



Reg.No. MDH 3.1.2-475/14

General Syllabus for the third-cycle subject area of Energy and Environmental Engineering at Mälardalen University

Valid for all doctoral students admitted to the third-cycle subject area after 30 September 2014 onwards.

Doctoral students admitted before 30 September 2014 have the right to complete their studies up to the public defence of their thesis according to the syllabus that was valid at the time of their admission to the third-cycle study programme. The doctoral student may also choose to follow the new syllabus.

Deciding authority: The Faculty Board

This document is a policy document for the third-cycle subject area and shall be revised/reviewed no later than four years after the latest ratification. The *School of Business, Society and Engineering* is responsible for revision.

Table of Contents

Introduction	3
Subject description	3
Research domain	3
Third-cycle subject area.....	3
Area- and subject-specific qualitative targets	3
Degree of Doctor	4
Objectives	4
Degree of Licentiate	4
Scope of Degree of Licentiate	4
Objectives	4
Programme structure	4
Scope	4
Courses and seminars	5
Entry requirements	5
Selection	6
Examination	6
Degree of Doctor	6
Knowledge and Understanding	6
Title of degree	7
Internationalisation	7
Supervision	7
Preview	7
Transitional provisions	7
Appendix A– Degree of Licentiate	8
Knowledge and Understanding	8
Aptitudes and Accomplishments	8
Ability to Evaluate and Assess	8
Academic Paper	8
Appendix B– Degree of Doctor	9
Knowledge and Understanding	9
Aptitudes and Accomplishments	9
Ability to Evaluate and Assess	9
Academic Thesis (Doctoral Thesis)	9

Introduction

Pursuant to Chapter 6, Section 25 of the Higher Education Ordinance, HF, (1993:100), the Faculty Board at Mälardalen University (MDH) has established subjects which shall be arranged within third-cycle studies. Each third-cycle subject area shall have a ratified general syllabus in which the main contents of the study programme, specific entry requirements and other regulations necessary shall be stated in accordance with HF Chapter 6, Sections 26 and 27.

The School is responsible for establishing and revising the general syllabuses valid for the third-cycle subject areas for which the School acts as the host School. The Faculty Board ratifies the established or revised general syllabuses for the subjects in which third-cycle studies are arranged at MDH.

Furthermore the local policy document Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH 3.1-382/12) stipulates that the criteria for general entry requirements, description of selection criteria, description of compulsory modules and requirements for thesis work and course demands shall also be stated in the general syllabus for the subject. In addition, recommendations for prior knowledge which do not constitute formal entry requirements, as well as other relevant information, may be given.

Subject description

Research domain

At Mälardalen University the research domain of Environment-, Energy- and Resource Optimisation comprises two third-cycle subject areas: Energy- and Environment Engineering and Mathematics/Applied Mathematics. As the name indicates the subject of Energy- and Environment Engineering finds natural applications within the area of Environment-, Energy- and Resource Optimisation. The domain also encompasses the subject of Mathematics/Applied Mathematics since optimisation problems constitute a rich area of application for mathematical methods.

Third-cycle subject area

The subject of Energy- and Environment Engineering, and the knowledge within this, is built up and developed by the research in Energy of the Future. These third-cycle studies are mainly technologically directed towards renewable energy as well as energy- and resource optimisation in the process industry and buildings. Studies carried out within the subject are experimentally or theoretically oriented.

Research within the research profile of Energy of the Future focuses on renewable energy in the form of biogas, solar energy and biomass, more efficient use of energy and reduced emissions in both industry and for households, as well as smarter modelling for optimisation, decision support and control.

Area- and subject-specific qualitative targets

The general objectives of the third-cycle studies regarding knowledge and understanding, aptitudes and accomplishments, as well as the ability to evaluate and assess, are laid down in the Higher Education Ordinance.

