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Aalto University

Curriculum for Aalto Doctoral Programme in Chemical Engineering 2026-2028

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 for a given period of the time. The course descriptions and organization of teaching is presented in Sisu.

1. About the programme

1.1. Name of the programme

Aalto Doctoral Programme in Chemical Engineering
Kemian tekniikan tohtoriohjelma
Doktorandprogrammet i kemiteknik

1.2. Title of the degree

Doctor of Science (Technology), abbreviation D.Sc.(Tech.)
Licentiate of Science (Technology), abbreviation Lic. Sc. (Tech.)

1.3. Languages of degree

Finnish, Swedish, English

1.4. Programme scope

30 ECTS and doctoral thesis / licentiate thesis

1.5. Target time

Doctoral degree: 3-4 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. The offered communication and language skills training supports the doctoral students to communicate about their research in the national languages Finnish and Swedish.

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.

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

2.1. General research studies- 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, project management, leadership, and pedagogical skills, to work successfully in academic and other professional positions.
- Communicate professionally in the national language(s) ~~or~~ and in English.

2.2. Research field studies – Intended learning outcomes

The Aalto Doctoral Programme in Chemical Engineering comprises of research fields/majors confirmed by the Academic Committee of the School. The research fields and supervising professors are listed here: https://www.aalto.fi/en/doctoral-education/research-fields-and-supervising-professors-school-of-chemical-engineering.

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.

2.3. Content description

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 transferable skill studies.

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

In addition to the courses taught at the School of Chemical Engineering, the degree can include other courses taught at Aalto University or in other universities, as agreed on in the doctoral personal study plan of the student (DPSP).

3. Structure of the programme/ Degree structure and requirements

<table>
<tr><td rowspan="2">Doctoral thesis / Licentiate thesis</td><td>General research studies (5-20 ECTS)</td></tr>
<tr><td>Research field studies (10-25 ECTS)</td></tr>
</table>

Total credits 30 ECTS

General research studies 5-20 ECTS

Research field studies 10-25 ECTS

Doctoral thesis*

*No credits are granted for the doctoral thesis or licentiate thesis

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.

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

Based on the Degree Regulations on Doctoral Education (https://www.aalto.fi/en/applications-instructions-and-guidelines/degree-regulations-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 approved curriculum of their programme must obtain approval for their doctoral personal study plan. In addition to the courses taught at the School in Chemical Engineering, the degree can include other courses taught at Aalto University or other universities, as agreed in the doctoral personal study plan of the student (DPSP).

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 30 ECTS of studies as for the doctoral degree. Licentiate degree can be obtained if the student has been granted doctoral degree study right for Doctoral Programme of Chemical Engineering.

3.1. Degree requirements

Doctoral studies in Chemical Engineering follow the frames and detailed instructions for content of theory study plan. The Doctoral Programme Committee has formed the frames and approved these instructions *https://www.aalto.fi/en/programmes/aalto-doctoral-programme-in-chemical-engineering/frames-and-approved-instructions-for-study-credits*

3.1.1. Compulsory courses for general research studies

CHEM-L1200 Toolkit for Research, 1 ECTS (III-IV English)

or previous course CHEM-L1100 Toolkit for Doctoral Studies, 3 ECTS

or LC-L1001 Introduction to Doctoral Education, 1 ECTS (II Finnish).

Research Ethics LC-L1000, 2 ECTS (II English, IV English)

or previous course LC-L1010 Research Ethics for Doctoral Students, 1-2 ECTS

3.1.2. Elective courses for general research studies

Responsible conduct of research, theory or history of science

LC-1333 Navigate your doctoral studies while learning about equity, diversity, and inclusion, 3 ECTS (IV English)
LC-L1011 Open Science for Doctoral Students, 1 ECTS (any)
LC-L1020 Theory of Science, 1 ECTS (any)

MNGT-L2200 Philosophy of Social Science, 6 ECTS (IV English)

LC-L1021 Impact of Research*, 1 ECTS (any, English)

SCI-L1010 Scientific Computing Skills, 1-5 ECTS (I-V English)

MEC-E9020 Patents, 3 ECTS (III-IV English)

General methodological and theoretical studies

https://www.aalto.fi/en/programmes/aalto-doctoral-programme-in-chemical-engineering/frames-and-approved-instructions-for-study-credits

