



Mittuniversitetet

MID SWEDEN UNIVERSITY

Faculty of Science, Technology and Media

General study syllabus for third- cycle programmes in Electrical Engineering

Approved by the Council for Third-Cycle Education at the Faculty of Science,
Technology and Media

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Paragraphs retrieved from the Higher Education Ordinance (HF) in connection with drawing up the general study syllabus.

General study syllabus

Section 25, Chapter 6 of HF: A university or higher education institution entitled to award third-cycle qualifications shall determine the subjects in which third-cycle courses and programmes may be offered. Ordinance (2010:1064).

1. Teaching and research duties

The subject Electrical Engineering for doctoral education at Mid Sweden University consists of three specializations: Circuits and Systems, Embedded Systems, and Metrology and Data Analysis.

Circuits and Systems

Circuits and Systems include active and passive electrical components, electrical circuits and systems. The focus is on electrical drive systems, electrical power conversion and electrical energy storage systems, energy harvesting for embedded systems, and microwave technology, such as antennas.

Embedded Systems

Embedded Systems includes components of embedded systems, system design, and interaction between embedded systems. The focus is on implementation aspects for resource-constrained systems, as well as embedded and distributed computing architectures for data- and computationally intensive sensor applications.

Metrology and Data Analysis

Metrology and data analysis encompasses both theoretical and experimental studies of sensors, instrumentation and measurement methods, as well as systems for data acquisition and analysis of large amounts of data with a focus on data-driven modeling. This area also includes sensor systems based on optical measurement through camera techniques and X-ray imaging, as well as acoustic measurement.

Scope and outcome of the courses and study programmes

Section 2, Chapter 6 of HF: The extent of a course or study programme shall be denoted by credits, with full-time study during a normal academic year of 40 weeks corresponding to 60 credits. Ordinance (2006:1053).

Scope of third-cycle courses and study programmes according to HF Annex 2

Qualifications Ordinance:

Degree of Licentiate

Scope

A Degree of Licentiate is awarded

either after a third-cycle student has completed a study programme of at least 120 credits in a subject in which third-cycle teaching is offered,

or after a third-cycle student has completed one part comprising at least 120 credits of a study programme intended to conclude with the award of a PhD, if a higher education institution decides that a Degree of Licentiate of this kind may be awarded at the institution.

Thesis

For a Degree of Licentiate the third-cycle student shall have been awarded a pass grade for a research thesis of at least 60 credits

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Licentiate with a defined specialisation.

Degree of Doctor

Scope

A Degree of Doctor is awarded after the third-cycle student has completed a study programme of 240 credits in a subject in which third-cycle teaching is offered.

Research thesis (doctoral thesis)

For the Degree of Doctor the third-cycle student shall have been awarded a pass grade for a research thesis (doctoral thesis) of at least 120 credits.

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Doctor with a defined specialisation.

Outcomes for third-cycle courses and study programmes according to HF Annex 2 Qualifications Ordinance:

Knowledge and understanding

For a Degree of Licentiate the third-cycle student shall demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.

For the Degree of Doctor the third-cycle student shall

- demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For a Degree of Licentiate the third-cycle student shall

- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work,
- demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general, and
- demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.

For the Degree of Doctor the third-cycle student shall

- demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically,
- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work,
- demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research,
- demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and 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 social development and support the learning of others both through research and education and in some other qualified professional capacity.

Judgement and approach

For a Degree of Licentiate the third-cycle 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 the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

For the Degree of Doctor the third-cycle student shall

- demonstrate intellectual autonomy 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 the individual for how it is used.

Local rules:

The third-cycle courses and study programmes in Electrical Engineering end with a licentiate degree or doctorate. Credits for a licentiate degree can be transferred to a doctorate. A doctoral student who has already been admitted for a licentiate degree and would like to be admitted for a doctorate can apply for this to the Board of Third-Cycle Education. An updated individual study plan including a funding plan and, if applicable, a current agreement for the full programme length up until the public defence shall be enclosed with the application.

3. Entry requirements and previous knowledge requirements

General entry requirements

Section 39, Chapter 7 of HF: A person meets the general entry requirements for third-cycle courses and study programmes if he or she:

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

The higher education institution may permit an exemption from the general entry requirements for an individual applicant, if there are special grounds. Ordinance (2010:1064).

Specific entry requirements

Section 40, Chapter 7 of HF: The specific entry requirements laid down shall be essential for students to be able to benefit from the course or study programme. These requirements may comprise

1. knowledge from one or more higher education courses and study programmes or corresponding courses and study programmes,
2. specific professional or vocational experience, and
3. specific professional or vocational experience, and (2006:1053).