Degree of Doctor

Objectives

The purpose of the third-cycle studies in Energy- and Environment Engineering at Mälardalen University is to give the doctoral student in-depth knowledge in the subject of Energy- and Environment Engineering, a thorough knowledge of research methods and a good insight into the problems that occur in research and its practical applications. The overriding goal of the programme is to make the doctoral student into a critical and independent researcher in energy- and environment engineering with an ability to plan and carry out theoretically technical or experimental research projects.

Degree of Licentiate

Guidelines for a Degree of Licentiate are given in the Rules for and Regulations Third-cycle Studies at Mälardalen University (MDH 3.1-382/12). In Industrial Economics and Organisation the following additionally applies.

For a Degree of Licentiate is required

- a Pass grade on courses of at least 30 higher education (HE) credits
- a Pass grade on an approved academic paper whose scope corresponds to studies of at least 90 HE credits

The Licentiate paper shall be examined at a licentiate seminar. Guidelines for the structure of the seminar and the choice of examiner are laid out in the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH 3.1-382/12).

The requirements for taking a licentiate degree are a Pass grade on all the knowledge tests included in the third-cycle studies and also the licentiate paper.

Scope of Degree of Licentiate

A Degree of Licentiate is obtained after the doctoral student has completed a study programme of at least 120 HE credits within a third-cycle subject, or after the doctoral student has completed a part comprising at least 120 HE credits of a study programme which is to lead towards a Degree of Doctor, if the University decides that such a licentiate degree can be given at the University.

Objectives

The purpose of the third-cycle studies in Energy- and Environment Engineering at Mälardalen University is to give the doctoral student in-depth knowledge of scientifically technological research work. Further, the aim is to develop the student's ability to solve advanced technical problems. The overriding goal of the programme is to make the doctoral student into a critical and independent researcher.

Programme structure

For each doctoral student an individual study plan in which the structure of the study programme is planned in detail shall be established. The study plan shall be updated and reviewed in connection with every major change in the structure of the study programme and at least once per year.

Scope

A Degree of Doctor is obtained after the doctoral student has completed a study programme of 240 HE credits within a third-cycle subject.

For a Degree of Doctor the doctoral student shall have a Pass grade on an academic thesis (doctoral thesis) of at least 180 HE credits. The thesis should be written as a compilation thesis and comprise at

least 4 scientific articles of high quality, or alternatively contain contributions of corresponding scope and scientific high level.

In addition to the goals stated in the Higher Education Ordinance, the Faculty Board at MDH has ratified joint goals according to the Guidelines for Third-cycle Studies.

Courses and seminars

The study programme shall include courses. For each course there shall be an examiner at the institution which gives the course. The examiner shall establish a written course syllabus which among other things shall state the objectives, contents and amount of credits for the course. See further the Guidelines for Third-cycle Studies and the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH 3.1-382/12).

In the study programme there shall be included courses comprising 30/60 HE credits for a licentiate- and doctoral degree respectively. In the individual study plan it shall be stated, among other things, what courses for each individual research student shall or may be included in the study programme and also how many credits each course then counts as.

The courses shall preferably be courses at third-cycle level. Only in exceptional circumstances may first-cycle courses be included in the degree. A maximum of 30/60 HE credits from first- or second-cycle may be given credits for in the licentiate and doctoral degrees respectively.

The contents of the course part are decided by the principal supervisor after consultation with the research student and the other supervisors. Research students participate regularly in Energy for the Future's research seminars.

[...] The following guidelines apply for the structure of the course part of the programme.

- In consultation with the supervisors, courses from adjoining areas of research can be selected.
- Doctoral student courses may be read at Mälardalen University or some other higher education institution (HEI). The doctoral student's supervisor validates courses read at other HEIs.

As part of the studies and thesis work the student shall participate in seminars on both Energy for the Future's research activities and other doctoral students' thesis work. Students can be offered course credits for regular, active participation in the subject's seminar activities. The Council of Supervisors compile, on an annual basis, a seminar series with activities that are recommended to be counted as a doctoral student course. Seminar credits can comprise no more than 7,5/15 HE credits in a licentiate/doctoral degree.

