



## COURSE SYLLABUS

# Energy and Building Services Engineering, 6 credits

*Energi- och installationsteknik, 6 högskolepoäng*

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<b>Course Code:</b> TEIN19	<b>Education Cycle:</b> First-cycle level
<b>Confirmed by:</b> Dean Jun 1, 2019	<b>Disciplinary domain:</b> Technology
<b>Valid From:</b> Aug 1, 2019	<b>Subject group:</b> BY1
<b>Version:</b> 1	<b>Specialised in:</b> G2F
	<b>Main field of study:</b> Civil Engineering

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### Intended Learning Outcomes (ILO)

After a successful course, the student shall

Knowledge and understanding

- display knowledge of the building as an energy system and how it can be controlled to support a sustainable development
- display knowledge and understanding of the energy balance of the building
- display knowledge of different types of technical systems (electricity, heat, ventilation and sanitation) in buildings

Skills and abilities

- demonstrate the ability to calculate and design the building envelope and services according to standard requirements and criteria for low-energy buildings

Judgement and approach

- demonstrate the ability to evaluate the building with its energy and technical installation systems from a sustainable development perspective, including ecological, social and economic aspects

### Contents

A survey course about different building services and how these in interaction with the building envelope affect the energy balance of the building.

The course includes the following elements:

- Thermal physics and its technical requirements and standards required in the structures of the building envelope.
- Thermal indoor climate and thermal comfort.
- Regulations and regulatory requirements.
- Air treatment with, ventilation needs, air quality, different ventilation systems, fire safety and ventilation, heat recovery and ventilation efficiency.
- Heat production and heat sources, heating technology, various heating systems.

- Sanitation engineering with technical systems for drinking water, wastewater and stormwater
- Electrical engineering with electrical services, electrical safety, artificial lightning.
- Solar cells and solar heat.
- Renewable energy.
- Energy balance of the building.
- Environmental certification of buildings.
- Low-energy buildings.
- Technical drawings with symbols and designations for plumbing and electrical systems.
- Space requirements for technical systems in buildings connected to technology and work environment.

### Type of instruction

Lectures, exercises and study visit.

The teaching is conducted in English.

### Prerequisites

General entry requirements and completed courses 60 credits in first cycle including the courses Building Materials and Building Technology 2, 6 credits and BIM 2 Analysis and Simulation - Architectural Engineering, 6 credits or BIM 2 Analysis and Structural Design - Construction Engineering, 6 credits (or the equivalent).

### Examination and grades

The course is graded 5,4,3 or Fail .

Registration of examination:

Name of the Test	Value	Grading
Examination <sup>1</sup>	3 credits	5/4/3/U
Project work	3 credits	U/G

<sup>1</sup> Determines the final grade of the course, which is issued only when all course units have been passed.

### Course literature

The literature list for the course will be provided one month before the course starts.

Title: Building Services Design for Energy Efficient Buildings

Author: Tymkow, P. Tassou, S. Koloktroni, M & Jouhara, H. (2013)

Publisher: Routledge, London. ISBN: 9780415596374.

(Also available as pdf to download).