



Course syllabus

Bostadshus - integrering av termiska aspekter och fuktsäkerhet Residential Building - Integrating Thermal and Moisture Aspects

AEBN11, 15 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

This course will allow explorations of passive design principles. The students will have the opportunity to concretely apply and test these principles using a holistic approach encompassing building technology, building physics, indoor climate and building services. The course also aims to show the potential of thermal and climatic constraints as a guide in explorations and development of configurations and solutions in case study projects. In addition, the course will allow the application of rules of thumb and tools (computer, hand calculations) - acquired in theoretical courses - for thermal balance, thermal comfort and moisture safety predictions. These tools will be used to feed the iterative design process and inform wise design decisions. Finally, students will also learn to present passive concepts and strategies using graphic methods in a productive way supported by data (results from simulations or hand calculations).

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- demonstrate clear understanding of how a building is functioning as a climatic system,
- be able to describe and critically discuss the passive house concept, its characteristics and main strategies, using adequate vocabulary;
- be able to identify and discuss critical parts in sustainable, low-energy dwellings, which should be analyzed from a moisture, indoor climate and energy point of view, in relation to building configuration, site, material and system selection, detailing, etc.

Competences and skills

For a passing grade the student must

- be able to design a sustainable and energy-efficient building consisting of interacting components of building systems, materials, services, using an integrated approach and taking into consideration the specific user needs;
- demonstrate the ability to study, analyse and present a passive house design project that is suitable for the cold climatic context;
- develop skills to propose adequate, integrated and economically justified solutions for a housing project, taking into consideration thermal, moisture and energy issues;
- develop abilities to use tools, energy simulations, hand calculations and hygrothermal calculation tools in a productive way to analyse the effects of proposed solutions and propositions and thereby successfully guide design decisions;
- develop skills to communicate verbally, textually and graphically a passive house concept, using the appropriate vocabulary;
- be able to apply the moisture safety design principles in relation to the whole building design;
- be able to describe how various heating systems in buildings can be designed.

Judgement and approach

For a passing grade the student must

- be able to select an adequate, wisely integrated solution leading to very low energy solution in a housing project located in a cold climate;
- have the capacity to critically discuss and justify the selected solutions using appropriate vocabulary and fact based arguments;
- be able to discuss current technical and research trends and challenges related to passive housing in Sweden;
- be able to critically analyze and judge technical solutions based on operation, satisfying indoor climate, energy efficiency and moisture safety;
- formulate relevant technical challenges and tasks in relation to passive house concept and future development in Sweden.

Contents

"Passive Houses" were defined as buildings which, in the Central European climate, have a negligible heating energy requirement and therefore need no traditional heating system. Such houses can be kept warm "passively", using mainly the existing internal heat sources, solar energy admitted by windows and by heating the fresh air supply.

Passive design is not the attachment or supplement of architectural design, but an integrated design process within the architectural design. Although it is mostly applied to new buildings, it has also been used for refurbishments.

This course is an advanced practical course on passive house concept, principles and strategies, with a special focus on thermal and moisture aspects i.e. thermal comfort and thermal balance of buildings.

The students will design a residential passive row house considering the energy-efficiency, sustainability, thermal comfort and moisture safety. The assignment will include qualitative and quantitative methods to achieve a long term satisfactory result. The assignment is based on the two theoretical courses which are associated with this

practical course (“AEBN05 Energy Use and Thermal Comfort in Buildings” and “VBFN15 Moisture Safety Design of Buildings”).

An extensive report shall be delivered at the end of the course. The results will be presented orally and critically reviewed by other students.

Examination details

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

Assessment: Active participation and attendance at lectures, tutorials, group meetings, presentations etc is compulsory. The final grade is to 75% based on the written report, to 25% based on the oral presentation.

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.

Admission

Admission requirements:

- Submitted exercises in the courses "Energy use and thermal comfort in buildings" and "Moisture safety design of Buildings"

The number of participants is limited to: No

The course overlaps following course/s: AEBN10

Reading list

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

Contact and other information

Course coordinator: Jouri Kanters, jouri.kanters@ebd.lth.se

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Course homepage: <http://www.ebd.lth.se/master>