

## GENERAL SYLLABUS FOR DOCTORAL STUDIES IN ATMOSPHERIC SCIENCES AND OCEANOGRAPHY

incl. general syllabus for programmes leading to a licentiate degree

Most admissions to doctoral studies at Stockholm University should be to programmes leading to a doctoral degree.

National regulations concerning doctoral studies can be found in the *Higher Education Ordinance*, Chapters 5-7, 10, 12 and Appendix 2. In addition, the following rules and regulations are in effect at Stockholm University: *Admission Regulations for Doctoral Studies at Stockholm University*, *Regulations for Third-Cycle Education and Examinations at Stockholm University*, and *Local System of Qualifications for Stockholm University*.

This general syllabus was adopted by the Board of the Faculty of Science on 2017-07-01, and revised on 2017-06-12 and on 2020-06-17.

### 1 Subject description

Atmospheric sciences and oceanography utilise physics and chemistry together with mathematical and numerical methods to study the atmosphere and the ocean, and their interactions, over all spatial and temporal scales. In doctoral studies, theoretical and experimental methods are applied within the research fields of atmospheric physics, chemical and dynamical meteorology, and oceanography. Important areas of application include climate science and development of numerical weather prediction techniques.

### 2 Programme objectives

In addition to the provisions for first- and second-cycle studies, third-cycle (doctoral) studies should provide the knowledge and skills required to be able to conduct independent research.

The doctoral studies programme aims to give advanced knowledge in atmospheric sciences and oceanography as well as familiarity with research methodology. Courses taken as part of the programme should give a broad and general overview of the main areas and advanced knowledge within some specific areas of the subject. Through the thesis work, the doctoral student should demonstrate ability to plan and carry out research within a specific area as well as to critically review and analyse their own research results.

The programme leads to a licentiate or doctoral degree. The objectives defined for these degrees in the *Higher Education Ordinance* are presented in sections 5 and 6 below.

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## Områdesnämnden för naturvetenskap



### **3 Prerequisites and entry requirements**

Admission to doctoral studies requires that the applicant meet the general and specific entry requirements, in addition to being otherwise capable of completing the training.

#### **3.1 General entry requirements**

In order to meet the general entry requirements for doctoral studies, the applicant must have completed a second-cycle degree, completed courses equivalent to at least 240 higher education credits (of which 60 credits must be in the second cycle), or have otherwise acquired equivalent knowledge in Sweden or elsewhere.

The academic area board may permit an exemption from the general entry requirements for an individual applicant under special circumstances.

#### **3.2 Specific entry requirements**

The specific entry requirements additionally require a minimum of 90 higher education credits in any of the fields of meteorology, oceanography, physics or chemistry; and at least 15 higher education credits in mathematics as well as a degree project of at least 15 higher education credits. At least 60 higher education credits of these courses must be on the second-cycle level. In addition, proficiency in English language, equivalent to English B in Swedish high school, is required.

The specific entry requirements may also be fulfilled by a person who has otherwise acquired equivalent knowledge in Sweden or elsewhere.

### **4 Selection and admission**

The selection between candidates who meet the entry requirements will be made with reference to their ability to benefit from the training. However, the fact that an applicant is deemed able to transfer credits from previous training or professional experience may not alone give the applicant priority over other applicants in the selection process. Admission decisions are made in accordance with current delegation policies.

The selections process takes into account the familiarity and skill of the subject, ability to communicate in spoken and written English, analytical ability, creativity, initiative and independence, and ability to interact in group. The selection is based on the relevance of previous studies, grades of higher education courses (especially those at second-cycle level), quality and scope of degree projects, references, interviews, and supplemented letter of intent.

### **5 Programmes leading to a doctoral degree**

#### **5.1 General provisions**

Programmes leading to a doctoral degree require four years of full-time study (240 higher education credits) and are comprised of a thesis part, a course part of 60 ECTS and other compulsory activities, see 5.3. Although course component may precede the thesis component, the student is encouraged to discuss the topic of the thesis at an early stage.



## Objectives for doctoral degrees according to the Higher Education Ordinance

### Knowledge and understanding

For a Degree of Doctor, the doctoral student must:

- demonstrate broad knowledge in, and a systematic understanding of, the field of research, together with deep and current specialist knowledge in a defined part of this field;
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

### Skills and abilities

For a Degree of Doctor, the doctoral student must:

- demonstrate an ability to engage in scholarly analysis and synthesis, as well as in independent, critical review and assessment of new and complex phenomena, issues, and situations;
- demonstrate an ability to identify and formulate issues critically, independently, creatively, and with scholarly precision; to plan and conduct research and other advanced tasks using appropriate methods within specified time limits; and to review and evaluate such work;
- demonstrate an ability to make a substantial contribution to the development of knowledge through their own research in a thesis;
- demonstrate an ability, in both national and international contexts, orally and in writing, to present and discuss research and research findings authoritatively in dialogue with the scholarly community and society in general;
- demonstrate an ability to identify areas where further knowledge is required;
- demonstrate the potential to contribute to social development and support the learning of others, both in the fields of research and education and in other qualified professional contexts.

