International Symposium on Software Reliability Engineering Workshops (ISSREW) (pp. 93-96). IEEE.

Jansen, S., Cusumano, M., & Popp, K. M. (2019). Managing software platforms and ecosystems. IEEE Software, 36(3), 17-21.

Jason, G., Nikolay, M., & Guohua, W. The Partner Ecosystem Evolution from On-premises Software to Cloud Services: a case study of SAP.

Loukis, E., Janssen, M., & Mintchev, I. (2019). Determinants of software-as-a-service benefits and impact on firm performance. Decision Support Systems, 117, 38-47.

Raghavan R., S., K.R., J. & Nargundkar, R.V. (2020). Impact of software as a service (SaaS) on software acquisition process, Journal of Business & Industrial Marketing, 35(4), 757-770. https://doi.org/10.1108/JBIM-12-2018-0382

Yrjönkoski, T., & Systä, K. (2019, August). Productization levels towards whole product in SaaS business. In Proceedings of the 2nd ACM SIGSOFT International Workshop on Software-Intensive Business: Start-ups, Platforms, and Ecosystems (pp. 42-47).

DEVOPS AND CONTINUOUS SOFTWARE ENGINEERING

Fitzgerald, B., & Stol, K. J. (2017). Continuous software engineering: A roadmap and agenda. Journal of Systems and Software, 123, 176-189.

O'Connor, R. V., Elger, P., & Clarke, P. M. (2017). Continuous software engineering—A microservices architecture perspective. Journal of Software: Evolution and Process, 29(11), e1866.

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SOFTWARE ENGINEERING FOR ARTIFICIAL INTELLICENCE

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# ITI41120 Applied Computer Science Project (Spring 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Stefano Nichele**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Mandatory course in the master programme in applied computer science full-time and part-time.

# Absolute requirements

Passed at least one specialisation course in the first semester

# Lecture Semester

Second semester (spring) in the full-time programme.

Fourth semester (spring) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- has deep knowledge of at least one research area at the faculty
- is familiar with relevant publishing channels
- is familiar with relevant methods and techniques

Skills

The student is able to

- write a scientific paper aimed at publishing

- define and defend a research problem
- develop and carry out a research design

General competence

The student gains experience with project work, including planning, performing and reporting in an existing research area

## Content

In this course, the students will complete a project based on their two specialisations. The topic for the project is chosen in collaboration with the supervisor and shall, as a general rule, be linked to an existing research area at the department.

The project should be applied within a domain relevant to the digital society.

## Forms of teaching and learning

Practical project work with regular supervision.

## Workload

Approx. 280 hours.

## Coursework requirements - conditions for taking the exam

The student must deliver:

- a project description within two weeks after starting the project
- a mid-term report

Coursework requirements must be accepted to qualify for the exam.

# Examination

Paper and individual oral exam

The assessment is based on the paper and an individual oral exam.

The paper (approx. 10 pages) is graded on the A - F grading scale. It is given a tentative grade of the paper. This grade can be adjusted at the oral presentation. The papers can be carried out individually or in groups of two students. The students will get an individual grade. The paper must be passed before the oral presentation can be carried out

The individual oral exam consists of a presentation and discussion of the paper. Duration approx. 20-30 min. Except the presentation, no supporting materials are allowed.

If the student decides to challenge the assessment, the paper must be re-assessed. If the new assessment affects the tentative grading of the paper, a new oral exam will be arranged.

# Examiners

External and internal examiner, or to internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken. Upon re-examination, a new project must be carried out.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:22 AM

# ITI41820 Advanced Topics in Machine Learning (Spring 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Kazi Shah Nawaz Ripon**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science full-time and part-time.

# Recommended requirements

ITI41720 Machine Learning

# Lecture Semester

Second semester (spring) in the full-time programme.

Second or fourth semester (spring) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- is the possibilities and advantages of employing the machine learning methods in the course as well as possible problems that may be encountered and how to overcome them.
- knows how the algorithms presented in the course work and their characteristics, for example which problems they work best for, overfitting, expected accuracy and computational requirements, for example how much benefit that accelerators may provide.

