

## **General syllabus for third-cycle studies in Water Resources Engineering TEVVRF00**

The syllabus was approved by the Board of the Faculty of Engineering/LTH 24 September 2007 and most recently amended 17 November 2020 (reg. no U 2020/934).

### **1. Subject description**

Water Resources Engineering comprises water-related subjects of importance for the built environment in a broad sense. Emphasis is on the sustainable use of water resources, both today and in the future. Although engineering solutions are in focus, the subject also involves the interaction between such solutions and society in general. The major research areas are general hydrology, atmospheric hydrology, geohydrology, urban hydrology, hydrodynamics, coastal engineering, physical processes in lakes and rivers, and water quality, both from a chemical and biological point of view. The research carried out is often multidisciplinary and conducted both in the laboratory and field. The research includes national and international perspectives.

### **2. Objective of third-cycle studies at LTH**

The Board of LTH established the following objective for third-cycle studies on 15 February 2007.

The overall objective of third-cycle studies at LTH is to contribute to social development and prosperity by meeting the needs of business and industry, academia and wider society for staff with third-cycle qualifications. LTH shall primarily provide education leading to a PhD or licentiate in the fields of LTH's professional degrees. The programmes are first and foremost intended for the further training of engineers and architects. The programmes are designed to encourage personal development and the individual's unique qualities.

Third-cycle graduates from LTH shall demonstrate:

- proficiency in research theories and methods and in a critical, scientific approach
- both breadth and depth of knowledge within the subject of his or her third-cycle studies

The programmes aim to develop:

- creativity and independence with the ability to formulate advanced research issues, solve problems and plan, carry out and evaluate projects within a set time frame
- openness to change
- personal networks, both national and international
- social skills and communication skills
- teaching ability
- innovation skills, leadership and entrepreneurship

In order to enable students to achieve these skills and abilities, LTH provides:

- high-quality supervision and good conditions for study in a creative environment
- a good balance between basic and applied research, with openness to wider society
- a range of advanced third-cycle courses at both departmental and faculty level
- a good balance between courses and thesis work
- opportunities to present research findings at national and international conferences and in internationally recognised journals, or by another equivalent method which leads to wide exposure and circulation
- opportunities to spend time in international research environments for short or extended periods

### 3. Learning outcomes for third-cycle studies

The learning outcomes for third-cycle studies are given in the Higher Education Ordinance.

#### 3.1 Licentiate

##### **Knowledge and understanding**

For a 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

##### **Competence and skills**

For a 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
- demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity

##### **Judgement and approach**

For a 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
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning

## **3.2 Doctor of Philosophy**

### **Knowledge and understanding**

For the degree of Doctor of Philosophy 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
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular

### **Competence and skills**

For the degree of Doctor of Philosophy the third-cycle student shall:

- demonstrate the capacity for scholarly analysis and synthesis as well 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 thesis 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
- 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 the degree of Doctor of Philosophy the third-cycle student shall:

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics
- 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

### **Midway Review**

A midway review, with the aim of reviewing the doctoral student's education in relation to the learning outcomes for the degree in the Higher Education Ordinance, is to be implemented at least once during the doctoral student's programme for all doctoral students whose education is to conclude with a doctoral degree.

## 4. Admission requirements

### General requirements

A person meets the general admission requirements for third-cycle courses and study programmes if he or she:

1. has been awarded a second-cycle qualification, or
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 requirements

In the specific requirements it is possible to stipulate from the 240 credits that fits within the general requirements.

A person meets the specific admission requirements if he or she has:

1. at least 120 credits in subjects of relevance to the field of research including at least 75 second-cycle credits in a relevant field for the subject area, or
2. a second-cycle degree in civil engineering, environmental engineering, or similar

Finally, the student must be judged to have the potential to complete the programme.

Exemptions from the admission requirements may be granted by the Board of LTH.

## 5. Selection

Selection for third-cycle studies is based on the student's potential to profit from such studies.