Science communication and presenting doctoral research

CHEM-L2011 Presenting research poster at a conference I, 1 ECTS– International conference poster presentation of your doctoral thesis research (any, English)

CHEM-L2012 Presenting research (talk) at a conference II, 1 ECTS – International conference oral presentation of your doctoral thesis research (any, English)

LC-1350 Writing Doctoral Research for Engineering and Science, 3 ECTS (I-II English, IV English, V English, summer English)
LC-1331 Presenting Doctoral Research D, 3 ECTS (IV English)

LC-1335 Preparing for the Doctoral Defense (o), 1 ECTS (I English, III English)
LC-1336 Popularize your Research (o,w), 2 ECTS (2027-2028 II English)
LC-7110 Tieteellinen kirjoittaminen tohtoriopiskelijoille D, 3 ECTS (IV-V Finnish)
LC-L1017 Asiantuntijaesittämisen valmennus tohtoriopiskelijoille D, 3 ECTS (I Finnish)
LC-L1018 Tutkimusraportoinnin tekstiretriitit tohtoriopiskelijoille D, 3 ECTS (I Finnish)
LC-L1019 Tutkimustiedon yleistajuistaminen D, 5 ECTS (I-II Finnish)

Peer-reviewed publication published during your doctoral studies, and not part of your thesis research work

CHEM-L2070 Publishing research I, 2 ECTS (any, English)
CHEM-L2071 Publishing research II, 2 ECTS (any, English)
CHEM-L2072 Publishing research III, 2 ECTS (any, English)

CHEM-L2050 Reviewing a scientific manuscript I, 1 ECTS (any) **
CHEM-L2051 Reviewing a scientific manuscript II, 1 ECTS (any) **

LC-02245 Negotiation skills D, 3 ECTS (III; English))
LC-0320 Public speaking skills D, 3 ECTS
LC-0330 Leadership communication D, 3 ECTS
LC-0340 Communication competence in the workplace D, 2-3 ECTS
LC-0510 Conference presentations D, 1-2 ECTS
LC-0521 Impact and argumentation D, 3 ECTS
LC-0531 Public speaking and stage fright D,

LC-0551 Communication skills D, 3 ECTS
LC-561 Interaction in teams and projects, 2-3 ECTS

Scientific community, teaching and working life skills

JOIN-L3000 Designing impact, 2 ECTS (IV English)

TU-L1030 Design a meaningful doctoral career, 1 ECTS (TBA)

TU-L1040 Making your research matter, 1 ECTS (TBA)

BIZ-L3000 From expert to enabler: facilitation skills for researchers, 1 ECTS (II English)

LC-L1012 Business Skills for Doctoral Students, 1 ECTS (any)*
LC-L1013 Career Course for Doctoral Students, 1 ECTS (any)*
LC-L1014 Interactive Leadership Skills for Doctoral Students, 1 ECTS (any)*
LC-L1015 Project Management for Doctoral Students, 1 ECTS (any)*
LC-L1016 Writing Research Grant Applications for Doctoral Students, 1 ECTS (any)*

PED-9011 A! Peda Intro, 5 ECTS (TBA)
CHEM-L2021 Academic advising of bachelor's Thesis I, 1 ECTS (any)**
CHEM-L2022 Academic advising of bachelor's Thesis II, 1 ECTS (any)**
CHEM-L2023 Academic advising of bachelor's Thesis III, 1 ECTS (any)**
CHEM-L2024 Academic advising of master's Thesis I, 2-5 ECTS (any)**
CHEM-L2025 Academic advising of master's Thesis II, 2-5 ECTS (any)**
CHEM-L2031Teaching at higher education I, 1-5 ECTS (any)**
CHEM-L2032 Teaching at higher education II, 1-5 ECTS (any)**
Other pedagogical studies available https://www.aalto.fi/en/services/aalto-university-pedagogical-training-for-faculty

* These are independent online courses, to be completed at findocnet.fi in English, Finnish or Swedish. Registration by email to udes@aalto.fi. More information at aalto.fi.

**These are independent studies, to be agreed with the supervising professor and completed in the agreed timeframe in English, Finnish or Swedish.

