HÖGSKOLAN
I GÄVLE

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PROGRAMME SYLLABUS

SECOND CYCLE

MASTER PROGRAMME IN ENERGY ENGINEERING, ENERGY ONLINE
Programme Code: TAETM
Established by the Board of Science and Technology
2006-11-30

Programme Syllabus

Master Programme in Energy Engineering, Energy Online, 60 HE credits

(*Magisterprogram i Energiteknik Energy Online, 60 hp****)***

This programme syllabus applies to students admitted to the autumn semester of 2007 or later.

MASTER PROGRAMME IN ENERGY ENGINEERING, ENERGY ONLINE at Högskolan i Gävle

1 General Arrangement

The education is carried out in cooperation between Högskolan i Gävle, Karlstads universitet, KTH, Linköpings universitet, Umeå universitet and Uppsala universitet. The education, which is a web-based distance education, is given in English. The programme turns to those with a Bachelor of Science in Engineering and who want to specialise in energy engineering. With six higher education institutions interacting, it is possible to specialise in the following areas: renewable energy sources, primary energy transformation, energy use, energy economics and systems, and in energy-related fluid mechanics.

The labour market for a master's degree in energy engineering exists, for example, at the energy companies, the processing industry, and within the consultant and contract business. Expected tasks are, for example, research and development, project management and efficiency improvement in the field of energy engineering. The master programme Energy Online includes 60 HE credits and requires that the student has a higher education qualification of at least 180 HE credits in a relevant subject area.

2 Expected Learning Outcomes

2.1 Expected Learning Outcomes for Second-cycle Programmes According to the Higher Education Act, Chapter 1, Section 9 and Qualification Descriptor According to the Higher Education Ordinance, Appendix 2

2.1.1 Expected Learning Outcomes for Second-cycle Programmes According to the Higher Education Act, Chapter 1, Section 9

Second-cycle studies should essentially expand upon the knowledge that students acquire in first-cycle studies or equivalent knowledge.

Second-cycle studies should imply a development of knowledge, skills and abilities in relation to first-cycle studies and should,

- in addition to the requirements of first-cycle studies, further develop the students' ability to independently integrate and use knowledge,
- develop the students' ability to handle complex phenomena issues and situations, and
- improve the students' conditions for work with high demands on independence or for research and development.

2.1.2 Qualification Descriptor According to the Higher Education Ordinance, Appendix 2

Master's Degree
Extent

A master's degree is achieved when the student has successfully completed required courses of 60 HE credits with a certain specialisation decided by each higher education institution, of which at least 30 HE credits of advanced studies in the main field of study of the education.

A bachelor's degree, Bachelor of Arts, professional qualification of at least 180 HE credits or equivalent foreign higher education qualification is also required. Exceptions from the requirement of a previous higher education qualification may be made for a student who has been admitted to the education without fulfilling the general entry requirements in the form of a higher education qualification.

However, this does not apply if an exception according to chapter 7, section 28, the second paragraph, has been made in the admission because the degree certificate has not had the time to be awarded.

Knowledge and Understanding
For a master's degree, the student should

- demonstrate knowledge and understanding of the programme's main field of study, including both an overview of the field and advanced knowledge in certain parts of the field, and understanding of current research and development,
- and
- demonstrate deeper method knowledge in the programme's main field of study

Skills and Abilities
For a master's degree, the student should

- Demonstrate the ability to integrate knowledge and to analyse, assess and handle complex phenomena, issues and situations also with limited information,
- Demonstrate the ability to independently identify and formulate issues, and to plan and with adequate methods, carry out qualified assignments within given time frames,
- Demonstrate the ability to give a clear account of and discuss the own conclusions and the knowledge and arguments constituting the basis for these in dialogue with different groups, orally and in writing, and
- demonstrate the skills required to participate in research and development, or to work with other qualified activities

Judgement and Approach
For a master's degree, the student should

- Demonstrate the ability to make assessments within the programme's main field of study, considering relevant scientific, social and ethical aspects, and show awareness of ethical aspects of research and development
- demonstrate an understanding of the possibilities and limitations of the discipline, its role in society and people's responsibility for how it is used, and
- demonstrate the ability to identify the own need of additional knowledge and to take responsibility for the own knowledge development

Thesis (degree project)
For a master's degree, the student must have successfully completed an individual assignment (degree project) of at least 15 HE credits, within the framework of the required courses and in the programme's main field of study.

