Master in Applied Computer Science, part-time (120 ECTS)

Study Plan for Master in Applied Computer Science, part-time (120 ECTS) (2022–2026)

Facts about the program

ECTS Credits:
120

Study duration:
4 years

Teaching language:
English

Campus:
Halden

Table of contents

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 sourvce 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.

Assessment
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 the research activities at the department, but is also contributes to our research. All courses in the first two years 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 23, 2021

The study plan applies to

The programme description applies to the period 2022-2026 (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

Select the first specialisation

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

Core courses

ITI41020 Scientific Methods in Computer Science	**10** stp

Spring 2023

Choose specialisation to view courses

Autumn 2023

Select the second specialisation

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

Choose specialisation to view courses

Spring 2024

Core courses

ITI41120
Interdisciplinary Project
10 stp

Autumn 2024

Core courses

ITI42320
Computer Science in the Digital Society
10 stp

ITI53020 / Part 1 of 4
Master's Thesis

You may apply for a long Master’s Thesis (60 ECTS)

ITI54020 / Valgbart emne / Part 1 of 4
Master's Thesis

Spring 2025

Core courses

ITI53020 / Part 2 of 4
Master's Thesis

You may apply for a long Master’s Thesis (60 ECTS)

ITI54020 / Valgbart emne / Part 2 of 4

Master's Thesis

Autumn 2025

Core courses

ITI53020 / Part 3 of 4
Master's Thesis

Elective courses

Choose one elective

ITI41520 / Valgbart emne Interaction Design	**10** stp
ITI41720 / Valgbart emne Machine Learning and Deep Learning	**10** stp
ITI41920 / Valgbart emne Automation, Adaptation and IoT	**10** stp
ITI42122 / Valgbart emne Cyber Security Governance	**10** stp
ITI60020 / Valgbart emne Digital Fabrication and Making	**10** stp

You may apply for a long Master’s Thesis (60 ECTS)

ITI54020 / Valgbart emne / Part 3 of 4
Master's Thesis

Spring 2026

Core courses

ITI53020 / Part 4 of 4 Master's Thesis	**40** stp

You may apply for a long Master’s Thesis (60 ECTS)

ITI54020 / Valgbart emne / Part 4 of 4 Master's Thesis	**60** stp

Last updated from FS (Common Student System) June 28, 2024 2:34:54 AM

Emner som ikke er tatt med

Emnesiden finne ikke

- ITI42320 2024h
- ITI53020 2024h
- ITI54020 2024h
- ITI42122 2025h
- ITI60020 2025h

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.

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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

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

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.

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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.

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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.

Johanssen, J. O., Kleebaum, A., Paech, B., & Bruegge, B. (2018, May). Practitioners' eye on continuous software engineering: an interview study. In Proceedings of the 2018 International Conference on Software and System Process (pp. 41-50).

Ebert, C., Gallardo, G., Hernantes, J., & Serrano, N. (2016). DevOps. Ieee Software, 33(3), 94-100.

Zhu, L., Bass, L., & Champlin-Scharff, G. (2016). DevOps and its practices. IEEE Software, 33(3), 32-34.

Humble, J., & Molesky, J. (2011). Why enterprises must adopt devops to enable continuous delivery. Cutter IT Journal, 24(8), 6.

https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=527148

https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=638576

SOFTWARE ENGINEERING FOR ARTIFICIAL INTELLICENCE

Menzies, T. (2019). The Five Laws of SE for AI. IEEE Software, 37(1), 81-85.

McDermott, T., DeLaurentis, D., Beling, P., Blackburn, M., & Bone, M. (2020). AI4SE and SE4AI: A Research Roadmap. INSIGHT, 23(1), 8-14.

Amershi, S., Begel, A., Bird, C., DeLine, R., Gall, H., Kamar, E., ... & Zimmermann, T. (2019, May). Software engineering for machine learning: A case study. In 2019 IEEE/ACM 41st International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP) (pp. 291-300). IEEE.

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

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

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

ITI41120 Interdisciplinary Project (Spring 2024)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Halden

Course Leader:
Thi Thuy Nga Dinh

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 for all specialisations, full-time and part-time.

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 an in-depth knowledge of the process leading to the completion of an interdisciplinary or industrial project carried out in teams of diverse individuals
- is familiar with relevant publishing channels

Skills

The student is able to

- contribute to the writing of a scientific paper aimed at publishing
- critically reflect on the role of diversity and interdisciplinarity, as well as the role of personal experience, professional background, gender, culture, and other social identities when working in interdisciplinary and diverse teams

- apply their academic expertise in cooperation with people from other subject areas, and jointly define problems and find solutions to them

General competence

The student gains experience with interdisciplinary or industrial project work and the process leading to the completion of the project done by a team of diverse individuals, including planning, carrying out part of the work, reporting, presenting, and reflecting on possible issues.

Content

In this course, the students will complete an interdisciplinary project carried out together with a team composed by students from all the specialisations, or in collaboration with one of our partners in the private or public sector.

The project's topic is chosen in collaboration with a supervisor and shall, as a general rule, tackle a complex real-world problem faced by today’s digital society. Teams will be required to leverage their collective skills and contribute with their specific expertise in their specialisation areas to effectively collaborate and contribute towards the solution to the project challenges.

In case of a project in collaboration with a private or public partner, the student(s) and the company have to prepare a draft project description that must be endorsed by the faculty before the work starts. This is done to ensure necessary volume and depth in the project. In addition, an agreement between the student and the company must be made.

Forms of teaching and learning

Practical project team-work with regular supervision. Students will be working in groups of 4-8 students. In case of industrial projects, the groups can be smaller. In such case, an external mentor from the collaborating partner has to be identified, in addition to the internal supervisor.

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 oral presentation in groups

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 are submitted for the whole group. The students will get an individual grade. The paper must be passed before the oral presentation can be carried out.

The group presentation consists of a presentation and discussion of the paper. Duration approx. 20-30 min with questions from the examiners. Except the presentation, no supporting materials are allowed. The students will get an individual grade.

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 2024 Spring can be found in Leganto

Last updated from FS (Common Student System) June 29, 2024 12:15:28 AM