UiT Norges arktiske universitet

Program description
Engineering Design – Master

120 Credits/Campus Narvik

Based on «Vilkår for bruk av den beskyttede tilleggstittelen Sivilingeniør» approved by NRT 2023

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

Revised 05.09.2023

Valid from the academic year 2024/2025

Study programme name	Bokmål: Engineering Design, sivilingeniør - master Nynorsk: Engineering Design, sivilingeniør - master Engelsk: Engineering Design - Master
Degree obtained	*Master i teknologi, Ingeniørdesign* *Master of Science in Engineering Design*
Target group	*Any person who meets the admission requirements*
Admission requirements, required prerequisite, recommended prerequisite knowledge	A relevant undergraduate Bachelor degree in mechanics, materials, structural, modelling 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. *The requirement for physics can be covered by 7.5 credits in physics, building physics, fluid mechanics, thermodynamics and/or mechanics of materials.*
The study programme's Learning Outcome	*After passing the program, the candidate has the following learning outcomes:* *Knowledge:* • *has advanced knowledge within the academic field of mathematics, physics and engineering and specialized insight in a limited area within the field of engineering design (K1)* • *has thorough knowledge of different theories and methods in the field of engineering design (K2)* • *can apply knowledge to new areas within the academic field of numerical and analytical calculations, computations, materials, systematic design process, computational methods, engineering design (K3)* • *can analyze academic problems on the basis of the history, traditions, distinctive character and place in society of the academic field in engineering (K4)* *Skills:* • *can analyze and deal critically with various sources of information and use them to structure and formulate scholarly arguments (S1)*

	• *can analyze existing theories, and interpretations in the field of engineering design and work independently on practical and theoretical problems (S2)* • *can use relevant methods in engineering design for research and scholarly in an independent manner (S3)* • *can carry out an independent, limited research or development project under supervision and in accordance with applicable norms for research ethics (S4)* • *can analyze and deal critically with various sources of information and use them to structure and formulate scholarly arguments (S1)* • *can analyze existing theories, and interpretations in the field of engineering design and work independently on practical and theoretical problems (S2)* *General competence:* • *can analyze relevant academic, professional and research ethical problems (GC1)* • *can apply the knowledge and skills within engineering design in new areas in order to carry out advanced assignments and projects (GC2)* • *can communicate extensive independent work and masters language and terminology of the academic field of engineering design (GC3)* • *can communicate about academic issues, analyses and conclusions in the field of engineering design, both with specialists and the general public (GC4)* • *can contribute to new thinking and innovation processes (GC5)*
Academic content and discription of the study programme	*Engineering Design is design based on engineering science and includes knowledge about product design and computational technology. The main ingredients in Engineering Design is technical scientific computations/calculations and applied mathematics, which is applied to problems related to design, geometry and materials science. Engineering Design courses provides students with an understanding of design and aesthetic design in addition to deep understanding of mathematical and physical principles and methods in the design process. We place special emphasis on the geometry and shape, product and design processes, strength calculations and analysis, materials, computer-based modeling and simulations.* *The main feature of a product is that it can withstand the stresses it is intended to be exposed to. For example, design and materials adapted to extreme heat or cold, heavy loads over long or short time, and electric or thermal radiation. Sometimes the friction should be as large as possible, while other times it should be as small as possible. Flexible hinges (eg, plastic tops) should withstand being opened and closed many times without going failing. In addition, we may have different requirements and wishes for instance that the product should be as light as possible, as stiff as possible, as cheap as possible or as soundproof as possible, which means that the design and materials must be optimized*

accordingly. This process requires careful analysis and calculations, specific processes and techniques that you learn during the study period. Good and appropriate solutions to advanced engineering scientific problems can be solved by using the knowledge in the mathematical and physical theories that you work with in the course of the study. During the course there are also projects where students design, calculate, model, simulate, redesign, and create prototypes.

With a master's degree in science, in Engineering Design, you will have a broad theoretical platform. This will make you an indispensable resource for any company that is eager to be at the forefront of the technological development.

You learn about the systematic ways to make the right choice of materials and design of various products and structures. Composite materials, modern and advanced materials and structures are important elements of the program. In addition, you learn applied mathematics and theories that are used, among others, to model, visualize, simulate and perform calculations on the products and structural elements. In addition to performing the design, modeling and visualization projects on computers, we also use modeling workshop and the layered production technique or the 3D printer to create a variety of physical prototypes of the products in projects.

