UiT Norges arktiske universitet

Study plan
Electrical Engineering – Master

120 Credits/Campus Narvik

Based on the document “Vilkår for bruk av tilleggsbetegnelsen Sivilingeniør (siv.ing.)” approved by The Norwegian Association of Higher Education Institutions spring 2016

The programme description has been approved by the board of Faculty of Engineering Science and Technology on 01.12.2017

Valid from the academic year 2023/2024

Study programme name	Bokmål: Elektroteknikk, sivilingeniør - master Nynorsk: Elektroteknikk, sivilingeniør - master Engelsk: Electrical Engineering - Master
Degree obtained	Master i Teknologi, Elektroteknikk Master of Science in Electrical Engineering
Target group	The Master Program in Electrical Engineering is suitable for students with an interest in power systems and electric energy sources, energy storage and conversion, as well as advanced electric motor drives.
Admission requirements, required prerequisite, recommended prerequisite knowledge	A relevant undergraduate Bachelor degree in Engineering programme in power electronics and electrical machines. Basic knowledge in power systems is also an advantage. 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 completing the study program the candidate has the following learning outcome: **Knowledge:** • has basic knowledge about economics and innovation, with special focus on creating an enterprise, developing concepts and protection of rights. • knows the principles of electric power system and understands the limitations and bottlenecks in such a system. Key topics are renewable energy, stability of power systems and operation and control of power systems. • has a thorough knowledge of electrical machines, their dynamics and choice of suitable converter types for motor drives. The candidate also knows about available measurement sensors and how these could be integrated in an advanced control system. • has basic knowledge of computer architecture and programming. **Skills:** • can use linear algebra and numerical methods as mathematical tools for analyzing physical processes and technical solutions. • can combine power electronics, control engineering and electrical systems into advanced electric motor drives.

	• can perform basic simulations and analyzes of power systems, in regards to load flow, stability, operating conditions or economic considerations. • can use computers, microcontrollers or other types of microelectronics in order to control and monitor mechatronic systems. • completes the study program through performing a larger diploma work of a six-month duration. **General competence:** • gains insight into new and innovative technologies and will be able to put these into a society perspective. • gains insight into various aspects of future network systems, energy solutions and climate challenges. • is able to combine energy systems with signal transfer and ICT solutions in an overall system with high flexibility.
Academic content and description of the study programme	The program is aimed at automated industrial processes, with the use of computer aided advanced control systems and inverter technologies. In addition, there is an emphasis on a basic understanding of the properties and limitations of power systems, as well as the potential of small-scale renewable energy sources. The study also focuses on applied mathematics, economics and business development. The program covers the following disciplines: - Linear Algebra and Numerical Analysis - Control Engineering - Instrumentation and Measurement - Signal Transmission - Computer Programming - Programmable Controllers - Electrical Machines and Power Electronics - Basic Power System Theory - Renewable Energy Sources - Power System Operation and Stability - Final thesis See additional information in the different course descriptions. The program is uniform, except for 5 ECTS of electives, and does not include different modules, and all teaching is on campus. Mandatory tasks are described in the different course descriptions. The program can be done part-time over four years. It will be possible to take part of the studies abroad, provided that external courses are similar in content and scope to those specified in the study plan.
Tabell: oppbygging av studieprogram	

Semester	10 ECTS	10 ECTS	10 ECTS
1. semester	MAT-3800 Linear algebra 2	ELE-3606 Control Engineering	ELE-3600 Power System Fundamentals

		MAT-3801 Numerical Methods		
	2. semester	ELE-3611 Programming	ELE-3612 Instrumentation & measuring systems	ELE-3610 Power System Stability
		ELE-3609 Signal Distribution and Transmission	ELE-3607 Power Electronics	TEK-3501 Innovation and economics
	3. semester	ELE-3608 Advanced electric drives	ELE-3601 Renewable energy - generation and conversion	ELE-3602 Power System Operation and Control
		TEK-3500 Innovation and management	ELE-3603 Fundamentals of Programmable Controllers	Electives ELE-3604 Distributed Generation and Micro Grids: Concepts and Roles Or ELE-3605 Electrical Engineering Project
	4. semester	ELE-3900 Diploma Thesis - M-EL		
Learning activites, examination and assessment	Most courses are based on lectures, self-study and assignments or small projects, individually or in groups. Each 5 ECTS course usually includes 40 lectures, plus supervision time. The handouts can be voluntary or mandatory. Mandatory lab exercises are included in some topics. Scientific theory application and analysis is emphasized in assignment and project solution. The different course descriptions provide additional information.			

	The study offers a learning foundation where digital tools and online support resources are widely used. Learning resources of each subject are available in an LMS (Learning Management System, currently Canvas). Most of the subject information is gathered there, such as lecture notes, assignments, tests, links, deadlines, etc., and it is also a platform for the main communication with lecturers and fellow students. Teaching can take place in different ways depending on the topic. Traditional lecture model is used mainly, but "flipped classroom" is included in some subjects. In a traditional lecture model, teachers will lecture in scheduled hours. However, a part of the hourly scheduled hours will be hours of study, where students can work with lab assignments, tasks that are included in work requirements or tasks that are part of an assessment. The lecturer plus any scientific assistants will be present.
Relevance	You can work in development, construction, research, environmental surveillance, data technology, electrical supply and instrumentation. Employers are often in the process industry and the power sector. With a growing focus on the development of sustainable and renewable energy production, electric energy will play a key role in many new energy-intensive areas of our society. We see it in transport, on land, sea and in the air as an exciting development area. The electrical engineer will play a central role in the renewable energy community of the future.
Scope of work	The annual scope of work should be 1500 work hours. In order to achieve the learning objectives, the students are expected to work 40 hours per week, including lectures, lab exercises and self study.
Master Thesis	The master thesis cover the entire final semester and has a scope of 30 ECTS. The work will be evaluated based on the written report with grades A – F. It is recommended that the work is done individually. It is possible to form groups, but then it should be clearly described who has participated on the different parts of the report.
Teaching and examination language	English
Internationalization	The study program is open to international students, and the teaching and examination language is English. The institute is participating in international research projects, which influences on subject contents and diploma projects.
Student mobility	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 Head of the Study Program. The most convenient solution is to work with the Diploma Thesis abroad for the last semester.
Head of study and head of administration	Head of Study Trond Østrem Institute of Electrical Engineering, Head of Institute Arild Steen

	Faculty of Engineering Science and Technology, Dean Bjørn Reidar Sørensen
Quality assurance	Annual subject evaluation reports and study program evaluation reports. Periodic evaluation of the study program every six years.