



Aalto University

Curriculum for the Aalto Doctoral Programme in Electrical Engineering 2024-2026

Content

According to the Aalto University General Regulations on Teaching and Studying, a curriculum is a confirmed overall description of the learning outcomes of the degree programme, the goals and contents of the study modules, course selection and the organisation of teaching in a given period of time. The course descriptions and organization of teaching is presented in Sisu.

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1. Basic information on the programme

1.1. Name of the programme

Aalto Doctoral Programme in Electrical Engineering
Sähkötekniikan tohtorihjelma
Doktorandprogrammet i elektroteknik

1.2. Title of the degree earned

Doctor of Science (Technology)
Licentiate of Science (Technology)

1.3. Languages of degree

Finnish, Swedish, English

1.4. Programme scope

40 ECTS + doctoral thesis / licentiate thesis

1.5. Target time

Doctoral degree: 4 years of full-time studies or 4-8 years of part-time studies
Licentiate degree: 2 years of full-time studies or 2-4 years of part-time studies

2. Education objectives and intended learning outcomes of the programme

After completing the degree the doctoral student is able to carry out independent and original academic research.

Doctoral education at Aalto University is conducted within a multidisciplinary international academic community that provides opportunities for field-specific and multidisciplinary research, as well as for various forms of education and learning. High quality education, transferable skills training, and network-building ensure the development of doctoral students as independent researchers and experts of their research fields. Communication skills are supported by providing tools for mastering the national languages of Finland.

The education prepares doctoral students for academic careers at top-level institutions. It provides competencies to pursue various career paths also outside of academia, for example working at demanding expert positions or as entrepreneurs.

The doctoral degree is a requirement to serve as a thesis advisor for doctoral students and as an examiner for a doctoral thesis.

3. Structure of the programme

Doctoral thesis / Licentiate thesis	General research studies (5-20 ECTS)
	Research field studies (20-35 ECTS)

The programme comprises three study modules:

- General research studies, 5-20 ECTS
- Research field studies, 20-35 ECTS
- Doctoral thesis / licentiate thesis

The general research studies prepare students for research work, the application of research results and to learn the principles of responsible conduct of research. General research studies can include transferrable skill studies.

The research field studies and the doctoral thesis help students to gain comprehensive and in-depth knowledge of their research field and prepares them for the dissemination of research findings.

If the student does not want to finish the doctoral degree, the licentiate degree can be completed as an intermediate degree. The licentiate degree consists of an approved licentiate thesis and the same 40 ECTS of studies as for the doctoral degree.

Planning the studies

Based on the degree regulation on doctoral education, doctoral students must prepare a doctoral personal study plan (DPSP), which includes plans for the contents, scope and duration of their studies, research, supervision, funding and career. Students who wish to deviate from the confirmed curriculum of their programme must obtain approval for their doctoral personal study plan.

The courses in the doctoral degree can be courses taught at the School of Electrical Engineering, or other courses taught in Aalto University or in other universities, as agreed in the doctoral personal study plan of the student (DPSP).

The courses included in the research field studies of the doctoral degree must be doctoral level courses or master level courses suitable for the doctoral degree. The doctoral level courses are indicated with the letter L in the course code (e.g. ELEC-L1234) and suitable master level courses are typically indicated with the letter E in the course code and with the letter D in the end of the name of the course (ELEC-E1234 Interesting course **D**). Also 2 master level courses, without the letter D in the end of the name of the course may be included in the degree (ELEC-E1235 Another interesting course).

In the general research field studies of the doctoral degree, doctoral level courses (letter L in the course code) are suitable for the module. Also other courses indicated to be doctoral level courses (e.g. with the letter D in the end of the course name) can be included in the general research studies

module. Additionally, language studies in Finnish or Swedish can be included in this module (maximum 6 ECTS).