### Judgement and approach

For a Degree of Doctor, the doctoral student must:

- demonstrate intellectual independence and scholarly integrity, as well as an ability to make ethical assessments relating to research;
- demonstrate specialised insight into the potential and limitations of research, its role in society, and the responsibility of the individual for how it is used.

## 5.2 Individual study plan

An individual study plan must be drawn up for each doctoral student. This study plan shall be discussed in the individual committee set up for each doctoral student, consisting of student, lead and assistant supervisors and two independent researchers.

The individual study plan should include:

- a research plan, including a timetable;
- information relating to how the supervision is organised;



- a plan of which courses/what type of courses the doctoral student is going to take;
- a description of other academic activities, such as participation in seminars and reading courses;
- a description of other obligations the student and the department may have during the training period;
- a financial plan covering the entire period of study;
- if the training is not funded by means of employment, the financial plan should specify what social benefits apply to the type of funding in question, for example in the event of illness or parental leave.

The individual study plan should be drawn up in consultation with the doctoral student and his or her supervisor, and be reviewed at least once a year. The individual study plan should be adopted and reviewed in accordance with current delegation policies. When the individual study plan is reviewed, it should be specified how the doctoral studies relate to the qualitative targets outlined in the *Higher Education Ordinance*.

### 5.3 Courses and instruction

The courses taken as part of doctoral studies aim for a broad understanding within the research topic and a deep knowledge within the thesis topic. Courses shall therefore be carefully selected to fulfil the targets defined in the individual study plan.

The doctoral education has one mandatory course: The general Circulation (15 higher education credits). This course is intended to ensure the stipulated requirements of a broad knowledge within the area of atmospheric sciences and oceanography. For doctoral students that fulfil the specific entry requirements (see 3.2) with 90 higher education credits in chemistry, this course may be replaced by "Biogeochemical Cycles" (7.5 higher education credits) in combination with "Physics of the climate and the general circulation" (7.5 higher education credits). The syllabuses of these courses are decided by the board of the Department Meteorology.

In addition, a basic course in university pedagogics (3 higher education credits) is mandatory for doctoral students serving as teaching assistants at the department. Participation in a seminar on research ethics and scientific conduct (1.5 higher education credits), arranged jointly by the mathematical-physics section, is also compulsory.

Remaining courses are selected in consultation with the doctoral student's individual committee. The need for supplementary courses shall be considered. Courses or similar activities can be taken at other departments or institutes of learning or from other organizations, and will be credited according to the existing routines.

Doctoral students must hold two mandatory seminars per study year; one research seminar and one either review or discussion seminar. In total the doctoral student shall thus hold four research seminars and four either discussion or review seminars; of the latter at least one should be a discussion seminar and at least one a review seminar. After 24 months of net study time, the doctoral student shall also hold a so-called half-time seminar, which will be counted as a research seminar; this can be replaced by a Licentiate seminar (see Section 6).



In addition, doctoral students are expected to participate actively in seminars discussing current research findings, as well as participate diligently and actively in seminars given by fellow doctoral students. Doctoral students should also take advantage of opportunities to visit guest lectures both within their own research topic and in neighbouring field of science.

Doctoral students are expected to participate actively in seminars discussing current research findings. Courses or instruction may be provided in collaboration with other departments. Doctoral students are expected to make use of the provided opportunities to attend guest lectures, both in their own and adjacent subject areas.

Compulsory activities that do not generate formal credits will be continuously registered in a legally safe manner, decided by the department board.

#### **5.4 Thesis**

As part of the training, the student will write an academic thesis. The thesis should reflect the doctoral student's ability to complete the selected research task in a scholarly and independent manner, with or without collaboration. The thesis should be of such quality that it could be considered to meet reasonable requirements for publication in an academic journal of good quality. The doctoral thesis should be written either as a unified, coherent academic work (monograph) or as a compilation of academic papers with a summary. The papers may be co-authored with other people, but the doctoral student's contributions must be clearly distinguishable.

The thesis should be written in English. The department is responsible for the English summary of the thesis being translated into Swedish.

#### **5.5 Supervision**

Each doctoral student should be assigned a principal supervisor and at least one assistant supervisor. At least one of the supervisors should have received training in supervision or be considered to have corresponding qualifications. Decisions regarding supervisors are made in accordance with current delegation policies.

A doctoral student is entitled to change supervisors upon request to the departmental board, in which case the individual study plan should be revised.

#### **5.6 Examination and public defence**

In order to receive a degree, the student must have received a passing grade on the thesis and the examinations included in the programme. Each course is usually concluded with a written or oral examination. In some cases, continuous examination may take place during teaching sessions or laboratory work. Examinations are assessed using the grades Pass or Fail.

