



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Hållbart byggande

Sustainable Building Technology

VBFN01, 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

Elective for: V5-hb, V5-bf

Language of instruction: The course will be given in Swedish

Aim

To give more advanced knowledge about how the resources of the earth are used in an as efficient and gentle way as possible regarding designing and building houses.

The aim is to use the natural resources in an efficient and for the environment friendly way before energy and resources are supplied to the system of the building so that energy bought for heating, cooling and electricity supply is minimized. To attain this, knowledge is required about the technical prerequisites and limitations that exists, where a satisfying indoor climate is one fundamental prerequisite.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to describe how a sustainable building and its parts can be designed
- be able to explain different types of low-energy buildings such as passive houses and plusenergy houses and buildings without heating systems
- be able to identify critical parts in sustainable/low-energy buildings which should be analysed from a moisture, indoor climate and energy point of view.
- be able to describe technical solutions for the use of solar energy for heating and electricity supply to buildings. be able to describe how solar use can be integrated in the structure, be able to explain how sunshading can be designed

- be able to describe resource-efficient local energy supply systems in the building such as heat pumps, solar collectors and heat from the ground, be able to describe how tap water and waste water systems with a low water- and energy use can be designed
- be able to describe ventilationssystem which take advantage of natural driving forces ; the wind called hybrid ventilation and explain technical prerequisites and limitations that are needed to fulfil a satisfying indoor climate
- be able to describe sustainable building materials in point of moisture, duration and emissions
- have a basic knowledge about hazardous substances in the building area, their effects on human and environment and what to do if they exist.

Competences and skills

For a passing grade the student must

- be able to design and develop sustainable buildings and their parts
- be able to analyse how different combinations of measures will affect the energy- and efficiency-need, the indoor climate and the moisture conditions
- be able to judge and design technical efficient combinations of system of local energy supply systems in buildings.
- be able to calculate and design buildings with a large daylight use
- be able to develop passive strategies for indoor climate control
- be able to design ventilation systems and their components which adjusts the flow after the need; called demand control ventilation with the purpose of creating a good indoor climate in the most energyefficient way
- be able to independently analyse the resulting indoor climate, energy use and moisture safety based on the technical solutions
- be able to analyse and calculate transient conditions of coupled heat- and moisture flux in building elements and structures and evaluate the moisture safety from the results
- be able to analyse the reliability of results from computer programs
- be able to analyse technical solutions based on lifecycle cost
- be able to calculate the carbon foot print for some building parts
- be able to use existing knowledge to judge influence of future climate changes
- show ability for teamwork and cooperation in groups, be able to oral and in written, in dialog with other groups, present and discuss ones results and conclusions

Judgement and approach

For a passing grade the student must

- be able to critically analyse and judge technical solutions based on function, satisfying indoor climate, energy efficiency and moisture safety and value if it is "facts or myth"
- be able to identify faults, risks, and limitations with new untested building- and buildings service solutions
- be able to identify ones need for more knowledge within the building area.

Contents

By way of introduction relevant terms such as sustainable building in a global perspective together with international and national goals are presented. Then focus is on building and building services technology.

The course deals with sustainability in aspects of; low energy use, comfortable and healthy indoor climate, moisture safety and cautious use of natural resources.

The course treats technical solutions applied in low-energy houses such as passive houses and plus energy houses where the building produces more energy than it uses on a yearly basis; how to use the solar energy and integrate this in the building component; sustainable building materials, hybrid ventilation is presented where the natural driving forces are used during periods when it is possible. The technical solutions are analysed in point of energy, indoor environment and moisture. The course also deals with new combinations of material from environmental- and health aspects, moisture, mould, other environmental damaging substances from the building trade, carbon foot print, passiv building design and demolition and recycling.

The course includes exercises in which the students in groups will design sustainable buildings with the technical solutions; building envelope, structure, building material and building service. The students will calculate moisture and heat conditions i critical parts, calculate technical performance and design input for local energy supply systems such as heat pumps and solar collectors, design windows and calculate the daylight factor, calculate the carbon foot print, design structure and sunshading to give good thermal climate with a low cooling energy need and design a demand controlled ventilation system.

The course is the last within the building service and the building physics area and concludes the area which makes it a synthesis course for this specialization.

Examination details

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

Assessment: Written examination and exercise. To pass the course the students must pass the examination and complete the project exercise. A well done project can raise the final grade.

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: 0112. **Name:** Sustainable Building Technology.

Credits: 4,5. **Grading scale:** TH. **Assessment:** Written examination

Code: 0212. **Name:** Exercise.

Credits: 3. **Grading scale:** UG. **Assessment:** Approved written report and oral presentation of project exercise. Approved computer and laboratory exercises. **Contents:** Dimensioning of passive house regarding power need, photo voltaics, solar heating, day light, choice of environmental and healthfriendly materials, solar shading, termal indoor climate, heating system, ventilation system and moisture safety.

Admission

Admission requirements:

- VBFN05 Energy, Air Movements and Moisture at Rebuilding and Administration or VBFN10 Design concerning Energy, Air Movements and Moisture in New Buildings
- VBFF01 Energy Efficiency and Indoor Environment

The number of participants is limited to: No

Reading list

- Varis Bokalders, Maria Block: Byggekologi, Kunskaper för ett hållbart byggande. Svensk Byggtjänst, 2014, ISBN: 9789173336260. In Swedish.
- Föreläsningar tillgängliga via kurshemsidan.

Contact and other information

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