



HÖGSKOLAN I GÄVLE

PROGRAMME SYLLABUS

FIRST CYCLE

**STUDY PROGRAMME IN BUILDING
ENGINEERING**

Programme Code: TGBYY

Specialisation Code: Architecture and
Environment: ARMI

Established by the Board of Science and
Technology 2007-05-08

Revised by the Board of Science and Technology
2008-09-18

Revised by the Board of Science and Technology
2009-05-07

Revised by the Faculty Board
2010-09-23

Programme Syllabus

Study Programme in Building Engineering, 180 HE credits

- Specialisation in Architecture and Environment

(Byggnadsingenjörsprogrammet, inriktning mot arkitektur och miljö 180 hp)

This programme syllabus applies to students admitted to the autumn semester of 2011 or later.

STUDY PROGRAMME IN BUILDING ENGINEERING at Högskolan i Gävle

1 General Arrangement

The Study Programme in Building Engineering results in a Bachelor of Science in Engineering of 180 HE credits. The education provides a combination of the technological fields of building engineering, architecture and environmental technology, where building technology constitutes the main field of study of the education. The Study Programme in Building Engineering contains a basic introduction year, a broadening continuation year and a year of advanced studies. During the year of advanced studies, half of the programme length consists of a degree project that should be company or research-related.

The programme is based on project-based learning with the starting point in a problem. In the projects, the students will function in the different roles of a project group, and are therefore trained to cooperate in a project and also between different project groups. Elements of group dynamics give the students understanding of how conflicts may arise and are handled in a project group. Planning, management and documentation of projects are included as a natural part of the different projects. The students are also given an orientation in different tools used for planning and management of projects. The students may use specific project rooms with Internet-connected computers throughout the programme.

Courses and project are alternated in the education. The courses are given both as project support and engineering support courses. Engineering support courses provide the engineering width of knowledge used in the education and in the future working life as an engineer.

2 Expected Learning Outcomes

2.1 Expected Learning Outcomes for First-cycle Programmes According to the Higher Education Act, Chapter 1, Section 8 and Qualification Descriptor According to the Higher Education Ordinance, Appendix 2

2.1.1 Expected Learning Outcomes for First-cycle Programmes According to the Higher Education Act, Chapter 1, Section 8

First-cycle studies should essentially expand upon the knowledge that pupils acquire on national or specially designed programmes in upper-secondary school, or equivalent knowledge.

The government may, however, grant exemptions regarding programmes in fine, applied and performing arts.

First-cycle studies should develop the students

- ability to make independent and critical assessments
- ability to independently discern, formulate and solve problems, and
- preparedness to address changes in the working life.

Within the field of the education, the students should, in addition to knowledge and skills, develop the ability to

- search and evaluate knowledge on an academic level
- follow the knowledge development, and
- exchange knowledge also with individuals without expertise in the area.

2.1.2 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.

2.2 Specific Expected Learning Outcomes for the Programme

The programme gives the students good basic knowledge and proficiencies on an academic and practical basis, to be able to work as engineers in the building sector.

Knowledge and Understanding

For a Bachelor of Science in Engineering, the student should

- demonstrate knowledge of the different stages of the building process, mainly in the project design phase
- demonstrate knowledge of building-physical laws and the most common building materials, their properties and usage in buildings
- be able to calculate and assess section forces in the framing, and dimension and design load-bearing elements in detail.
- demonstrate knowledge of the external impact of buildings on the environment, the internal impact on people's health and the environmental work of the building sector.
- demonstrate knowledge of different local, regional and global environmental problems, effects on health and comfort
- be able to critically analyse proposals for design of buildings and demonstrate knowledge of supporting legislation
- be able to account for differences in design and building systems in different eras
- have understanding of the building as a coherent system
- be able to define and explain central concepts, methods, phases and roles of the project process.

Skills and Abilities

For a Bachelor of Science in Engineering, the student should

- be able to apply the technology fields in an engineering way to identify, formulate, analyse and solve problems
- demonstrate skills in analysing the indoor environment by means of user questionnaires, technical measurements and inspection
- demonstrate skills in environmentally adapting an existing or planned building using systematic environmental assessments, regarding internal and external environmental impact
- demonstrate skills in working with design issues, both of buildings as a whole and in detail
- demonstrate skills in reading and establishing sketches and drawings
- demonstrate skills in planning, carrying out and evaluating a project.

Judgement and Approach

For a Bachelor of Science in Engineering, the student should

- with a comprehensive view, observe building-technical,

- architectural and environmental aspects promoting a long-term sustainable building
- be able to critically analyse information and follow the scientific knowledge development in the subject areas.