Local rules:

Specific entry requirements for admission to third-cycle courses and study programmes are that the applicant must have a minimum of 90 credits in a subject relevant to the research specialisation or in some other way in or outside Sweden have acquired essentially the equivalent knowledge.

4. Admission to third-cycle courses and study programmes

Section 34, Chapter 7 of HF: The number of doctoral students admitted to third-cycle courses and study programmes may not exceed the number that can be offered supervision and otherwise acceptable conditions for study and whose studies are funded pursuant to Section 36. Ordinance (2006:1053).

Section 35, Chapter 7 of HF: The requirements for admission to third-cycle courses and study programmes are that the applicant

1. meets the general and specific entry requirements that the higher education institution may have laid down, and
2. is considered in other respects to have the ability required to benefit from the course or study programme. Ordinance (2010:1064).

Section 36, Chapter 7 of HF: A higher education institution may admit an applicant to third-cycle courses and study programmes who has been appointed to a doctoral studentship. The higher education institution may also admit an applicant who has some other form of funding for their studies if it assesses that

1. funding can be guaranteed during the entire period of study, and
2. the applicant can devote enough time to their studies to enable their completion within four years in the case of a licentiate degree or a licentiate degree in the fine, applied and performing arts or eight years in the case of a PhD or a doctorate in the fine, applied and performing arts.

For an applicant with funding that is a stipend, funding pursuant to item 1 of the first paragraph is regarded as guaranteed if the level of the stipend is equivalent to the pay level for doctoral students regulated by a Swedish collective agreement or standard practice in the profession, after deductions for preliminary tax at source according to the tax table equivalent to the average tax rate for municipalities and regions and which is annually published by Statistics Sweden. If the applicant will alternate staying in Sweden and another country, the requirement for the level of the stipend only applies to the time the applicant intends to stay in Sweden. Ordinance (2019:1014).

5. Admission to third-cycle courses and study programmes

Section 37, Chapter 7 of HF: Decisions relating to admissions are made by the higher education institution. A person who wishes to be admitted to a third-cycle course or study programme shall apply within the time prescribed and in compliance with the procedures laid down by the higher education institution.

When a higher education institution intends to admit one or several third-cycle students, information shall be provided by the higher education institution through advertising or some equivalent method. Information need not, however, be provided:

1. about the admission of a third-cycle student who is to complete the course or study programme within the framework of employment by an employer other than the higher education institution,
2. about the admission of a third-cycle student who has previously begun third-cycle studies at another higher education institution, or
3. if there are similar special grounds. Ordinance (2006:1053).

Section 38, Chapter 7 of HF: A higher education institution that has been entitled to award third-cycle qualifications within an area may permit a third-cycle student who has been admitted to some other university or some other higher education institution to transfer without a new admission process to the higher education institution and to continue his or her courses and study programmes and receive his or her qualification there. This only applies, however, if the third-cycle student has completed the major part of his or her third-cycle studies at the higher education institution in the area in which entitlement to award third-cycle qualifications has been granted.

What is said in the first paragraph is to apply similarly at a higher education institution that in having been granted the title of university is entitled pursuant to Section 11 of Chapter 1 of the Higher Education Act (1992:1434) to award third-cycle qualifications. Ordinance (2010:1064).

Section 41, Chapter 7 of HF: In selecting between applicants who meet the requirements laid down in Sections 35 & 36 their ability to benefit from the course or the study programme shall be taken into account.

The higher education institution determines which assessment criteria shall be used in determining the ability to benefit from the courses and study programmes.

However, the fact that an applicant is considered able to transfer credits from prior courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants. Ordinance (2010:1064).

6. Selecting between applicants to third-cycle courses and study programmes

Section 41, Chapter 7 of HF: In selecting between applicants who meet the requirements laid down in Sections 35 & 36 their ability to benefit from the course or the study programme shall be taken into account.

The higher education institution determines which assessment criteria shall be used in determining the ability to benefit from the courses and study programmes.

However, the fact that an applicant is considered able to transfer credits from prior courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants. Ordinance (2010:1064).

