



LUNDS UNIVERSITET  
Lunds Tekniska Högskola

*Course syllabus*

# **Energianvändning och termisk komfort i byggnader**

## **Energy Use and Thermal Comfort in Buildings**

**AEBN05, 7,5 credits, A (Second Cycle)**

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

### **General Information**

**Main field:** Energy-efficient and Environmental Buildings.

**Compulsory for:** MEMB1

**Language of instruction:** The course will be given in English

### **Aim**

The course aims at introducing sustainable building design concepts for cold climates - with low or zero energy building design at the centre of the course discussions. The course provides an overview of performance parameters and targets in buildings and an in-depth study of significant climatic parameters.

The course also aims at providing an understanding and training about the strategies and measures towards low energy use and high thermal comfort in buildings. Also, the aim is to provide an understanding of possibilities and limitations of high performance buildings.

### **Learning outcomes**

*Knowledge and understanding*

For a passing grade the student must

- show deep understanding of key energy concepts and issues, at local and global scales;
- understand and be able to critically discuss the most significant issues related to energy efficiency and energy use in buildings;
- understand general as well as specific principles and main strategies related to passive and climatic design of buildings in cold climates;

- understand the influence of key building parameters, regulations and performance targets in relation to thermal comfort and energy conservation in buildings;
- show deep understanding of the difference between diverse validation tools (hand calculations, steady-state, dynamic).

#### *Competences and skills*

For a passing grade the student must

- show the ability to describe and discuss important concepts and key issues related to energy use at the global, local and building scale;
- show the ability to use low energy strategies for buildings in cold climates focused on energy conservation, passive solar gains and solar protection, etc;
- show the ability to discuss climatic parameters and integrate strategies in order to reduce energy use and improve thermal comfort in buildings;
- show the ability to wisely use tools related to thermal design of buildings to analyse the energy performance and for support of design decisions;
- show the ability to propose adequate design strategies (verbally and graphically), concepts and measures responsive to local climate and performance targets, and influence design decisions using facts and knowledge supported by the use of the acquired tools (hand calculations, spread-sheet programmes, dynamic simulations).

#### *Judgement and approach*

For a passing grade the student must

- be able to demonstrate awareness of key issues related to energy use at the global, local and building scale;
- be able to show literacy regarding recent innovative, high performance low energy buildings and concepts;
- be able to identify relevant research, consulting and regulation issues in the field of low energy building design and thermal comfort.

## **Contents**

The course will start with an overview of the goals for the master's programme with a global perspective on environmental issues, energy needs and natural resources, directives and goals, policies, incentives and moisture design process.

The course will continue with lectures, exercises and tutorials about strategies and measures towards low energy use and high thermal comfort in buildings. The themes covered include thermal performance targets, basics of heat transfer mechanisms, thermal comfort parameters and regulations, performance of building envelope, thermal balance of buildings, basic thermal calculations and simulations. Different low energy concepts will be discussed and exemplified through lessons learnt from case study buildings, which will yield knowledge and understanding of possibilities and limitations in high performance buildings.

## **Examination details**

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** The final grade is to 70% based on the written examination and to 30% on the performance related to the exercises and lectures.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

### **Parts**

**Code:** 0123. **Name:** Exercise.

**Credits:** 3. **Grading scale:** UG. **Assessment:** Examination based on written report according to given criteria.

**Contents:** Assignment in 2 parts: 1) Calculation of energy use for a building using simple spreadsheet program and heat balance equations. 2) Calculation of energy use and thermal comfort based on dynamic simulation programme.

**Code:** 0223. **Name:** Written Examination.

**Credits:** 4,5. **Grading scale:** TH. **Assessment:** Examination based on the written examination. **Contents:** Written examination of the whole course.

### **Admission**

**The number of participants is limited to:** No

**The course overlaps following course/s:** AEBF10

### **Reading list**

- Course literature will be available through an electronic course library via the course website.

### **Contact and other information**

**Teacher:** Henrik Davidsson, [henrik.davidsson@ebd.lth.se](mailto:henrik.davidsson@ebd.lth.se)

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