3 Description of the Programme

3.1 Main Field of Study and Programme-specific Courses

3.1.1 Main Field of Study Building Technology with Architecture and Environmental Technology

Building Technology

Building Technology is the central field of the programme. The courses are divided into the areas Framing, Building Physics, Building Materials and Building Technology. The area of Framing includes basic building mechanics and solid mechanics directed towards framing made of the most common building materials, such as steel, wood and concrete. Building Physics includes the heat, air and moisture transfers occurring in buildings. The laws of building physics constitute the basis for material and building-technical choices. Building Technology mainly covers how the building components should be put together as a whole. The students should understand the function of different designs and the interplay between the different components and systems of the building.

Architecture

In the field of architecture, the process of formation is treated: what should be built, for whom, in what way, the aesthetic design integrated in all parts. In addition, the field contains techniques to communicate these ideas in an intelligible way to other concerned parts in the building process. Architecture contains e.g. planning, design, the project design process and drawing techniques and presentation. Parts concerning current housing legislation are also included.

Environmental Technology

In the Study Programme in Building Engineering, environmental technology is applied in the building area. It means that the internal and external environmental impact of buildings is analysed, based on several perspectives; new/reconstruction and existing houses, residences and premises. The courses provide an orientation in all areas: energy use, material use, dangerous substances, indoor environmental assessments, moisture in buildings, legislation, environmental impact, environmental management and assessment (mainly life-cycle analysis). The courses also cover the environmental work of the building sector, and environmental adaptations of existing or planned buildings. In project form, an indoor environmental inventory where user questionnaires are used is carried out, and also technical measurements and inspections of the indoor environment.

3.1.2 Project Courses

Within the programme, three major project courses with clear progression are carried out. The first course contains an introduction to the fields of technology, while project methodology, presentation and communication techniques are studied at the same time. The course also includes several study visits.

One semester every academic year is then devoted to projects, where the technological

fields of building technology, architecture, environmental technology and engineer support subjects are combined and applied. The projects may cover planning and project design in new productions and reconstruction.

The themes that are chosen provide the basis for both independent work in the project groups and for presentations at seminars and discussions. The projects are presented at seminars where the companies providing the projects are sometimes represented.

3.1.3 Engineering Support Courses

Engineering support courses consist of courses in mathematics, linear algebra and calculus, and one elective course e.g. Contract Law and Procurement or Management Accounting and Analysis. Mathematics is mainly applied in building-technical courses and in the project courses. Economics and law are important fields for a building engineer.

3.1.4 Degree Project

The programme ends with a degree project. Through the degree project, knowledge acquired during previous studies should be applied, broadened and advanced. Through the degree project, the student should demonstrate that the learning outcomes for first-cycle programmes stated in the Higher Education Act, the learning outcomes for Bachelor of Science in Engineering stated in the Higher Education Ordinance and the specific learning outcomes stated in this programme syllabus have been fulfilled.

3.2 Teaching and Examination

3.2.1 Teaching

The educational view is based on the fact that all learning is an active, dynamic process that occurs in collaboration between teachers and students. All teaching and supervision should be based on the student taking own responsibility for the studies and for active knowledge acquisition. The learning implies that the theoretical and practical teaching in the courses should be integrated as useful knowledge and skills in each individual. In that way, the student is given the opportunity of personal development, which is of great importance for the future profession and a lifelong learning. The student should also acquire preparedness to address changes and the ability to review the own knowledge to be able to actively participate in the development and evaluation of the professional domain. Different teaching and working methods should teach the student to actively search for knowledge, critical thinking, reflection and oral and written proficiencies and in using academic literature.

In the education, the ability to work in project form is practised. The students will function in different roles and as project managers. The different projects are carried out with clear progression. Each project has clearly stated targets for what knowledge and skills the student should acquire. Through examination of the projects, the level of knowledge is tested, both in the groups and individually.

The scheduled teaching is given as lectures, seminars, laboratory sessions, project work and supervision individually and in groups. Parts of the teaching are carried out as group assignments. Apart from the scheduled teaching, self-studies occur. The teaching is mainly given in Swedish, but lectures in English and English course

literature may occur.

The progression in the programme occurs through a progressive specialisation within the chosen technology field, both through in-depth subject studies and development of the scientific approach, and through improved skills in relation to the engineering profession. In the technical main field of study, progression occurs through a broadening of the knowledge in the project courses and other courses. The engineer support courses provide additional broadening.

3.2.2 Examination

In the programme courses, varying examination formats are applied, depending on the structure of the course. Both written and oral examinations occur, individually and in groups. The design, extent and duration of the examinations are adapted to the expected learning outcomes stated for respective course. Examples of other examination formats are written assignments, laboratory sessions and seminar assignments.

3.3 Placement

Placement at workplaces that provide an insight into and preparation for the future working life is recommended, but not provided by the higher education institution. The placement mainly intends to provide an insight into the working conditions of the future engineer. Placement approved by the faculty programme director may be registered in the Diploma Supplement. Apart from placement, the education includes parts where different forms of cooperation take place with companies in the region. These parts may be carried out both at the higher education institution and at the company.

