



Programme syllabus

[An accessible version of the syllabus can be found in the Course and programme directory.](#)

Master's Programme, Innovative Sustainable Energy Engineering, 120 credits 120 credits

Masterprogram, innovativ uthållig energiteknik

Valid for students admitted to the education from autumn 21 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Beyond the objectives which are specified in the Higher Education Degree Ordinance, there are also specific goals for this programme. After completing the programme, the student shall:

Knowledge and understanding

- Have a broad, scientific foundation to be able to work within the energy engineering area. It should comprise knowledge about sustainable systems, energy sources and utilization, including assessment of technical, economical, and environmentally-related consequences related to different energy conversion processes

- Show broad knowledge within this technical field, including knowledge in mathematics and natural science, and critical, deepened knowledge within selected parts of the field

Skills and abilities

- Show good ability to, independently as well as in a group, be able to apply knowledge and abilities in practical activities with regard to relevant scientific professional and social judgements and viewpoints
- Show good ability to analyze, formulate and manage the technical problems from a system perspective, with a holistic view of their life cycle, from concept / requirements to specification, development, operation and decommissioning, and the ability to set limits, determine the necessary resource usage and manage processes for problem solving / realization
- Possess individual and professional skills like languages, leadership, project management, and communication for work as an engineer in a leadership role or as a leader in a technical intensive company, or in order to be able to continue toward a research career

Ability to make judgements and adopt a standpoint

- Have very good understanding that engineering-related problems are often complex, can be incompletely defined and sometimes contain conflicting goals and conditions
- Be aware of the responsibility and the ethical viewpoints which can arise in connection with different technical, organisational, economical, ecological and social activities

Extent and content of the programme

The programme consists of 120 credits which corresponds to two years full time studies. The Programme is mainly on the second level. The language of instruction for the programme is English. The Programme is offered by six participating universities in the cooperation called Nordic 5 Tech.

Participating Universities in Nordic 5 Tech (N5T):

KTH – Royal Institute of Technology, Stockholm, Sweden
 Chalmers - Chalmers University of Technology, Gothenburg, Sweden
 DTU - Technical University of Denmark, Lyngby, Denmark
 NTNU - Norwegian University of Science and Technology, Trondheim, Norway
 Aalto University, Helsinki, Finland

Háskóli – University of Iceland, Reykjavik, Iceland has been invited to cooperate with N5T

A variety of specializations are available (see course list in appendix).

At Royal Institute of Technology KTH in Sweden, this Nordic Master Programme is divided into following two study tracks. During the two years of Programme, students will spend their time at two different universities on the basis of "year 1 university/year 2 university". For each study track there

is a university responsible for the first year of study, and another university responsible for the second year of study.

1. Energy Systems Track (First year at Aalto University in Finland and 2nd year at KTH in Sweden). For detail of courses; <http://msisee.org/the-master-programme/study-tracks/energy-systems/>

2. Bio-Energy Track (First year at KTH in Sweden, 2nd year at Aalto University in Finland). For detail of courses; <http://msisee.org/the-master-programme/study-tracks/bio-energy/>

Eligibility and selection

In order to be eligible to the master's programme, a relevant higher education degree of at least 180 credits, degree of bachelor in science or in engineering, or technical bachelor's degree preferably within Mechanical Engineering, Chemical Engineering, Energy Engineering, where courses in engineering mechanics, applied thermodynamics and heat transfer are required. Other corresponding technical or natural scientific degrees on the first level can also give eligibility, providing that courses in engineering thermodynamics, heat transfer, fluid dynamics, mathematics and numerical methods are included.. Such specific requirements may be assessed as not fulfilled if

1. The average grade is in the lower third on the grading scale used (above pass level).
2. The degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located.
3. The degree does not qualify for admission to equivalent Master level in the country where the degree is awarded.

A sound and documented knowledge of written and spoken English is required from all applicants. Applicants who do not qualify for a waiver as described by official KTH admission requirements must provide proof of English proficiency via one of the following tests:

1. IELTS – Score 6.5 or higher, with a minimum of 5.5 on written section
2. TOEFL – Minimum score 580 paper-based (written 4), 237 computer-based (written 4), or 92 Internet-based (written 22)
3. Cambridge Certificate in Advanced English (CAE) or Cambridge Certificate of Proficiency in English (CPE) – grade "A", "B" or "C"

The evaluation scale is 1-75.

Admissions is handled by one of the partners within the consortium, in accordance with the Consortium Agreement.

Implementation of the education

Structure of the education

Academic year

Each academic year consists of two semesters which are 20 weeks each. Each semester is divided into two study periods.

Structure of the programme

Admitted students may initiate studies at a partner university in accordance with the Consortium Agreement. Mobility is conducted in a one year + one year format. Selection of study location for the first semester is made by the applicant at the time of admission. Students in the program must spend at least one full academic year at each of two participating universities. The studies are ended with a fourth semester where the student performs a degree project during 5-6 months. Options for research preparatory courses exist.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The type of instruction and examination format vary between the courses and these are indicated in each official course syllabus.

