

## Explanatory Guide to Examination Criteria in the General Syllabus for doctoral studies in Atmospheric Sciences and Oceanography

*English translation. The Swedish version is the official version which applies.*

### General Overview

The overarching aim of doctoral education is to *develop the knowledge and skills required to independently conduct research*. Various components are included in the doctoral program to achieve this goal.

The doctoral education at the Department of Meteorology at Stockholm University (MISU) is governed by the *General Syllabus for Doctoral Studies in Atmospheric Sciences and Oceanography* (ASP; SU FV 4.1.1-2572-20), established by the Natural Sciences Faculty Board according to the applicable delegation order. The objectives that a doctoral candidate must meet are specified in the Swedish Higher Education Ordinance and are also outlined in the ASP.

The dissertation, the thesis, and the grading of the thesis are not regulated by the ASP but by the Higher Education Ordinance, Stockholm University's Rules for Education and Examination at the Doctoral Level, and the Rules for Doctoral Education within the Natural Sciences Faculty. In addition to these regulations, the department's current procedures must be followed, as well as the Guidance for doctoral defenses and the Format of Doctoral Theses within the Natural Sciences Faculty.

This document provides a more detailed interpretation of the degree requirements outlined in the documents mentioned above.

# Doctoral Degree

## Courses

The total course requirement is at least 60 credits, which corresponds to one year of full-time study. According to the ASP, the courses that contribute to doctoral education are *aimed at providing both a broad understanding of the subject and in-depth knowledge of the thesis topic*. It is therefore important that courses are selected with care to ensure they contribute to this goal. In exceptional cases, it may be necessary to participate in more courses than the 60 credits required in order to meet the course objectives in the ASP.

The program includes one compulsory course: General Circulation<sup>1</sup> (15 credits). This course is designed to address the goal of breadth within the subject. It covers the general circulation of the atmosphere in both the troposphere and the stratosphere, as well as ocean circulation; it also provides an overview of other related areas that influence these systems and reflects the research at the department.

It is also mandatory to participate in the seminar on research ethics and scientific integrity (1.5 credits), which is organized jointly within the faculty's mathematical-physical section.

For doctoral students who engage in teaching as part of their departmental duties, it is also compulsory to complete an introductory course in university pedagogy (3 credits).

Other courses should be selected in consultation with the doctoral student committee, in a way that meets the general objectives for breadth and depth as outlined in the ASP and corresponds to the individual study plan (ISP) that all doctoral students must have.

Doctoral-level courses are offered according to current regulations.

Courses can also be taken at other departments and/or centers within Stockholm University, nationally or internationally. Summer schools or similar programs, organized by other organizations or projects, can also contribute to the credit requirements as long as they are justified by the fundamental objectives and the ISP. Courses that are not motivated by these objectives can still be taken but will not contribute to fulfilling the 60 credits requirement. Credits from courses taken outside MISU will be transferred and registered in a special manner according to the applicable regulations. The following applies:

1. Doctoral-level courses will be credited with full points. It is important that the content and scope are well documented. Ideally, the course leader should indicate the course scope through a specific certificate or statement detailing how many credits the course grants students at their own institution.

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<sup>1</sup> For students admitted to the doctoral program with 90 credits in chemistry as special eligibility, this can be replaced with Biogeochemical Cycles (7.5 credits) plus The Physics of Climate and Circulation Systems (7.5 credits).

2. Master-level courses may be selected as supplements and are usually credited with full points.
3. Bachelor-level courses are credited with 50–100% of their nominal points, depending on the course's level and content, after an assessment by the Head of Subject.

## Other Obligatory Components (No Credits)

Each doctoral student is required to hold two seminars annually: one research seminar and one discussion or review seminar. Over the course of their studies, a doctoral student should give a total of four research seminars, one of which is a so-called midway seminar (see below), as well as four discussion or review seminars. Of the latter, at least one must be a discussion seminar and at least one a review seminar.

