



Programme syllabus

Master's Programme, Environmental Engineering, 120 credits

Masterprogram, miljöteknik

120.0 credits

Valid for students admitted to the education from autumn 12 (HT - Autumn term; VT - Spring term).

This is a translation of the Swedish, legally binding, programme syllabus.

Programme objectives

The information is valid for students who started the program academic year 2012/2013. Later decisions may affect year 2 in the program. Please look at www.kth.se/studies?l=en_UK for further information.

In addition to the general objectives for Masters programmes as stated in the national degree ordinance and the local degree policy of KTH, specific learning outcomes are defined for the study track Environmental Management in the Nordic Masters programme Environmental Engineering. After completing the programme requirements students shall:

Knowledge and understanding

- Demonstrate knowledge on the theoretical concepts and foundations in environmental engineering and management.
- Demonstrate in-depth knowledge on how human interventions and natural changes affect the environmental conditions in land and water resources, and what resulting effects these can cause.
- Demonstrate specialised knowledge on the tools and methods that can be applied to analyse the status of land and water resources.
- Demonstrate a sound understanding of the relation between theory and practice in environmental engineering, as well as of the linkages to other disciplines involved in environmental engineering at the local, regional and global level.

Skills and abilities

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- Demonstrate the ability to carry out qualified research tasks on contemporary problems, and in this way contribute to scientific progress in the field of study
- Demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work.
- Be able to make effective oral and written presentations of complex tasks related to environmental engineering/management using modern techniques and tools to illustrate and visualise results.
- Be able to lead and work in multidisciplinary groups and contribute to the outcome of the working task.

Ability to make judgements and adopt a standpoint

- Be able to detect normative assumptions in theoretical and societal views on sustainability.
- Demonstrate the ability to critically reflect on alternative scientific approaches for different environmental problems
- Demonstrate the ability to critically reflect on the causes of, as well as potential solutions for, new upcoming environmental problems
- Demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Extent and content of the programme

The Masters programme Environmental Engineering counts 120 hp and consists of three terms of coursework and one term for the degree project, together 2 years. The course-work encompasses a theoretical courses, exercises, projects and laboratories that aim at providing students knowledge and skills in the field of environmental engineering. All courses in the programme are at advanced (2ndcycle) level. The language of instruction is English.

The Nordic Master program Environmental Engineering is a joint two-year master program that is offered by Aalto University, Chalmers University of Technology (CTH), Technical University of Denmark (DTU), Royal Institute of Technology (KTH) and the Norwegian University of Science and Technology (NTNU). The program covers four tracks among which KTH offers the track Environmental Management together with DTU.

Environmental Management is an essential part of Environmental Engineering which refers to the interaction between human society and the environment. To meet the challenges for a sustainable management of natural resources there is a need for cross cutting professionals who are able to combine in-depth knowledge on local and global environmental impacts with expertise on strategies and tools that aim at reducing the total impact of human activities on nature and environment. This requires among others models and methods for collecting and analyzing environmental information, knowledge on the inter-dependencies between society and environmental problems, and tools and technologies for mini-

mizing environmental impacts of human activities. To prepare students for their professional career, the study track offers a sequence of technical courses and management courses as well as a number of courses on the interplay between the economic, social and environmental determinants that contribute to sustainable development.

Eligibility and selection

The general admission requirement for the Nordic masters' programme in Environmental Engineering is a completed Bachelor's degree in Civil or Environmental Engineering, corresponding to a Swedish Bachelor's degree (180 ECTS), or equivalent academic qualifications from an internationally recognised university. Students in their final year of their undergraduate education may also apply and if qualified, receive a conditional acceptance. The applicant's qualifications must include a strong working knowledge of mathematics, physics and chemistry and applicants must document that they have fulfilled the following minimum requirements:

- Mathematics: 20 ECTS, including linear algebra, calculus and differential equations
- Physics: 10 ECTS
- Chemistry: 5 ECTS

For English language proficiency following requirements are defined:

TOEFL: Paper-based: 580 (written section grade 4,5) or Internet-based test: 92 (written section grade 22)

IELTS: 6.5, no section lower than 5.5 (only IELTS Academic Training accepted).

