Aalto University

Curriculum
for Licentiate Degree in
Aalto Doctoral Programme in Science 2020-2022 (Aalto SCI)

[March 2020]

Contents

In accordance with the Aalto University General Regulations on Teaching and Studying, the curriculum is a confirmed overall description of the learning outcomes of a programme, the goals and contents of its study modules and the courses offered as well as the organisation of teaching within a given period of time as indicated in the Aalto University General Regulations on Teaching and Studying (Section 2). When the curriculum is being designed, at least the following details must be specified for each course: name, scope in credits, timing, learning outcomes, implementation method, language of instruction, assessment methods, grading scale, prerequisites (if any), the unit responsible for and the teacher-in-charge of the course.

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1. Basic information about the programme

1.1. Name of the programme

Aalto Doctoral Programme in Science

1.2.Degree of the programme

Doctor of Science (Technology)

Licentiate of Science (Technology)

Doctoral degree has been described in a separate document.

1.3.Language of the degree

Finnish, Swedish, or English

1.4. Research fields

The Aalto Doctoral Programme in Science comprises six research fields, which are based on the strong research traditions of the departments. The programme is a joint effort of the Department of Neuroscience and Biomedical Engineering, Department of Mathematics and Systems Analysis, Department of Applied Physics, Department of Computer Science, and Department of Industrial Engineering and Management.

The doctoral candidate chooses a research field when applying to the programme. The professor supervising the doctoral studies is agreed upon at the same time.

The research fields for academic years of 2020–2022 are:

- Neuroscience and Biomedical Engineering
- Mathematics and Statistics
- Systems and Operations Research
- Applied Physics
- Computer Science
- Industrial Engineering and Management

1.5. Scope of the programme

The degree of Licentiate of Science (Technology) in the programme should be able to be studied in two years, if studied full time. The programme consists of theoretical studies including transferable skills and studies in the research field, in addition to the thesis itself.

1.6.Timetable of the degree

2 years of full-time study

1.7. Doctoral programme director

Professor Adam Foster

The doctoral programme director is in charge of the planning, execution, assessment and development of the programme.

2. Education objectives and intended learning outcomes of the Doctoral Programme in Science

Aalto University's strategic objectives is to educate game changers — professionals with the knowledge and capabilities to build a sustainable society and to increase well-being through disruptive change[1]. These capabilities need to be rooted in disciplinary excellence augmented by art, creativity, multidisciplinary collaboration and entrepreneurship.

Each doctoral candidate makes a study plan, research plan, supervision plan, financial plan, and an optional career plan; the implementation of all of which is followed up by the supervising professor. The supervising professor is also responsible for the supervision arrangements of the doctoral candidate.

The goal of the Doctoral Programme in Science is professional and high quality doctoral education in the fields of physics, mathematics, biomedical engineering, computer science and industrial engineering and management. Based on the strong research traditions of the departments, the curriculum is flexible, allowing doctoral candidates to compile their own combination of courses and research according to their own interests. The programme covers all disciplines of the School of Science and allows multi-disciplinary co-operation in international scientific community.

The Doctoral Programme in Science prepares the licentiates for an academic career or, increasingly also for a diversity of career pathways outside the academia in expert positions.

After completing the licentiate degree, the graduated licentiates:

- have the capability to work in a multidisciplinary and international environment together with various actors.
- have the capability to lead things and/or people.
- have the ability to search for and apply knowledge, and the ability to use scientific research methods
- are able to publish scientific results in peer-reviewed publications and disseminate the results on scientific forums.
- are able to make such syntheses and critical assessments as are required to solve complex problems in research and innovation and in other areas of society.
- have versatile written and oral communication skills
- will work responsibly in the light of ethical and sustainable considerations and their work in the scientific community will follow good scientific practice

3. Structure of the degree

Licentiate studies at Aalto University consist of an approved licentiate thesis and study modules. In the technology, the study modules comprise research field studies as well as scientific principles and practices in total of 40 ECTS. The completion of a licentiate degree equals two years of full-time studies.

Licentiate thesis	**TECH:** Scientific principles and practices (5-20 ECTS)
	TECH: Research field studies (20-35 ECTS)

4. Content of studies

Licentiate studies are completed in the form of study modules[2]. Those admitted to doctoral education shall:

i) pursue studies that deal with the preparation for research work, the application of research results and the dissemination of research findings;
ii) gain comprehensive and in-depth knowledge of a research field;
iii) learn the principles of responsible conduct of research.

4.1.Scientific practices and principles

Learning outcomes of the module

The aim of the module is to provide doctoral candidates with knowledge of the basic concepts of science, the key characteristics of scientific research and scientific knowledge, familiarisation with the most important research methods of their research field, and to develop their transferable skills.

After completing the module, doctoral candidates:

- are able to apply the principles of good scientific practice to their own research
- are able to apply the basic structure of scientific publications to their research reports
- know the key publication series of their fields
- have gained the ability to draft an appropriate and suitable structure for their licentiate thesis

Scope of the module

The scope of the module is 5–20 ECTS.

Content of the module

The content of the module is confirmed individually for each doctoral candidate following the requirements of the Doctoral Programme in Science:
https://into.aalto.fi/display/endoctoralsci/Study+plan.

[2] Degree Regulations on Doctoral Education as of 1 August 2018.