Entry requirements

The general entry requirements for admission to third-cycle studies are regulated in the Higher Education Ordinance, Chapter 7, Section 39.

The general regulations for eligibility for third-cycle studies are stated in the Admissions Regulations for Third-cycle Studies (MDH 3.2.1-1044/10).

For eligibility for admission to third-cycle studies in Energy- and Environment Engineering as specific entry requirements, the research student shall have one of the following:

- a degree of Master of Science in Engineering within the relevant field of engineering
- a four-year natural science programme with a technology bias corresponding to a degree of Master of Science in Engineering

- In any other way within or outside the country has acquired largely equivalent knowledge.

Selection

Selection among applicants fulfilling the entry requirements is made according to the following criteria:

- subject knowledge
- the ability to solve technical problems
- relevant multidisciplinary knowledge within the specialisation subjects
- estimated prerequisites to be able to conduct research programme studies, e.g. writing ability
- interest in and prerequisites for co-production

Examination

Third-cycle studies are concluded with a doctoral degree or, if the student so wishes, a licentiate degree. The student should take a licentiate degree as a stage in the third-cycle studies. If the student, together with the supervisors, intends to exclude a licentiate degree as a stage, particular reasons for this should be given to the Council of Supervisors.

In the study programme an academic paper shall be included, documented in a licentiate thesis or a doctoral thesis. General guidelines are laid down in the Rules for and Regulations Third-cycle Studies at Mälardalen University (MDH 3.1-382/12).

Degree of Doctor

Guidelines for a Degree of Doctor are given in the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH 3.1-382/12). In addition the following applies regarding Energy- and Environment Engineering:

For a Degree of Doctor is required

- a Pass grade on courses of at least 60 HE credits.
- a Pass grade on an approved thesis whose scope corresponds to studies of at least 180 HE credits.

The doctoral thesis shall be examined at a public defence proceeding. Guidelines for the order of the proceeding, choice of faculty examiner and the constitution of the examining committee are laid down in the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH 3.1-382/12).

The requirements for taking a doctoral degree are a Pass grade on all the knowledge tests included in the research programme and also the doctoral thesis.

Knowledge and Understanding

For a Degree of Doctor the doctoral student shall:

- demonstrate a broad knowledge of Energy- and Environment Engineering and a systematic understanding of the research domain, as well as in-depth and current specialist knowledge within a limited area of this, and
- demonstrate familiarity with research methodology in general and of the specific research domain in particular.

Title of degree

Degree of Doctor of Philosophy in Science/ Degree of Licentiate of Science.

If another degree title is given in the doctoral student's first-cycle degree (Philosophy), the doctoral student may apply to the Faculty Board to receive this title in the third-cycle degree too, in accordance with the Rules and Regulations for Third-cycle Studies at Mälardalen University.

Internationalisation

Doctoral students should be offered the opportunity of going abroad, participating in international conferences, and reading doctoral student courses at other HEIs within and outside the country. The principal supervisor has the responsibility for this and also for the doctoral student to be introduced into the international network within the research domain.

Supervision

The right to a supervisor and to supervision is regulated in the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH3.1-382/12).

Those admitted to research studies have the right to supervision in accordance with current provisions. The principal supervisor is appointed by the Council of Supervisors, dependent on the contents and methods of the research project in question. The principal supervisor appoints supervisors in consultation with the Council of Supervisors. It is desirable that the doctoral student's supervisors are part of the same research project as the doctoral student to facilitate regular supervision.

Preview

Preview of licentiate theses and doctoral theses is regulated partly in the Rules and Regulations for Third-cycle Studies at Mälardalen University (MDH3.1-382/12). The Council of Supervisors is responsible for previewing every individual thesis within the subject. Each doctoral student who wishes to submit a licentiate thesis or doctoral thesis shall, after the supervisor has deemed it suitable, present the thesis work to the Council of Supervisors. The Council of Supervisors assesses the scope of the research paper that has been produced and also the doctoral student's ability to present the work, its scholarly maturity, independent thinking and understanding.

