



LUND UNIVERSITY

Faculty of Science

18 December 2013

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Faculty Board

## General Syllabus for Third-Cycle Studies in Geobiosphere Science

Specialisation in *Physical Geography and Ecosystem Science*, NAGBVN01

Specialisation in *Lithosphere and Palaeobiosphere Sciences*, NAGBVB01

Specialisation in *Quaternary Sciences*, NAGBVK01

Specialisation in *Geographical Information Science*, NAGBVG01

*This is a translation of the general syllabus approved in Swedish.*

**This syllabus was approved by the Board of the Faculty of Science on 18 December 2013 and applies to third-cycle students admitted from 1 January 2014.**

**The syllabus is based on the Higher Education Ordinance (1993:100) Chapter 6 Sections 1–11, 25–36, Chapter 7 Sections 34–41 and Annex 2 Qualifications Ordinance.**

### 1. Available degrees

The programme described in this syllabus can lead to one of the following degrees:

Doctor of Philosophy in Geobiosphere Science with one of the above-mentioned specialisations

Licentiate of Philosophy in Geobiosphere Science with one of the above-mentioned specialisations

In consultation with the Faculty of Engineering/LTH, the Faculty Board has decided (NA35 643/2005) that students admitted to third-cycle studies at the Faculty of Science on the basis of an MSc in Engineering shall be entitled to be awarded the degrees of Doctor of Philosophy in Science or Licentiate of Science without special application.

### 2. Subject description

Geobiosphere Science is the general discipline for research studies at the departments of Physical Geography and Ecosystem Science and Geology. The general discipline comprises four specialisations: Physical Geography and Ecosystem Science (NEV), Lithosphere and Palaeobiosphere Sciences (BGG),

Quaternary Sciences (KVG) and Geographical Information Science (GIV). The two departments are both part of the Centre for Geobiosphere Science (CGB).

Research in Geobiosphere Science is focused on the composition and dynamics of the Earth, the evolution of organisms, the processes and ecosystems of the Earth's surface, and natural and anthropogenic environmental changes on different scales. The current research areas are described on the departmental websites [www.nateko.lu.se](http://www.nateko.lu.se) and [www.geol.lu.se](http://www.geol.lu.se).

#### **Specialisation in Physical Geography and Ecosystem Science, NAGBVN01**

Research in Physical Geography and Ecosystem Science comprises studies of landscapes and ecosystems, including their resources and changes as a result of natural processes and human impact. Climatology, the study of climate change, is a significant component, as are the processes that affect the exchange of mass and energy between ecosystems and the atmosphere. Ecosystem Science deals with vegetation dynamics, ecosystem processes and biogeochemistry among other subjects. The research is strongly focused on cross-disciplinary studies of environmental and climate change from both local and global perspectives, and with exogenous processes applied to geomorphological changes to landscapes in different climate environments. A significant aspect of the specialisation is the development and application of methods of remote observation of the Earth and of geographical analysis.

#### **Specialisation in Lithosphere and Palaeobiosphere Sciences, NAGBVB01**

Research in geology focuses on physical, chemical and biological processes from the formation of the Earth to the present. The principal aim is to arrive at a holistic view of the development of the lithosphere and of the processes that create and change the Earth's crust and provide the conditions for the development of the Earth and organic life. A further aim is to reconstruct ancient environments, climates, sea levels, geographical conditions and flora and fauna developments, and to understand the processes and causes behind local, regional and global changes. By focusing on the fourth dimension, time or 'deep time', Lithosphere and Palaeobiosphere Sciences achieve a holistic perspective on the geobiosphere and its development.

#### **Specialisation in Quaternary Sciences, NAGBVK01**

Research in Quaternary Sciences focuses on physical, chemical and biological processes during the Quaternary period, primarily through dating and stratigraphic analysis of terrestrial and marine sediments, and through mapping and modelling of processes and connections in the Earth system. Changes in the climate, the expansion and reduction of ice, sea levels, hydrology, circulation in seas and the atmosphere, vegetation, fauna and human development are the foundations for basic research in Quaternary Sciences as well as for methodological development and applied research in the form of, for example, geophysics, hydrogeology and the geology of earth resources. The general aim is to increase the understanding of the complex system of the Earth and its most recent geological history. The research is often closely associated with issues of ongoing and future changes to the climate and environment.