Skills

Given a machine learning application, the student is able to

- determine which theory and which methods that are presented in the course that are relevant and also how to apply them.
- perform hyperparameter tuning or in some cases even perform modifications of the source codes.
- use at least one implementation for each of the major machine learning techniques that are taught in the course.

General competence

The student

- is able to independently read machine learning papers and other literature and evaluate what works well and what does not for new problems.
- knows the terminology of machine learning and be familiar with the mathematics that is common in the field.
- knows the general behaviour of machine learning methods for example regarding how much data that is required, how to preprocess the data and ensure that its quality is sufficient.

# Content

The course goes in depth on selected topics and methods within machine learning and their applications. Examples include:

- advanced neural net and deep learning models, such as: ResNET, Zero shot, GAN, LSTM.
- Evolutionary and bio-inspired algorithms algorithms (like GA, EA, ES, PSO, ACO, AIS) in search, optimization and classification.
- Program induction. Symbolic regression. Automatic programming.
- Markov models, Kernel methods. SVM

- Implementing machine learning in Industries and business
- Machine learning challenges and future
- Philosophical fundamental problems and ethical questions related to machine learning

The course syllabus will continuously be updated with methods from state-of-the-art research. Other topics may be chosen by machine learning group members each year and may vary depending on who is involved.

## Forms of teaching and learning

The students will learn by attending seminars, reading papers and online material in the course reading list and above all by working on a project with a selected topic throughout the course and giving presentations at the seminars.

## Workload

Approx. 280 hours.

## Coursework requirements - conditions for taking the exam

The student must:

- give presentations at two seminars
- contribute with questions in at least two other seminars

Coursework requirements must be accepted to qualify for the exam.

## Examination

Project report and individual oral exam

The assessment is based on the project report and an individual oral exam. The project report is graded on the A - F grading scale. It is given a tentative grade of the report. This grade can be adjusted at the oral presentation. The project must be passed before the oral presentation can be carried out.

The individual oral exam based on the course curriculum and project work. Approximately 30 minutes duration. No supporting materials allowed.

# Examiners

External and internal examiner, or to internal examiners.

# Conditions for resit/rescheduled exams

In case of re-examination, a new project must be carried out in agreement with the course instructor.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:22 AM

# ITI41620 Design for Cooperation (Spring 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Joakim Karlsen**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Recommended requirements

ITI41520 Interaction Design

# The student's learning outcomes after completing the course

Knowledge:

The student is familiar with

- central theories and concepts for understanding how people cooperate in workplaces or in everyday life
- methods, tools and techniques for designing IT solutions in support of cooperative practices

Skills:

The student is able to

- use methods, tools, and techniques for designing IT solutions in support of cooperative practices

General competence

The student can

- conduct methodologically and ethically sound research according to the scientific standards in CSCW

# Content

The course introduces the students to Computer-Supported Cooperative Work (CSCW), an interdisciplinary research field concerned with understanding how to support cooperative practices by technology design.

The course gives an overview of central theories and concepts for understanding how people cooperate in workplaces or in everyday life and a toolbox of methods, tools and techniques that will help them design IT solutions in support of these cooperative practices.

# Forms of teaching and learning

There will be lectures, plenary discussions and project work.

The lectures and plenary discussions will focus on:

- classical case studies in CSCW
- central theories and concepts in CSCW
- methods, tools and techniques for designing support for cooperative practices as developed in CSCW

The project work will lead to the writing of one scientific paper and will be conducted according to the requirements and deadlines set by the professors responsible for the course.

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must have finished their project work.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Individual oral exam and scientific paper in groups

The exam is divided into two parts:

- Individual oral exam (50%): Based on the course curriculum. Duration 30 min. Some supporting material will be allowed. This will be specified by the lecturer.
- Scientific paper in groups (50%): Based on the project work.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the exam as a whole.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

# Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:22 AM

# ITI42020 Modelling Cyber-Physical Systems (Spring 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Øystein Haugen**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Recommended requirements

ITI41920 Hands-on Introduction to Cyber-Physical Systems and general programming skills

# Lecture Semester

Second semester (spring) in the full-time programme.

