



The Faculty of Engineering and Sustainable Development

Programme Syllabus

For

Study Programme in Energy Systems Engineering, Co-op, 180 HE credits

Energisystemingenjör, Co-op, 180 hp

Programme Code:	TGENS
Level:	First Cycle
Valid from:	Autumn Semester 2011
Established:	2009-09-17 (the Board of Science and Technology)
Latest Revised:	2011-12-14
Reference Number:	HIG 2011/915
Established by:	The Faculty Board

Entry Requirements

Specific Entry Requirements 8. Mathematics D, Physics B and Chemistry A.

Expected Learning Outcomes

Qualification Descriptor According to the Higher Education Ordinance, Appendix 2

Bachelor of Science in Engineering

Extent

Bachelor of Science in Engineering is achieved when the student has successfully completed required courses of 180 HE credits.

Expected Learning Outcomes

For a Bachelor of Science in Engineering, the student should demonstrate the knowledge and abilities required to work independently as an engineer.

Knowledge and Understanding

For a Bachelor of Science in Engineering, the student should

- demonstrate knowledge of the disciplinary foundation of the chosen technological field and its best practice, and knowledge of current research and development, and
- demonstrate a broad expertise in the chosen field of technology, and relevant knowledge in mathematics and natural sciences.

Skills and Abilities

For a Bachelor of Science in Engineering, the student should

- demonstrate the ability to independently and creatively identify, formulate and handle issues with an overall view, and analyse and evaluate different technical solutions
- demonstrate the ability to plan and with adequate methods, carry out assignments within given frames
- demonstrate the ability to critically and systematically use knowledge, and to model, simulate, predict and evaluate developments based on relevant information
- demonstrate the ability to design and handle products, processes and systems, with consideration to people's conditions and needs and the targets of society for an economically, socially and ecologically sustainable development,
- demonstrate the ability to work in teams and cooperate in groups with different compositions, and
- demonstrate the ability to account for and discuss information, problems and solutions in dialogue with different groups, orally and in writing.

Judgement and Approach

For a Bachelor of Science in Engineering, the student should

- demonstrate the ability to make assessments with consideration to relevant scientific, social and ethical aspects
- demonstrate an understanding of the possibilities and limitations of technology, its role in society and people's responsibility for its use, including social and economic aspects and environmental and working environmental aspects, and
- demonstrate the ability to identify the own need of additional knowledge and to continuously develop the own skills.

Thesis (degree project)

For a Bachelor of Science in Engineering, the student must have successfully completed an individual assignment (degree project) of at least 15 HE credits, within the framework of the required courses.

Specific Learning Outcomes for the Study Programme in Energy Systems Engineering, Co-op

Knowledge and Understanding

After the education, the student should:

- demonstrate knowledge of the main field of Energy Systems
- demonstrate knowledge of thermodynamics, fluid mechanics, industrial and building technology energy systems and energy technical installations

- be able to design technical systems to achieve a well-functioning indoor climate
- be able to map complex energy systems and optimise these regarding energy and resource management.

Skills and Abilities

After the education, the student should:

- demonstrate an understanding of the main field of Energy Systems to be able to independently analyse, understand and solve problems in indoor climate technology, in a creative way
- be able to optimise energy systems, regarding energy and resource management
- be able to critically, systematically and based on relevant information, evaluate and assess analyses in a scholarly way
- demonstrate the ability to formulate search questions and seek information in relevant sources
- demonstrate the ability to interpret and write references
- be able to account for the differences between scholarly material and other types of material.

Judgement and Approach

After the education, the student should:

- by applying social, economic and environmental perspectives on the own work, demonstrate an approach to knowledge and lifelong learning that is characterised by an active, responsible and self-reflecting way of studying
- demonstrate the ability to identify the own need of additional knowledge and constant professional development
- be able to read and understand advanced literature in the area of Energy Systems
- be able to follow the knowledge development in the own subject area
- be familiar with the forms of scholarly communication and publication
- demonstrate the ability to review, analyse and evaluate both the search process and search results
- demonstrate the ability to present criteria for assessment of sources of information and application of these.

The Contents and Arrangement of the Programme

The Main Field of Study Energy Systems

The main field of study is Energy Systems, and the application mainly concerns three different energy systems: Industrial Energy Systems, Building Energy Systems and National/Regional Energy Systems. These energy systems are studied and applied in the work with minimising the resource use. Basic knowledge of the concept of energy systems is provided in Introduction to Energy Systems and Basic Thermodynamics and Fluid Mechanics. Also the production of energy from a thermodynamic and energy technology perspective constitutes the basis of energy systems. Then, the energy use in society is studied with focus on buildings and industrial usage. During the third/fourth year, the studies are advanced with e.g. simulation and optimisation of the energy systems covered earlier in the education. Optimisation is carried out with the purpose of minimising the resource use of capital, raw material, manpower etc. but still satisfy the user's demands on the energy supply.

Primary Arrangement

The Study Programme in Energy Systems Engineering, Co-op, includes 180 HE credits. The education provides specialisation in energy systems. The programme provides basic knowledge of how different energy systems function. Emphasis is on providing good knowledge of production, distribution and energy use on system level. To be able to map complex energy systems and optimise these, regarding energy and resource management is an important element in the education. In the programme, simulation and optimisation of these energy systems are applied, with the intention of creating persistent systems regarding energy, environment and economy.

