

Course Syllabus

Solar Building Design 5 Credits*, Second Cycle Level 1

Learning Outcomes

After the course, the students shall be able to

- define and individually analyse different ways to adapt and design buildings so that they, because of their form and place, can use solar energy and the microclimate on the site to reduce their heating and/or cooling demands.
- review different types of windows in a building and the way in which they contribute to the heating of a building.
- make independent use of calculation programmes for the calculation of the heat balance of a building where factors like internal heat generation and solar gain and heat losses through windows are taken into account.
- conduct a critical analysis on how a town can be designed and adapted in a sustainable way so as to avoid heat island effects both today and in the future.

Course Content

The course starts with an overview of different ways to design buildings so they can use the available solar radiation and microclimate for reducing the needs of energy for heating, cooling and ventilation. The physics of windows, like U value and g value, and the heat balance of a building are discussed, and the student will learn how to calculate with internal generation of heat and solar gain through windows. These skills are used in Excel calculations of heat balance in buildings as well as in the use of simpler simulation programmes for the energy balance in buildings. The course focuses on buildings in Europe where the demand for heat is greater than the demand for cooling; however, examples and methods will be provided so that the student can use his/her acquired knowledge to analyse buildings in warm climates as well.

The microclimate on a site, like wind, humidity and local temperature, shading from other buildings, or the topography and the way these affect the energy demands of a building are examined. One special focus is large towns and their microclimate and how heat island effects can be avoided or reduced by methods such as the choice of colour or vegetation. The course will give an overview of the different tools and working methods used by architects and engineers to facilitate the use of solar energy in buildings

Assessment

Written lecture reports where the student comments on, reflects on and analyses the content of the lectures and given literature 3 credits, written individual home exercises and

laboratory work conducted in groups 2 credits

Forms of Study

Lectures, seminars, laboratory work, home exercises and reflection report. Study visits will be arranged if appropriate locations can be found. The lectures are given in English.

Grades

The Swedish grades U, 3, 4, 5.

Written individual home exercises and laboratory work U-G.

Credit will be based on the lecture reports. Well done home exercises may affect the credit in a positive way.

Prerequisites

B.A. in engineering (mechanical, electrical, energy, physical sciences, construction engineering, architecture) of at least 180 credits and English 6. Solar Radiation and Solar geometry 5 credits

Other Information

Maximum five occasions for examination (submitted lecture reports and revised versions after comments from the teacher)

Subject:

Energy Technology

Group of Subjects:

Energy Technology

Disciplinary Domain:

Technology, 100%

This course can be included in the following main field(s) of study:

1. Energy Technology
2. Solar Energy Engineering

Progression Indicator within (each) main field of study:

1. A1N
2. A1N

Approved:

Approved 27 August 2015

Valid from 21 November 2015