Other
For a master's degree with a certain specialisation, the specific requirements decided by each higher education institution within the framework of the requirements in this qualification descriptor, should also apply.

2.2 Specific Expected Learning Outcomes for the Programme.
The study programme results in a master's degree in energy engineering, and the purpose is to provide advanced skills in one of the fields of renewable energy sources, primary energy transformation, energy use and energy systems, based on a bachelor of science in engineering.

Strong emphasis is placed on the students' ability to apply advanced theories, mathematical models and modern measuring techniques for efficiency improvement, development and renewal of energy systems. The previously mentioned general expected learning outcomes are supplemented below with the following programme-specific learning outcomes.

Knowledge and Understanding
For a master's degree, the student should
- deeper understanding of renewable and sustainable energy technology, and how it may be used to modernise the energy systems of today
- acquired advanced knowledge that makes it possible for the student to actively take part and participate in the development in one of the profiling areas, after completed higher education qualification, and be familiar with the research in the field

Skills and Abilities
For a master's degree, the student should
- the ability to locate, identify and formulate problems and be able to quickly acquire the additional knowledge required to solve these
- the ability to understand both technical and non-technical consequences of the introduction of new energy engineering solutions
- the ability to plan, complete and evaluate different development projects, both individually and in collaboration with others

Judgement and Approach
For a master's degree, the student should
- be able to understand alternative perspectives, value systems and expressions, to be able to interact and communicate both with technicians and with non-technicians, in the best possible way

3 Description of the Programme

3.1 Main Field of Study

3.1.1 Main Field of Study Energy Engineering

The study programme Energy Online results in a master's degree in energy engineering. A higher education qualification is achieved when the student has successfully completed courses of 60 HE credits in total, including at least 30 HE credits in second-cycle energy engineering courses. The education ends with a second-cycle degree project that corresponds to 15 HE credits. The programme contains courses in energy engineering and electronics. Thereafter, it is possible to choose an advanced project course offered by the participating higher education institutions.

3.1.2 Degree Project

The degree project is usually carried out at the end of the education and may not be initiated until the entry requirements according to the course syllabus are fulfilled. In the degree project, the student will apply the knowledge acquired during the education, and present the results of the work both orally and in writing. The work, which includes at least 15 HE credits, should contain a topic-specific specialisation in the programme's main field of study and be carried out individually or in pairs.
The degree project is usually carried out at a company, but may also be carried out in a public organisation or at an academic department. The degree project is a part of the higher education, and an examiner at the university is responsible for the assessment. A supervisor is appointed both at the company where the work is carried out, and at the university.

The written report should be of a linguistic and stylistic quality equivalent to university and business reports. The report may be written in Swedish or English. Choice of language is made in consultation with the examiner/supervisor at the university and the company/department where the degree project is carried out. If the report is written in Swedish, a specific page with both the title and a summary translated into English should be enclosed, and vice versa if the report is written in English.

3.2 Teaching and Examination.

3.2.1 Teaching

The programme courses are designed to provide a comprehensive view and understanding to be able to design the best solution regarding technology, environment and economy for an energy system. The educational view includes concepts such as responsibility and freedom. It means that all teaching and supervision should be based on the fact that the student takes own responsibility and actively seeks knowledge. The learning is based on an interactive process between teachers and students. The students have previous experience of studies in science and technology, which is an important factor at the implementation of the courses. In the student group, groups will be formed containing different fields of competence to broaden the academic discussion. The programme courses will be given in English. The teaching, which is given in English, is carried out as a distance education, using web-based tools on the Internet. Joint meetings may occur and then mainly at laboratory sessions. The form of teaching can vary from course to course, but mainly

consists of lectures and calculation exercises via the Internet, and through supervision in connection with laboratory sessions and project work. Presentation of laboratory sessions and projects can take place both orally and in writing and are important elements of the education. The course literature is in English.