Each doctoral student must hold a midway seminar in the semester when they have completed 24 months of net study time. This can be replaced by a Licentiate seminar (see below). The execution of the midway seminar is regulated separately, and both the execution and participation in these seminars must be documented in a specific manner.

## Dissertation

A doctoral thesis must be written and publicly defended. No thesis is like any other. Individual differences exist and must be allowed; the purpose of the following rules is to provide guidelines on the minimum quantitative scope of a thesis, but do not ensure that the quality is adequate. Ultimately, it is the examination committee that decides whether a thesis is acceptable.

A doctoral thesis at MISU is typically a compilation thesis, consisting of a summary of about 30-50 pages, along with several attached articles.

The summary should be based on the results of the articles, while also being able to be read independently of them. The purpose is to put the dissertation work in perspective and, to some extent, make the results accessible to a broader audience. The summary is not a standalone research article, and it is written independently by the doctoral student. In the summary, the doctoral student's contribution to the cited articles must be clearly identifiable and documented, for example, in a separate section.

The aim is for a doctoral thesis at MISU to contain 3-5 articles, and as a general rule, it should include at least three articles with the doctoral student as the first author. Of these three articles, at least one must be accepted or published in a recognized journal, one must be submitted to such a journal, and one may be a manuscript ready for submission.

It is possible to deviate from this general rule under certain circumstances, but the scope of the doctoral student's work should at least correspond to the basic rule. Examples of this could be if the doctoral student is the first author of two articles but has made significant contributions to one or more other studies, or if two or more doctoral students lead a joint study and their contributions are significant.

A decision to deviate from the general rule must be made in consultation with the doctoral student committee at least one year before the planned defense. For planning

purposes, this can ideally be done earlier. The plan should be presented to the Head of Subject, who can consult colleagues as necessary to assess whether the planned thesis is likely to be defensible at the time of the defense. The Head of Subject will then provide recommendations to the doctoral student.

In the case of an extended publication process, it may be decided to deviate from the general rule closer to the defense date; in this case, documentation explaining why publication has been delayed compared to what is considered normal must be submitted to the doctoral student committee and the Head of Subject.

## Disputation

The thesis must be defended at a public defense, discussed by an external opponent, and assessed by an examination committee according to the applicable rules for the field of science.

The first step in planning the assessment procedure is an internal review conducted at the department; there are also specific rules for this. At MISU, the internal reviewer typically also serves as an alternate member of and coordinator for the examination committee, which means that the committee usually lacks regular representation from the department.

The disputation is led by a chair from the department, and it is organized so that the candidate first presents their work for 15-20 minutes, followed by the opponent's presentation for about 10 minutes, which aims to place the thesis in a broader scientific context. This is followed by the opponent's critical review, which should take the form of a scientific discussion between the candidate and the opponent. The disputation concludes with an open question session, where the examination committee typically begins with their questions, after which the audience is invited to ask questions.

There is no upper time limit for the disputation, and all questions must be answered or discussed. A disputation typically lasts about 2 hours; if it exceeds this time, a short break should be taken.

## Licentiate Degree

A Licentiate degree can be a step on the way to a doctoral degree, but it can also be a goal in itself. In the latter case, special rules apply to the admission procedure. Regardless of the final goal, a plan for a possible Licentiate degree should be discussed in the first individual study plan at the first meeting of the doctoral student committee.

For a Licentiate degree, according to the ASP, 35 credits of approved courses are required, one of which is a compulsory basic, but optional course, participation in the faculty-wide seminar on research ethics and scientific integrity (1.5 credits), as well as the completion of mandatory seminars: two research seminars and one review seminar or one discussion seminar.

In addition, a thesis is required, which must consist of at least one article, which does not need to be published, or the equivalent, along with a summary. The purpose of the summary in the thesis is similar to that for a doctoral thesis (see above), but its scope is

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smaller, around 10-15 pages. The thesis must be presented at a public Licentiate seminar. There is a specific procedure for Licentiate seminars, decided by the Natural Sciences Faculty, and special application regulations at MISU.