#### **Specialisation in Geographical Information Science, NAGBVG01**

Research in Geographical Information Science (GIS) is both intradisciplinary and associated with other disciplines through applied GIS. The key issues of the

specialisation concern methods of collecting, integrating, storing, analysing, distributing and presenting geographical data in the form of primary field data, secondary data (e.g. remote analysis data) and other geographical databases. Among the research areas in the discipline are the integration of long-term data and models (of ecosystem processes, for example) and studies of systems of collection (primarily through remote analysis) and distribution (primarily web-based). The research is often cross-disciplinary, involving links to hydrology, health issues, demography, climatology and community planning, among other subjects.

### **3. Objectives**

Third-cycle courses and study programmes shall be based fundamentally on the knowledge acquired by students in first- and second-cycle courses and study programmes, or its equivalent. In addition to the requirements for first- and second-cycle courses and study programmes, third-cycle courses and study programmes shall develop the knowledge and skills required to be able to undertake autonomous research.

The third-cycle programme in Geobiosphere Science aims to be an education of the highest international standard capable of increasing scientific expertise and contributing to an understanding of major geobiosphere challenges to society and research. Furthermore, the programme aims to provide students with

- general knowledge of the composition and dynamics of the Earth, the development of organisms, the processes and ecosystems of the Earth's surface, and natural and anthropogenic environmental changes on different scales.
- advanced professional and specialist expertise in one of the specialisations demonstrated through a major independent project in the form of a Licentiate or PhD thesis.
- familiarity and contact with the international research forefront and current debates in their own research areas through courses, reading, conference participation and individual research.

The general outcomes for third-cycle courses and study programmes are defined in the Higher Education Ordinance Annex 2 Qualifications Ordinance.

#### **3.1. Outcomes for a degree of Doctor**

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

For the degree of Doctor 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, and
- 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 the third-cycle student shall

- demonstrate the capacity for scholarly analysis and synthesis as well as the ability 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 and
- 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 the third-cycle student shall

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

### ***Outcomes for a degree of Doctor in Geobiosphere Science***

On completion of the programme, the doctoral student shall demonstrate the knowledge and skills to

- in general terms, describe changes and explain connections in one or several of the Earth's dynamic systems from both long-term and short-term perspectives and thereby demonstrate understanding of the dynamics of the natural processes of the Earth
- demonstrate specialised knowledge within the areas associated with the student's specialisation
- independently analyse, critically assess and draw relevant conclusions about complex geobiosphere connections based on empirical data and/or models.

### **3.2. Outcomes for a degree of Licentiate**

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

For a Degree of 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 Degree of Licentiate the third-cycle student shall have:

- 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, and
- 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 Degree of 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, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

#### ***Outcomes for a degree of Licentiate in Geobiosphere Science***

On completion of the programme, the research student shall demonstrate the knowledge and skills to

- in general terms, describe changes and explain connections in one or several of the Earth's dynamic systems from both long-term and short-term perspectives and thereby demonstrate understanding of the dynamics of the natural processes of the Earth
- demonstrate specialised knowledge within the areas associated with the student's specialisation

## **4. Admission requirements**

The requirements for admission to third-cycle courses and study programmes are that the applicant meets the general and specific entry requirements that the higher education institution may have laid down, and is considered in other respects to have the ability required to benefit from the course or study programme.

### ***General admission requirements***

A person meets the general entry 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 head of department may permit an exemption from the general entry requirements for an individual applicant, if there are special grounds.

*Transitional provision:* Those who meet the general admission requirements for doctoral programmes before 1 July 2007 will also be considered to meet the general admission requirements for third-cycle courses and study programmes until the end of June 2015.

If a specific number of credits or a qualification from previous first- or second-cycle courses and study programmes are required for admission to third-cycle courses and study programmes, those with corresponding credits or qualifications from undergraduate programmes awarded before 1 July 2007 will also be eligible.

### ***Specific admission requirements***

To be admitted to the third-cycle programme in Geobiosphere Science the student must have a second-cycle degree of at least 60 credits specialising in physical geography and ecosystem science or geology including a degree project of at least 30 credits. Some research tasks may, however, require specialisations other than physical geography and ecosystem science or geology, such as biogeophysics, geophysics, biogeochemistry, geochemistry, ecosystems analysis, ecology, biology, geography, geographical information science or similar subjects, in which case one of these subjects can be accepted as a specialisation qualifying for admission to the programme. Equivalent knowledge acquired through corresponding programmes will be assessed individually. To be admitted to the programme, the student must also demonstrate spoken and written proficiency in English.

## **5. Selection**

In selecting between applicants who meet the requirements, their ability to benefit from the course or study programme shall be taken into account. However, the fact that an applicant is considered able to transfer credits from prior courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants.

The following selection criteria will be applied:

Study record from undergraduate and Master's courses or the equivalent. The breadth, depth and relevance of undergraduate and Master's courses or the equivalent. The quality of the degree project and other independent work.