3.1. General research studies

3.1.1. Intended learning outcomes

Depending on the studies chosen for this module, the doctoral student will be able to

- to comprehend and conscientiously address the fundamental ethical and sustainability considerations associated with their research.
- choose and apply appropriate research methods to the research question at hand
- adhere to the principles of responsible conduct of research (RCR) in both their research work and interactions within the research community
- work collaboratively within a multidisciplinary and international environment, engaging with diverse stakeholders.
- proficiently present their research in both scientific and professional settings.
- identify, utilize and communicate their transferable skills, such as communication, interpersonal skill, project management skills, leadership and pedagogical skills and to work successfully in academic and other professional positions.
- communicate professionally in the national language(s)

3.1.2. Degree requirements

Compulsory courses for all students

LC-L1000 Research Ethics for Doctoral Students, 2 ECTS

Examples of other courses suitable for the general research studies

Responsible conduct of research

ELEC-L0902 Introduction to doctoral studies 2-3 ECTS

LC-1333 Navigate your doctoral studies while learning about equity, diversity, and inclusion, 3 ECTS

LC-L1011 Open Science for Doctoral Students, 1 ECTS

LC-L1020 Theory of Science, 1 ECTS

General studies

Research methodology courses

MEC-E9020 Patents D, 3 ECTS

ELEC-D7020 Elements of Sustainable ICT D, 5 ECTS

Science communication and presenting doctoral research

LC-1331 Presenting Doctoral Research (o), 3 ECTS

LC-1335 Preparing for the Doctoral Defense (o), 1 ECTS

LC-1336 Popularize your Research (o,w), 2 ECTS

LC-1350 Writing doctoral research for Engineering and Science, 3 ECTS

LC-7110 Tieteellinen kirjoittaminen tohtoriopiskelijoille, 3 ECTS
LC-L1017 Asiantuntijaesittämisen valmennus jatko-opiskelijoille, 3 ECTS
LC-L1018 Tutkimusraportoinnin tekstireitit jatko-opiskelijoille, 3 ECTS
LC-L1019 Tutkimustiedon yleistajuistaminen, 5 ECTS

LC-0550 Communication Skills, 2-3 ECTS
LC-0320 Public speaking skills, 3 ECTS
LC-0530 Public speaking and stage fright, 2-3 ECTS
LC-0520 Impact and argumentation, 2-3 ECTS
LC-0340 Communication Competence in the Workplace, 2-3 ECTS
LC-0330 Leadership Communications, 3 ECTS
LC-0224 Negotiation Skills, 2-3 ECTS
LC-0510 Conference Presentations, 1-2 ECTS
LC-0560 Interaction in teams and projects, 2-3 ECTS

ELEC-L0210 Presenting research at a conference I D, 1 ECTS
ELEC-L0211 Presenting research at a conference II D, 1 ECTS
ELEC-L0212 Presenting research at a conference III D, 1 ECTS

Scientific community and working life skills

LC-L1011 Aalto Open science for Doctoral Students D (1-2 ECTS)
LC-L1012 Business Skills for Doctoral Students (1 ECTS)
LC-L1013 Career Course for Doctoral Students, (1 ECTS)
LC-L1014 Interactive Leadership Skills for Doctoral Students, (1 ECTS)
LC-L1015 Project Management for Doctoral Students, (1 ECTS)
LC-L1016 Writing Research Grant Applications for Doctoral Students, (1 ECTS)

ELEC-L0240 University practices I D, 1-3 ECTS
ELEC-L0241 University practices II D, 1-3 ECTS

ELEC-L0220 Academic advising B.Sc. I D, 1 ECTS
ELEC-L0221 Academic advising B.Sc. II D, 1 ECTS

ELEC-L0225 Academic advising M.Sc. I D, 1-2 ECTS
ELEC-L0226 Academic advising M.Sc. II D, 1-2 ECTS
ELEC-L0227 Academic advising M.Sc. III D, 1-2 ECTS

ELEC-L0230 Teaching at higher education I D, 1-3 ECTS
ELEC-L0231 Teaching at higher education II D, 1-3 ECTS
ELEC-L0232 Teaching at higher education III D, 1-3 ECTS

Pedagogical studies

PED-9011 A! Peda Intro (5 ECTS)

Other pedagogical studies: <https://www.aalto.fi/en/services/pedagogical-training-main-page> (totally max 18 ECTS)

Finnish/Swedish language studies

Maximum of 6 ECTS of Finnish/Swedish courses (minimum level A1) from Aalto University Language Centre

For example:

LC-7210 Finnish 1, 3 ECTS

LC-7220 Finnish 2, 3 ECTS

LC-5771 Swedish 1, 3 ECTS

LC-5772 Swedish 2, 3 ECTS

3.2. Research field studies

The Aalto Doctoral Programme in Electrical Engineering comprises 13 research fields confirmed by the Academic Committee of the School. The research fields and their descriptions can be found here: <https://www.aalto.fi/en/doctoral-education/research-fields-and-supervising-professors-school-of-electrical-engineering>.

