



Program description

Applied Computer Science – Master Master i Data/IT - Sivilingeniør

120 Credits
Campus Narvik

Based on «Vilkår for bruk av den beskyttede tilleggstittellen Sivilingeniør» vedtatt av NRT 2016.

The program description has been approved by the board of the faculty of Engineering Science and Technology (IVT) on 01.12.2017

Revised 19.01.2023

Valid from the academic year 2023/2024



Navn på studieprogram/ <i>Study programme name</i>	Bokmål: Applied Computer Science, sivilingeniør - master Nynorsk: Applied Computer Science, sivilingeniør - master Engelsk: Applied Computer Science - Master
Oppnådd grad/ <i>Degree obtained</i>	Master i teknologi, Applied Computer Science Master of Science in Applied Computer Science
Målgruppe/ <i>Target group</i>	Alle personer som oppfyller opptakskrav Everyone who are qualified for admission
Opptakskrav, forkunnskapskrav, anbefalte forkunnskaper/ <i>Admission requirements, required prerequisite, recommended prerequisite knowledge</i>	Bachelorgrad i ingeniørfag eller tilsvarende innen fagområdet datateknikk eller andre tilsvarende hovedfag. I tillegg må følgende krav være oppfylt: Det kreves minimum 25 studiepoeng i matematikk, tilsvarende Matematikk 1, 2 og 3 5 studiepoeng i statistikk 7,5 studiepoeng i fysikk på høyere nivå <i>Kravet til fysikk kan dekkes av 7,5 studiepoeng i fysikk, bygningsfysikk, fluidmekanikk, termodynamikk og/eller fasthetslære.</i> Har du for lite matematikk og/eller fysikk for å kvalifisere til siv.ing/master i teknologi, kan du ta ett av disse emnene i første semester ved UiT i Narvik: TEK-2800 Matematikk 3 (5 stp) og/eller TEK-2801 Fysikk 2 (5 ects) ----- A relevant undergraduate Bachelor degree in Engineering programme in computer science or equivalent. In addition, the following requirements must be met: • minimum 25 credits in mathematics (equivalent to Mathematical Methods 1, 2 og 3)

	• 5 credits in statistics • 7,5 ects i physics on a higher level is required. <i>The requirement for physics can be covered by 7.5 credits in physics, building physics, fluid mechanics, thermodynamics and/or mechanics of materials.</i>
Læringsutbytte- beskrivelse/ The study programme's Learning Outcome	Etter bestått studieprogram har kandidaten følgende læringsutbytte. After completion of the programme the candidate is possessing the following learning outcome. Kunnskaper / knowledge: • The candidate will have necessary basic knowledge as well as expertise knowledge to challenging jobs in research, industrial development and other areas. The knowledge is on a level such that the candidate can analyze problems and apply the knowledge in new areas. • The candidate will have thorough knowledge of the different theories and methodologies of software development and especially computer programming, including advanced object oriented programming and meta-programming, based on knowledge of mathematics and technology applicable to both general-purpose programming and especially to technical applications on different platforms. • The candidate will have special knowledge in the combined fields of geometric modelling and programming, geometry combined with artificial intelligence and programming, simulations/computations and programming, and geometry and computer graphics. Ferdigheter / skills: • The candidate will work independently with problems, by analyzing the problems and make plans for solving them. • The candidate will be able to independently make large and/or complex computer programs that can run on different platforms. • The candidate can carry out an independent research or development project within the field of computer science under supervision and in accordance with applicable norms for research ethics.

