

Examination criteria for the research education (PhD or Licentiate)

General

The overriding aim for a research education is to *develop the knowledge and ability to conduct independent research* and the different components of the research education are designed to meet this target.

The research education at the Department of Meteorology, Stockholm University, (MISU) is regulated by the *General syllabus for doctoral studies in Atmospheric Sciences and Oceanography* (General Study Plan, GSP: SU FV 4.1.1- 2572-20), established by the Board of the Science Area, and according to the Delegation of Authority. The overarching goals are established by the government in the Higher Education Ordinance; these goals are also cited in the GSP.

The current document is a somewhat detailed interpretation of the examination criteria in the GSP.

PhD

Courses

A total of 60 credits of coursework, corresponding to one year of fulltime studies, is required. The GSP stipulates that courses generating credits are those that *aim for a broad understanding within the research topic and a deep knowledge within the thesis topic*. The selection of courses to contribute to this aim is therefore important; courses given at MISU are listed on the web.

There is one compulsory course: The General Circulation¹ (15 credits). This course is designed specifically to fulfil target on breadth within the research topic. Its focus is on the general circulation of the atmosphere and ocean, but it also briefly covers several related and important subareas with influence on this, and also reflect the different areas of research at the department.

Participation in the seminar on *research ethics and scientific honesty* (1.5 credits), jointly organized within the mathematic-physics sub-faculty is also compulsory.

For those students that take part in education as a part of assistantships, a course in basics university pedagogics (3 credits) is also compulsory.

¹ For those students that are fulfilling the special admission requirement with 90 credits in chemistry, this course can be exchanged for Biogeochemical Cycles (7.5 credits) plus Physics of climate and circulation systems (7.5 credits).

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Other courses are selected in consultation with the student's committee and shall aim to fulfil the overarching aims on breadth and depth and also correspond to the specific targets in the individual study plan, that all students must have. The director of studies conducts a survey among the students every autumn to determine which courses should be offered at MISU the following year; under normal circumstances three students are required to motivate that a course is offered.

Courses can also be taken at other departments and/or centers within the university, within the country and internationally. Also so-called "summer courses" or similar, arranged by other organizations or projects can generate credits, provided that they contribute to fulfilling the stated aims. Courses that do not contribute to these aims can of course also be taken but will not generate credits.

Finally, it is possible to arrange topical courses designed for small groups or single students on a one-time-only basis to fill particular gaps; such a course need to be approved by the PhD program director and special rules apply.

Courses taken outside MISU are credited and registered according to current regulations, after being claimed on a special form:

- 1) PhD-level courses are fully credited. It is important that content and extent of the course is carefully documented. Preferably the organizer of the course shall certify the result in a certificate or statement and also indicate the extent or how many credits students at the host department would normally be credited.
- 2) MSc-level courses are normally fully credited.
- 3) BSc-courses are credited to 50-100% of the nominal credit, depending on the level of difficulty and student's background, as judged by the Director for the PhD program.

Other compulsory activities (do not generate credits)

Each student must hold two seminars each year, one research seminar and one either discussion or review seminar. In total each student must give four research seminars, of which one is a so-called half-time seminar, and four discussion or review seminars. Of the latter there must be a minimum of one of each. Giving as well as participation in these seminars, as given by others, will be documented.

Each student must, during the semester when 24 months of net study time has been reached, hold a so-called half-time seminar. Half-time seminars are regulated in a separate document. The half-time seminar can be replaced by a Licentiate seminar; see below.

Promotion

There are two steps in the promotion ladder for PhD students at Stockholm University; after having fulfilled 50% and 80% of the requirements for the PhD exam. Each essentially only affects salary.

To qualify for having reached 80% all course requirements must be fulfilled. In addition, three of the papers for the thesis must be completed and all compulsory seminars held except one research and one either discussion or review seminar².

To reach the 50%-level there are two options:

- 1) A Licentiate exam, which is the recommended path. The requirements for a Licentiate exam are described below.
- 2) A minimum of 40 credits course work, half the compulsory seminars (two research seminars and two discussion/review seminars) and at least one finished and submitted paper with the student as the lead author.