3.2.1 Intended learning outcomes

After completing this module, the doctoral student will be able to:

- demonstrate advanced discipline-specific knowledge
- identify essential research methods for their own research and apply them proficiently.
- disseminate research findings through relevant research forums and to the wider public.

3.2.2. Degree requirements

Compulsory courses

No compulsory course

Other courses suitable for the research field studies (examples)

Doctoral seminars and courses

ELEC-L3511 Doctoral Course in Electronic Circuit Design I D, 8 ECTS

ELEC-L3521 Doctoral Course in Electronic Circuit Design II D, 1-8 ECTS

ELEC-L8122 Doctoral seminar in Automation, Systems and Control Engineering I D, 5 ECTS

ELEC-L8123 Doctoral seminar in Automation, Systems and Control Engineering II D, 5 ECTS

ELEC-L3212 Doctoral Course in Micro and Nanosciencens I D 10 ECTS

ELEC-L3222 Doctoral Course in Micro and Nanosciencens II D 10 ECTS

ELEC-L8745 Doctoral Course in Measurement Science and Technology D 10 ECTS

ELEC-L8743 Radar Electronics D, 6 ECTS

Methodological, theoretical and content studies (related to the thesis)

ELEC-L0260 Literature I D, 1-6 ECTS

ELEC-L0261 Literature II D, 1-6 ECTS

ELEC-L0262 Literature III D, 1-6 ECTS

ELEC-L0280 Summer or Winter Schools I D, 1-3 ECTS

ELEC-L0281 Summer or Winter Schools II D, 1-3 ECTS

ELEC-L0282 Summer or Winter Schools III D, 1-3 ECTS

Disseminating research results

ELEC-L0270 Publishing research results I D, 1-3 ECTS

ELEC-L0271 Publishing research results II D, 1-3 ECTS

3.3. Doctoral thesis /Licentiate thesis

3.3.1. Doctoral thesis

The doctoral thesis is written on a topic related to the research field that the doctoral student has chosen and that has been approved by the supervising professor and the doctoral programme committee of the School of Electrical Engineering. The approval of the thesis includes a public defence after a pre-examination process. The accepted forms of theses are monographs and article-based doctoral theses.

3.3.2. Intended learning outcomes of doctoral thesis

After successfully defending their doctoral thesis, the doctoral student will demonstrate the ability to:

- plan, execute, and report on their research and manage their data in accordance with established standards of academic research.
- proficiently search for, critically evaluate, apply and synthesize existing knowledge and to formulate research questions.
- employ scientific research methods to create new scientific knowledge independently.
- make critical assessments required for addressing and resolving complex problems in the realms of research, innovation, and societal challenges.

A doctoral thesis is a public document and is kept for public display at the university. All thesis works are public in Finland (law 621/1999).

3.3.3 Licentiate thesis

The licentiate thesis is written on a topic related to the research field that the doctoral student has chosen and that has been approved by the supervising professor and the doctoral programme committee of the School of Electrical Engineering. The approval of the thesis includes a presentation of the thesis at the department after an examination process. The accepted forms of licentiate theses are monographs and article-based licentiate theses.

3.3.4. Intended learning outcomes of licentiate thesis

After successfully completing their licentiate thesis, doctoral students will demonstrate the ability to:

- discuss and present knowledge related to the field of research
- independently and critically apply scientific research methods

A licentiate thesis is a public document and is kept for public display at the university. All thesis works are public in Finland (law 621/1999).

4. Extracurricular studies

The degree structure of the programme in Sisu also includes a module called “Extracurricular studies”. This module will not be included in the doctoral degree, but it can be used to register for courses which the doctoral student wishes to take in addition to their degree studies.