Second or fourth semester (spring) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student understands

- the challenges associated with cyber-physical systems
- the relevance of good software design principles
- how evolution and maintenance should be organized
- the value of abstraction

Skills

The student has the capability to

- model and implement reactive systems with concurrency
- perform analysis of consistency of models of systems with concurrency
- give and take constructive criticism of the system design and functioning
- receive the experience of building a cyber-physical system and making it execute

General competence

The student

- can build systems on «Internet of Things»
- can assess realistically what errors may occur in cyber-physical systems and how to minimize their vulnerability
- has some insight into precise descriptions and their semantics

# Content

The course focus on how reactive systems can be built with emphasis on modeling. The models are executable and based on state machines. The requirements of these concurrent systems are modeled as sequence diagrams, and it is emphasized that the requirements and design should be consistent.

We emphasize reactive systems on the Internet of Things, and we use a running example where the functionality is enhanced during the course following an agile approach.

Towards the end of the course, we show how systems can be made more resilient to unexpected incidents and errors. To perform risk-analysis of such systems will also be covered.

# Forms of teaching and learning

Project work, lectures and guided lab and exercises.

For each instance of the course, we create new project tasks. We teach the project teams how to give and take constructive feedback.

## Workload

Approx. 280 hours.

## Coursework requirements - conditions for taking the exam

- Mandatory project: There will be one project, with deliverable at each teaching session (2 deliverables). Project group size should be 2-4 people, but with few students, single person project will be possible. The students should expect to spend 100 hours on the project.

- Plenary presentation and evaluation of the project. The project should normally result in an executable model that should be demonstrated at the plenary presentation.

Coursework requirements must be accepted to qualify for the exam.

## Examination

Individual oral exam

Individual oral exam based on the course curriculum and mandatory exercises. Approximately 30 minutes duration. No supporting materials allowed.

Assessment on the A - F grading scale.

## Examiners

External and internal examiner, or two internal examiners.

## Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:23 AM

# ITI42220 Security in Information Systems and Software Engineering (Spring 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leaders:
- **André Alexandersen Hauge**
- **Vikash Katta**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

- Literature

## The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

## Recommended requirements

ITI41820 Advanced Topics in Information Systems

## Lecture Semester

Second semester (spring) in the full-time programme.

Second or fourth semester (spring) in the part-time programme.

## The student's learning outcomes after completing the course

Knowledge

The student

- knows how to specify and analyse security requirements in the development and acquisition process
- understands the differences between security concerns in software acquisition and development environments
- is able to recognize common security engineering risk analysis tools and methods
- knows main secure design considerations

- is able to understand main testing approaches for security
- is familiar with common DevSecOps toolchains and configurations
- is able to identify and understand maturity models in security and DevSecOps scenarios

Skills

The student is

- able to use common security requirements engineering methods (e.g. MSRA, SQUARE, GBRAM…) in real settings
- able to perform a security risk analysis
- able to justify the need of DevSecOps approaches and guide them in practical business settings
- able to secure DevOps scenarios
- able to introduce security in software design and coding phases
- able to use main testing approaches with an accent in security
- capable of using a set of DevSecOps software tools for business needs
- able to measure security levels by means of metrics and models

General competence

The student is able to apply theories and methodologies in the course in a practical business setting.

# Content

1. Security in Requirements: Development and Acquisition

2. Security Engineering Risk Analysis

3. DevSecOps: Strategy and Implementation

# Forms of teaching and learning

Teaching will be based on blended learning approaches. There will be recorded lectures of the topics of the course and in a weekly or bi-weekly basis, physical meetings will take place to mentor the development of the paper and guide students in the course.

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must deliver up to four assignments.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Individual written exam and scientific paper

The exam is divided into two parts:

- Individual written exam (50%) based on the course curriculum. Duration 4 hours. No supporting materials allowed.

- Scientific paper (50%) on a topic related to the course. The topic is chosen by the students and agreed with the course responsible. The paper can be developed individually or in groups of two students. The students will get an individual grade.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the course. The student will get an individual joint grade for the entire course.

## Examiners

External and internal examiner, or two internal examiners.

## Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

## Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

## Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:23 AM

# ITI42420 Business Project (Autumn 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Monica Kristiansen Holone**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in applied computer science, full-time and part-time.

# Lecture Semester

Third semester (autumn) in the full-time programme.