7. Credit transfer

Section 6, Chapter 6 of HF: If a student at a higher education institution in Sweden has successfully completed a higher education course or study programme, she or he is entitled to transfer the credits awarded for a course or study programme at another higher education institution. This does not apply, however, if there is a substantial difference between these courses or study programmes. The same applies for students who have successfully completed a course or study programme

1. at a university or higher education institution in Denmark, Finland, Iceland or Norway or a signatory to the Council of Europe's Convention of 11 April 1997 on the Recognition of Qualifications concerning Higher Education in the European Region (Swedish Treaty Series 2001:46), or
2. at Nordiska högskolan för folkhälsovetenskap (NHV – The Nordic School of Public Health). Ordinance (2006:1053)

Section 7, Chapter 6 of HF: A student is entitled to transfer credits from a course or study programme other than that laid down in Section 6 if the nature and extent of the knowledge and skills cited by the student are such that they correspond on the whole to the course or study programme for which the credits are to be recognised. A student may also be given credit for corresponding knowledge and skills acquired in a vocational or professional capacity. Ordinance (2006:1053).

Section 8, Chapter 6 of HF: The higher education institution shall assess whether credits can be awarded for the prior course or study programme or professional or vocational experience.

Credits may only be awarded to those who are students unless otherwise provided by statute or ordinance. Ordinance (2010:1064).

Local rules:

Credit transfers for courses completed before admission can be allowed after application, at the time of admission, by the Board of Education on a Research Level provided they are not included in the 240 credits that form part of the general entry requirements or the courses

required by the specific entry requirements. Decisions on any other courses for which the credits are to be transferred are made by the principal supervisor concerned in consultation with the examiner concerned and other supervisors concerned. A doctoral student who has completed some of the third-cycle courses and study programmes at a higher education institution or university in or outside Sweden has the right, in some cases, to transfer these credits. An assessment of such completed courses and study programmes shall be made by the principal supervisor in consultation with other supervisors concerned. See also 10:2.

8. Decisions on admission to third-cycle courses and study programmes

Local rules:

The Board of Education on a Research Level makes decisions on admission to third-cycle courses and study programmes and appoints a principal supervisor and assistant supervisors proposed by the department concerned. If the admission is linked to a position as a doctoral student, the head of department concerned decides on the employment after the decision on admission to third-cycle courses and study programmes has been taken by the Board of Education on a Research Level.

See Mid Sweden University's steering document 'Antagningsordning för utbildning på forskarnivå vid Mittuniversitetet' (Admissions procedure for third-cycle courses and study programmes at Mid Sweden University).

9. Employment as a doctoral student

Section 1, Chapter 5 of HF: Higher education institutions may establish specific posts for third-cycle students to enable them to complete their third-cycle studies. Ordinance (2006:1053).

Section 2, Chapter 5 of HF: Those appointed to doctoral studentships shall primarily devote themselves to their studies. Those appointed to doctoral studentships may, however, work to a limited extent with educational tasks, research, artistic research and administration. Before a PhD or a doctorate has been awarded, however, duties of this kind may not comprise more than 20 per cent of a full-time post. Ordinance (2014:1012).

Section 3, Chapter 5 of HF: Only those who are or have been admitted to third-cycle courses and study programmes at a higher education may be appointed to doctoral studentships. Ordinance (2006:1053).

Section 3a, Chapter 5 of HF: A doctoral studentship shall be a full-time post. If a third-cycle student so requests, the appointment may be a part-time post but for no less than 50 per cent of a full-time post. Ordinance (2002:139).

Section 4, Chapter 5 of HF: A doctoral student in receipt of a doctoral grant shall on application be appointed to a doctoral studentship no later than the date on which according to the individual study plan there remains a period of study corresponding to three years of full-time study before the award of a PhD or a doctorate in the fine, applied and performing arts. This does not apply, however, if the vice-chancellor has decided on the withdrawal of the student's resources pursuant to Section 30 of Chapter 6 of this Ordinance. Ordinance (2017:947).

Section 4a, Chapter 5 of HF: A doctoral student in receipt of a doctoral grant does not need to be appointed pursuant to Section 4 if the grant is awarded as part of

1. an aid and capacity building programme in which grants are an accepted form of funding with reasonable terms and conditions and the admitting higher education institution has insight into these terms and conditions and into how the grant is paid, or
2. a programme funded by the European Union or other partnerships, in which grants with reasonable terms and conditions comprise an accepted form of funding and where requirements for funding through employment are a barrier to participation for the admitted higher education institution. Ordinance (2018:525).

Section 5, Chapter 5 of HF: When an appointment to a doctoral studentship is to be made, the ability of the student to benefit from third-cycle courses and study programmes must be taken into account.