For a licentiate thesis an internal reviewer of the paper is appointed and for a doctoral thesis an internal and an external reviewer are appointed. The task of the reviewers is, together with the supervisors, to recommend whether the thesis is to be submitted and also whether the work is of sufficient high quality for a public defence.

Transitional provisions

Doctoral students admitted before 30 September 2014 have the right to complete their studies up to the public defence of their thesis according to the syllabus that was valid at the time of their admission to the third-cycle study programme. The doctoral student may also choose to follow the new syllabus.

Appendix A– Degree of Licentiate

Given below are the degree requirements of the system of qualifications and requirements for fulfilment to obtain a Degree of Licentiate, Appendix 2, HF.

Knowledge and Understanding

For a Degree of Licentiate the doctoral student shall:

- demonstrate knowledge and understanding within the research domain, inclusive of current specialist knowledge within a limited area of this, as well as a specialised knowledge of research methodology in general and of the specific research domain in particular.

Aptitudes and Accomplishments

For a Degree of Licentiate the doctoral student shall:

- demonstrate the ability to identify and formulate questions with scientific meticulousness, critically, independently and creatively, and to plan and undertake, using adequate methods, a limited research project and other qualified assignments within stipulated time limits and thereby contribute to the development of knowledge as well as to evaluate this work,

- demonstrate the ability, in national as well as international contexts, to clearly present and discuss, orally and in writing, research and research findings in dialogue with the academic community and society in general, and

- demonstrate the skills required to participate independently in research and development work and to work independently in some other qualified capacity.

Ability to Evaluate and Assess

For a Degree of Licentiate the doctoral student shall:

- demonstrate the ability to make assessments of ethical aspects of his or her own research,

- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of people for how it is used, and

- demonstrate the ability to identify the personal need for further knowledge and take responsibility for the development of such knowledge.

Academic Paper

For a Degree of Licentiate the doctoral student shall have been awarded a Pass grade for an academic paper (licentiate thesis) of at least 90 HE credits.

Appendix B– Degree of Doctor

Given below are the degree requirements of the system of qualifications and requirements for fulfilment to obtain a Degree of Doctor, Appendix 2, HF.

Knowledge and Understanding

For a Degree of Doctor the doctoral student shall:

- demonstrate a broad knowledge within and a systematic understanding of the research domain, as well as in-depth and current specialist knowledge within a limited area of this, and
- demonstrate familiarity with research methodology in general and of the specific research domain in particular.

Aptitudes and Accomplishments

For a Degree of Doctor the doctoral student shall:

- demonstrate the capacity for scientific analysis and synthesis as well as to review and assess new and complex phenomena, questions and situations, independently and critically,
- demonstrate the ability to identify and formulate questions with scientific meticulousness, critically, independently and creatively, and to plan and undertake research and other qualified assignments using adequate methods and within stipulated time limits, and to review and evaluate such work,
- demonstrate through a thesis the ability to make a significant contribution to the development of knowledge through his or her own research,
- demonstrate the ability, in national as well as international contexts, to authoritatively present and discuss, orally and in writing, research and research findings in dialogue with the academic community and society in general,
- demonstrate the ability to identify the need for further knowledge, and
- demonstrate the capacity to contribute to the development of society and to support the learning of others both through research and education as well as in other qualified professional capacities.

Ability to Evaluate and Assess

For a Degree of Doctor the doctoral student shall:

- demonstrate intellectual independence and disciplinary rectitude as well as the ability to make assessments of research ethics, and,
- demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of people for how it is used.

Academic Thesis (Doctoral Thesis)

For a Degree of Doctor the doctoral student shall have been awarded a Pass grade for an academic thesis (doctoral thesis) of at least 180 HE credits. The thesis should be a compilation thesis with at least 4 articles of high academic quality or equivalent scope.

In addition to the goals stated in the Higher Education Ordinance, the Faculty Board at MDH has ratified joint goals according to the Guidelines for Third-cycle Studies.