Linnæus University

Dnr: 2022/2999-3.1.1.3

Programme syllabus

Faculty of Technology

Elektroteknik, inriktning signalbehandling och vågutbredning, masterprogram, 120 högskolepoäng

Electrical Engineering, specialisation Signal Processing & Wave Propagation, Master Programme, 120 credits

Level
Second Level

Date of Ratification
Approved by Faculty of Technology 2009-09-15

Revised 2022-09-09

The programme syllabus is valid from autumn semester 2023

Prerequisites
General entry requirements for second-cycle studies and specific entry requirements:

- Bachelor Degree in Electrical Engineering or Computer Engineering or the equivalent. All students must have completed introductory courses in Telecommunications, Electronics, Signals and Systems theory, and Mathematics including multidimensional analysis.
- English 6 or the equivalent

Description of Programme

The programme allows specialization with an industrial or an academic emphasis. The first part of the programme provides a platform comprising Mathematics, Physics and Electrical Engineering. In the second year students specialize within the chosen field and complete their studies with a degree dissertation project.

The first year covers the mathematical methods that are needed for studies at the advanced level. In the first year students also meet applications in the form of radio systems. The second year allows for specialization or alternatively the study of adjacent fields of interest. Courses in adjacent subjects are available from the program TAEL2. In the dissertation work, subject knowledge is transformed into scientific writing.

Telecommunication, combined with an introduction to power engineering, is likely to correspond to the students', and particularly the international students', notion of where the technological development is heading.

Objectives

Knowledge and understanding

For a Degree of Master (Two Years) students must
- demonstrate knowledge and understanding in their main field of study, including both broad knowledge in the field and substantially deeper knowledge of certain parts of the field, together with deeper insight into current research and development work; and
- demonstrate deeper methodological knowledge in their main field of study.

Skills and abilities

For a Degree of Master (Two Years) students must
- demonstrate an ability to critically and systematically integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;
- demonstrate an ability to critically, independently and creatively identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work;
- demonstrate an ability to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts; and
- demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts.

Judgement and approach

For a Degree of Master (Two Years) students must
- demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work;
- demonstrate insight into the potential and limitations of science, its role in society and people’s responsibility for how it is used; and
- demonstrate an ability to identify their need of further knowledge and to take responsibility for developing their knowledge.

Content

Programme Overview

Some courses are only offered every other year and are thus available either in year 1 or 2. The programme is offered by the Faculty of Technology The main subject area of the programme is Electrical Engineering. Some courses are optional and could be replaced by other relevant courses after consulting the programme director.

The overall responsibility for the programme lies with the programme director. The programme consists of 120 credits, or 2 years of full-time studies.

In agreement with program coordinator, courses can be exchanged for corresponding courses within the program's specialization. In exchange for courses, the program coordinator makes sure that the program's objectives are still met. The pre-requisite for courses and the local rules for graduation at Linnaeus University must always be met.

Programme Courses

Year 1:

Multivariable calculus and vector calculus, 7,5 credits, (G)
A repetition and standardization of mathematics skills. The course deals with central concepts and theorems in multivariate analysis and linear algebra.

Signal processing, 7.5 credits, (A,*)
A specialization towards the theme of the program. The course deals with signal theory and stochastic processes with applications in adaptive and statistical signal processing.

Radio engineering, 7.5 credits, (G,*)
A course in electrical engineering with laboratory sessions. The course deals with transmission lines, resonant circuits, amplifiers, oscillators and phase locked loops.

Antenna technology with applications, 7.5 credits, (A,*)
A specialization course towards the theme of the program. The course introduces antenna types and antenna concepts and addresses wire dipoles and array antennas.

Mobile radio communication and wave propagation, 7.5 credits, (A,*)
A specialization towards the theme of the program. Basic wave propagation, the statistical model for mobile systems, and digital modulation are dealt with.

Project course electrical engineering, 7.5 credits, (A,*)
The students work in groups on a project.

Electric power and smart grids, 7,5 credits (A, *)
A course that deals with high voltage technology and system aspects of the power grid.

Topics in wave propagation and sustainability, 7.5 credits, (A,*)
Covers various aspects of wave propagation and has exercises in report writing. The course can accommodate guest lectures given by visiting teachers.

Year 2:

Microwave theory, 7.5 credits, (A,*)
Provides deeper knowledge of electrical engineering, based on the course Radio engineering.

Signal processing antennas, 7.5 credits, (A,*)
Provides deeper knowledge of signal processing with signal theory and stochastic processes.

Automatic control, 7.5 credits (G,*)
An introductory course in control technology where the mathematical description of dynamic systems and concepts like stability are treated.

Electricity from renewable sources, 7.5 credits (A,*)
The course deals with renewable sources, solar, wind and hydropower, generators and converters.

Degree project, 30 credits (15 credits), (A2E,*)

* = course marked with an (*) lies within the main subject (60 credits required)

(G) = course marked with a (G) is at the elementary level
(A) = course marked with an (A) is at the advanced level (90 credits required)

Societal relevance
The demand for engineers is already strong and is likely to increase with the transformation of the energy sector. This makes the program relevant for both society and students. The field of smart grids combines telecommunication and traditional power enigneering.
Project and overview courses and the final thesis work, especially when carried out in a company, give the student a gradual transition to the modus of the workplace.
Internationalization

It is possible to study abroad on student exchanges within the framework for the programme. Exchanges are normally organized in the third term in consultation with international coordinators and the programme director.

Quality Development
The programme is evaluated on a yearly basis. Each course includes a course evaluation. Summaries of course and programme evaluations are archived at the school. Company contacts offer information on employment opportunities. An advisory board with external representatives is to be set up for a number of master's programmes including this programme.

An advisory board has been established in order to ensure industrial relevance and improve employment prospects.

Degree Certificate
After completing programme studies, corresponding to the requirements expressed in the Higher Education Ordinance degree order as well as Linnaeus University degree order, the student may apply for a degree. Those who have completed the programme may obtain the following degree:

Teknologie masterexamen med inriktning mot Signalbehandling och vågutbredning
Huvudområde: Elektroteknik

Master of Science (120 credits) with specialisation in Signal Processing and Wave Propagation.
Main field of study: Electrical Engineering.

To obtain the prefix “Teknologie”, the student should have a higher education diploma in engineering or a Bachelor degree in technology.

The degree certificate is bilingual (Swedish/English) and accompanied by a Diploma Supplement (in English).

Other Information
The language of instruction is English.

Within the program, there are study visits, excursions, study trips and similar compulsory elements that may involve a cost for the student, and it is further assumed that the student has the digital equipment required to be able to complete the education.

A method course could be included to support the project course.