Seventh semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student knows

- how to develop a project plan in collaboration with a customer/partner
- how to apply own expertise and scientific background to a real project
- how to balance academic interest and research perspectives with the demands in a commercial/real-life project

Skills

The student is able to

- collaborate in a group setting with an external customer/partner
- communicate across and bridge the gap between academia and industry
- put theoretical knowledge into practical use

- plan and manage a project in collaboration with others
- understand an application domain and get familiar with new concepts and terminology

General knowledge

The student can

- work in groups and take responsibility
- write and present a project report
- schedule, manage and conduct necessary meetings according to a project plan

# Content

The course consists of a hands-on project in collaboration with one of our partners in the private or public sector. The project is a practical project with an academic/research flavour. Through the course, the student gains valuable experience working on real projects in the real world, applying skills and knowledge from his/her fields of specialization.

An agreement between the student and the company must be made before the student can attend this course. The agreement must be approved by the Head of Studies before the project starts.

A description of the business project should be prepared by the student and the company in collaboration. The project description must be endorsed by the faculty before the work starts. This is done to ensure necessary volume and depth in the project.

# Forms of teaching and learning

Project work with guidance from a mentor at the company and a supervisor at Østfold University College.

# Workload

Approx 280 hours.

# Coursework requirements - conditions for taking the exam

- Deliver a preliminary project report within two weeks after starting the project.
- Prepare and conduct meetings with mentor and supervisor at least once every month, including writing abstracts and logging working hours.
- Present the project at half time (approximately 140 hours). This includes delivering a mid-term report.

Coursework requirements must be accepted to qualify for the exam

# Examination

Individual project report and individual oral exam

The assessment is based on an individual project report and an individual oral exam. The project report is graded on the A - F grading scale. It is given a tentative grade of the report. This grade can be adjusted up to 2 stages at the oral exam.

The project report must be passed before the oral exam can be carried out.

The individual oral exam consists of a presentation and discussion of the project report. Duration approx. 20-30 min. Except the presentation, no supporting materials are allowed.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

In case of re-examination, a new project must be carried out in agreement with the course instructor and the company.

## Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

## Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:20 AM

# ITI52020 Master's Thesis (Autumn 2023–Spring 2024)

### Facts about the course

ECTS Credits:
**60**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Jan Høiberg**

Teaching language:
**English**

Duration:
**1 year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in Applied Computer Science, full-time.

# Absolute requirements

The student must have passed at least 50 ECTS before starting this course (students who started in 2020 or earlier must have passed at least 45 ECTS).

# Lecture Semester

Third and fourth semester (autumn and spring).

# The student's learning outcomes after completing the course

Knowledge

The student has

- knowledge and expertise required for challenging jobs in research and development in the field
- knowledge about literature and methods related to the subjects that are part of the master thesis

Skills

The student is able to

- work independently with a complex problem over a longer period of time
- analyse a situation, describe a problem and plan its solution

- collect and analyse relevant information with an ethically sound and critical approach
- present research and results in a clear and comprehensive written thesis
- communicate knowledge clearly and precisely, orally and in writing
- express own and others reflections and solutions in the chosen area of research

General competence

The student has

- obtained a relation to scientific literature and methods
- developed academic curiosity
- gained consciousness towards values such as openness, precision and ability to discriminate between knowledge and opinions
- the ability to think critically about central ethical, philosophical and scientific problems in his/her field

# Content

The content will largely depend on the selected master project.

# Forms of teaching and learning

Supervised self-study.

# Workload

Approx. 1800 hours.

# Coursework requirements - conditions for taking the exam

The student must :

- attend a mandatory seminar in academic writing and a library course.
- deliver a written report (individually or in groups of two people) which includes a thorough literature study, a clearly defined problem statement, research questions, and a detailed project plan.
- present their project mid-way for supervisors and students within the same specialisation.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Master thesis and oral exam

The assessment is based on the master thesis (individually or in groups of two people) and an individual oral exam. At the oral examination the candidate first holds a presentation of the master thesis (approx. 30 min). Then the student defends the thesis (approx 30 min). The oral examination is public.

The master thesis must be passed before the oral exam can be carried out.

