Linnæus University

Jnr: LNU 2018/2850-3.1.1.3

Programme syllabus

Faculty of Health and Life Sciences

Miljövetenskap och hållbar utveckling, masterprogram, 120 högskolepoäng

Environmental Science and Sustainability, Master Programme, 120 credits

Level
Second Level

Date of Ratification
Approved by the Faculty Board within the Faculty of Health and Life Sciences 2018-10-25
The programme syllabus is valid from autumn semester 2019

Prerequisites
Basic eligibility for second-level studies and special eligibility:
(1) 90 credits in biology, geology, chemistry, engineering and/or environmental science, including an independent project/degree project (e.g., B.Sc. thesis) worth at least 15 credits or the equivalent
(2) 15 credits in chemistry
(3) English B/6, or the equivalent

Description of Programme

The programme offers a combination of courses and practical activities to build a solid, scientific-based knowledge of natural systems and impacts of human activities in the environment. The programme offers a comprehensive training including environmental risk analyses, dispersion of pollutants in natural media, and mitigation options such as geological disposal of nuclear waste, carbon dioxide and others wastes. The knowledge acquired during the two years of the programme can be directly applied to environmental management, such as in consulting companies responsible for contaminant- and risk assessments at contaminated sites, as well as in planning and leading remediation projects at public authorities at municipal, national and international levels. The programme also provides a strong background and experience for students willing to continue their education at Ph.D. level.

Objectives

Central degree objectives in accordance with the Higher Education Ordinance

Knowledge and understanding

For a Degree of Master (Two Years), students must:

- demonstrate knowledge and understanding in their main field of study, including both broad knowledge in the field and substantially deeper knowledge of certain

both broad knowledge in the field and substantially deeper knowledge of certain parts of the field, together with deeper insight into current research and development work
- demonstrate deeper methodological knowledge in their main field of study.

Skills and abilities

For a Degree of Master (Two Years), students must:

- demonstrate an ability to critically and systematically integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available
- demonstrate an ability to critically, independently and creatively identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work
- demonstrate an ability to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts
- demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts.

Judgement and approach

For a Degree of Master (Two Years), students must:

- demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work;
- demonstrate insight into the potential and limitations of science, its role in society and people's responsibility for how it is used;
- demonstrate an ability to identify their need of further knowledge and to take responsibility for developing their knowledge.

Content

Programme overview

The programme is divided in two years. During the first year, the students are introduced to environmental risk analyses principles, risk management of contaminated sites, and environmental risk communication. Practical activities include field work (including sampling and monitoring strategies for soils, sediments, water, and/or air) and data processing and analyses. The students work in groups with real cases, in order to understand background environmental conditions, degradation and mitigation.

The second year includes work in groups and the consolidation of scientific research methods. A special course in geological disposal of nuclear waste, carbon dioxide and other waste, which includes a research visit to disposal sites, gives students a strong background on mitigation options for waste disposal. A major part of the second year is dedicated to the individual research project (master thesis). The project is carried out within fields related to environmental science and sustainability.

The programme is entirely in English.

Courses in the programme

Year 1

Research Methodology in the Natural Sciences*, 15 credits, A1N.
The course aims to further develop and gain an understanding of the research methodsthat are used in the natural science research field. The course includes 6 subcourseswith the following content: philosophy of science, research ethics, literature searching,quantitative research methods in the natural sciences, oral presentation skills, andlaboratory safety and qualitative methods.

Environmental risk analyses*, 15 credits, A1N.
Focusing on risks associated with environmental pollution, the course deals with basic concepts and methods for hazard characterization, exposure assessment and risk characterization.

Risk management of contaminated sites*, 7.5 credits, A1N.
The course explores the principles of dispersion of pollutants in the environment and how risks can be assessed. It also discusses risk management (including remediation methods), as well as examples of important actors commonly involved on environmental issues and the pertinent legislation.

Environmental risk and disasters communication*, 7.5 credits, A1N.
The course describes various communication strategies, the role of different actors in communicating environmental risks and disasters, as well as how risk perception and attitudes are formed and integrated into the communication process.

Project course in environmental science and sustainability 1*, 15 credits, A1F.
The course aims to deepen and broaden knowledge of the subject environmental science and sustainability through a survey of current research literature. The course discusses the relationships between the three dimensions (economy, social, environment) of sustainability. Students are involved in working groups to discuss and present results of their studies. Students have the opportunity to participate of research activities developed by research groups of the department.

Year 2

Statistics for Health and Life Sciences – an Introduction*, 7.5 credits, A1N.
The aim of the course is to deepen the students' knowledge and application of statistical methods within the natural science research field. The course includes modules with ablend of theory and application of parametric and nonparametric statistics as well asmultivariate tests used to evaluate ecological and epidemiological processes.

Fieldwork and data analysis*, 7.5 credits, A1N.
This course includes planning and execution of fieldwork (including sampling of soil, water, air, etc) and lab analyses for exploration or monitoring purposes. It also includes an overview of current techniques for interpretation of data.