The student must register for the individual courses the way each one of the partner universities decides.

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.

As the programme is a result of a cooperation agreement between KTH and five other Nordic universities other types of grading might also be used.

Grading scale is found in the course syllabus.

Conditions for participation in the programme

Participation requires admission to courses within the programme and course registration.

For studies at a higher study year there are *specific admission requirements for the courses. Admission requirements are specified in the course syllabus.*

In order to be allowed to pass from Semester 1 to Semester 2:
the students must have achieved at least 22 credits by the end of the exam period in January and must have attempted to pass all the compulsory assignments (calculations, simulations, laboratory,) present in all courses. At least 80% of these compulsory assignments should have been passed.

To pass from Semester 2 to Semester 3:

at least 50 credits should have been achieved by the end of the exam period in August, all compulsory assignments should have been attempted and at least 80% of these assignments should have been passed.

To pass from Semester 3 to Semester 4:

at least 80 credits, should have been achieved by the end of the exam period in January, all compulsory assignments should have been attempted and at least 90% of these assignments should have been passed.

Degree project

Degree project, second cycle

The programme includes a degree project for a Degree of Master that comprises 30 credits and which is usually done during spring semester of year 2.

The degree project is the finishing part of the programme. The degree project can be started when the special requirements are fulfilled.

To start the degree project at least 80 ECTS course credits should have been achieved, all compulsory assignments should have been attempted and at least 90% of these assignments should have been passed (as described under "Conditions to participate in the educational program" above).

In order to fulfil requirements for obtaining a master degree the project must be part of the required in-depth studies at second level in the main field of study for the programme. The topic of the project must be accepted by the Programme Committee.

The project can be performed either at an industry, community, agency or at one of the partner universities.

The partner universities might have special requirements for the degree project.

Degree

Conditions for a Degree of Master, 120 credits

A Degree of Master of Science is obtained after completing the degree programme. The programme

is designed so that the student, when they graduate, has fulfilled the national qualification requirements with a passing grade in all courses included in the student's study plan of 120 credits, of which

- at least 90 credits are attained in the second cycle, which includes at least 60 credits (including a 30 credit degree project) of specialised studies within the programme's main field of study.

Title of general qualification at second cycle

Degree of Master of Science (120 credits), Teknologie masterexamen

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



Appendix 1: Course list

Master's Programme, Innovative Sustainable Energy Engineering, 120 credits (TIEEM)

General courses

Year 1

Mandatory courses (57.0 Credits)

Code	Name	Credits	Edu. level
MJ1402	Introduction to Energy Technology	3.0 hp	First cycle
MJ2405	Sustainable Power Generation	9.0 hp	Second cycle
MJ2407	Sustainable Energy Utilisation	9.0 hp	Second cycle
MJ2410	Energy Management	6.0 hp	Second cycle
MJ2411	Renewable Energy Technology	6.0 hp	Second cycle
MJ2412	Renewable Energy Technology, Advanced Course	6.0 hp	Second cycle
MJ2413	Energy and Environment	6.0 hp	Second cycle
MJ2424	Computational Methods in Energy Technology	6.0 hp	Second cycle
MJ2426	Applied Heat and Power Technology	6.0 hp	Second cycle

Conditionally elective courses

Code	Name	Credits	Edu. level
ME2085	Transformation in Energy Systems and Industries	6.0 hp	Second cycle
MJ2381	Introduction to Energy Systems Analysis and Applications - Minor Course	6.0 hp	Second cycle
MJ2437	Modeling of Energy Systems - Energy Utilization	6.0 hp	Second cycle
MJ2438	Modeling of Energy Systems - Heat and Power Generation	6.0 hp	Second cycle
MJ2476	Strategies in the Global Climate Agenda	6.0 hp	Second cycle

Supplementary information

Profile Bio-Energy

Study year 1 at KTH, and study year 2 at Aalto University

Information regarding conditionally elective courses

One of the conditionally elective courses must be chosen.

Year 2

Mandatory courses (30.0 Credits)

Code	Name	Credits	Edu. level
MJ2383	Energy System Economics, Modelling and Indicators for Sustainable Energy Development	6.0 hp	Second cycle
MJ2409	Applied Energy Technology, Project Course	9.0 hp	Second cycle
MJ2413	Energy and Environment	6.0 hp	Second cycle
MJ2440	Measurement Techniques	3.0 hp	Second cycle
MJ2475	Theory and Methodology of Science for Energy Research	6.0 hp	Second cycle

Supplementary information

Course list: Information is based upon the curriculum for academic year 2020/2021.

Changes may occur.

Profile Energy System

Study year 1 at Aalto University, and **study year 2 at KTH.**

Master thesis 30 credits is mandatory



Appendix 2: Specialisations

Master's Programme, Innovative Sustainable Energy Engineering, 120 credits (TIEEM)

This programme has no specialisations.