	• The candidate can find, analyze and deal critically with various sources of information and use them in development and in argumentation. • The candidate will be able to write a longer continuous report and present research clearly in written work and communicate knowledge in general orally and in writing. Generell kompetanse / general competence: • The candidate is influenced to maintain and develop curiosity and values such as openness, precision and the importance of separating between knowledge and opinions. • The candidate can communicate about academic issues, analysis and conclusions in the field of computer science by using the relevant terminology to communicate with specialists and also with the general public. • The candidate can contribute to new thinking and innovation processes in cooperation with experts from other fields.
Faglig innhold og beskrivelse av studiet/ Academic content and discription of the study programme	The Master in Applied Computer Science is founded on the "conditions for use of the protected title Sivilingeniør" enacted by "Nasjonalt råd for teknologisk utdanning (NRT), 2016". The study programme is built from applied mathematics and technical programming as a common platform with specializations within computational geometry, artificial intelligence (AI) and simulations. There are no elective subjects. The purpose for the students is to learn fundamental theory within linear algebra, partial differential equations (PDEs), geometric modeling, AI and numerical methods, and to become competent in technical programming via implementing various applications of these, among others in the shape of simulators. The study is provided over two years on full-time at Campus Narvik. There are four semesters pr. year. Each semester lasts for nine weeks and gives 15 ECTS, which typically consist of three 5 ECTS courses. An overview of the programme structure can be found in the table below. Up-to-date course descriptions can be found online.

Tabell: oppbygging av studieprogram/ Table: programme structure	Termin	5 ECTS	5 ECTS	5 ECTS
	1. termin Aug-Oct	MAT-3800 Linear algebra 2	DTE-3611 Algorithms and data structures	MAT-3801 Numerical Methods
	2. termin Oct-Des	MAT-3802 Game- and Graph Theory / Discrete mathematics		DTE-3801 Partial differential equations
	3. termin Jan-Mar	DTE-3608 Artificial Intelligence and Intelligent Agents - theory	DTE-3607 Systems programming for computational mechanics	
	4. termin Mar-Jun	DTE-3604 Applied geometry and special effects	TEK-3501 Innovation and economics	END-3607 Geometric modelling
	5. termin Aug-Oct	DTE-3606 Artificial Intelligence and Intelligent Agents - project	TEK-3500 Innovation and management	DTE-3609 VR, graphics, and animation – theory
	6. termin Oct-Des	DTE-3612 FEM theory and implementation	DTE-3601 Simulations	DTE-3605 VR, graphics, and animation - project
	7. termin Jan-Mar	DTE-3900 Diploma Thesis - M-IT		
	8. termin Mar-Jun			
	Undervisnings-, lærings- og vurderingsformer/ Learning activities, examination and assesement	There is a wide range of variation within learning activities, examination, and assessment between the individual subjects in the program portfolio. The implementation of the subjects is adapted to meet the individual learning outcomes, which together cover the overall learning outcomes for the study. The exam- and assessment forms include written exam, project with oral exam, project with home exam, project report and demonstration, report / group work, report, and written thesis.		

	Specific assessment form for individual subjects are specified in the course descriptions. A list of evaluation forms and the relevance to the overall learning outcome for each individual subject is provided in the table below. The practice is diverse through a mixture of lessons, flipped classroom, exercises, lab activity, project tasks, supervision and more. In this way the students can take an active role in the learning process by adjusting the tempo and study technique individually, within certain limits. The study program is using block-based teaching. This means that one subject is taught pr. week. The semesters are divided into two termini of 15 ECTS. A typical subject of 5 ECTS has two allocated teaching weeks. In addition to six teaching weeks pr. termini there are two self-study weeks and an examination week. The students dispose dedicated rooms for teaching and work activities. The teachers and professors seek to be available for the students and are happy to discuss all matters of the studies with the students, both individually and in groups. Both formal and informal meetings are arranged between the students' representatives and the program coordinator to facilitate for interaction among the students and between the students and the staff. The teachers are active researchers, and the course contents and the teaching activities are based on relevant research within the appropriate field. The students benefit from this by acquiring knowledge of scientific theory and practical use of scientific methods to develop understanding, reflection and matureness. Mandatory safety training in health, security and environment (HSE) All students must complete mandatory safety training before they are allowed access and given permission to work in laboratories, workshops and the like. This also goes for participation in fieldwork/research cruises and similar. Please contact your immediate supervisor for list of mandatory courses.
Relevans/ The study programme's relevance	This study programme is unique in Norway with a mixture of applied mathematics, technical programming and a specialization within computational geometry, artificial intelligence and simulations. The purpose of the study programme is to educate students of high quality with a subject portfolio that is relevant to a broad range of companies.