The assessment of potential in accordance with the first paragraph is made primarily on the basis of academic results from the first and second cycle. Special attention is paid to the following:

1. Knowledge and skills relevant to the thesis project and the subject of study. These may be demonstrated through documents appended to the application and at a possible interview.
2. An assessment of ability to work independently and to formulate and tackle research problems. The assessment could be made on the basis of the student's degree project and a discussion of this at a possible interview.
3. Written and oral communication skills.
4. Other experience relevant to the third-cycle studies, e.g. professional experience.

## 6. Degree requirements

Third-cycle studies lead to a PhD or, if the student wishes or if it has been specified in the decision on admission, to a licentiate. The student also has the right to

complete a licentiate as a stage in his or her third-cycle studies, but is not obliged to do so.

The requirements for a licentiate are:

- passed courses of at least 30 credits, and
- a passed thesis of a scope corresponding to studies of at least 60 credits

The thesis and courses shall comprise at least 120 credits in total.

The requirements for a PhD are:

- passed courses of at least 60 credits, and
- a passed thesis of a scope corresponding to studies of at least 150 credits

The thesis and courses shall comprise at least 240 credits in total.

## 6.1 Degrees awarded

The programme can lead to the following degrees:

Teknologie licentiatexamen/*Licentiate in Engineering*

Teknologie doktorsexamen/*Doctor of Philosophy in Engineering*

or:

Filosofie licentiatexamen/*Licentiate of Philosophy*

Teknologie licentiatexamen/*Licentiate in Engineering*

Teknologie doktorsexamen/*Doctor of Philosophy in Engineering*

## 7. Course component

The programme is to include courses. For each course, an examiner shall be appointed at the department that delivers the course. The examiner shall draw up a written syllabus which states the course title in Swedish and English, the learning outcomes of the course, the course content and the number of credits.

The individual study plan is to include details of which courses the individual student shall or may include in his or her studies and how many credits for each course may be included in the degree. Courses taken at other faculties or higher education institutions may also be included in the study plan.

### 7.1 Licentiate

It is compulsory to attend and earn a Pass grade on the courses Research Ethics, GEM090F, Introductory Workshop for Newly Admitted PhD Students at LTH (2 credits) and at least one of the courses Advanced Hydraulics (7.5 credits) or Advanced Hydrology (7.5 credits) together with at least two faculty-wide course encompassing at least 4.5 credits. The faculty-wide courses should cover subjects like research ethics, research methodology etc.

### 7.2 Doctor of Philosophy

It is compulsory to attend and earn a Pass grade on the courses Research Ethics, GEM090F, Introductory Workshop for Newly Admitted PhD Students at LTH (2 credits) and at least one of the courses Advanced Hydraulics (7.5 credits) or Advanced Hydrology (7.5 credits) together with at least two faculty-wide course encompassing at least 7.5 credits. The faculty-wide courses should cover subjects like research ethics, research methodology etc.

## 8. Thesis

The programme shall include a research project documented in a licentiate or doctoral thesis.

### 8.1 Licentiate thesis

The licentiate thesis can be either a research paper or an investigation report based on research. The thesis should have a quality that satisfies the requirements for publication in academic journals. It may consist of several studies, at least one of which must be an international journal article. The thesis is to be presented at a public seminar chaired by an external reviewer.

### 8.2 PhD thesis

A research thesis is to be compiled and publicly defended. The thesis can be structured either as a monograph or as a compilation of internationally published articles. In the latter case, depending on the extent of co-authorship, a compilation thesis should include 4–7 articles. Regardless of the type of thesis, the doctoral student should have co-authored two articles accepted for publication in international journals at the time of the defense.

## 9. Other rules and regulations

Each research student shall be supervised by a principal supervisor and at least one assistant supervisor. The assistant supervisors shall have the qualifications of a reader (*i.e.*, docent) or particular expertise in the relevant research area.

## 10. Transitional provision

For doctoral students with an admission date of 1 January 2019 or later, it is compulsory to participate in and pass the course Introductory Workshop for Newly Admitted Doctoral Students at LTH (Introduktionskurs för nyantagna doktorander vid LTH) GEM056F or the equivalent in order to fulfil the requirements for the degree.

For doctoral students admitted on or after 1 January 2021, it is compulsory to attend and earn a Pass grade on the course Research Ethics, GEM090F.

The midway review is compulsory for doctoral students admitted on or after 1 January 2019.