



Programme description

Reference number:
V-2022 0370 3.2.3

Doctoral Programme

Valid from: 2023-0509

Revised as of:

Programme description: Doctoral Programme in Engineering Mechanics

Programme name in English

Engineering Mechanics

Indicate the third-cycle subjects included in the programme.

Engineering Mechanics

Programme organisation

Programme council

To help monitor and develop the programme, the programme director (PA) has a programme council consisting of the PA, at least one doctoral student representative and three supervisors from the faculty of the programme. Changes to the course syllabus or general syllabus, and the registration of new courses, must be approved by the programme council before being decided.

Courses

Range of courses offered

The range of third-cycle courses in the programme covers all subject areas in which research is conducted within the research groups. The conditional elective third-cycle courses are specialised courses in one of three areas: acoustics, biomechanics or fluid mechanics. In addition, there are a number of elective courses, where general skills, such as scientific writing and engineering for sustainable development, can preferably be obtained from KTH's general course offerings. The regular course programme is supplemented by journal clubs, temporary summer schools with invited teachers and seminar series.

There is a compulsory course in the programme that lasts for most of the study period, bringing together a common base of knowledge and systematic understanding, skills and abilities as well as adequate values and attitudes at the level of depth required for a doctoral degree. Summative assessment in this course, together with summative assessment in other third-cycle courses, thesis work and the public defence, is intended to ensure that the formal requirements for a doctoral degree are met.

Current courses are listed on the KTH website:

<https://www.kth.se/en/sci/forskning/forskarutbildning/kurser-pa-forskarniv>

Quality assurance and monitoring of programme courses

Course surveys and analyses are compulsory for third-cycle courses at KTH schools. (See more under Description of the continuous, systematic quality-enhancement activities of the programme)

Other programme content and support for the programme's doctoral students

Programme-specific activities

The following types of seminars are available:

- Guest speakers (international or national researchers)
- Public defence of doctoral theses and licentiate seminars
- Research group seminars (including third-cycle students and researchers in the group) and project meetings with external stakeholders
- Annual meetings of relevant research centres with guest and in-house speakers

Attendance and active participation in a specific number of these open seminar activities is regulated by assessment components in a compulsory course summarising the programme, which is described in brief below.

The thesis work, which is conducted within one of the programme's research groups and with the support of at least two supervisors, shall result in a presentation of an independently conducted scientific project in the subject area.

Measures to support goal attainment

The intended learning outcomes established in the Higher Education Ordinance for third-cycle education are divided into three categories: 1. Knowledge and understanding, 2. Competence and skills, 3. Judgement and approach. A plan for how the outcomes in each category will be met during the programme and then progressively fulfilled shall be presented in the annually updated individual study plan. Assessment is made by the supervisors in discussion with the doctoral student.

The doctoral student's so-called generic skills regarding knowledge and understanding are developed through individual oral summative assessment in some of the doctoral courses, where the link between theoretical knowledge and physical understanding of the same is particularly tested in the doctoral student. The development of the doctoral student into an independent researcher is pursued by taking responsibility for the planning and implementation of the thesis work both in terms of its experimental and/or modelling and computational parts. In addition, summer schools/specialist courses in relevant research areas are regularly offered as a complement to the departments' third-cycle courses. These courses are often led by internationally recognised guest lecturers and usually involve project work within the framework of the course. This can accelerate the development of the doctoral student's skills and abilities in a particular area. The doctoral student's development of values and attitudes is supported by communication from supervisors and other senior researchers at internal seminars and meetings. Feedback is provided at regular weekly meetings.

The overall compulsory course is divided into a number of summative assessment elements that aim to ensure that all doctoral students in the programme have a common base of knowledge and systematic understanding, competence and skills, as well as adequate judgement and attitudes, including research integrity, sustainable development and JML, at the level of depth required for a doctoral degree. In particular, the different elements provide doctoral students with the competence and skills to analyse and constructively and critically review the research of others.

Description of the continuous, systematic quality-enhancement activities

Quality-enhancement activities are carried out in various areas, especially in the educational environment, structured thesis work and through the development of supervisor competences. These areas are described in greater detail below.

Education environment

As described above, the programme continuously reviews its range of doctoral courses and strives to have updated course syllabi for advanced courses in the programme. Third-cycle studies within the doctoral programme are a natural continuation and deepening of engineering mechanics that can follow second-cycle studies in the Master's programme in Engineering Mechanics at KTH. This enables effective coordination of the quality-enhancement activities for courses at second- and third-cycle level. Many supervisors in the programme serve as teachers in both the doctoral and the Master's programmes in Engineering Mechanics.

