University *of Ljubljana*
Faculty *of Mechanical Engineering*

Solar Utility Technologies 5 ECTS

Lecturer: **Sašo Medved, Ciril Arkar**

Lectures: 30h | Tutorials: 10h | Labs: 20h | Project: 0h | Lang. :

Objectives

The objective of the subject is to provide the students with theoretical, methodological, analytical knowledge with elements of research work form a basis to high demanding professional work in field of design and assessment of solar utility technologies including :

- an overview of renewable energy technologies and perspectives;
- moddeling of solar irradiation and radiation on arbitrary plane;
- knowledge on radiative heat transfere and optical properties of surfaces;
- abilities to design and modeling passive solar systems, mid temperature range hydronlic and air solar heating systems and solar concentrators;
- abilities to design and modeling solar cooling systems ;
- practice in experimental evaluation of solar collectors and solar heating/cooling systems;
- abilities to design and modeling PV systems;
- LCA and LCC assessment of soalr utility technologies.

Programme

1. Renewable energy sources and perspective 2030 and 2050
2. Extraterrestrial and terrestrial solar radiation and irradiation
3. Radiative heat transfer and optical properties of solar receiving surfaces
4. Solar thermal systems from passive to high temperature
5. Solar cooling
6. Photovoltaics, building integrated BIPV, AgroPV
7. Solar energy utilization in agriculture and industry

Prerequisites

In order to achieve the objectives successfully, the students must have:

- Good knowledge in physics and heat transfer
- Good knowledge in energy modelling

Learning outcomes

After attending this course, the student will have:

- knowledge to define and understand fundamental scientific problems in field of solar energy utilization to creatively deal with professional challenges and the ability to upgrade and use the engineering knowledge, including the development and design of solar utilization technologies.
- ability to use contemporary research methods and procedures for modelling solar utilization processes and systems and gain capacity to transfer the knowledge into the practice in form of optimal solutions based on analysis and synthesis.

Assessment

Theory - lectures and exercise problems (50%); Individual/group work at exercises (25%); Practical seminary work (25%)

Literature

1. Medved, S., Arkar, C. Renewable energy sources: Faculty of Mechanical Engineering, Ljubljana, 2019.
2. Tiwari, G. N., Tiwari, A., Shyam. Handbook of Solar Energy : Theory, Analysis and Applications. Springer Singapore, 2016.
3. Malamatenios, C., Giakoumelos, L., Mavrou, E. Handbook for the Renewable Energy Sources Course. Centre for Renewable Energy Sources and Saving, Athens, 2016.