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General syllabus for doctoral (third-cycle) studies in Process Metallurgy **at Luleå University of Technology**

Decided by the Chair of the Board of Faculty of Science and Technology on 13 January 2022.

1. Subject description

Swedish name: Processmetallurgi
English name: Process Metallurgy
Process Metallurgy is concerned with the sustainable extraction of metals from primary and secondary raw materials using both pyrometallurgical and hydrometallurgical processes

2. Programme aim and intended learning outcome

The aim of the doctoral (third-cycle) studies in Process Metallurgy at the University is to give the doctoral student specialised knowledge in Process Metallurgy, in-depth knowledge of different research methods and a good understanding of the challenges related to research and its practical application. The overall objective of the programme is that the doctoral student develops into a critical and autonomous researcher in Process Metallurgy, able to plan and carry out research projects. The doctoral student shall fulfil all the qualitative targets specified in the Higher Education Ordinance as well as in the locally decided qualitative targets, if any (see attached Annex A).

3. Admission requirements and selection

3.1 General entry requirements
An applicant meets the general entry requirements for doctoral (third-cycle) studies if he or she has been awarded a Master's (second-cycle) qualification, has satisfied the requirements for courses comprising at least 240 credits, of which at least 60 second-cycle credits, or has acquired substantially equivalent knowledge in another way, in Sweden or elsewhere (Higher Education Ordinance (2010:1064) Chapter 7 Section 39).

3.2 Specific entry requirements
None.

3.3 Selection
In selecting among applicants who meet the requirements, their ability to benefit from the course or the study programme shall be taken into account. However, the fact that an applicant may be credited for previous courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants (Higher Education Ordinance

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(2010:1064) Chapter 7 Section 41). The University's local guidelines in the Admissions procedure for doctoral (third-cycle) studies must also be applied.

The following criteria will be used in the selection of applicants for doctoral (third-cycle) studies in Process Metallurgy.

- Assessment of the applicant´s ability to benefit from third-cycle courses and study programme in the research subject in accordance with criteria methodical cogency, theoretical awareness, critical thinking capacity, autonomy, originality, and communicative skills
- Knowledge relevant for the current project
- Previous studies and knowledge: the study programme(s)/course(s) completed by the applicant and results thereof.
- Good command of oral and written communication in English.

4. The degree

The doctoral (third-cycle) studies lead to a Degree of Doctor. Within Process Metallurgy, a student admitted to doctoral studies has the right to be awarded a licentiate degree after having completed at least 120 credits of the programme leading to a Degree of Doctor.

4.1 Degree requirements

For a Degree of Doctor, the doctoral student shall

- have been awarded a pass grade for courses of at least 60 credits
- have been awarded a pass grade for a research thesis (doctoral thesis) of at least 180 credits.

The thesis and the courses shall together amount to 240 credits for a Degree of Doctor.

For a Degree of Licentiate, the doctoral student shall

- have been awarded a pass grade for courses of at least 30 credits.
- have been awarded a pass grade for a licentiate thesis of at least 90 credits.

The thesis and the courses shall together amount to 120 credits for a Degree of Licentiate.

4.2 Titles of degree

- After the completion of the Degree of Doctor in Process Metallurgy the doctoral student is awarded the title Doctor of Philosophy in Science
- After the completion of the Degree of Licentiate in Process Metallurgy, the doctoral student is awarded the title Degree of Licentiate of Science.

A request of a title of degree other than the stipulated may be submitted in accordance with laid down guidelines.

5. Programme structure and implementation

5.1 Programme scope and structure

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The doctoral (third-cycle) programme includes two blocs; courses and thesis work. The programme comprises four years (two years for the licentiate degree). In case the doctoral student has a doctoral studentship and carries out departmental duties to a certain extent (no more than 20% of the whole programme), a corresponding prolonged period may be approved.

5.2 Individual study plan and supervision

An individual study plan outlining the implementation of the studies is drawn up for each doctoral student. The plan is established in consultation with the supervisor is decided by the Head of Department by delegation of the Vice-Chancellor. The plan is reviewed and revised at least once a year.

The Head of Department shall appoint at least two supervisors, one of whom is appointed principal supervisor, for each doctoral student. The person appointed principal supervisor shall have at least qualifications required for appointment as a docent and be employed by the University. A principal supervisor who no longer meets the job requirements may continue as supervisor until the doctoral student completes his or her studies, by an individual agreement with the relevant department. The doctoral student is entitled to supervision during the studies, unless the Vice-Chancellor has decided otherwise in accordance with the Higher Education Ordinance (2010:1064) Chapter 6 Section 30. A doctoral student who so requests may have another supervisor (Higher Education Ordinance (2010:1064) Chapter 6 Section 28). The request does not need a justification.

5.3 Courses

The individual study plan shall specify the courses to be included in the doctoral student's education. The goal attainment is examined according to the examination procedure specified in the course syllabus. Credits may be transferred in accordance with the local guidelines in the Admissions procedure for doctoral (third-cycle) studies.

Courses shall predominantly consist of courses within the subject's core area. For licentiate degree, the courses within the subject's core area shall give knowledge and understanding in the field of Process Metallurgy. At licentiate level, the remaining part of the courses will contribute to in-depth knowledge of research methodology in general and the methods of the specific field of research in particular, as well as develop the doctoral student's abilities and approaches. For doctoral degree, the courses within the subject's core area shall give broad knowledge in and a systematic understanding of the field of Process Metallurgy as well as a deep and current specialist knowledge within a limited part of this. At doctoral level, the remaining part of the courses will contribute to familiarity with research methodology in general and with the methods of the specific field of research in particular, as well as develop the doctoral student's skills, abilities and approaches. Knowledge of gender equality must be ensured in both the licentiate degree and the doctoral degree, which can be done through a course or in another way.

5.4 Thesis

The thesis may take the form of either a single coherent work (a monographic thesis) or a compilation comprising a number of scientific articles interrelated by an introductory summary

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chapter (a compilation thesis). Quality and scope requirements for the research activities do not differ between the two alternatives. The scientific articles or, as appropriate, the monograph must be of such quality that they meet reasonable requirements for publication in a peer-reviewed scientific forum.

The number of articles may vary depending on the student's own contribution to each article and on the scope and scientific contribution of the articles. Usually a doctoral thesis consists of 4–5 articles presented in the form of scientific publications in, for the subject's relevant peer-reviewed journals. At least two of the articles shall be accepted for publication in scientific journals, and 2–3 articles should meet the standard for scientific publication. The introductory summary chapter (kappa) contains an overall analysis and summary discussion of the articles.
A compilation thesis shall clearly show the doctoral student's individual contribution and the contribution of the other co-authors

A licentiate thesis normally consists of two articles of which at least one is accepted for publication in a scientific journal and the other one meet the standard for scientific publication. The introductory summary chapter (kappa) contains an overall analysis and summary discussion of the articles. It shall clearly show the doctoral student's individual contribution and the contribution of the other co-authors.

The introductory summary chapter shall include a separate section describing the doctoral student's contribution to the articles.

The doctoral thesis shall be defended at a public defence seminar. The grades for the thesis are either 'pass' or 'failed'. When grading the thesis, the content and the defence of thesis shall be taken into account. The grade of a doctoral thesis is decided by an examining committee, appointed anew for each thesis.

A doctoral student wanting to be awarded a Degree of Licentiate shall, after consultation with his or her supervisor, request approval from the responsible Head of Department. The doctoral student defends his or her licentiate thesis at a licentiate seminar after which the thesis is graded 'pass' or 'failed'. When grading the thesis, the content and the defence of the thesis is taken into account. An examiner, appointed by the Head of Department, grades the licentiate thesis.

6. Entry into effect and interim regulations

The previous general syllabus will cease to apply for third-cycle students who are admitted to studies at third-cycle level after 2022-01-13.

If agreed between the third-cycle student and the supervisors, the new general syllabus LTU 4599-2021 may be used as a steering document for a previously admitted third-cycle student.

It must be documented in the third-cycle student´s individual study plan which general syllabus that applies.

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