

General syllabus for the third-cycle programmes concerning
Machine Design
within the Graduate School of Industrial Product Realisation

**Approved by the Board of Education and Research Education (NUF),
September 7, 2015**

Third-cycle subject area: Machine design

Titles of qualifications: Licentiate and Doctor of Philosophy
Licentiate of Science/Doctor of Philosophy in Science (Machine Design)

The regulations of the Award of Certain Degrees Licensing Act (1993:792) form the basis of third-cycle courses and study programmes at Jönköping University (JU). The requirements laid down for third-cycle qualifications can be found in the Higher Education Ordinance (1993:100), Appendix 2, System of Qualifications. Also applicable are the degree requirements approved in the general syllabus for third-cycle programmes concerning the subject area and the local regulations education approved by the Board of Education and Research Education (NUF) at JU (*Regulations and guidelines for first, second and third-cycle education at Jönköping University*).

Description of the subject area

The third-cycle subject area of machine design includes methods and techniques for the design of mechanical products/components; an essential element of industrial product realisation. Particular emphasis is laid on the use of computer-based tools for engineering design. This subject area includes both synthesis and analysis in order to create, optimise and evaluate design solutions with regard to – for example – manufacturability, strength, performance, cost and environmental aspects. Within this subject area, computer support of various kinds, such as simulation and optimisation, are important for the virtual development and verification of products.

Structure of the study programme

The programme length for third-cycle students should normally be two years for a Licentiate and four years for a Doctor of Philosophy. Admissions may be made for Licentiate or Doctor of Philosophy level. The study programme includes a course element and a thesis (see also under the heading Degree requirements). Doctoral students are expected to participate actively in seminars relating to their own third-cycle subject area and within the Graduate School.

Individual study plans will be compiled for each doctoral student. This must be approved by the research education study advisor at the School of Engineering following a proposal from the principal supervisor in consultation with the doctoral student. The doctoral student and principal supervisor must sign the proposal and be notified of the approval. The individual study plan must include, as a minimum:

- a schedule for the doctoral student's study programme,
- information on how the supervision of the doctoral student is organised,
- a description of the general undertakings of the doctoral student and the school throughout the period of education, and
- other information required to allow the study programme to take place effectively.

During follow-up sessions, the doctoral student and principal supervisor must notify the research education study advisor at the School of Engineering of the progress of the study programme. The research education study advisor must document the results of follow-ups so that it is possible to monitor the development of the doctoral student during his or her period of study.

Supervision

At least two supervisors must be appointed for every doctoral student. At least one of these supervisors must have completed supervision training or have equivalent expertise. One of the supervisors will be appointed principal supervisor, and this person must be qualified as a reader (docent) or professor. The assistant supervisor must hold a Doctor of Philosophy. Following a report by a research leader within the research area in question, the head of research education approves the proposed supervisors in connection with the admission. A decision on an allocated supervisor can be altered on application by a doctoral student or supervisor, or for other reasons. The head of research education also approves the proposal in the event of a change of supervisor. Doctoral students are entitled to supervision for the total time which may be regarded as being necessary for the prescribed study programme of 120 credits or 240 credits respectively.

Courses within the third-cycle programmes

Mandatory courses within the Graduate School of Industrial Product Realisation

There are four mandatory courses within the Graduate School of Industrial Product Realisation, totalling 17 credits.

- Industrial Product Realisation (5 credits)
- Theory of Science and Research Methodology (5 credits)
- Teaching and Learning (4 credits)
- Information Literacy and Scholarly Communication (3 credits)

Courses on the subject area (machine design)

Mandatory courses on the subject area (machine design)

- Design optimisation (7.5 credits)
- Systems for automated design (7.5 credits)

Other courses

Other courses can be selected from the range of courses available to doctoral students at Jönköping University or at other higher education institutions. Courses may be teacher-supervised or of literature study type. Courses may also be selected from the range of relevant second-cycle courses and study programmes. Examples of courses relevant to the subject area are Non-linear FEA, Systems Engineering, Database Technology, Constraint Programming, Engineering Design Research, Simulation of Behaviours and Performance in Technical Systems, Continuum Mechanics, Material Models, Numerical Methods, Statistical Methods, etc.

A plan of which courses are to be included in the third-cycle programmes will be compiled in consultation between the principal supervisor, the assistant supervisor and the doctoral student and documented in the student's individual study plan.

Entry requirements

For admission to third-cycle programmes, applicants must:

1. meet basic entry requirements and the special entry requirements prescribed for a specific subject area, and
2. be deemed to have the sufficient general ability required to benefit from the study programme.

A person meets the general entry requirements for third-cycle programmes if he or she:

- has been awarded a second-cycle qualification
- has satisfied the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded in the second-cycle, or
- has acquired substantially equivalent knowledge in some other way in Sweden or abroad.

Besides this minimum level, specific entry requirements are applicable for the subject area, which at the School of Engineering are equivalent to a Master (60 or 120 credits) or a Master of Science in Engineering related to the subject area in question.

In selecting between applicants, their ability to benefit from the programmes will be taken into account.

Degree requirements

After completing the third-cycle programmes, the doctoral student will be well prepared for ongoing independent and high-quality research and teaching in academia or industrial work in which significant elements may comprise research and development. The objective is to educate Licentiates of Science and Doctors of Philosophy in Science, giving them outstanding scientific expertise within a broad range of applications (industrial product realisation) and specialist expertise within their own third-cycle subject area (machine design).

To be awarded a Licentiate or Doctor of Philosophy, the Higher Education Ordinance (1993:100), Appendix 2, System of Qualifications requires completion of a study

programmes amounting to at least 120 credits within a third-cycle subject area (Licentiate) or completion of a study programmes amounting to at least 240 credits (Doctor of Philosophy) within a third-cycle subject area. To be awarded a Licentiate, the doctoral student must also have been awarded a pass for a scholarly essay (licentiate thesis) amounting to at least 60 credits; and to be awarded a Doctor of Philosophy, the doctoral student must have been awarded a pass for a scholarly thesis (doctoral thesis) amounting to at least 120 credits.

Degree of Licentiate

120 credits are required to be awarded a degree of Licentiate, of which 40 credits will need to be acquired from the course element and the remaining 80 credits from a licentiate thesis. The mandatory joint courses Industrial Product Realisation, Theory of Science and Research Methodology, and Information Literacy and Scholarly Communication must be completed before a Licentiate can be awarded. The licentiate thesis must be presented verbally in English or Swedish at a open seminar. This thesis will be awarded a pass or a fail.

Degree of Doctor of Philosophy

A further 120 credits (totalling 240 credits) are required to be awarded a Doctor of Philosophy, of which 20 credits (totalling 60 credits) will need to be acquired from the course element and the remaining 100 credits (totalling 180 credits) from a doctoral thesis. The thesis must be defended verbally in English or Swedish at a public defence of the doctoral thesis. This thesis will be awarded a pass or a fail. All mandatory courses in the Graduate School and in the subject area must be completed for a Doctor of Philosophy to be awarded.

Testing knowledge

Knowledge may be tested during the third-cycle course of study programmes by means of written or verbal examination or in another appropriate manner.