Students with a B.Eng degree (Diplomingeniør(DK), Polytechnic(FI), Högskoleingenjör(SE) or equivalent) must have completed courses within the areas of operations research or discrete mathematics (5 ECTS) and algorithms and stochastic processes (5 ECTS).

For candidates fulfilling the above requirements, the ranking and selection of students is carried out by the partner universities on basis of the student's academic achievements.

Implementation of the education

Structure of the education

Since the program results in a double degree, student should complete at least 60 ECTS of coursework at KTH and DTU respectively. Students who apply to the masters programme in Environmental Engineering at KTH will start their first year of studies (60 ECTS) in the track Environmental Management at KTH and continue at DTU to complete their second year of studies (60 ECTS), including a 30 ECTS degree project. Another option is to start at DTU to complete the first year (60 ECTS) and continue the second year of studies at KTH (60 ECTS), including a 30 ECTS degree project. For this option students should apply to DTU.

Independent of whether students start at KTH or DTU, the Environmental Management track consists of a combination of technical and management courses, together with courses that highlight environmental

challenges in a societal context. In the first year, KTH offers courses in Environmental Impact Assessment and Strategic Environmental Assessment which are worldwide established frameworks for environmental management. In addition, a course in Environmental Chemistry and Risk Assessment is offered that provides knowledge on pollutants behavior in natural environments and remediation technologies, which prepares students for the course in Water and Wastewater Engineering. Moreover the track includes a sequence of courses in environmental management and information consisting of Environmental Data, Natural Resources Management and Environmental Measuring and Monitoring. In the courses Sustainable Urban and Rural Development or Environmental Aspects of the Built Environment environmental problems are analysed in a societal context provides a basis for the course Governance of Land and Water Resources which focuses on alternative strategies for a sustainable management of natural resources.

The second year at DTU offers courses on principles and tools for environmental management in different settings and socio-economic perspectives on environmental problems. The third semester also allocates 10 ECTS for electives. The fourth semester is devoted to the degree project.

For students who start at DTU, the first year consists of courses on tools for environmental systems analysis and environmental management. In addition, a course on chemical eco-toxicology is offered as well as two courses on the interaction between society and environment. The first year also allows students to select electives corresponding 10 ECTS. The third semester at KTH includes a number of courses which students can choose among: Environmental Impact Assessment, Environmental Data or Environmental Geology. The semester comprises two mandatory courses Project Environmental Engineering, in which students apply their collected knowledge in a practical project, and Water Treatment Processes and Technology. In the last semester students have to carry out a Degree Project.

A course in Theory of Science and Research Methodology (7,5 ects) is mandatory for all master programs at KTH and students who have not completed an equivalent course in their previous studies, should choose the course Theory and Methods of Science or equivalent during their studies in the program.

The academic year covers 40 weeks, starting in September and divided into two terms, which each consists of two study periods. Each study period concludes with a regular examination period of at least one week. In addition, three re-exam periods are scheduled, after Christmas, after the regular examination period of study period 4 (end of May) and before the start of a new academic year (August).

As part of the Nordic masters program Environmental Engineering, joint extra curricular activities will be organised by the institutions involved in the program, e.g. summer schools. These activities aim to exchange experiences and knowledge among the participants, and gain knowledge on a topical subject in the field of environmental engineering. All students in the program will attend these activities.

Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

During the first year at KTH, the program includes a set of courses which allows students to acquire specialised professional skills. In period 2, 3 and 4 students can choose among different courses. Students can apply to exchange a course for another course that is not included in the curriculum of the program. A decision is made from case to case considering the student's previous knowledge and relevance for the degree project. The course Theory and Methodology of Science or equivalent is mandatory. A full list of courses is included in appendix 1.

Grading system

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

All courses in the programme, including the Master's Degree project, are graded on a scale A-F, where A-E are passing grades with A as the highest grade. For some sections in the courses a grading system of pass (P) or fail (F) can be applied, for example for attendance. The grade reflects the students' performance in relation to the goals of the course (goal oriented grading).

