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# PROGRAMME DESCRIPTION

Applied Computer Science – Master

**120 ECTS credits**

IVT, UiT - Narvik

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

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

Study programme name	Bokmål: Master i Data/IT - Sivilingeniør Nynorsk: Master i Data/IT - Sivilingeniør Engelsk: Applied Computer Science – Master
Degree obtained	Master i teknologi / sivilingeniør Data/IT Master of Science – Computer Science
Target group	Alle personer som oppfyller opptakskrav Everyone who are qualified for admission
Admission requirements, required prerequisite, recommended prerequisite knowledge	Ingeniør / bachelor innen datateknologi eller tilsvarende, med minst 30 studiepoeng matematikk. Normalt må ingeniørstudenter ta emnet matematikk 3 / fysikk 2 for å oppfylle kravet.  An undergraduate Bachelor Engineering programme within Computer Science, or equivalent, with minimum 30 credits in mathematics/statistics.  Knowledge in Physics (7.5 - 10 ECTS) on a higher level is recommended to be able to follow different courses on the master programme. Some of the courses in the bachelor programme have a certain amount of physics included and can be accepted.
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.  <b>Kunnskaper / knowledge:</b> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• 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.</li> </ul> <b>Ferdigheter / skills:</b>

	<ul style="list-style-type: none"> <li>• The candidate will work independently with problems, by analyzing the problems and make plans for solving them.</li> <li>• The candidate will be able to independently make large and/or complex computer programs that can run on different platforms.</li> <li>• 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.</li> <li>• The candidate can find, analyze and deal critically with various sources of information and use them in development and in argumentation.</li> <li>• 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.</li> </ul> <p><b>Generell kompetanse / general competence:</b></p> <ul style="list-style-type: none"> <li>• The candidate is influenced to maintain and develop curiosity and values such as openness, precision and the importance of separating between knowledge and opinions.</li> <li>• 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.</li> <li>• The candidate can contribute to new thinking and innovation processes in cooperation with experts from other fields.</li> </ul>
<p>Academic content and discription of the study programme</p>	<p>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".</p> <p>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.</p> <p>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.</p>

Table: programme structure	Termin															
	1. termin Aug-Okt	SMN6190 Linear algebra 2	STE6274 Introduction to Technical Programming	SMN6191 Numerical Methods												
	2. termin Okt-Des	SMN6192 Game- and Graph Theory / Discrete mathematics	SMN6203 PDE and the finite element method	STE6245 Advanced Game- and Simulator Programming												
	3. termin Jan-Mar	STE6238 Geometric modelling	STE6291 FEM programming													
	4. termin Mar-Jun	STE6249-001 VR, graphics and animation - theory	SAD6210 Innovation and economics	STE6246-001 Knowledge-based systems -theory												
	5. termin Aug-Okt	STE6246-002 Knowledge-based systems	SAD6211 Innovation and management	STE6249-002 VR, graphics and animation												
	6. termin Okt-Des	SMN6200 Fluid mechanics	STE6239 Simulation	STE6247 Applied geometry and special effects												
	7. termin Jan-Mar	SHO6264 Diploma Thesis - M-IT														
	8. termin Mar-Jun															
Learning activities, examination and assesement	<p>There is a wide range of variation within learning activities, examination and assessment between the individual subjects in the programme's portfolio. The implementation of the subjects are adapted to meet the individual learning outcomes, which together cover the overall learning outcomes for the study.</p> <p>A list of evaluation forms and the relevance to the overall learning outcome for each individual subject is provided in the table below.</p> <table border="1"> <thead> <tr> <th>Subject code</th> <th>Name</th> <th>Evaluation form</th> <th>Relevance to the overall learning outcome</th> </tr> </thead> <tbody> <tr> <td>SMN6190</td> <td>Linear algebra 2</td> <td>Written exam</td> <td>The examination tests knowledge and skills</td> </tr> <tr> <td>STE6274</td> <td>Introduction to Technical Programming</td> <td>Project with oral exam</td> <td>The examination tests knowledge, skills and general competence</td> </tr> </tbody> </table>				Subject code	Name	Evaluation form	Relevance to the overall learning outcome	SMN6190	Linear algebra 2	Written exam	The examination tests knowledge and skills	STE6274	Introduction to Technical Programming	Project with oral exam	The examination tests knowledge, skills and general competence
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<b>SMN6191</b>	Numerical methods	Written exam	The examination tests knowledge and skills
<b>SMN6192</b>	Game- and graph theory / discrete mathematics	Written exam	The examination tests knowledge and skills
<b>SMN6203</b>	PDE and the finite element method	Written exam	The examination tests knowledge and skills
<b>STE6238</b>	Geometric modeling	Written exam	The examination tests knowledge and skills
<b>STE6245</b>	Advanced game- and simulator programming	Project with oral exam	The examination tests knowledge, skills and general competence
<b>STE6291</b>	Finite element methods, programming	Project with oral exam	The examination tests knowledge, skills and general competence
<b>STE6249-001</b>	Virtual reality, graphics and animation – theory	Project with home exam	The examination demonstrates knowledge, skills and general competence
<b>SAD6210</b>	Innovation and economics	Project report, demonstration and written exam	The exam, report and presentation tests knowledge, skills and general competence. The report and the presentation contributes 50% to the final grade.
<b>STE6246-001</b>	Artificial intelligence – theory	Written exam	The examination tests knowledge, skills and general competence
<b>STE6239</b>	Simulation	Written exam	The examination tests knowledge and skills
<b>SAD6211</b>	Innovation and management	Report / group work and written exam	The exam, report and presentation tests knowledge, skills and general competence. The report and the presentation contributes 50% to the final grade
<b>STE6249-002</b>	Virtual reality, graphics and animation - project	Project with oral exam	The examination tests knowledge, skills and general competence
<b>SMN6200</b>	Fluid mechanics	Report	The report demonstrates knowledge, skills and general competence, and provides writing skills.
<b>STE6246-002</b>	Artificial intelligence - project	Report	The report demonstrates knowledge, skills and general competence, and provides writing skills.
<b>STE6247</b>	Applied geometry and special effects	Project with oral exam	The examination tests knowledge, skills and general competence

