General syllabus for doctoral (third-cycle) studies in Robotics and AI at Luleå University of Technology

Decided by the Chair of the Board of Faculty of Science and Technology on 24 September 2020.

1. Subject description

Swedish name: Robotik och Artificiell Intelligens
English name: Robotics and Artificial Intelligence

Robotics and artificial intelligence aim to develop novel robotic systems that are characterised by advanced autonomy for improving the ability of robots to interact with the surrounding environment and humans during the execution of specific tasks.

2. Programme aim and intended learning outcome

The aim of the doctoral (third-cycle) studies in Robotics and Artificial Intelligence at the University is to give the doctoral student specialised knowledge in Robotics and Artificial Intelligence, 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 Robotics and Artificial Intelligence, 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

A person is qualified for admission to doctoral (third-cycle) studies in Robotics and Artificial Intelligence if he or she meets the general entry requirements and has successfully completed an level master program in the following areas: Electrical engineering, Mechanical Engineering, Mathematics, or Computer Science, or has a related Master of Science degree in Engineering/Master of Technology or equivalent degree. An applicant also meets the specific entry requirements if he or she has acquired substantially equivalent advanced knowledge in another way, in Sweden or elsewhere.

3.3 Selection

For each subject in which doctoral (third-cycle) courses and study programmes are offered, a general study syllabus is required (Higher Education Ordinance (2010:1064) Chapter 6 Section 26). The general study syllabus must include the details specified in this template. The admission of a doctoral student presupposes that the Chair of the relevant Faculty Board has adopted a general study syllabus for the doctoral (third-cycle) subject area. The relevant Head of Department is responsible for proposing a general study syllabus to the Chair of the relevant Faculty Board in accordance with the established template. Text in italics describes how to complete the template and should thereafter be deleted.

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 (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 Robotics and Artificial Intelligence.

- Assessment of the applicant's ability to benefit from third-cycle courses and study programmes in the research subject in accordance with criteria for methodical cogency, theoretical awareness, critical thinking capacity, autonomy and originality, and communicative skills.
- Previous studies and knowledge: the study programme(s)/course(s) completed by the applicant and results thereof.
- Specific subject knowledge (state)
- Personal characteristics, relevant for third-cycle courses and study programmes.
- Degree projects (master's thesis) or other written work.
- Portfolio

4. The degree

The doctoral (third-cycle) studies lead to a Degree of Doctor. Within the Robotics and Artificial Intelligence subject, 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 120 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 60 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 Robotics and Artificial Intelligence the doctoral student is awarded the title Doctor of Philosophy.
- After the completion of the Degree of Licentiate in Robotics and Artificial Intelligence, the doctoral student is awarded the title Licentiate of Science.

For each subject in which doctoral (third-cycle) courses and study programmes are offered, a general study syllabus is required (Higher Education Ordinance (2010:1064) Chapter 6 Section 26). The general study syllabus must include the details specified in this template. The admission of a doctoral student presupposes that the Chair of the relevant Faculty Board has adopted a general study syllabus for the doctoral (third-cycle) subject area. The relevant Head of Department is responsible for proposing a general study syllabus to the Chair of the relevant Faculty Board in accordance with the established template. Text in italics describes how to complete the template and should thereafter be deleted.

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

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 och 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, as specified in the three categories below, may be part of a Degree of Licentiate or of Doctor in Robotics and Artificial Intelligence.

1. Courses in Electrical engineering or Mechanical Engineering or Computer science.
2. Courses in related fields, for example, mathematics, control engineering, programming or courses of immediate relevance for the doctoral student's research specialisation.
3. General third-cycle courses, for example, research methodology, theory of knowledge, information retrieval and pedagogy.

A Degree of Licentiate must comprise at least 30 credits within category 1 and 2. A Degree of Doctor must comprise at least 50 credits within category 1 and 2, and maximum 10 credits within categories 2 and 3 (general third-cycle courses).

It is also mandatory for the PhD student to acquire knowledge about gender equality.

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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 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.

A monograph is individually written by the student and is normally around 200 pages long. A compilation thesis consists of a number of scientific articles and an introductory summary chapter linking the articles together. The summary chapter may also discuss and justify, for example, the choice of method or of theoretical frame, since the constituent articles do not allow this kind of discussion. As a general rule, a compilation thesis often includes four articles of which at least two are written with the doctoral student him- or herself as the first author. It is not unusual that the doctoral student seek to have his or her articles published in scientific journals or books - this is without a doubt a merit. However, there is no requirement for publishing the articles, and, by analogy, it is not certain that the thesis will receive a pass grade just because it includes published articles.

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 2020-09-24

If agreed between the third-cycle student and the supervisors, the new general syllabus LTU 3184-2020 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.

For each subject in which doctoral (third-cycle) courses and study programmes are offered, a general study syllabus is required (Higher Education Ordinance (2010:1064) Chapter 6 Section 26). The general study syllabus must include the details specified in this template. The admission of a doctoral student presupposes that the Chair of the relevant Faculty Board has adopted a general study syllabus for the doctoral (third-cycle) subject area. The relevant Head of Department is responsible for proposing a general study syllabus to the Chair of the relevant Faculty Board in accordance with the established template. Text in italics describes how to complete the template and should thereafter be deleted.