3.2.2 Examination.

Examination is usually carried out at the end of courses or parts of courses, but can also take place continuously during a course. Examination of acquired knowledge and skills is usually based on submitted reports, presentations and on written or oral tests. Students who have failed the examination of a course or part of a course, are given the opportunity of additional examinations. Students who have failed twice, have the right to request that another teacher is appointed examiner at the department board.

3.3 Placement

No compulsory placement is required. The degree projects may be located at a building/industry with applications in energy engineering.

3.4 Student Influence

There are student representatives in the board of governors, the faculty boards and in the department boards. Gefle Student Union appoints student representatives.

3.5 Internationalisation

Högskolan i Gävle participates in the IAESTE and WITEC programmes. These programmes are administrated by the International Office at HiG. There is also an established collaboration within the SIDA-supported programme MFS (Minor Field Studies). The programme will be carried out in English.

3.6 Sustainable Development/Technology and Society

An important starting point for the education is that an educated engineer must be able to view new technology from a social perspective. The educated engineer needs knowledge and skills in managing products, processes and working environments with consideration to the conditions and needs of people, and to the targets of society concerning social relations, resource management, environment and economics. After the education, the student should be able to take human science and environmental requirements in problem-solving and product development into account, and have the conditions to promote an environmentally adapted technology. Therefore, working methods that develop these abilities are important elements in the education. The whole programme is based on creating a sustainable development in society by optimising the energy use, regarding the different social energy systems. This will decrease the use of resources and thereby result in a sustainable society.

4 Courses in the Programme

The students have guaranteed admission to the courses within the programme. Course applications for the following semester must be submitted. Changes in the order of courses may be made in consultation with students in the programme. Changes in the programme courses are determined by the Faculty Board. Change of period when the course given is determined on department level. Alternative course

choices may be made in consultation with the programme coordinator, provided that the expected learning outcomes for the programme are fulfilled.

F = First Cycle
S = Second Cycle

Period	Course Code	Course Name	HE credits	Level	Main Field of Study
1		Global Energy Perspectives[1]	6	S	Energy Technology
1		Renewable Energy[2]	6	F	Energy Technology
2		Power Generation [2]	9	S	Energy Technology
2		Energy Utilization[3]	9	S	Energy Technology
2		Applied Energy Technology Project Course[4]	7,5	S	Energy Technology
3		Control Techniques[5]	4,5	S	Electronics
3		Measurement Techniques [2]	3	S	Electronics
4		Thesis project	15	S	Energy Technology

[1] The course is given by Uppsala universitet
[2] The course is given by KTH
[3] The course is given by Högskolan i Gävle
[4] The course is given in cooperation between all participating higher education institutions i.e. Karlstad universitet, Linköping universitet, KTH, Umeå universitet, Högskolan i Gävle, Uppsala universitet
[5] The course is given by Umeå universitet

5 Entry Requirements

Qualified for the education are those with a Bachelor of Science in Engineering of 180 HE credits and who fulfil the following specific entry requirements or equivalent:

- Thermodynamics 6 HE credits (The course is given by Umeå universitet on distance)
- Fluid Mechanics 6 HE credits (The course is given by Högskolan i Gävle)
- Heat Transmission 6 HE credits (The course is given by Umeå universitet on distance)
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For those who have not read the courses Thermodynamics 6 HE credits, Fluid Mechanics 6 HE credits and Heat Transmission 6 HE credits, are offered these courses annually in the spring semester, in parallel with the master programme.

6 Grades

Grades are given for the programme courses according to relevant course syllabus.

7 Examination Regulations

7.1 Title of Qualification

Degree of Master of Science with a major in Energy Technology, 60 HE credits
Teknologie magisterexamen med inriktning Energisystem, 60 högskolepoäng

7.2 Qualification Criteria

If possible, all programme courses according to the programme syllabus should be completed before the degree project is started, and if not, the subject representative will assess if the student has the courses relevant for the degree project to be initiated.

7.3 Degree Certificates

To receive a master's degree with a specialisation in energy engineering, the student must have successfully completed the courses stated in the programme syllabus. The programme ends with a degree project of at least 15 HE credits.

8 Further Instructions

Interim Regulations.
For students who have had approved leave from studies, a specific study plan is established by the programme coordinator in consultation with study advisers.