Finnish/Swedish language studies
Doctoral degree in Chemical Engineering may include at maximum of 6 ECTS of Finnish/Swedish language courses from Aalto University Language Centre starting from level A1. Equally the doctoral students with advanced proficiency in Finnish or Swedish, may include Finnish and Swedish language academic presentation and writing courses to their doctoral degree study plan at maximum of 6 ECTS.

For example:

LC-7210 Finnish 1, 3 ECTS
LC-7220 Finnish 2, 3 ECTS

LC-7230 Finnish 3, 3 ECTS

LC-5771 Swedish 1A, 3 ECTS
LC-5772 Swedish 1B, 3 ECTS

3.1.3. Compulsory courses for Research field studies

CHEM-L1300 Midterm review for CHEM doctoral students, 2 ECTS (any)

Note: Compulsory prerequisites: Student has completed the advisory group meeting AG 1. The presentations materials of the AG 1 meeting and given comments have been downloaded.

3.1.4. Elective courses for Research field studies

Doctoral seminar/ Research related summer school/ Winter school

Department's / Research fields' / Major's seminars and courses

CHEM-L2010 Cellulose Chemistry, (summer, English)

CHEM-L2170 Unit Operations in Paper and Board Finishing and Converting, (I-V, English)

CHEM-L2180 Thermodynamics of Modeling and Simulation, (any, English)

CHEM-L2240 Ultrathin Films of Soft Materials, (2027-2028 Spring IV, English)

CHEM-L2250 Advanced Electrochemistry, 5 ECTS (IV-V, English)

Methodological, theoretical, and content studies

Courses and individual study entities which are discipline-specific and related to the thesis research

Literature I **

Literature II**

**These are independent studies, to be agreed with the supervising professor and completed in the agreed timeframe in English, Finnish or Swedish.

3.2. Doctoral thesis and intended learning outcomes

Doctoral thesis for the Doctoral Progamme in Chemical Engineering must meet the criteria and follow the instructions of the Doctoral Programme Committee
https://www.aalto.fi/en/programmes/aalto-doctoral-programme-in-chemical-engineering/chem-instructions-for-doctoral-thesis

After successfully defending their thesis, doctoral students 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; formulate research questions.
- employ scientific research methods to create new scientific knowledge independently
- make syntheses and critical assessments required for addressing and resolving complex problems in the realms of research, innovation, and societal challenges.

3.3. Licentiate thesis and intended learning outcomes

The licentiate thesis is written on a topic related to the student's chosen research field, which must have been approved by the supervising professor and the doctoral programme committee of the School of Chemical Engineering. The approval of the thesis includes a presentation of the thesis at the department after an examination process. The author's contribution to the research work, related results and writing must be explained in detail.

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

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

4. Extracurricular studies

The degree structure of the programme in Sisu also includes a module called "Extracurriculum 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.

These can be e.g.

Finnish as a foreign language: Finnish as a second language | Aalto University With LC courses you can have Finnish language minor of 15 ECTS

Swedish as a foreign language minor can be combined from various sources (Aalto LC and Open University) Swedish | Aalto University

LC-5011 Ruotsia kansainvälisille opiskelijoille 1, 3 op, sekä Kielikeskuksen että Avoimen tarjonnassa OPS-kaudella 2026–2028
LC-5012 Ruotsia kansainvälisille opiskelijoille 2, 3 op, sekä Kielikeskuksen että Avoimen tarjonnassa OPS-kaudella 2026–2028
LC-5013 Ruotsia kansainvälisille opiskelijoille 3, 3 op, pelkästään Avoimen tarjonnassa OPS-kaudella 2026–2028
LC-5014 Ruotsia kansainvälisille opiskelijoille 4, 3 op, pelkästään Avoimen tarjonnassa OPS-kaudella 2026–2028
LC-5015 Ruotsia kansainvälisille opiskelijoille 5, 3 op, pelkästään Avoimen tarjonnassa OPS-kaudella 2026–2028

Language and communication courses for doctoral students: https://www.aalto.fi/en/language-and-communication-studies/language-and-communication-courses-for-doctoral-students

Other language and communication studies: https://www.aalto.fi/en/language-and-communication-studies/teaching

Researcher and working life skills: https://www.aalto.fi/en/doctoral-education/doctoral-courses-and-curriculum#2-researcher-and-transferable-skills-courses