Conditions for participation in the programme

For citizens of a country within the EU/EEA or Switzerland, the application and tuition is free of charge. Non EU/EEA students will be charged fees at the university he/she is studying in accordance with the prevailing university regulations, i.e. he/she has to pay fees for 2 semesters at KTH and 2 semesters at DTU.

Students who have been admitted to the programme have to attend the registration meeting in order to enrol for the programme. Students who received conditional acceptance should provide documented proof that he/she has a completed Bachelor's degree or equivalent to a minimum of 180 ECTS. If a student is not able to attend the registration meeting for reasons beyond his/her control he/she should register not later than two weeks after the start of the courses.

After registration in the programme, students will be registered for term 1 and 2. For registration in term 3 students should have completed at least 45hp. For registration for the degree project students should have completed at least 60 hp of the compulsory courses. Through signing the attendance list during the first week of the course, students will be registered for the course. If a student for reasons beyond his/her control is not able to attend during the first week he/she has to contact the course administrator.

Recognition of previous academic studies

The Royal Institute of Technology has a policy for recognising previous academic studies. The course that the student wants to be recognised should be similar to a course in the curriculum of the specialisation track in which the student is registered in terms of contents, level and number of credits. Moreover, the courses that the student wants to be recognised should not be part of the bachelor program that was basis for admission to the masters program. The decision on recognising documented results is made by the vice dean of education at the School of Architecture and the Built Environment upon application by the student.

Studies abroad

The Nordic master program Environmental Engineering involves one year of mandatory studies at one of the partner universities. For students in the track Environmental Management this implies that students have to complete one year of studies (60 ECTS) at DTU. The programme offers no opportunities for studies at another university except for the Master's Degree project where the student can choose to carry out a study at an organisation outside KTH/DTU. However, the program has no resources to provide support so students should make such arrangements themselves.

Degree project

The degree project comprises 30 ECTS and provides students with the opportunity to investigate a problem in depth under the supervision of experienced practitioners and researchers.

Students who start their studies in the Environmental Management track will conduct the Degree project at DTU with a supervisor from DTU and a co-supervisor from KTH. Students who start their studies at DTU will conduct their degree project at KTH with a supervisor at KTH and a co-supervisor at DTU. The supervision from each of the two degree awarding institutions involved in the study ensures the integration of the program components.

The degree project is graded on a scale A-F, where A-E are passing grades with A as the highest grade. The grading of degree projects is based on an overall assessment of working process, scientific contents and presentation.

Degree

Students who have fulfilled all course requirements in the Masters programme (120 ECTS) will be awarded a double degree:

KTH: Teknologic masterexamen, translated into English as Degree of Master of Science (120 ECTS)

DTU: Master of Science in Engineering

Website

More information on the Nordic masters program Environmental Engineering and the other tracks within the program is available on the website www.enviro5tech.org.

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Environmental Engineering, 120 credits
(TEEGM), Programme syllabus for studies starting in autumn 2012

General courses

Year 1

Recommended courses

Course code	Course name	Credits	Edu. level
AE2104	Environmental Measuring and Monitoring	7.5 hp	Second cycle
AE2304	Water and Wastewater Handling	7.5 hp	Second cycle
AE2501	Environmental Impact Assessment	7.5 hp	Second cycle
AE2502	Natural Resources Management	7.5 hp	Second cycle
AE2503	Environmental Data	7.5 hp	Second cycle
AE2507	Strategic Environmental Assessment	7.5 hp	Second cycle
AE2707	Governance of Land and Water	7.5 hp	Second cycle
AE2801	Environmental Chemistry and Risk Assessment	7.5 hp	Second cycle
AG2143	Sustainable Rural and Urban Development	7.5 hp	Second cycle
AG2806	Environmental Aspects of the Built Environment	7.5 hp	Second cycle
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle

Supplementary information

Students who apply to the masters programme in Environmental Engineering at KTH will start their first year of studies (60 ECTS) in the track Environmental Management at KTH and continue at DTU to complete their second year of studies (60 ECTS), including a 30 ECTS degree project as follows;

For students who start at DTU, the first year of studies includes following courses:

12104 Modelling of Environmental Processes and Technologies (10 ECTS)
<http://www.kurser.dtu.dk/12104.aspx?menulanguage=en-gb>

12240 Environmental Management and Ethics (5 ECTS)
<http://www.kurser.dtu.dk/12240.aspx?menulanguage=en-gb>

42631 Environment and Economics (5 ECTS)
<http://www.kurser.dtu.dk/42631.aspx?menulanguage=en-gb>

12242 Environmental Management in the Tropics (10 ECTS)
<http://www.kurser.dtu.dk/12242.aspx?menulanguage=en-gb>

42372 Life Cycle Assessment of Products and Systems (10 ECTS)
<http://www.kurser.dtu.dk/42372.aspx?menulanguage=en-gb>

12237 Chemicals in the Environment (10 ECTS)
<http://www.kurser.dtu.dk/12237.aspx?menulanguage=en-gb>

42273 Urban Planning and Sustainable Urban Development (10 ECTS)
<http://www.kurser.dtu.dk/42273.aspx?menulanguage=en-gb>

electives

Year 2

Optional courses

Course code	Course name	Credits	Edu. level
AE211X	Degree Project in Ground Water Chemistry, Second Cycle	30.0 hp	Second cycle
AE212X	Degree project in Land and Water Resources, Second Cycle	30.0 hp	Second cycle
AE230X	Degree project in Water, Sewage and Waste, Second Cycle	30.0 hp	Second cycle
AE251X	Degree Project in Environmental Assessment, Second Cycle	30.0 hp	Second cycle
AG280X	Degree Project in Environmental Strategies, Second Cycle	30.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
AE2302	Water Treatment Processes and Technology	7.5 hp	Second cycle
AE2501	Environmental Impact Assessment	7.5 hp	Second cycle
AE2503	Environmental Data	7.5 hp	Second cycle
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle

Recommended courses

Course

code	Course name	Credits	Edu. level
AE2401	Engineering Geology	7.5 hp	Second cycle
AE2708	Project in Environmental Engineering	7.5 hp	Second cycle

Supplementary information

Students who apply to the masters programme in Environmental Engineering at KTH will start their first year of studies (60 ECTS) in the track Environmental Management at KTH and continue at DTU to complete their second year of studies (60 ECTS), including a 30 ECTS degree project.

Link to courses at DTU

Semester 3 at DTU:

12240 Environmental Management and Ethics 5 ECTS <http://www.kurser.dtu.dk/12240.aspx?menulanguage=en-gb>

42631 Environment and Economics 5 ECTS <http://www.kurser.dtu.dk/42631.aspx?menulanguage=en-gb>

42470 Introduction to Industrial Environmental Management 5 ECTS <http://www.kurser.dtu.dk/42470.aspx?menulanguage=en-gb>

42372 Life Cycle Assessment of Products and Systems 10 ECTS <http://www.kurser.dtu.dk/42372.aspx?menulanguage=en-gb>

12242 Environmental Management in the Tropics 10 ECTS <http://www.kurser.dtu.dk/12242.aspx?menulanguage=en-gb>

Electives 5 ECTS http://www.kurser.dtu.dk/search.aspx?lstDepartment=11,12&lstTeachingPeriod=E1;E2;E3;E4;E5;E1A;E2A;E3A;E4A;E5A;E1B;E2B;E3B;E4B;E5B;E&lstType=DTU_MSC%C2%A4DTU_Advanced&YearGroup=2011-2012&btnSearch=Search

Semester 4 at DTU:

Degree Project 30 ECTS

For students who start at DTU, the second year of studies includes following courses, see academic plans.



Appendix 2: Specialisations

Master's Programme, Environmental Engineering, 120 credits
(TEEGM), Programme syllabus for studies starting in autumn 2012

This programme has no specialisations.