The thesis is graded on the A - F grading scale. It is given a tentative grade of the thesis. This grade can be adjusted at the oral presentation.

If the student decides to challenge the assessment, the thesis must be re-assessed. If the new assessment affects the tentative grading of the thesis, a new oral exam will be arranged.

Plagiarism control/cheating

Master's theses are subject to electronic plagiarism control. Exam papers that are partly or entirely identical will not be approved and will be regarded as cheating. For further information please see Exam regulations for Østfold University College.

# Examiners

External and internal examiner.

# Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken.

If the student wishes to improve a passed result of his/her master thesis, the thesis must be rewritten with a new problem statement. In this case, the student is not entitled to receive new academic supervision.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:20 AM

# ITI51020 Master's Thesis (Autumn 2023–Spring 2024)

### Facts about the course

ECTS Credits:
**40**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Jan Høiberg**

Teaching language:
**English**

Duration:
**1 year**

## Table of contents

# The course is connected to the following study programs

Elective course in the master programme in Applied Computer Science, full-time.

# Absolute requirements

The student must have passed at least 50 ECTS before starting this course (students who started in 2020 or earlier must have passed at least 45 ECTS).

# Lecture Semester

Third and fourth semester (autumn and spring).

# The student's learning outcomes after completing the course

Knowledge

The student has

- knowledge and expertise required for challenging jobs in research and development in the field
- knowledge about literature and methods related to the subjects that are part of the master thesis

Skills

The student is able to

- work independently with a complex problem over a longer period of time
- analyse a situation, describe a problem and plan its solution

- collect and analyse relevant information with an ethically sound and critical approach
- present research and results in a clear and comprehensive written thesis
- communicate knowledge clearly and precisely, orally and in writing
- express own and others reflections and solutions in the chosen area of research

General competence

The student has

- obtained a relation to scientific literature and methods
- developed academic curiosity
- gained consciousness towards values such as openness, precision and ability to discriminate between knowledge and opinions
- the ability to think critically about central ethical, philosophical and scientific problems in his/her field

# Content

The content will largely depend on the selected master project.

# Forms of teaching and learning

Supervised self-study.

# Workload

Approx. 1200 hours.

# Coursework requirements - conditions for taking the exam

The student must :

- attend a mandatory seminar in academic writing and a library course.
- deliver a written report (individually or in groups of two people) which includes a thorough literature study, a clearly defined problem statement, research questions, and a detailed project plan.
- present their project mid-way for supervisors and students within the same specialisation.

Coursework requirements must be approved before the student can take the exam.

# Examination

Master thesis and oral exam

The assessment is based on the master thesis (individually or in groups of two people) and an individual oral exam. At the oral examination the candidate first holds a presentation of the master thesis (approx. 30 min). Then the student defends the thesis (approx 30 min). The oral examination is public.

The master thesis must be passed before the oral exam can be carried out.

The thesis is graded on the A - F grading scale. It is given a tentative grade of the thesis. This grade can be adjusted at the oral presentation.

If the student decides to challenge the assessment, the thesis must be re-assessed. If the new assessment affects the tentative grading of the thesis, a new oral exam will be arranged.

Plagiarism control/cheating

Master's theses are subject to electronic plagiarism control. Exam papers that are partly or entirely identical will not be approved and will be regarded as cheating. For further information please see Exam regulations for Østfold University College.

# Examiners

External and internal examiner.

# Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken.

If the student wishes to improve a passed result of his/her master thesis, the thesis must be rewritten with a new problem statement. In this case, the student is not entitled to receive new academic supervision.

# Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:20 AM

# ITI42320 Computer Science in the Digital Society (Autumn 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Hasan Ogul**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Mandatory course in the Master`s Programme in Applied Computer Science full-time and part-time.

# Absolute requirements

The student must have passed at least 30 ECTS before starting this course.

# Lecture Semester

Third semester (autumn) in the full-time programme.