The thesis should be defended orally at a public defence seminar. The defence seminar should follow the regulations of the Academic Area of Science at Stockholm University.



## 5.7 Credit transfer

Provisions concerning credit transfer can be found in the *Higher Education Ordinance*, Chapter 6, sections 6-8.

Courses that were part of the specific entry requirements cannot be given credit for as part of the doctoral degree.

Decisions regarding credit transfer are made in accordance with current delegation policies.

## 6 Programmes leading to a licentiate degree

Under special circumstances, the academic area board may decide to allow admissions to programmes that lead to a licentiate degree worth at least 120 higher education credits. An assessment that funding can be secured for the time required to complete a licentiate degree, but not a doctoral degree, does not alone constitute such a special circumstance.

Decisions to admit students to programmes that lead to a licentiate degree are made in accordance with current delegation policies.

In cases where a student who has been admitted to a programme leading to a licentiate degree student wishes to pursue a doctoral degree, a new academic review and an analysis of the financial plan will be carried out before a decision to admit the student to a programme leading to a doctoral degree can be made in accordance with current delegation policies.

### 6.1 General provisions

A third-cycle programme comprising at least 120 higher education credits, or a part comprising at least 120 higher education credits of a third-cycle programme leading to a doctoral degree, may be completed with a licentiate degree.

Licentiate studies consist of a scientific thesis and a course part of at least 35 higher education credits and some compulsory activities, see 6.3.

Although the course component precedes the thesis component, the student is encouraged to discuss the topic of the thesis at an early stage.

### Objectives for licentiate degrees according to the Higher Education Ordinance

#### Knowledge and understanding

For a Degree of Licentiate, doctoral students must:

- 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.

#### Skills and abilities

For a Degree of Licentiate, doctoral students must:

- demonstrate an ability to critically, independently, creatively, and with scholarly precision identify and formulate issues, and to plan and, using appropriate methods, complete a limited research project and other qualified tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work;
- demonstrate an ability to present and discuss research and research findings clearly, in dialogue with the scholarly community and society in general, orally and in writing, in both national and international contexts;
- demonstrate the skills required to participate independently in research and development and to work independently in other advanced contexts.

### **Judgement and approach**

For a Degree of Licentiate, doctoral students must:

- demonstrate an ability to make assessments of ethical aspects of their own research;
- demonstrate insight into the possibilities and limitations of research, its role in society, and our responsibility for how it is used;
- demonstrate an ability to identify their need of further knowledge and to take responsibility for developing their knowledge.

### **6.2 Individual study plan**

The individual study plan should be written the same way as for a doctoral degree, see 5.2.

### **6.3 Courses and instruction**

The courses taken as part of doctoral studies aim for a broad understanding within the research topic and a deep knowledge within the thesis topic. Courses shall be therefore be carefully selected to fulfil the targets defined in the individual study plan.

At least one 15 higher education credits course of general character is mandatory; a list of selectable courses is decided by the board of the Department Meteorology. Remaining courses are selected in consultation with the doctoral student's individual committee. The need for supplementary courses shall be considered. Courses or similar activities can be taken at other departments or institutes of learning or from other organizations, and will be credited according to the existing routines.

Participation in a seminar on research on ethics and scientific conduct (1.5 higher education credits), arranged jointly by the mathematical-physics section is also compulsory.

Licentiate students must hold two mandatory seminars per study year; one research seminar and one either review or discussion seminar. In total the Licentiate student shall thus hold two research, one discussion and one review seminars.

Doctoral students are expected to participate actively in seminars discussing current research findings. Courses or instruction may be provided in collaboration with other departments. Doctoral students are expected to make use of the provided opportunities to attend guest lectures, both in their own and adjacent subject areas.





Compulsory activities that do not generate formal credits will be continuously registered in a legally safe manner, decided by the department board.

#### **6.4 Thesis**

As part of the training, the student will write a licentiate thesis. The thesis should be of such quality that it could be considered to meet reasonable requirements for publication in an academic journal of good quality.

#### **6.5 Supervision**

See 5.5.

#### **6.6 Examination**

The first paragraph of 5.6 also applies to licentiate degrees. The examination of a licentiate thesis takes place in connection with a publicly advertised licentiate seminar and should follow the regulations of the Academic Area of Science at Stockholm University.

#### **6.7 Credit transfer**

Provisions concerning credit transfer can be found in the *Higher Education Ordinance*, Chapter 6, sections 6-8.

Courses that were part of the specific entry requirements cannot be given credit for as part of the licentiate degree.

Decisions regarding credit transfer are made in accordance with current delegation policies.

### **7. Rules of transition**

Students that have started their research education according to an earlier General Study Plan may finalize their studies according to the current plan, within the nominal term plus two years. The Head of Subject decides on transition rules after a request from a doctoral student.