Course syllabus

Byggnadsintegrerade solenergisystem
Building Integrated Solar Energy Systems

AEBN30, 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: MEMB2
Elective for: A4
Language of instruction: The course will be given in English

Aim

The aim of the course is to show how active solar energy systems can be integrated in and co-operate with the main energy system of buildings. The course gives an overview of both solar electrical (photovoltaic) and thermal systems. The course will provide an understanding on how solar thermal collectors and PV-systems can be integrated into buildings for production of heat and electricity. An important part of the course is to teach the students how to use simulation programs for investigating the performance and optimization of the solar energy system. Tools will be taught to perform a pre-study of the installation of a solar thermal system in a building.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- Show understanding of basic solar energy terms such as direct vs diffuse solar radiation, collector vs absorber, monocrystalline solar cells, inverter, etc.;

- Understand the basic design of solar thermal and electrical systems installed in buildings as well as the basic characteristics of the main components of solar energy systems such as solar thermal collectors, solar cells, storage tanks, etc;
- Show understanding of the potential savings of a solar thermal and electrical system in buildings;
- Understand important aspects of architectural integration of the systems in buildings;
- Understand how a solar collector can be tested to obtain important key figures for the collector.

Competences and skills
For a passing grade the student must

- Show the ability to communicate verbally and graphically an architectural solar concept, using the appropriate vocabulary concerning the basic design of solar energy systems, the main components and connection to the existing energy system of the building;
- Show the ability to carry out basic hand estimates and use basic simulation tools for both solar thermal and electrical systems and to estimate solar energy potential on building facades and roof for solar thermal and electrical systems;
- Show the ability to perform a basic pre-study of the installation of a solar thermal or electrical system in a building;
- Be able to make a principal design for a solar thermal system and a solar electricity system.

Judgement and approach
For a passing grade the student must

- Show the ability to discuss the potential energy savings of solar energy systems in buildings, as well as important aspects of architectural integration of the systems that can influence architectural design decisions;
- Be able to discuss the difference, benefits and drawbacks for different techniques e.g. flat plate versus vacuum tube solar collectors;

Contents

The course will focus on basic knowledge of solar energy concepts. Also, the main types of technologies regarding solar heating and electricity will be addressed. Simple hand calculations will be taught regarding the estimation of solar radiation on facades and roofs. The course will provide the simulation tools in order to design and optimize solar thermal and electrical energy systems. Important aspects of architectural integration of the systems that can influence architectural design decisions will be discussed.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: The final grade is 100 % based on results from the oral examination.

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:** Written Assignment.
Credits: 3. **Grading scale:** UG. **Assessment:** To pass the laboratory work the student need to actively participate in the lab-work and to present to poster. For a pass in the system simulations the student needs to carry out the simulations according to instructions. **Contents:** Assignment in 3 parts: 1) Performance measurement of a solar collector and solar cells. 2) System simulation of a solar heating installation. 3)

System simulation of a PV installation.
Code: 0223. **Name:** Oral Examination.
Credits: 4,5. **Grading scale:** TH. **Assessment:** Examination based on the oral examination. **Contents:** Oral examination of the whole course.

Admission

The number of participants is limited to: No
The course overlaps following course/s: AEBF20

Reading list

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

Contact and other information

Course coordinator: Henrik Davidsson, henrik.davidsson@ebd.lth.se
Teacher: Jouri Kanters, jouri.kanters@ebd.lth.se
Teacher: Agnieszka Czachura , agnieszka.czachura@ebd.lth.se
Course administrator: Linnéa Ekman, linnea.ekman@ebd.lth.se
Course homepage: https://canvas.education.lu.se/courses/6996