If an appointment to a doctoral studentship is to be made in connection with admission to a study programme, the provisions of the second and third paragraphs of Section 41 of Chapter 7 on determination of the assessment criteria and the prohibition of preferential treatment shall apply.

The higher education institution shall provide information about vacant positions in the form of advertising or some equivalent procedure so that those who are interested in appointment to a doctoral studentship may notify the higher education institution of their interest within a stipulated period. Information need only be provided, however, if appointment to a doctoral studentship is to be made in connection with admission to a study programme and if, pursuant to Section 37 of Chapter 7, information shall be provided in connection with admission. Ordinance (2017:284).

Section 6, Chapter 5 of HF: Appointment to a doctoral studentship shall be decided by the vice-chancellor. Ordinance (1998:80).

Section 7 Chapter 5 of HF: Appointment to a doctoral studentship shall apply for an indefinite period, however for no longer than until a specified date and never for a period extending more than one year after the award of a PhD or a doctorate.

The initial appointment may apply for no longer than one year. An appointment may be renewed for no more than two years at a time.

A person may be appointed to a doctoral studentship for a total of eight years. The total employment period may, however, not exceed the time corresponding to full-time third-cycle study for four years. For courses or study programmes to be concluded with the award of a licentiate degree the total employment period may not exceed the time corresponding to full-time third-cycle study for two years. The time spent studying by the third-cycle student while not appointed to a doctoral studentship shall be deducted from these periods.

The total period of employment may, however, exceed that stated in the third paragraph if special grounds exist. Such grounds may comprise leave of absence because of illness, leave of absence for service in the defence forces or an elected position in a trade union or student organisation, or parental leave. Ordinance (2009:933).

10. Courses and study programmes structure and content

10.1 Miscellaneous

Local rules:

Third-cycle courses and study programmes for a doctorate shall comprise a total of 4 years' full-time studies (240 credits). The study programmes consist of courses and a dissertation.

Third-cycle courses and study programmes for a licentiate degree shall comprise a total of 2 years' full-time studies (120 credits). The study programmes consist of courses and a dissertation.

10.2 Courses

Local rules:

The total length of the third-cycle courses and study programmes for a doctorate shall be at least 60 and at most 70 credits.

The total length of the third-cycle courses and study programmes for a licentiate degree shall be at least 35 and at most 45 credits.

General courses consist of the compulsory courses for all doctoral students within the NMT faculty. At least one of these must be included in the licentiate degree.

- Philosophy of science, ethics and research methodology 7.5 credits
- Scientific writing and presentation techniques 7.5 credits

Corresponding courses offered by other higher education institutions can be credited towards the doctoral program with approval from the main supervisor.

Of the chosen courses and study programmes for a doctorate, a maximum of 30 credits may consist of first- and second-cycle courses. Of these 30 credits, a maximum of 15 credits ought to consist of first-cycle courses.

Of the chosen courses for a licentiate degree, a maximum of 15 credits may consist of first- and second-cycle courses. Of these 15 credits, a maximum of 7.5 credits may consist of first-cycle courses.

10.3 Dissertation

Local rules:

The doctoral student shall write a research thesis that shows the doctoral student's ability to independently – or within the framework for teamwork – solve the chosen research task in a scientifically satisfactory way.

For third-cycle education aiming at PhD degree the scope of the thesis must be 170 to 180 credits.

For third-cycle education aiming at licentiate degree the scope of the thesis must be 75 to 85 credits.

Unless there are special reasons, the dissertation shall be written in English. The dissertation shall contain a short summary in both English and Swedish. The research content of the dissertation shall be of such quality that the main results can be deemed to meet reasonable requirements to be accepted for publication in a research publication of good international standard with a referee system. The dissertation shall be organised as a compilation of a number of academic papers together with a short summary (compilation thesis) or as a cohesive research work (monograph thesis). The included academic papers shall be of such quality that they can be admitted for publication in a research publication of good international standard with a referee system. If all or part of the dissertation is produced in cooperation with others, the individual doctoral student's contribution should be easy to differentiate.

10.4 Supervision

Section 28, Chapter 6 of HF: At least two supervisors shall be appointed for each doctoral student. One of them shall be nominated as the principal supervisor. The doctoral student is entitled to supervision during his or her studies unless the vice-chancellor has decided otherwise by virtue of Section 30.

A doctoral student who so requests shall be allowed to change supervisor. Ordinance (2010:1064).