Other knowledge and skills of relevance to the research specialisation.

Suitable candidates should be called to an interview, if possible.

The recruitment and selection to third-cycle studies must always take diversity and gender balance into account, in compliance with the Lund University gender equality policy, equal opportunities policy and diversity plan. The underrepresented gender should always be given precedence in cases of equal qualifications, unless there are valid reasons to the contrary.

## 6. Degree requirements

The completion of the third cycle programme results in a degree of Doctor of Philosophy or, if the student so wishes or if this is stated in the admission decision, a degree of Licentiate. The student may also but is not obliged to complete a degree of Licentiate as a stage in the third-cycle programme.

The degree of Doctor comprises 240 credits and the degree of Licentiate 120 credits.

For a degree of Doctor or Licentiate the research student must have successfully completed a PhD or Licentiate thesis and passed all courses and other components specified below. The head of department (or person to whom the task has been delegated) is to check and determine if all the formal requirements of a degree of Doctor or Licentiate have been satisfied.

### 6.1. Thesis

The programme is to include a research project documented in a PhD or Licentiate thesis. The thesis is to be defended orally at a public defence and reviewed by a faculty examiner (PhD thesis) or critical reviewer (Licentiate thesis).

#### *PhD thesis*

The PhD thesis is to comprise 180 credits.

The PhD thesis can be designed as *compilation thesis* or as a *monograph*.

A compilation thesis consists of copies of a number of research articles or manuscripts and a summarising chapter. The articles may be written by the doctoral student individually or in cooperation with others, but the summarising chapter must be written individually by the doctoral student. The research articles must be of a quality required for publication in recognised peer-reviewed journals and it must be possible to determine the contributions of different authors. The summarising chapter is to consist of an introduction to the research area of the thesis and a presentation and discussion of the findings of the articles. The presentation and discussion shall be written in a form and style that is independent and different from the articles. This makes it possible to situate the findings in a wider context.

A monograph thesis is a unified report including descriptions of the research issue, research questions, methods, analysis, findings and discussion.

***Licentiate thesis***

The Licentiate thesis is to comprise at least 75 credits.

The Licentiate thesis can be designed as a summary of at least one research article (or manuscript), written by the student individually or in cooperation with others, or a unified research report (monograph). The thesis must be of a quality required for publication in recognised peer-reviewed journals and it must be possible to determine the contributions of different authors. For more information on summary and monograph theses, please see compilation thesis and monograph thesis above.

**6.2. Courses and other programme components**

The courses and other components of the third-cycle programme in Geobiosphere Science are to comprise 60 credits for a degree of Doctor and 30–45 credits for a degree of Licentiate.

The required courses and other components can be offered at Lund University or at other higher education institutions. The head of department (or person to whom the task has been delegated) determines the number of credits that can be transferred from courses and other components offered at other faculties or higher education institutions.

***Compulsory courses and other components*****All specialisations**

An introductory course to research studies of at least 1.5 credits, of which 0.5 credits is for all doctoral students at the Faculty of Science

Problem analysis, 8 credits

Introduction to teaching methods (compulsory for doctoral students who teach) (3 credits)

Midway seminar, 1.5 credits

In addition to earning credits from these components, research students are required to present their research at recurring departmental seminars or other events specifically arranged for third-cycle studies.

**For the specialisation in Physical Geography and Ecosystem Science**

General Physical Geography, 4 credits

**For the specialisation in Quaternary Sciences**

General Quaternary Sciences (literature seminars), 8 credits

***Recommended courses*****General, irrespective of specialisation**

The choice of courses below depends on the research specialisation of the student.

General Geobiosphere Science

Global Elemental Cycles and Environmental Change

Research Ethics and Theory of Science



Academic Writing

Statistics

Data Management and Analysis through MATLAB for the Geosciences

**For the specialisation in Physical Geography and Ecosystem Science**

Micrometeorological Measurement – Biogeophysics

Remote Analysis of Vegetation – Theories and Modelling

GIS – Management and Modelling of Spatial Data

Climatology and Climate Change

Ecosystem Processes in Arctic and Boreal Environments

Vegetation Modelling

**For the specialisation in Geographical Information Science**

Remote Analysis of Vegetation – Theories and Modelling

GIS – Management and Modelling of Spatial Data

Cartographic Theory

**Other components that may be included the programme**

Excursions of scientific relevance (max 10 credits)

Active conference participation (max 6 credits)

Active conference participation in the form of a poster presentation or paper may be credited up to 1.5 credits per conference.