The module may include the following:

- Postgraduate-level and advanced-level courses in:
  - Research methodology
  - History or philosophy of science
- Transferable skills and competences:
  - Aalto University Communication courses: https://into.aalto.fi/display/enopinnot/Courses+for+doctoral+students
  - Nationally jointly developed courses (*offered via findocnet.fi*)
    - Research Ethics for Doctoral Students, LC-L1010 (1-2 ECTS)
    - Open Science for Doctoral Students, LC-L1011 (1-2 ECTS)
    - Business Skills for Doctoral Students, LC-L1012 (1 ECTS)
    - Career Course for Doctoral Students, LC-L1013 (1 ECTS)
    - Interactive Leadership Skills for Doctoral Students, LC-L1014 (1 ECTS)
    - Project Management for Doctoral Students, LC-L1015 (1 ECTS)
    - Writing Research Grant Applications for Doctoral Students, LC-L1016 (1 ECTS)
- Pedagogical studies: https://www.aalto.fi/en/services/pedagogical-training-main-page
- Individual study attainments, to be agreed with the supervising professor:

		Max. amount of ECTS
Presentation of research work at scientific conferences	2 ECTS/conference	**6 ECTS**
Guidance of theses or special assignments	2 ECTS/thesis	**6 ECTS**
Teaching, planning or implementing a new course		**6 ECTS**

Restrictions

- Language courses (ie. Finnish for international students) cannot be included in the degree
- Module cannot consist solely of conference presentations
- One bachelor-level course (denoted as PHYS-**C**1234*)* of max. 5 ECTS can be included in the degree in this module

Compulsory courses

Industrial Engineering and Management

Doctoral candidates in the research field of **industrial engineering and management** must complete the following three methodology courses:

- TU-L0000 Research Methods in Industrial Engineering and Management (5 ECTS)
- TU-L0022 Statistical Research Methods (5-8 ECTS)
- TU-L0031 Qualitative Research Methods (3-6 ECTS)

Courses are compulsory for those doctoral candidates in the research field of industrial engineering and management who have received their study right after 1 August 2017.

Evaluation of the module

No grade is given for the module. Individual courses and study attainments are graded either as Pass/Fail or as grades 1-5.

4.2. Research field studies

Learning outcomes of the module

The aim of the research field studies is to support the writing of the licentiate thesis and prepare the doctoral candidates for research and other demanding work that requires expertise.

After completing the module, doctoral candidate:

- has specific research methodology knowledge appropriate to their licentiate thesis focus
- has knowledge of the background to their research field at an advanced level
- has experience of the practical implementation of appropriate research methodologies in a learning environment

Scope of the module

The scope of the module is 20–35 ECTS

Content of the module

The content of the module is confirmed individually for each doctoral candidate following the requirements of the Doctoral Programme in Science:
https://into.aalto.fi/display/endoctoralsci/Study+plan.

The module may include the following:

- Postgraduate-level and advanced-level courses, which support the licentiate thesis
- Individual study attainments, to be agreed with the supervising professor:

		Max. amount of ECTS
Attending scientific summer/winter schools	2-3 ECTS/week	
Journal articles and conference papers, which are not included in the thesis	2 ECTS/article	**6 ECTS**
Self-study (e.g. written/oral exam, review or a report).	1-10 ECTS	
Refereeing scientific papers	1 ECTS = 3 papers	

Compulsory courses

Engineering Physics

Full-time doctoral candidates in the research field of **engineering physics** must complete the following course:

- PHYS-L0666 Midterm review 10 ECTS

The course can be included either in the Research field -module or in the Scientific practices and principles -module.

Industrial Engineering and Management

Doctoral candidates in the research field of **industrial engineering and management** must complete **two** of the following three courses:

- TU-L0010 Advanced Organizational Theory (a joint course with Aalto BIZ and Hanken, 5 ECTS)
- TU-L1003 Doctoral Course in Strategy, Venturing, and Organizations (8 ECTS)
- TU-L2001 Doctoral Course in Operations Management (5 ECTS)

Courses are compulsory for those doctoral candidates in the research field of industrial engineering and management who have received their study right after 1 August 2018.

Evaluation of the module

No grade is given for the module. Individual courses and study attainments are graded either as Pass/Fail or as grades 1-5.

4.3. Licentiate thesis

The licentiate thesis is written on a topic related to the research field that the doctoral candidate has chosen and that has been approved by the doctoral programme committee of the School of Science and the supervising professor[3]. The thesis shall demonstrate good conversance with the field of research and the capability of independently and critically applying scientific research methods. Approval of the thesis includes a public presentation at the department.

The accepted forms of theses are monographs, a number of scientific publications or manuscripts vetted for publication deemed sufficient by the university, which deal with the same set of problems and a summary of the findings or some other work which meets corresponding scientific criteria. The publications man include co-authored publications if the author's independent contribution to them can be demonstrated.

A licentiate thesis is a public document and is kept for public display at the university.

4.3.1. Examination and approval of the licentiate thesis

The licentiate thesis is presented at the school. The school appoints one or two examiners for the licentiate thesis and obtains statements from all of them. The doctoral candidate is provided with an opportunity to comment on the choice of the examiner(s), concerning their impartiality.

[3] Appendix 'Section 43A Degree regulations on doctoral education' in the Aalto University General Regulations on Teaching and Studying (OOS).

4.3.2. Evaluation and grading

Licentiate theses are evaluated on a scale of Pass/Fail.