Course syllabus

Solenergi - grundkurs i solvärmeteknik
Solar Heating Technology, Basic Course

AEBF25, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED V
Date of Decision: 2023-03-21

General Information

Elective for: E4, F4, M4, W4-es, MHET2
Language of instruction: The course will be given in English

Aim

There is from a national and global point of view necessary to develope renewable energy technologies for generating energy. The use of energy in Sweden in buildings exceeds annually 100 TWh. This means that it is important to design new buildings with a low energy use and to surpress the energy use in old buildings. Installations of solar thermal systems can be a part of this efforts. The aim of the course is to show how the solar heating system can be integrated in and co-operate with the buildings main energy system. An important part of the course is to teach the student how to use simulation programs for investigating the performace of the solar system.

After the course is completed the student should be able to perform a prestudy of the installation of a solar thermal system in a building or in a larger system.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to describe and explain the mechanisms for green house effect and Ozone depletion

- be able to describe the national and international use and demand of energy and the importance of the renewable energy sources.
- be able to describe and explain how different types of solar collectors work and i what type of applications they should be used
- be able to describe and explain how different types of solar systems works and how they can be used for conserving energy
- be able to explain the performance of different types of energy efficient materials

Competences and skills
For a passing grade the student must

- be able to estimate and describe the use of heat and hot water in a building
- be able to charcterize a solar collector, i.e. measure the efficiency-curve
- be able to use a simulation programme for estimation of the energy delivered from a solar thermal-system
- be able to design a solar thermal system and describe how its components work and adapt it to a given building
- be able to use a calculation programme for estimation of the solar irradiance towards surfaces in different geometries.
- be able to with different methods calculate the cost for solar thermal and competing technologies
- understand how a solar thermal system can be designed so it interacts with other energy systems like electric heating, heat pumps, district heating and bio fuel system,

Judgement and approach
For a passing grade the student must

- be able to take part in and analyze the current discussion of energy use and global environmental problems
- be aware of the influence of the building design and the energy system on the energy use of the building
- be able to perform a critical analysis of the use and value of delivered solar energy
- learn to critically evaluate and analyse information in general

Contents

- Basic energy knowledge and the problems connected to the use of energy.
- Radiation physics, the annual irradiance distribution and the climatic conditions for using solar energy in Sweden, calculation of solar angulars and the irradiance on different surfaces.
- Performance and efficiency of different types of solar collectors.
- Material- and optical- properties of different types of energy efficient surfaces.
- Function and performance of the components in a solar thermal system.
- System design of small and large solar thermal systems.
- Building integration of solar systems.
- Use of simulation programmes for estimation of annual and monthly performance of solar thermal systems.
- Studie visits to Solar thermal installations.
- Laborations and computer simulations.
- Write a deep assignment on a specific subject.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written or oral examination, approved assignments, approved reports from laborations.

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:** Examination.
Credits: 5. **Grading scale:** TH. **Assessment:** Written or oral exam **Contents:** Examination
Code: 0223. **Name:** Deep Assignment.
Credits: 2. **Grading scale:** UG. **Assessment:** report and presentation **Contents:** deep assignment
Code: 0323. **Name:** Laboratory.
Credits: 0,5. **Grading scale:** UG. **Assessment:** report and attendance **Contents:** laboratory work

Admission

Assumed prior knowledge: Basic knowledge in building services, heat transfer and thermodynamics. Knowledge from use of caculation program like Matlab and Excel.
The number of participants is limited to: 60
Selection: Completed university credits within the programme. Priority is given to students enrolled on programmes that include the course in their curriculum. Interviews can apply.
The course overlaps following course/s: TNA165, AEBF20

Reading list

- Andrén Lars: Solar installations, Practical applications for the built environment. James & James (SciencePublishers), 2007, ISBN: 978-902916-45-3. Andrén Lars, Solar installations– Practical applications for the built environment 2007 ISBN 978-902916-45-3.
- Written course materiels which are developed within course. This materiel is distributed in the course or can be downloaded from the course home page.
- Simuleringsprogrammen System Advisor Model and Solar Collector.

Contact and other information

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