



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Measurements in the energy sector [N1Energ1>MwE]

### Course

Field of study

Power Engineering

Year/Semester

4/8

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

polish

Form of study

part-time

Requirements

elective

### Number of hours

Lecture

10

Laboratory classes

10

Other (e.g. online)

0

Tutorials

0

Projects/seminars

10

### Number of credit points

3,00

### Coordinators

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### Lecturers

### Prerequisites

- Knowledge of the thermodynamics, fluid mechanics - Basic knowledge of the basics of temperature and pressure measurement - The student should also be able to obtain information from specified sources and be willing to cooperate as part of a team.

### Course objective

Acquainting with measuring instruments of basic physical quantities in thermal energy. Elements of mathematical statistics, theory of measurement errors in relation to measuring systems in energy systems. This applies to devices such as boilers, turbines, compressors, heat exchangers.

### Course-related learning outcomes

Knowledge:

1. has structured, theoretically founded knowledge of programming techniques and knows methods of simulating phenomena in energy systems.
2. has systematic knowledge in the field of conventional energy. knows and understands phenomena, operating principles of machines and energy devices. understands processes and phenomena occurring in discussed elements of thermal circuits.

3. has systematic knowledge of the basics of control and automation of technological processes in the energy sector; understands the problems of stability in dynamic systems and knows the methods of their description.

#### Skills:

1. is able to develop documentation regarding the implementation of an engineering task using appropriate methods and tools, including advanced information and communication techniques (ict); is able to prepare a text discussing the results of this task.
2. is able to use properly selected methods and devices enabling measurement of basic quantities characterizing energy elements and systems.
3. is able to use known analytical, simulation and experimental methods and mathematical models to analyze and evaluate the operation of energy elements and systems.

#### Social competences:

1. understands the need and knows the possibilities of continuous training, raising professional, personal and social competences (e.g. through second and third cycle studies, postgraduate studies, courses); and is ready to critically assess knowledge, recognizes its importance in solving cognitive and practical problems.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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- Knowledge acquired as part of the lecture is verified by a final exam consisting of 6 to 9 questions with various points depending on their level of difficulty. Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.
- Skills acquired as part of the laboratory classes are verified on the basis of short input colloquia and reports from classes. Passing threshold: 50% of points. Issues are first discussed on the blackboard and then implemented in groups - practical exercises.
- In the initial part of the project classes issues are first discussed on the blackboard and then implemented in groups - practical exercises. Skills acquired as part of project classes are verified on the basis of short presentations during the semester, questions from the teacher and based on the final project developed. Passing threshold: 50% of points.

### Programme content

Types and ranges of measurements in the energy sector. Classification of instruments and measuring methods. Types of measuring instruments used. Construction and operation of the most commonly used instruments. Pressure, temperature, volumetric and mass flow measurements. Selection of measuring instruments, methods of mounting measuring sensors. Measuring transducers - classification, principle of operation, selection methods, measuring systems. Fundamentals of error account and processing of measurement results. Tests of selected power devices - pump, fan.

### Teaching methods

- Lecture: blackboard with multimedia presentation.
- Project classes: discussing theory and assumptions for classes on the board and performing tasks given by the teacher, independent work on the design task.

### Bibliography

Basic

Fodemski T.R. i inni: Pomiary cieplne, cz. I i II, WNT, Warszawa 2001.

Kulesza J. i inni: Pomiary cieplne, cz. I i II, WNT, Warszawa 1993.

Jaworski J. i inni: Wstęp do metrologii i techniki eksperymentu, WNT, Warszawa, 1992.

Additional

PN-93/M-53950/01

### Breakdown of average student's workload

	Hours	ECTS
Total workload	70	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	2,00