In exceptional circumstances, it is possible to reach the 50%-level also without a submitted paper, if there is documentation of some other substantial independent work such as field work, model development or instrument design and building necessary for the PhD project.

Decisions on reaching the 50- or 80% levels are taken by the PhD program director³ after submitting the request on a special form, signed by the PhD-student, supervisors and committee members.

² In addition, the following applies according to the current local labor agreement: If the 80% level has not been obtained at the time when the student will be given the employment agreement for the final 12 months, and the employer after consulting with the supervisors, makes the judgement that this will happen within the upcoming 6 months, the student shall have a salary at the 80% level.

If a PhD student has one year of net study time left but has not reached the 80% level, and this is not expected to happen within the next 6 months, this *must* be discussed in the student's committee. Responsibility to make this happen rests with the main supervisor. Courses of action may differ from case to case, for example extra supervision, end the studies with a Licentiate degree, or supply additional funding to allow the student to continue beyond the nominal 4 years of study time. It is, however, not allowed to ignore this situation without discussion.

³ If the 80%-level is reached during the last 12 months of net study time, the decision must be taken by the Prefekt.

PhD thesis

No thesis is like any other and large individual differences are to be – and have to be – expected; what is stated here should therefore be viewed as a guideline and not as fixed criteria. At the end, what constitutes an acceptable thesis is decided individually by each grading committee after the thesis defense.

At MISU a PhD-thesis is normally a summary thesis, consisting of an executive summary of around 30-40 pages and a number of scientific papers attached. The summary must build on the results in the papers but should also be written so as to constitute rewarding reading by itself, in isolation. The PhD candidate should author the summary independently.

The number of papers in the thesis varies depending on scope and width, (intended) journal, authorship, for example the number of co-authors and lead authorship. Typically, a thesis at MISU consist of four papers, of which two are published or accepted, one is submitted and the final paper is an unsubmitted but finished manuscript.

The PhD candidate's contributions to the papers should be distinguishable and clearly documented in the summary according to the rules. The candidate should be a main author for the papers; often this means lead author but in collaborative work second or third author may suffice. With collaborative work between PhD students within the department, the same paper can be used in more than one thesis.

Defense

The thesis should be defended at a public defense, where it is critically assessed and discussed by an external opponent and then assessed by a grading committee according to the rules by the Faculty of Science.

The first step in the assessment procedure is an internal review at the department; special rules apply also for this. At MISU the internal reviewer is often the alternate member of the grading committee, meaning that the committee typically does not have an ordinary representation from the department.

The defense is led by a chair from the department and is organized so that the candidate starts with a c:a 15 minute presentation of the thesis, followed by a 10-15 minute presentation by the opponent, meant to put the thesis in a broader scientific context. Then follows the questioning by the opponent (*opposition*), which should have the character of a through scientific discussion between the opponent and the candidate. The defense is ended with questions from the auditorium; the committee is first allowed to ask questions after which the public can also ask questions.

There is no upper time limit for the length of a defense, and all questions must be answered or discussed; however, a typical defense is around 2 hours or maybe somewhat

longer. If the defense is expected to go on for much more than two hours, the chair should call for a break after about two hours.

Licentiate

A Licentiate can be a step towards a PhD but is also a degree in itself. In the latter case, special admission rules apply. Regardless of the final target, the plan for a taking a Licentiate exam or not must be discussed at the student's fist committee meeting and included in the ISP. Special faculty and department regulations exist for the Licentiate exam.

For a Licentiate exam 35 credits course work is required including one main 15 credit course according to the rules in the GSP, participation in the compulsory seminar on *research ethics and scientific honesty* (1.5 credits) and half of the compulsory seminars; two research seminars one review seminar and one discussion seminar.

Additionally, a thesis is required, composed of at least one scientific paper (a report or an article that does not have to be submitted) and a short summary (typically < 10 pages). If the thesis has more than one paper, the summary can be shorter (~3-5 pages). The thesis must be defended at an open seminar where it is assessed by an external opponent and by a grading committee.



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