COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heat and fluid flow measurements [S2EPiO1-ECiO>MC]

Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
1/1

Area of study (specialization)
Thermal and Renewable Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

dr inż. Robert Kłosowiak
robert.klosowiak@put.poznan.pl

Lecturers

Prerequisites

The student has a basic knowledge of thermodynamics and fluid mechanics. Has knowledge of physics in relation to the basic phenomena used in measurement

Course objective

Acquaintance with the latest measuring technologies. Discussion of the measuring point issues. Teaching how to carry out measurements of thermodynamic quantities and error analysis of these measurements.The student has a basic knowledge of thermodynamics and fluid mechanics. Has knowledge of physics in relation to the basic phenomena used in the measurement.The student is able to cooperate in a group, taking on different roles in it to solve the tasks set before him. The student demonstrates independence in solving problems, acquiring and improving acquired knowledge and skills.

Course-related learning outcomes

Knowledge:
has knowledge of the latest constructions of measuring machines and devices used in the energy industry
knows and understands the fundamental aspects related to the design, construction, implementation

and maintenance of control and measurement systems in industrial energy.
has knowledge of the negative impact of energy technologies on the environment

Skills:
is able to design - in accordance with the given specification - and make simple devices, objects, systems or implement processes for industrial and renewable energy, using appropriately selected research methods, measuring techniques, tools and materials.
is able to solve research and engineering tasks requiring the use of engineering standards and norms and the use of measurement technologies appropriate for industrial and renewable energy, using experience gained in an environment professionally engaged in engineering activities.
is able to use the experience gained in the construction of control and measurement systems related to the maintenance of devices, facilities and systems of industrial and renewable energy

Social competences:
student is ready to critically assess knowledge and received information
student is ready to recognize the importance of knowledge in solving cognitive and practical problems and to seek expert opinions in case of difficulties in solving the problems
student is ready to think and act in an entrepreneurial way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Written exam from the lecture, minimum to pass – 51% of total available points
passing the project and laboratory

Programme content

Error analysis, ways of presenting results, ways of preparing research reports. Basic physical phenomena on which modern measuring systems used in industry are based. Analysis of measuring tracks adapted to the testing of heat-flow machines occurring in thermal energy. The principles of balancing and determining the efficiency (effectiveness) of heat and flow machines.

Course topics

Error analysis, ways of presenting results, ways of preparing research reports. Basic physical phenomena on which modern measuring systems used in industry are based. Analysis of measuring tracks adapted to the testing of heat-flow machines occurring in thermal energy. The principles of balancing and determining the efficiency (effectiveness) of heat and flow machines.

Teaching methods

lecture

Bibliography

Basic
Pomiary cieplne. Praca zbiorowa pod redakcją prof. dr inż. Tadeusza R. Fodemskiego. WNT Warszawa 2001.
J. Wojciechowski, Pomiary w elektrowniach cieplnych, PWT, Warszawa 1958.
K. Bakinowska, Pomiary cieplne, cz. I, WNT, Warszawa 1995
W. Minkina, Pomiary termowizyjne : przyrządy i metody; Politechnika Częstochowska, 2004
H. Madura, Pomiary termowizyjne w praktyce , Agenda Wydawnicza PAKu, Warszawa, 2004
Additional
Pomiary temperatury w badaniach silników i urządzeń cieplnych. Stefan Wiśniewski. WNT Warszawa 1983
W. Kołodziejczyk, Pomiary zużycia ciepła w budynkach, Centralny Ośrodek Informacji Budownictwa, Warszawa, 1993
W. Minkina, S. Chudzik ,Pomiary parametrów cieplnych materiałów termoizolacyjnych : przyrządy i metody; Politechnika Częstochowska, 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50