

## GOVERNING DOCUMENT

Subject area: Research and doctoral education

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## General syllabus for the doctoral programme in the subject of:

### SOIL SCIENCES

Valid as of 1 January 2013

Department to which the syllabus applies	Subject code	Specialisation (if applicable)
ECOLOGY	NLMARK00	-
SOIL AND ENVIRONMENT	NLMARK01	-
SOIL AND ENVIRONMENT	NLMABI01	Environmental physics
SOIL AND ENVIRONMENT management	NLMAHY00	Agricultural water
SOIL AND ENVIRONMENT	NLMAJO00	Soil management
SOIL AND ENVIRONMENT	NLMAMA00	Soil biology
SOIL AND ENVIRONMENT science	NLMJOR00	Soil chemistry and soil
SOIL AND ENVIRONMENT	NLMAVA00	Water quality management
SOIL AND ENVIRONMENT	NLMAVÅ01	Soil fertility and plant nutrition
AGRICULTURAL RESEARCH FOR NORTHERN SWEDEN	NLMABI00	Soil biology
FOREST MYCOLOGY AND PATHOLOGY	NLMARK04	-
AQUATIC SCIENCE AND ASSESSMENT	NLMARK02	-
CROP PRODUCTION ECOLOGY	NLMARK03	-

The goals and design of the programme may vary between departments (see 4. Miscellaneous)

### *Regulations for third-cycle (doctoral) education at SLU*

These can be found in the [Guidelines for third-cycle \(doctoral\) education](#) (reg. no SLU ua Fe.2012.40-3218) and [Admission regulations for third-cycle \(doctoral\) education at SLU](#) (reg. no. SLU ua Fe.2012.4.4-3467). These governing documents lay out rules and recommendations for *entry requirements, recruitment and admission, joint programmes leading to a double or joint degree, scope and content of the programme, planning and follow-up of the programme, procedure when a course or study programme is unsatisfactory, examination and degrees.*

General study plans for subjects within the doctoral studies can provide additional, subject-specific rules in addition to these joint rules. This document specifies the subject-specific rules for the subject soil science. In other respects the third-cycle studies in this subject shall adhere to the Guidelines for third-cycle education and the Admission regulations for third-cycle education at the Swedish University of Agricultural Sciences.

### *1. Purpose and objectives*

After completing the programme, the student should be familiar with the general tools of science as well as the research methods that are typical of the subject field soil sciences. The subject includes the study of soil composition, various chemical, physical and biological processes in the soil, soil as the basis for plant production, the interactions between the soil, the plant and the atmosphere, how the soil and plants react to environmental disturbances and how water can be used, handled and maintained (see appendix for specialisations). The purpose is to meet the qualitative targets for third-cycle studies specified in the Higher Education Ordinance, Annex 2 – Qualifications ordinance.

### *2. Entry requirements*

Those admitted shall meet the following specific entry requirements.

The specific entry requirements are normally knowledge corresponding to at least 60 credits in soil science or corresponding knowledge. For persons who have received a degree in a main subject other than soil sciences or who have studied at a university other than SLU, eligibility is assessed on a case-to-case basis, using the requirement above.

### *3. Scope and content of the programme*

The programme contains two main elements: research and coursework.

#### **Research**

During their studies, the student shall carry out independent research which is presented in a compilation thesis or monograph. The compilation thesis includes a summary and 3-5 works (1-2 for a licentiate degree). All the works shall be of such a standard that they may be published in refereed international scientific publications. The doctoral student shall be the lead author and shall have provided the most essential contributions to at least two of the papers. A doctoral thesis shall correspond to studies of at least 180 credits, and a licentiate thesis shall correspond to 90 credits.

Parts of the studies can take place abroad or at another Swedish higher education institution/university. Doctoral students should be given opportunity to participate in international courses and conferences.