Fifth semester (autumn) in the part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- has a good overview of the field of applied computer science
- has an in-depth understanding of relevant scientific publication channels
- has deep knowledge of relevant scientific approaches and methodologies relevant to applied computer science
- is familiar with seminal papers relevant to the research group core areas
- understands the link between computer science and the domains in which it is applied

- understands cooperation between academic research and partners in public and private sectors

Skills

The student

- is able to read and review papers within the field of computer science
- is able to communicate the connection between computer technology and relevant application areas in society
- is able to discuss with peers and researchers about technological challenges, opportunities and applications in society
- is able to communicate research design, results and impact on society
- has the capacity to critically reflect on the role of technology in society

General competence

The student has

- gained experience in critical thinking and discussion
- a more mature view on digital technology and its role in society
- gained experience in oral presentations and plenary discussions
- a broader understanding of the field of applied computer science, relevant publication channels and research topics

# Content

In this course, the students will apply their knowledge from their specialisations in the MA programme and use it in a larger context.

In the first part of the course, the department's four research groups in:

- Information Systems ans Software Engineering
- Cyber-Physical Systems
- Interaction Design
- Machine Learning

will present topics and projects related to the digital society, as well as discuss technical and ethical challenges in their domains. Research projects where the department is involved will be presented as cases in the course (including ongoing PhD projects at the department). External partners in the projects will take part to clearly communicate the impact and importance of the research projects in today's digital society.

The second part of the course consists mainly of group sessions and supervision, where the students are tasked with reading and critical analysis of papers relevant to and largely based on the introductory part of the course.

In this part, the students will write:

- a systematic literature review (SLR) about computer science methods/methodologies/technologies (in the field of any of the four research groups) applied on a specific digital society problem/challenge. The SLR topic is chosen by the students and agreed with the course responsible.
- a project proposal, which addresses the specific digital society problem reviewed in the SLR and offers a computer science solution in the scope of any of the four research groups.

# Forms of teaching and learning

Lectures, presentations, group sessions and supervision.

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must:

- Deliver a systematic literature review (SLR) report within 6 weeks after starting the semester.
- Deliver a project proposal (initial version - abstract) within 8 weeks after starting the semester.
- Attend a group session to present own proposal and get feedback from the course responsible and other students.
- Attend at least four group sessions to give feedback to other students' projects.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Project proposal and individual oral exam

The assessment is based on the project proposal and an individual oral exam.

The proposal can be developed individually or in groups two students. The students are given an individual tentative grade on the proposal using the A - F grading scale. This grade can be adjusted up to 2 stages at the oral exam.

The project proposal must be passed before the oral exam can be carried out.

The individual oral exam consists of a presentation and discussion of the project proposal. Duration approx. 20-30 min. Except the presentation, no supporting materials are allowed.

If the student decides to challenge the assessment, the project proposal must be re-assessed. If the new assessment affects the tentative grading of the proposal, a new oral exam will be arranged.

# Examiners

External and internal examiner, or two internal examiners.

## Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken.

## Course evaluation

This course is evaluated by a

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

## Literature

The reading list may be subject to changes before 15th of May 2022.

Last updated from FS (Common Student System) June 29, 2024 12:15:20 AM

# ITI42122 Cyber Security Governance (Autumn 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Mary Luz Sanchez Gordon**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Mandatory course in the master programme in applied computer science with specialisation in cyber security, full-time and part-time.

# Recommended requirements

Knowledge about:

- Governance and management of IT
- Cyber security

# Lecture Semester

First semester (autumn) in the full-time and part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The student

- knows main ISO IT Security standards
- is familiar with the Information Technology Infrastructure Library (ITIL)
- is able to understand main risk scenarios and challenges
- knows how to apply Control Objectives for Information and Related Technology (COBIT) to specific information security topics/practices within an enterprise.
- is able to identify and understand security and controls across the strategic, tactical, and operational levels within an organization
- is able to understand main adversary tactics and techniques
- is able to distinguish governance and management by their types of activities and responsibilities

Skills

The student is able to

- use well-known frameworks and standards (COBIT, ITIL, ISO 27K) in real settings
- justify the need of IT Security and continuity planning issues for effective IT and guide them in practical business settings
- select the appropriate controls
- know whether business operations and information are secure and reliable
- know whether an enterprise is maintaining an effective system of internal control
- assess and articulate security risks from the board level to the code level.

General competence

The student gains experience with project work, including planning, performing and reporting in an existing research area.