3.4 Student Influence

There is a council for educational affairs linked to the programme, which consists of representatives from the working life, teachers and students. The council for educational affairs is advisory, and the faculty programme director is the chairman. Gefle Student Union appoints student representatives. There are student representatives in the Board of Governors, the Faculty Board and in the Academy Council.

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).

3.6 Sustainable Development - Technology and Society

An important starting point in the education is that an engineer must be able to view new technology from a social perspective. An engineer must have knowledge about and skills in managing products, processes and working environments with consideration to people's conditions and needs and to the targets of society concerning social relations, resource management, environment and economy. After the education, the student should be able to take human science and environmental requirements into account in problem-solving and product development, and have the conditions to work for a sustainable development. Working methods exercising these abilities are therefore important elements in the education.

4 Courses in the Programme

The students have guaranteed admission to the courses within the programme. Application for programme courses should be submitted by the students before the following semester. 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 is given is determined on department level. Alternative course choices may be made in consultation with the faculty programme director, provided that the expected learning outcomes for the programme are fulfilled. F = First-cycle

Year 1

Period	Course Name	HE credits	Level	Main Field of Study
1:1-2	Project 1. Detached Houses	30	F	Building Tech.
1:3-4	Building Materials and Applied Building Physics	15	F	Building Tech.
1:3	Linear Algebra	7.5	F	Mathematics
1:4	Calculus	7.5	F	Mathematics

Year 2

Period	Course Name	HE credits	Level	Main Field of Study
2:1	Structural Engineering 1- Structural Analysis and Solid Mechanics	7.5	F	Building Tech.
2:1	CAD and Building Information Modelling	7.5	F	Building Tech.
2:2	Structural Engineering 2 - Structures	7.5	F	Building Tech.
2:2	Functions and Design of Buildings	7.5	F	Architecture
2:3-4	Project 2. New Constructions	15	F	Building
2:3	Environmental Assessment of Buildings	7.5	F	Envir. Tech.
2:4	Contract Law and Procurements (elective)	7.5	F	BA/Law
2:4	Management Accounting and Analysis (elective)	7.5	F	BA

Year 3

Period	Course Name	HE credits	Level	Main Field of Study
3:1-2	Project 3. Changing Buildings	15	F	Building Tech.
3:1	The Architectural Design of Changed Buildings	7.5	F	Architecture
3:2	Life-cycle Analysis	7.5	F	Envir. Tech.
3:3	Experimental Methodology for Buildings	7.5	F	Building Tech.
3:3	Structural Engineering 3 - Structures (elective)	7.5	F	Building Tech.
3:3	Future Building and Urban Development (elective)	7.5	F	Architecture
3:4	Degree Project	15	F	Building Tech.

5 Entry Requirements

Qualified for the Study Programme in Building Engineering are those who fulfil the conditions for general entry requirements stated in the Higher Education Ordinance, and fulfil Specific entry requirements 8, i.e. fulfil the following specific entry requirements:

Subject	Course
Mathematics	Ma D
Physics	Fy B
Chemistry	Ke A

The grade for each of the above subjects should be at least Pass.

6 Grades

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

7 Examination Regulations

7.1 Title of Qualification

Bachelor of Science in Engineering
Högskoleingenjörsexamen

7.2 Qualification Criteria

The main field of study on this programme is Building Technology. The specialisations are Architecture and Environmental Technology.

To receive certificate for Bachelor of Science in Engineering, the student must have successfully completed courses of 180 HE credits. Higher education qualification must include at least 15 HE credits in mathematics, at least 75 HE credits with a progressive specialisation in the main field of building technology and a degree project of 15 HE credits. In addition, 30 HE credits in architecture and environmental technology are required. Remaining credits are used for broadening and/or specialisation in the main field, other technical courses and engineer support courses in the area.

To fulfil the degree requirements for Bachelor of Science, students who follow the Study Programme in Building Engineering must to supplement with e.g. studies in mathematics. An individual study plan may be established by the faculty programme director.

7.3 Degree Certificates

Students who fulfil the requirements for a higher education qualification should receive a degree certificate on request.

Each degree certificate must be followed by a diploma supplement that describes the education and its place in the education system (the Higher Education Ordinance, chapter 6, section 15). The appendix is called Diploma Supplement. Diploma Supplement should facilitate recognition and credit transfer of a Swedish higher education qualification in employment and continued studies abroad, but also in Sweden.

8 Further Instructions

Interim Regulations.

Students admitted to the earlier years of the Study Programme in Building Engineering follow the programme syllabi for that year.

For students admitted to the later part of the programme and students who have had approved leave from studies, a specific study plan will be established by the faculty programme director.