Cooperative Education, Co-op

The programme may be studied as a traditional higher education resulting in a Bachelor of Science in Engineering after three years, or with Cooperative Education (Co-op), which take four years. Co-op implies that the student alternates studies and work during the planned work periods. The co-op positions are limited and the higher education institution cannot guarantee a position at any of the companies linked to the higher education institution, and the company decides if the student's application and interview lead to employment during the education. Students who do not receive a Co-op position will study for three years instead for four. The first semester gives further information about what Co-op implies and how to apply for the Co-op positions. The Co-op students' experiences will be utilised in several of the programme courses. Each work period should be reported in a written report and an oral presentation. The first work period must be preceded by studies of at least 45 HE credits within the programme at Högskolan i Gävle, of which at least 30 HE credits must be passed. In order to begin the second, third and fourth work period, courses within the programme of at least 45 HE credits, 60 HE credits and 75 HE credits must be passed.

Courses

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. Alternative course choices may be made in consultation with the faculty programme director, provided that the expected learning outcomes for the programme are fulfilled.

Study path according to the three-year model

F = First Cycle

Year 1

Period	Course Name	HE credits	Level	Main Field of Study
1:1	Introduction to Energy Systems	7.5	F	Energy Systems
1:1	Sustainable Energy Systems	7.5	F	Energy Systems
1:2	Basic Thermodynamics	7.5	F	Energy Systems
1:2	Calculus	7.5	F	Mathematics
1:3	Linear Algebra	7.5	F	Mathematics
1:3	Fundamentals in Fluid Mechanics	7.5	F	Energy Systems
1:4	Heat Transmission	7.5	F	Energy Systems
1:4	Management Accounting	7.5	F	Business Administration

Year 2

Period	Course Name	HE credits	Level	Main Field of Study
2:1	Applied Thermodynamics	7.5	F	Energy Systems
2:1	Applied Differential Equations	7.5	F	Mathematics
2:2	Building physics	7.5	F	Energy Systems
2:2	Fundamentals of Environmental Technology	7.5	F	Energy Systems
2:3	Energy Resources	7.5	F	Energy Systems
2:3	Fundamentals of Logistics	7.5	F	Industrial Management
2:4	Total Quality Management	7.5	F	Industrial Management
2:4	Environmental Assessment of Energy Systems	7.5	F	Energy Systems

Year 3

Period	Course Name	HE credits	Level	Main Field of Study
3:1	Building Energy Systems	7.5	F	Energy Systems
3:1	Industrial Energy Systems	7.5	F	Energy Systems
3:2	Energy Measurement Systems	7.5	F	Energy Systems
3:2	Energy and its Markets	7.5	F	Energy Systems
3:3	Simulation and	7.5	F	Energy Systems

	Optimisation of Energy Systems			
3:3	Scientific Theory and Writing	7.5	F	Energy Systems
3:4	Degree Project	15	F	Energy Systems

Study path according to the Co-op model

Year 1

Period	Course Name	HE credits	Level	Main Field of Study
1:1	Introduction to Energy Systems	7.5	F	Energy Systems
1:1	Sustainable Energy Systems	7.5	F	Energy Systems
1:2	Basic Thermodynamics	7.5	F	Energy Systems
1:2	Calculus	7.5	F	Mathematics
1:3	Linear Algebra	7.5	F	Mathematics
1:3	Fundamentals in Fluid Mechanics	7.5	F	Energy Systems
1:4	Work Period of 10 Weeks			

Year 2

Period	Course Name	HE credits	Level	Main Field of Study
2:1	Applied Thermodynamics	7.5	F	Energy Systems
2:1	Applied Differential Equations	7.5	F	Mathematics
2:2	Building physics	7.5	F	Energy Systems
2:2	Fundamentals of Environmental Technology	7.5	F	Energy Systems
2:3	Work Period 10 weeks			
2:4	Heat Transmission	7.5	F	Energy Systems
2:4	Management Accounting	7.5	F	Business Administration

Year 3

Period	Course Name	HE credits	Level	Main Field of Study
3:1	Building Energy Systems	7.5	F	Energy Systems
3:1	Industrial Energy Systems	7.5	F	Energy Systems
3:2	Work Period of 10 Weeks			
3:3	Energy Resources	7.5	F	Energy Systems
3:3	Fundamentals of Logistics	7.5	F	Energy Systems
3:4	Total Quality Management	7.5	F	Industrial Management

3:4	Environmental Assessment of Energy Systems	7.5	F	Energy Systems
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Year 4

Period	Course Name	HE credits	Level	Main Field of Study
2:1	Work Period 10 weeks			
2:2	Energy Measurement Systems	7.5	F	Energy Systems
2:2	Energy and its Markets	7.5	F	Energy Systems
2:3	Simulation and Optimisation of Energy Systems	7.5	F	Energy Systems
2:3	Scientific Theory and Writing	7.5	F	Energy Systems
2:4	Degree Project	15	F	Energy Systems

Higher Education Qualification

Those who have successfully completed all programme courses fulfil the requirements for:

Bachelor of Science in Energy Systems Engineering

Högskoleingenjörsexamen med huvudområdet Energisystem

Student Influence and Evaluation

The council for educational affairs should be linked to the study programme. The faculty programme director should be the chairman and summoner of the council. The purpose of the council for educational affairs is to give students and representatives from the working life/society influence over the study programmes.

The programme students should be given the opportunity to give their opinions about the study programme annually through a programme evaluation. The programme evaluation should be carried out using the evaluation tool of the higher education institution. A compilation of the results of the evaluation should be submitted to the Faculty Board.

Other

Students admitted to the earlier years of the Study Programme in Energy Systems Engineering, Co-op, follow the programme syllabus for that year. For students admitted to the later part of the programme and for students who have had approved leave from studies, a specific study plan is established by the faculty programme director in consultation with the student, and when necessary with study advisers or the director of studies.