	<table border="1" data-bbox="550 136 1503 280"> <tr> <td data-bbox="550 136 678 280"><b>SHO6264</b></td> <td data-bbox="678 136 970 280">Diploma thesis – M-IT</td> <td data-bbox="970 136 1161 280">Written thesis</td> <td data-bbox="1161 136 1503 280">The report demonstrates knowledge, skills and general competence, and provides writing skills.</td> </tr> </table> <p>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.</p> <p>The study programme 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.</p> <p>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 programme coordinator to facilitate for interaction among the students and between the students and the staff.</p> <p>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 maturity.</p>	<b>SHO6264</b>	Diploma thesis – M-IT	Written thesis	The report demonstrates knowledge, skills and general competence, and provides writing skills.
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The study programme's relevance	<p>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.</p> <p>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.</p> <p>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.</p> <p>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</p>				

	<p>systems, visualization, virtual reality. Former students have generally found employment in the most technologically advanced companies.</p> <p>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.</p>
Work scope	<p>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.</p> <p>The program utilizes problem-based learning. This means that theoretical instruction is followed by projects, in which students learn by applying the theory.</p> <p>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.</p> <p>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".</p>
For master's theses/independent work in master's degrees	<p>The mandatory master's thesis is corresponding to 30 ECTS. The topic and the supervisor(s) are specified by the institute.</p> <p>The thesis work shall be independent, and can be performed individually or as a part of a group. In the case of group work, each candidate's own contribution will be evaluated and shall correspond to 30 ECTS.</p> <p>A minimum of 80 ECTS of the programme's subjects must be completed in prior to the master's thesis work.</p> <p>The grading of the final master thesis is based only on the written report together with the material handed in as attachments.</p>
Language of instruction and examination	<p>The lectures are given in Norwegian and-/ or English. If international students are present, the language of instruction will be English.</p>

	The language in written instructions, books and syllabus and exams are English.
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.
Student exchange	<p>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.</p> <p>For this study programme the following universities provide relevant exchange opportunities.</p> <ol style="list-style-type: none"> <li>1. University of Hertfordshire, England</li> <li>2. University of Pretoria, Johannesburg, South Africa</li> </ol> <p>The applicable period for exchange is in the last semester by performing the 30 ECTS Master's thesis work at a foreign university.</p>
Administrative responsibility and academic responsibility	<p>The study programme belongs to the Faculty of Engineering Science and Technology (IVT), Institute of Computer Science and Computational Engineering (IDBI).</p> <p>The faculty provides administrative resources for the institute. The institute has appointed one academic responsible for the programme.</p>
Quality assurance	<p>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.</p> <p>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.</p>