	The subjects are designed to provide knowledge, skills and general competence suitable for the most technical challenging jobs within programming of critical systems where performance and robustness is demanded. The successful candidates are first and foremost attractive to companies developing simulators, graphics, kernels, or software products and tools for engineering within all disciplines, and for example advanced computer games, animations/movies, learning systems, visualization, virtual reality. Former students have generally found employment in the most technologically advanced companies. The degree qualifies to further studies at ph.d. level within relevant areas (i.e. geometric modeling, applied mathematics, computational methods, machine learning). Our faculty, IVT, covers these areas through its ph.d. programme.
Arbeidsomfang/ Work scope	The students should expect a workload of 45 hours pr. week with their studies, including lectures, seminars and self-studies, as stated by the European Higher Education Area (EHEA) and the Bologna process. The program utilizes problem-based learning. This means that theoretical instruction is followed by projects, in which students learn by applying the theory. Throughout the program various forms of evaluation methods are used in connection to the different subjects. In some cases individual written examinations are used as the subject grading. Some subject-evaluations are based on project works in which the grades are determined based on written reports, program codes and resulting computer programs together with an oral examination where the students make a demonstration, describe why and what they have done and answer questions concerning the syllabus in general. The grading of the final master thesis is based on the written report together with the material delivered together with it. Further information about the evaluation method of each subject is defined in the respective course description. However, the grading is normally based on the ECTS system with grades A, B, C, D, E and F, where F is "not passed".
For masteroppgaver/ selvstendig arbeid i mastergradsprogram/ For master's theses/independent	The mandatory master's thesis is corresponding to 30 ECTS. The topic and the supervisor(s) are specified by the institute. The thesis work shall be independent. It is normally performed individually. Group performance is possible only after a decision by

work in master's degrees	the program board. In the case of group work, each candidate's own contribution will be evaluated and shall correspond to 30 ECTS. The preceding subjects, as outlined in the student's individual study plan, must generally be completed in prior to the master's thesis work. Exceptions can be made by the program board. The grading of the master thesis is based on the written report together with the material handed in as attachments. Oral presentations are usually not a part of the examination but can be arranged by the supervisor(s) on special occasions.
Undervisnings- og eksamensspråk/ Language of instruction and examination	The lectures are given in Norwegian and-/ or English. If international students are present, the language of instruction will be English. The language in written instructions, books and syllabus and exams are English.
Internasjonalisering/ Internationalisation	It is possible to study parts of the master program at other universities. An individual plan must be made in accordance with the program coordinator.
Studentutveksling/ Student exchange	UiT has exchange agreements with a wide range of foreign universities. It is possible to perform a part of the study abroad as long as the overall learning outcome is fulfilled. For this study programme the following universities provide relevant exchange opportunities. 1. Salzburg University of Applied Sciences 2. University of Pretoria, Johannesburg, South Africa The applicable period for exchange is in the last semester by performing the 30 ECTS Master's thesis work at a foreign university.
Administrativt ansvarlig og faglig ansvarlig/ Administrative responsibility and academic responsibility	The study programme belongs to the Faculty of Engineering Science and Technology (IVT), Institute of Computer Science and Computational Engineering (IDBI). The faculty provides administrative resources for the institute. The institute has appointed one academic responsible for the programme.
Kvalitetssikring/ Quality assurance	Studieplanen er underlagt revisjon og kvalitetssikring i samsvar med kvalitetssystemet til IVT ihht. gjeldende vilkår for bruk av den beskyttede tittelen Sivilingeniør vedtatt av NRT.

	The study programme follows revision and quality assurance according to the quality system at the faculty and satisfies the requirements for use of the protected title Sivilingeniør enacted by NRT.
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