## Courses

The student is required to undertake coursework which corresponds to at least **45-60** credits for a Degree of Doctor, and at least **25-30** credits for a Degree of Licentiate. These studies shall include suitable general courses (10-15 credits) as well as individually selected subject courses (30-50 credits). Pedagogical training and writing of scientific articles are important parts of the education. General courses in teaching in higher education and participation in teaching at a first-cycle level should therefore be part of the education, as should first-cycle courses in the philosophy of knowledge and academic writing. See appendix for compulsory elements.

### *4. Miscellaneous*

Further information about third-cycle studies is available in SFS 2006:1053, and information about grants can be found in SFS 1995:938 as amended by 1998:81 (reprint), 1998:161 and 2006:1053. Information about third-cycle studies at SLU is available in the Admission regulations for third-cycle (doctoral) education (reg. no SLU ua 41-1482/07) with the annex to the Board's decision of 26 April 2007, reg. no SLU ua 41-1482/07, the Vice-Chancellor's decision and the guidelines for doctoral education at the Faculty of Natural Resources and Agricultural Science (reg. no SLU ua 40-1244/08). Each department to which the third-cycle subject area is linked can choose to specify requirements in addition to those in this study plan. These requirements are to be specified in an annex.

### *5. Annexes*

Annex 1 – Department of Soil and Environment, specialisations and specific requirements

## ANNEX 1

### Department of Soil and Environment

#### Specialisations

The Department of Soil and Environment offers doctoral education in soil science with one of the following specialisations:

##### *Environmental physics*

Biogeophysics concerns the transport and storage of water, heat and related matter in the soil-plant-atmosphere system. The subject includes studies of both the connections between soil, plants and atmosphere and studies of individual parts of the system that are relevant to the system's function.

##### *Agricultural water management*

Agricultural water management concerns water issues related to crop production and landscapes, with a special focus on water as a production factor and its regulation through technical means. The subject includes ground water regulation through draining and irrigation, soil maintenance and soil improvement, and international and urban soil and water issues.

##### *Soil management*

One general goal within soil management is to develop sustainable management systems with the least environmental impact possible while taking the individual farmer's economy into consideration. Intermediate objectives include optimising the ground structure, improving growing conditions, minimising loss of plant nutrients, creating more effective weed management and minimising energy losses.

##### *Soil biology*

The study of the soil's organisms, the processes that are governed by the organisms and the factors that affect organisms and processes. This concerns the organisms' interplay with crops and growers, the organic substance as a fertility factor and the use of organic fertilisers.

##### *Soil chemistry and pedology*

This specialisation concerns the ground's minerogenic and organogenic components regarding their chemical and structural composition and the importance of this for exchange processes with vegetation (crops) and the surrounding water environment. The soil is a key component for understanding the biogeochemical flows and it is therefore studied from an ecosystems perspective. The specialisation in soil chemistry and soil science

includes both farmland and forests, nationally and internationally. The fundamental subject components are mineralogy, soil chemistry and soil science, and the parts of ecosystem ecology that concern the biogeochemical cycles

*Water quality management*

The effect of crop cultivation on surface water and ground water. Especially the fundamental mechanisms behind nutrient and material flows.

*Soil fertility and plant nutrition*

The subject concerns the presence, bonding and freeing of essential and other minerals in the soil. The plant's mineral needs, the minerals' function in the plant and the effect on crops and the crop products' quality. Deficiency symptoms in cultivated plants, determination of nutrient and lime requirements, manure and liming materials, and short and long term measures for soil maintenance and care.

## Specific requirements at the Department of Soil and Environment

*The following elements are compulsory for all doctoral students admitted at the department:*

*Introductory course* (7 credits, compulsory for students working towards a licentiate or doctoral degree). In the first year (preferably the first six months) of the doctoral studies, the student shall carry out a literature review in their subject field, write an introductory paper (10-15 pages, in English) and present it to the supervisory group and other interested persons within the same research group. The doctoral student shall also write a summarising description of the project (half an A4 page in English) that is suitable for publishing on the department's website. The project description and introductory paper are, after approval from the main supervisor, submitted for approval to the doctoral education committee at the department.

*Seminar course* (5 credits), compulsory for doctoral students). The seminar course includes the doctoral students' half-time seminars.