Geological disposal and storage*, 7.5 credits, A1N.
This course will review and discuss the main options, risks, costs, safety and monitoring techniques of sites for disposal of nuclear waste and storage of carbon dioxide. Landfills and disposals of other waste types will also be discussed. A technical visit to storage or disposal sites like the Äspö laboratory in Sweden will be included in the course.

Project course in environmental science and sustainability 2*, 7.5 credits, A1F.
The course aims to deepen and broaden knowledge of the subject environmental science and sustainability through a survey of current research literature. Students will be involved in working groups to discuss and present results of their survey. Students have the opportunity to participate in research activities developed by research groups of the department. Students may have a chance to work with data to be used in their degree project.

Degree Project in environmental science and sustainability*, 30 credits, A2E.
The course aims to give a deeper understanding in a subject within the main fields of study, environmental science and sustainability, as well as train the student's analytical and laboratory skills and the ability to write a scientific work. The students are expected to prepare and defend a master thesis.

*Course in the main field of study (environmental science)

Societal relevance
Moving towards a sustainable world is one of the most important present-day challenges of mankind. Sustainable development is the general steering principle to achieve sustainability and the main tool to reach the United Nations' goals to end poverty, protect the planet and ensure prosperity for all. This master programme prepares students to act directly in favour of sustainable development and to disseminate scientific information related to environmental issues in- and outside the academia. The programme prepares students for the job market by giving them a strong background in environmental sciences and sustainability, which are of interest for consulting companies responsible for risk assessment and implementation of remediation projects at municipal, national and international levels. The knowledge and experience acquired during the programme will also be important for students willing to continue their education on environmental sciences at Ph.D. level.

Internationalisation
The programme provides possibilities for internationalization both at home and abroad. The programme is designed to attract students from all over the world. The students' different backgrounds are actively used in lectures and seminars, e.g. as a starting point for discussions about different countries' environmental politics and attitudes towards sustainability issues. The students have the opportunity to develop part of their studies in universities abroad. Linnaeus University and the Faculty of Health and Life Sciences offer a wide range of agreements with partner universities that the students may use. Either the third or fourth semester are recommended as first choice for studies abroad. During the fourth semester, the degree project is to be executed as a full-time activity at the end of the course, allowing the student to develop the thesis at a university abroad. Exchange studies should be planned in cooperation with the programme coordinator and the faculty's international coordinator.

Perspective on the education
The principles of sustainable development permeate the entire programme. There is a strong focus on the environmental domain, but students also establish links between the societal and economic domains of sustainability as well. Students have the opportunity to do so during the entire programme, but particularly in the project courses in environmental science and sustainability 1 and 2. Equal opportunity is one of the main pillars of sustainability, and it is included in several of the sustainable development goals that will be extensively explored throughout the programme. Students of the programme obtain a wide knowledge perspective on environmental issues owing to the multidisciplinary nature of the programme and the varied backgrounds of its teachers. The programme also contributes to promoting an entrepreneurial approach and critical thinking. The programme includes an introductory course in Research Methods and Ethics, which takes into account various aspects of relevance to the programme, including research methodology, history and ethics. The programme discusses gender equality, diversity and sustainable development in medicine and health, with both historical and contemporary comparisons.

Quality Development
A continuous quality evaluation of the programme will review how the learning environment supports the learning and development of the students. Quality control work is undertaken according to the guidelines drawn up by the Faculty of Health and Life Sciences and the Department of Biology and Environmental Science. The students are

invited to participate in course evaluation after completion of each course. Course evaluation results are compiled in a course report and archived. The results of the evaluations and any changes made in the implementation of a course or its syllabus are communicated to the students the next time the course is given according to LNU's regulations. Results and suggestions for improvements are discussed in a programme board (consisting of an external representative, teachers and students) and programme committee (consisting of examiners, course coordinators and programme coordinator) which provide support for the programme's development and quality assurance.

Degree Certificate

After completion of studies that correspond to the requirements stated in the Higher Education Ordinance and those stated in the local degree ordinance at Linnaeus University, the student can apply for a degree. Those who have completed the programme Environmental Science and Sustainability, Master Programme 120 hp can obtain the following degree:

Filosofie masterexamen (120 hp)
Huvudområde: Miljövetenskap.

Master of Science (120 credits)
Main field of study: Environmental Science

The degree certificate is bilingual (Swedish/English). The Degree Certificate is accompanied by a Diploma Supplement (English).

Other Information

Students with a Master degree (60 credits) obtained from the existing master programme in Environmental risk analysis at the Faculty of Health and Life Sciences (Environmental Risk Analysis, Master Programme 60 credits – in Swedish only) may apply for admission to programme in progess, i.e. for admission to the second year of the Master programme in Environmental Science and Sustainability.

After completing half of the programme, the student can apply for a one-year Master Degree on condition that the Project course in environmental science and sustainability 1 (A1F) is replaced by a degree project for a one-year Master Degree, 15 higher education credits and that the general requirements for a one-year Master Degree are satisfied. In that case the degree will be Master of Science (60 credits) , main field of study: Environmental Science.
For the student, some additional costs may occur within the education framework e.g. travel expenses in connection with research visits.