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.

Part-time studies with a duration of three or four years are possible through individual adjustments if granted by the program board.

Table: programme structure

code	Course	1st semester Autumn	2nd semester Spring	3rd semester Autumn	4th semester Spring
MAT3800	Linear Algebra II	5			
END3604	Structural analysis in engineering	5			
MAT3801	Numerical methods	5			
BYG3801	Fluid mechanics	5			
END3801	PDE and the finite element method	7,5			
END3607	Geometric modeling		5		
END3608	Material selection in product design.		7,5		

	END3606	Theory of Elasticity		5			
	TEK3501	Innovation & economics		5			
	END3600	Product design	2,5	7,5			
	END3800	Analytical computations			7,5		
	TEK3500	Innovation & management			5		
	END3601	Virtual Prototyping			5		
	END3602	Modern Materials and Computations			7,5		
	END3605	Dynamical Systems			5		
	END3900	Diploma thesis M-ID				30	
			30	30	30	30	**120**

Learning activites, examination and assessement	*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.* *The programme involves lectured courses, as well as a high degree of problem-based education (i.e. learning-by-doing), where the students spend their time working on relevant projects under supervision of a highly qualified staff. The projects are concerned with relevant topics within the field of engineering design.* *Through the two year master programme in Engineering Design, the students are evaluated in both theoretical knowledge and engineering skills. This evaluation is based on written exams and/ or written reports and presentation of project results. The programme aims at being international and research-based, and the students will therefore acquire state-of-the-art technological competence.* *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.* *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.*

	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. *After completing the master study in Engineering design the candidate has a MSc degree which qualify to start as a PhD-student within relevant ph.d.-areas (i.e. mechanical engineering, applied mathematics, computational methods).* *Our students are primarily attractive to companies working on problems related to the field of engineering design thus, working with CAD/ CAE software, materials and material structures, design process, material selection, analytical and numerical calculations, stress analysis, FEM software and problems related to elasticity. Former students have generally found employment in the most technologically advanced companies - off shore, on shore, civil or military related.*
The study programme's relevance	*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.* *After completing the master study in Engineering design the candidate has a MSc degree which qualify to start as a PhD-student within relevant ph.d.-areas (i.e. mechanical engineering, applied mathematics, computational methods).* *Our students are primarily attractive to companies working on problems related to the field of engineering design thus, working with CAD/ CAE software, materials and material structures, design process, material selection, analytical and numerical calculations, stress analysis, FEM software and problems related to elasticity. Former students have generally found employment in the most technologically advanced companies - off shore, on shore, civil or military related.*
Work scope	*In order to reach the learning objectives, students must expect to work 40 - 45 hours a week with the studies, including lectures, seminars and self-study as stated by the European Higher Education Area (EHEA) and the Bologna process.* *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 master's theses/independent work in master's degrees	*The mandatory master's thesis is corresponding to 30 ECTS. The topic and the supervisor(s) are specified by the master programme.* *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.* *A minimum of 75 ECTS of the programme's subjects must be completed in prior to the master's thesis work. Each candidate must be approved by the programme.*

	The grading of the final master thesis is based only on the written report together with the material handed in as attachments.
Language of instruction and examination	*Lecturing language is set to Norwegian. If international students are present, lecturing language will be English.* *Written exams are printed in English. Studenter på høyere nivå skal kjenne til og kunne bruke fagspråk både på norsk og på engelsk og/eller annet internasjonalt språk.*
Internationalisation	*It is possible to study parts of the master program at other universities. An individual plan must in this case be made in accordance with the program coordinator*
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.* *• University of Catania (Italy)* *• 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*
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.*
Quality assurance	*I studieplanene skal det gjøres rede for hvordan studieprogrammet kvalitetssikres og –utvikles.* *For studieprogram som gis i samarbeid mellom interne og/eller eksterne tilbydere, er det spesielt viktig at det fremgår hvordan programmet er kvalitetssikret totalt sett.* *For samarbeid med eksterne aktører, skal rammene for samarbeid samt administrativ- og faglig ansvarsdeling være særlig godt kvalitetssikret. UiT kan verken delegere det administrative- eller det faglige ansvaret til ekstern part.*
Andre bestemmelser	*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.*