Local rules:

The principal supervisor shall be a professor or associate professor and must have completed supervisor training with a permanent connection to Mid Sweden University. A supervision plan shall be described in the individual study plan. Part-time doctoral students have the right to supervision to the extent that corresponds to the degree of activity of the courses and study programmes. At least one supervisor must have completed supervisor training.

10.5 Examination

Public defence

Section 33, Chapter 6 of HF: The qualification descriptors for PhD's and doctorates in the fine, applied and performing arts lay down that an approved doctoral thesis is required for the award of these degrees.

The doctoral thesis shall be presented and defended orally in public. A faculty examiner (opponent) shall be appointed for this presentation. Ordinance (2010:1064).

Section 34, Chapter 6 of HF: At least one of those participating in the grading of a doctoral thesis shall be someone who does not have a post at the higher education institution awarding the degree. Ordinance (2010:1064).

Examination grades

Section 32, Chapter 6 of HF: Examinations that form part of third-cycle courses and study programmes shall be assessed in accordance with the grading system prescribed by the higher education institution.

The grade shall be determined by a teacher specially nominated by the higher education institution (the examiner). Ordinance (2010:1064).

Grading the doctoral thesis

Section 35, Chapter 6 of HF: A higher education institution may issue regulations on the grading system to be used and on public defences and grading in other respects. Ordinance (2010:1064).

Local rules:

See the rules for the public defence act and the competence requirements for the external faculty reviewer as well as the composition of the examining committee at the Faculty of Science, Technology and Media at Mid Sweden University and the rules for the licentiate seminar and the competence requirements for reviewers of the licentiate thesis at the Faculty of Science, Technology and Media at Mid Sweden University.

10.6 Degree certificate

Local rules:

A doctoral student who meets the requirements (all completed courses reported in LADOK and a pass on the dissertation including the public defence or licentiate seminar) for a doctorate or licentiate degree shall, on request, be given proof of this from Mid Sweden University.

Applications for a desired title of qualification shall be made in connection with the application for the public defence and the licentiate seminar.

10.7 Follow-up of studies

Individual study plans

Section 29, Chapter 6 of HF: An individual study plan shall be drawn up for each doctoral student. This plan shall contain the undertakings made by the doctoral student and the higher education institution and a timetable for the doctoral student's study programme. The plan shall be adopted after consultation with the doctoral student and his or her supervisors.

The individual study plan shall be reviewed regularly and amended by the higher education institution to the extent required after consultation with the doctoral student and his or her supervisors. The period of study may only be extended if there are special grounds for doing so. Such grounds may comprise leave of absence because of illness, leave of absence for service in the defence forces or an elected position in a trade union or student organisation, or parental leave. Ordinance (2010:1064).

Entitlement to supervision and other resources

Section 30, Chapter 6 of HF: If a doctoral student substantially neglects his or her undertakings in the individual study plan, the vice-chancellor shall decide that the doctoral student is no longer entitled to supervision and other study resources. Before such a decision is made, the doctoral student and the supervisors shall be given an opportunity to make representations. The case shall be considered on the basis of their reports and any other records available. The assessment shall take into account whether the higher education institution has fulfilled its own undertakings in the individual study plan. A written record of the decision shall be made, which is to include reasons for the decision.

Resources may not be withdrawn for any period in which the third-cycle student has been appointed to a doctoral studentship or is receiving a doctoral grant. Ordinance (2010:1064).

Section 31, Chapter 6 of HF: If study resources have been withdrawn pursuant to Section 30, the doctoral student may, on application to the vice-chancellor, recover his or her entitlement to supervision and other resources. The doctoral student must then demonstrate convincingly, by presenting prospective study results of considerable quality and scope or in some other way, that he or she can fulfil his or her remaining undertakings in the individual study plan. Ordinance (2010:1064).

Local rules:

A mentor shall be appointed for each doctoral student at the faculty.

11. The students' and doctoral students' insight into third-cycle courses and study programmes

Local rules:

Students and doctoral students at Mid Sweden University are able to influence the decisions

taken concerning third-cycle courses and study programmes through their representatives on the board of governors, the faculty board and the other bodies set up for third-cycle courses and study programmes. See the rules of procedure for the Faculty of Science, Technology and Media at Mid Sweden University.

The rules and regulations for third-cycle courses and study programmes at the Faculty of Science, Technology and Media are available at

<https://www.miun.se/en/staff/university/nmt/Doctoral-student-handbook-NMT/>

The admissions procedure for third-cycle courses and study programmes at Mid Sweden University is available at <https://www.miun.se/en/staff/university/nmt/Doctoral-student-handbook-NMT/>