SYLLABUS

1. Course title:

SOLAR PLANTS

2. Code:

3. Cycle of study:

I

4. ECTS credits:

5

5. Type of course:

Mandatory

6. Prerequisites:

None

7. Class restrictions:

None

8. Duration / semester(s):

I VII

9. Weekly contact hours and student workload:

	Semester (1)	Semester (2)	(for two-semester courses)	Workload: (hours)
9.1. Lectures	2		Classes:	45,00
9.2. Seminars	1		Individual work:	91,75
9.3. Laboratory / Practice classes	1		In total:	136,75

10. Faculty:

Faculty of mechanical engineering

11. Department/study program:

Energetics and thermo-fluid engineering

12. Lecturer:

dr.sc. Indira Buljubašić, Prof.

13. Course aims:

• Acquiring academic competencies in the field of using plants for converting solar energy into heat and electricity.
•Acquiring knowledge and competencies for modeling, designing and building various solar plants

14. Learning outcomes:

• Ability to analyze the potential of using solar energy at a given location, explain the functions and relevant characteristics of solar collectors, energy accumulators, heat exchangers and apply the mass and energy balance for solar system elements.
• Ability to analyze and select the best location for the construction of a suitable solar plant, design the plant taking into account the applicable legal and technical regulations.

15. Course content:

Dynamics of teaching units by week:
1. History of using solar energy. Areas of use of solar energy. Solar radiation: characteristics, potential, available energy at a given location on Earth.
2. Basic elements of solar heat systems: solar collectors, thermal energy accumulators.
3. Heat exchangers in solar thermal systems, transmission fluids, pipelines and other system components and their characteristics.
4. Solar systems for different purposes.
5. Photovoltaic solar systems. Photoelectric effect. PN junctions.
6. Solar cell. Photovoltaic modules.
7. Solar power plants - classification, advantages and disadvantages of certain types of power plants.
8. Determination of the energy characteristics of the selected solar system.
9. Analysis of the selection of the location for the installation of the solar system.
10. Techno-economic analysis of the solar energy system.
11. Management and supervision of the operation of solar power plants within the EES.
12. Design and modeling of solar plants.
13. Installation and maintenance of solar systems.
14. Laws and regulations. Test with tasks
15. Energy storage systems.

16. Learning methods:

Lectures using multimedia tools, active learning techniques with active participation and discussions of students. Preparation of assignments and preparations for other assigned activities as part of the exercises. In addition to the above, students have access to consultations with the subject teacher/associate during lecture/exercise periods as well as during certain consultation periods.

17. Assessment methods:

Pre-exam requirements - In the second part of the semester, a test is taken from tasks that were done in the auditory exercises, and if at least 50% of the points are scored on the test, the test is passed. If the tasks are not passed on the test, the test is taken during the final exam and the expected part of the points is transferred and scored during the final exam. As part of the pre-exam requirements, students are required to create an individual project task that involves designing a solar plant with the given data. The seminar paper must be sent to the assistant for review, who helps with advice and review, and when the work is completed, the assistant scores it and then the student can present and defend it in front of the professor. In order for the seminar to be considered completed, the student must receive at least 50% of the points expected for the work, and at least 50% of the points expected for the defense. The student can also earn some points based on attendance at classes and exercises.
Final exam - The exam consists of a part in which tasks are done (for those who did not pass the test) as well as a theoretical part. The exam is considered passed if a minimum of 50% of points are achieved in the assignments and a minimum of 50% of points in the theory.

Scoring scale:

Rating	Described	Verbally	Points
5 (five)	Does not meet the minimum criteria	F, FX	< 54
6 (six)	Meets the minimum criteria of	E	54-64
7 (seven)	Generally good, but with significant flaws	D	65-74
8 (eight)	Average, with noticeable errors	C	75-84
9 (nine)	Above average, with some errors	B	85-94
10 (ten)	Exceptional success without mistakes or with minor mistakes	A	95-100

18. Assessment components:

Pre-exam requirements (points):
- Lecture attendance - 2.5
- Exercise attendance 2.5
- Project assignment/seminar paper 20 writing +10 defense=30
- Test with assignments 30
Pre-exam requirements - total points: 65
Final exam - total points 35

TOTAL: 100 points

19. Mandatory reading list:

1. Gojak, M., Rudonja, N: Solarni termalni sistemi, Univerzitet u Beogradu, 2020.
2. Aleksić S. i dr.: Solarne komponente, zbirka riješenih zadataka i problema, Elektronski fakultet Niš, 2023.
3. Labudović, B.: Osnove primjene solarnih toplinskih sustava, Zagreb, 2010.
4. Buljubašić I., Osmić M.: Elektrane i okolina, Soreli d.o.o. Tuzla, 2020.

20. Additional reading list:

1. Z.Zavargo: Održive tehnologije, TEMPUS, Novi Sad, 2013.
2. P. Breeze: Power Generation Technologies, Elsevier, 2019.
3. G.Boyle: Renewable Energy- power for a sustainable future, Oxford, (2004) 2012.
4. M.Ebrahimi: Power Generation Technologies- Foundations, Design and Advances, Elsevier, 2023.
5. Y.Zang et.al: Advances in ultra low emission control technologies for coal-fired power plants, Elsevier, 2019.

21. Web sources:

https://www.iea.org/
https://commission.europa.eu/topics/energy_hr
https://www.energy-community.org/

22. Applicable from the academic year:

23. Adopted in the Faculty/Academy session: