SYLLABUS

1. Course title:

ENERGY-PROCESS MEASUREMENTS

2. Code:

3. Cycle of study:

I

4. ECTS credits:

4

5. Type of course:

Mandatory

6. Prerequisites:

None

7. Class restrictions:

None

8. Duration / semester(s):

I VIII

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:	74,92
9.3. Laboratory / Practice classes	1		In total:	119,92

10. Faculty:

Faculty of mechanical engineering

11. Department/study program:

nergy and thermal-fluid engineering

12. Lecturer:

dr.sc. Indira Buljubašić, Prof.

13. Course aims:

• Acquiring academic knowledge in measurement theory, methods of conducting measurements, statistical processing of data and presentation, and interpretation of measurement results.

• Mastering theoretical knowledge and acquiring practical skills in the field of measuring process quantities in energy and thermotechnical plants such as: temperature, pressure, volume and mass flow, level, air humidity.

14. Learning outcomes:

• Ability to independently or in a team define locations and quantities to be measured in industrial and process plants and independently process and analyze measurement results;
• Ability to independently or in a team perform measurements of quantities such as pressure, temperature and flow and to make decisions on process management in industrial and process plants based on this.

15. Course content:

Dynamics of processing teaching units by weeks:
1. Theory of measurement. Metrological information and measurement procedure. Quantities, units, standards.
2. International system of units. Legal and technical metrology. Measurement errors. Systematic and random errors.
3. Random variable. Statistical set. Mean values of a random variable.
4. Dispersion indicators. Distribution models.
5. Regression analysis. Statistical processing and presentation of measurement results.
6. Direct and indirect measurement. Test 1- tasks.
7. Temperature measurement. Temperature scales.
8. Methods and sensors for measuring temperature.
9. Pressure measurement. Types of pressures.
10. Methods and sensors for measuring pressure.
11. Methods and sensors for measuring volume flow.
12. Methods and sensors for measuring mass flow.
13. Air humidity measurements. Measurement of flue gas composition.
14. Level measurements. Measurements of other quantities in the energy and process industry.
15. Calibration of measuring equipment. Test 2-tasks.

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 - During the semester, two tests are 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 period and the expected part of the points are transferred and scored during the final exam period. As part of the pre-exam requirements, students are required to conduct measurements as part of laboratory exercises in the laboratories of the Faculty of Mechanical Engineering and prepare two reports on the exercises conducted. The report defense is mandatory before the subject teacher. The student can also earn part of the points based on attendance at classes and exercises.
Final exam - The exam consists of a part in which tasks are done (who did not pass the test) and a theoretical part. The exam is considered passed if at least 50% of the points on the tasks and at least 50% of the points on the theory are scored.

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
- Preparation and defense of a report on
the conducted laboratory exercises 2 exercises x 5= 10
-Tests with tasks 2 tests x 20 = 40
Pre-exam requirements - total number of points: 55
Final exam - total number of points 45
TOTAL: 100 points

19. Mandatory reading list:

1. Buljubašić I. i dr.: Energetsko-procesna mjerenja, Tuzla, 2013.
2. Topić R.: Projektovanje postrojenja i procesnih i energetskih sistema, Mašinski fakultet Univerziteta u Beogradu, 2013.
3. Valter Z.: Procesna mjerenja, Osijek, 2008.

20. Additional reading list:

1. Žanetić R., Stipišić R.: Mjerni pretvornici u procesnoj industriji, skripta, Split, 2005.
2. Đonlagić D.: Mjerenje temperature i pritiska, Maribor, 1995.
3. Z.Zavargo: Održive tehnologije, TEMPUS, Novi Sad, 2013.
4. G.Boyle: Renewable Energy- power for a sustainable future, Oxford, (2004) 2012.
5. M.Ebrahimi: Power Generation Technologies- Foundations, Design and Advances, Elsevier, 2023.

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:

2025/26.

23. Adopted in the Faculty/Academy session: