

General syllabus for the third-cycle programmes in
Materials and Manufacturing
within the Graduate School of Industrial Product Realisation

Approved by the Board of Education and Research Education (NUF), May 21, 2018.

Third-cycle subject area: Materials and manufacturing/Material och tillverkningsprocesser

Titles of qualifications: Licentiate and Doctor of Philosophy

Licentiate of Science/Doctor of Philosophy in Science (Materials and Manufacturing)

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), Annex 2, Qualifications Ordinance. Also applicable are the degree requirements approved in the general syllabus for third-cycle programmes concerning the subject area and the local regulations for 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*).

Validity and rules when shifting general syllabus

The general syllabus is valid for doctoral students admitted after its approval. Doctoral students admitted before may shift to this syllabus, if approved by the main supervisor, and documented in the individual study plan.

The following rules applies:

- The previous course in Theory of Science and Research Methodology (5 credits) is replaced by Theory of Science and Research Methodology (4 credits) and Ethics in Engineering Practice and Research (2 credits).

Description of the subject area

The subject area of materials and manufacturing focuses on the knowledge of how components, primarily but not limited to cast components, can be designed and manufactured and how the material microstructures and properties of components can be influenced and controlled. This subject area includes experimental methods for material production and characterisation, in term of microstructure and properties, as well as modelling/simulation. This research is multidisciplinary and is supported by disciplines such as physics, fluid dynamics, applied mechanics, solid mechanics, material science, materials technology and chemistry, as well as simulation and optimisation. The research approach is to link the different steps, related to product design, from material design to manufacturing technology, including pre and post treatment, to microstructure and final properties. Once linked, these steps can be used as inputs to a localized properties component optimization.

Structure of the study programme

The programme length for doctoral 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.

An individual study plans must be compiled for each doctoral student. The content of the individual study plan must apply to the requirements stated in *Regulations and guidelines for first, second and third cycle education at Jönköping University (BRJU)*. At School of Engineering the provided template (individual study plan) must be used and signed by all involved persons, according to the template.

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 main 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 the head of department, the associate dean of doctoral programmes 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 associate dean of doctoral programmes 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 five mandatory courses within the Graduate School of Industrial Product Realisation, representing in total 18 credits:

- Industrial Product Realisation (5 credits)
- Theory of Science and Research Methodology (4 credits)
- Ethics in Engineering Practice and Research (2 credits)
- Basic Communication and Teaching (4 credits)
- Information Literacy and Scholarly Communication (3 credits)

Courses within the subject area

In the subject area material and manufacturing three (3) of the following courses are mandatory:

- Casting (7.5 credits)
- Mathematical Modelling of Casting (7.5 credits)
- Metallurgy, Solidification and Modeling of Cast Iron (7.5 credits)
- Light metal (7.5 credits)
- Corrosion and surface protection (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. Mathematical Modelling, Casting Simulation, Advanced Cast Materials, etc. are examples of courses relevant to the subject area.

A plan of which courses are to be included in the third-cycle programmes will be compiled in consultation between the main 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 considered.

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 Doctor 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 (materials and manufacturing).

To be awarded a Licentiate or Doctor of Philosophy, the Higher Education Ordinance (1993:100), Annex 2, Qualifications Ordinance, 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 Licentiate, of which 30 credits will need to be acquired from the course element and the remaining 90 credits from a licentiate thesis. The mandatory joint courses Industrial Product Realisation, Theory of Science and Research Methodology, Ethics in Engineering Practice and Research and Information Literacy and Scholarly Communication must be completed before a Licentiate can be awarded. The thesis should be written in English or Swedish. The licentiate thesis must be presented verbally in English or Swedish at an open seminar. This essay will be awarded a pass or a fail.

Degree of Doctor of Philosophy

A further 120 credits (in total 240 credits) are required to be awarded a Doctor of Philosophy, of which 30 credits (in total 60 credits) will need to be acquired from the course element and the remaining 90 credits (in total 180 credits) from a doctoral thesis. The thesis should be written in English or Swedish. The thesis must be defended verbally in English or Swedish at a public defence of the doctoral thesis. The 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.

Knowledge assessment

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