The doctoral programme regularly offers doctoral students a number of broader subject courses, while more specialised courses are offered as conditions and needs arise. The aim of course activities is to strengthen the knowledge and skills that form the basis of the specific research work, and to stimulate synergies between the different subject areas. Another purpose of the basic courses is to ensure that all doctoral candidates in the subject have sufficient basic knowledge of the subject. Some courses are responsible for ensuring progression in the knowledge, competence and skills sought in the doctoral programme.

An important part of the educational environment is the various centres of which doctoral students can be a part. These networks promote the scientific breadth and diversity of the programme that characterises the development of engineering mechanics. The centres provide doctoral students in the programme with contact points with other environments at KTH as well as regularly organising third-cycle courses available to research students in the programme. Through these centres, and in general, the educational environment has strong international elements, with doctoral students, postdocs and senior researchers both visiting KTH and departing from KTH to visit institutions abroad. Extensive industrial contacts are also an important feature of the educational environment.

The Odqvist Laboratory for Experimental Mechanics includes the Fluid Physics Laboratory, MWL and the laboratories for Solid Mechanics and Lightweight Structures. This infrastructure is used in first-, second- and third-cycle education as well as in experimental research. The Fluid Physics Laboratory has several wind tunnels and other flow rigs, and the MWL has equipment for acoustic, flow acoustic and vibro-acoustic studies. Both laboratories have access to, and are constantly renewing, the advanced measuring equipment. Bio-mechanics can also benefit from this laboratory environment, but otherwise has its own Movability Lab integrated into the local research environment.

Programme council

The programme council usually meets several times a year, stays informed regarding changes in the general regulatory framework for third-cycle education and can propose changes and developments to the programme.

Quality council

A school-wide quality council for third-cycle education is chaired by the director of third-cycle education (FA). Council members, all PAs, deputy FAs, and representatives of teachers, supervisors, doctoral student councils and University Administration, are convened for a joint meeting several times per year. The quality council acts in an advisory capacity to the FA and head of school, supports the PA and deals with issues related to all third-cycle education at the school.

Thesis work

Thesis work is continuously reviewed by the appointed supervisors. The work is also reviewed by attending research colleagues in connection with the presentation of results at internal seminars and international conferences. Continuous presentation of the third-cycle student's work during the study period, via seminars and international conferences or project meetings with external stakeholders, is regulated by summative assessment in the mandatory summary course of the programme, as mentioned above. For compilation theses, peer review of published articles or accepted conference papers is also carried out.

Before a decision is made to permit a licentiate seminar or public defence of doctoral thesis, the thesis/dissertation is reviewed:

- Plagiarism review by the principal supervisor
- Advance review by someone other than the supervisors

Advance reviewers are appointed, according to the SCI school timetable. The preliminary reviewer assesses whether the (preliminary) thesis/paper is complete and ready for summative assessment.

The quality of the doctoral or licentiate thesis must be such as fulfils reasonable requirements to be accepted for peer-reviewed, international scientific publication. For a compilation doctoral thesis, at least one article should be published or accepted for publication before the thesis is submitted.

Reviewers at licentiate seminars, as well as opponents at doctoral theses, are typically highly qualified international researchers.

Supervisor competence

Doctoral supervisor training is a requirement for docent qualifications at KTH. Docents at KTH who act as principal supervisors have thus undergone such training, usually via KTH's courses. This allows new supervisors to benefit more quickly from the many years of experience that some principal supervisors have already built up, and to exchange knowledge effectively with them. There are also requirements for higher education pedagogical training for assistant and associate professors. KTH also encourages teachers to engage in continuous professional development. Researchers also can receive training in higher education pedagogy.

Summary

An important prerequisite for a successful doctoral programme is a highly qualified and sufficiently large pool of researchers and supervisors. Therefore, maintaining an appropriate age and competence structure and gender balance in the faculty is an essential part of quality-enhancement activities. This is done through continuous recruitment and faculty development.

The systematic, continuous quality-enhancement work can be summarised as follows

- Continuous renewal of the faculty
- Continuous development of courses and course offerings.
- Renewal of experimental resources.
- Renewal of computer resources.
- Availability and updating of relevant software.
- Active encouragement of international exchange, including through research visits to KTH and vice versa.

- Ensuring that KTH's guidelines for thesis and dissertation work are followed.
- Opportunities for younger researchers to achieve docent qualification through doctoral supervisor training.
- Opportunities for younger researchers to undergo training in higher education pedagogy.