# Content

- Control Objectives for Information and Related Technology (COBIT)
- Information Technology Infrastructure Library (ITIL) for security management
- ISO/IEC 27001 Information Security Management Systems

# Forms of teaching and learning

Teaching will be based on blended learning approaches. There will be recorded lectures of the topics of the course and in a weekly or bi-weekly basis, physical meetings will take place to mentor the development of the paper and guide students in the course.

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must deliver up to four assignments.

Coursework requirements must be accepted to qualify for the exam.

# Examination

Individual oral exam and a security governance plan

The exam is divided into two parts:

- The plan (50%) is graded on a selected case study. The case study is chosen by the students and agreed with the course responsible. The plan can be developed individually or in groups of two students. The students will get an individual grade.
- The individual oral exam (50%) is based on the course curriculum, aspects of the plan developed. Duration approx. 20-30 min. No supporting materials are allowed.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the course. The student will get an individual joint grade for the entire course.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination must be retaken.

# Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:19 AM

# ITI41322 Interaction Design Experiments (Autumn 2023)

### Facts about the course

ECTS Credits:
**10**

Responsible department:
**Faculty of Computer Science, Engineering and Economics**

Campus:
**Halden**

Course Leader:
**Georgios Marentakis**

Teaching language:
**English**

Duration:
**½ year**

## Table of contents

# The course is connected to the following study programs

Mandatory course in the master programme in applied computer science with specialisation in interaction design, full-time and part-time.

# Lecture Semester

First semester (autumn) in the full-time and part-time programme.

# The student's learning outcomes after completing the course

Knowledge

The candidate understands:

- use of quantitative methods in designing different interaction design settings
- experiment design and analysis
- quantitative descriptors of usability, users experience, affective and embodied aspects of interaction
- quantitative evaluation of user performance and experience

Skills

The candidate can:

- review literature and develop relevant hypotheses
- select quantitative measures for evaluating hypotheses
- design, plan, and execute experiments to gather data as appropriate for the different stages of the design process with a focus on evaluation
- apply statistical methods for analysing data from experiments
- reflect and discuss on the outcome of the experiments
- understand strengths and limitations of quantitative methods

General competence

The candidate:

- develops critical skills required for developing and testing hypotheses
- develops group work skills

# Content

The theoretical aspect of the course provides an in-depth discussion on the application of quantitative methods in interaction design and human computer interaction. The students are presented ways to quantify usability, user behaviour, and user experience as it emerges in common and emerging interactive settings involving different technologies. Relevant theory in experiment design and analysis is presented. Appropriate methods for statistical analysis are presented and discussed.

In the project work, students design, run, and analyse and experiment that addresses an aspect of an interaction design problem after reviewing relevant literature within a domain that is suggested or approved by the lecturer. Subsequently, they write a short scientific paper presenting their study.

# Forms of teaching and learning

The following methods are used:

- Presentations
- Supervision
- Workshops
- Reading and discussing literature
- Project Work

# Workload

Approx. 280 hours.

# Coursework requirements - conditions for taking the exam

The student must during the semester:

- complete and present at least one approved project (individually or in groups of 2-4 students) in which a quantitative user study is designed, executed, analysed and discussed
- provide and present a research paper (individually or in groups of 2-4 students) in which the project is described in accordance with the details provided by the instructor

Coursework requirements must be accepted to qualify for the exam.

# Examination

Individual written exam and project paper (individually or in groups of 2-4 students)

The exam is divided into two parts, each part counting 50%:

- Individual written exam based on the course curriculum. Duration 4 hours. No supporting materials allowed.
- Project paper (individually or in groups of 2-4 students) based on the project.

Grading scale A - F in both parts. Both parts of the exam must be passed to pass the course. The student will get an individual joint grade for the entire course.

# Examiners

External and internal examiner, or two internal examiners.

# Conditions for resit/rescheduled exams

Upon re-examination, each part of the examination can be retaken.

# Course evaluation

This course is evaluated by a:

- Mid-term evaluation (compulsory)

The responsible for the course compiles a report based on the feedback from the students and his/her own experience with the course. The report is discussed by the study quality committee at the Department of Computer Science and Communication.

# Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:19 AM