COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automation and control of thermal and fluid flow processes [S2EPiO1>SiAPCiP]

Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
2/3

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
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Wojciech Judt

Lecturers

Prerequisites

KNOWLEDGE: Knowledge acquired during the course of studies: thermodynamics, fluid mechanics, basics of automation, boilers, steam and gas turbines, compressors, pumps, fans, heat and mass transfer, energy management. SKILLS: The student is able to use the basic methods used in automation and digital technology, is able to read and create simple block diagrams of automation systems and computer programs. Can use the basic functions of any higher-level programming language. The student is able to use the knowledge acquired so far to analyze and solve problems occurring in thermal and fluid flow processes. SOCIAL COMPETENCES: The student is able to cooperate in a group, taking different roles in it. The student is able to determine the priorities important in solving and the hierarchy of other tasks set before him. The student demonstrates independence in solving problems, gaining and improving acquired knowledge and skills.

Course objective

In-depth knowledge of the fundamental foundations of the theory of control of heat-flow processes. Getting acquainted with currently used technical solutions and directions of technological development in this field.

Course-related learning outcomes

Knowledge:

1. has extended knowledge of the latest scientific discoveries in the field of thermodynamics, fluid dynamics, heat transfer, combustion processes with particular emphasis on the latest control systems
2. has expanded knowledge necessary to understand profile subjects and specialist knowledge about construction, methods of constructing, manufacturing, controlling machines and devices in the energy sector, knows the main processes and transformations taking place in energy machines
3. has ordered and in-depth knowledge necessary to understand the issues of energy security and the latest solutions in the field of energy process control

Skills:
1. is able to solve research and engineering tasks requiring the use of engineering standards and norms and the use of technologies specific to industrial and renewable energy, using experience gained in an environment professionally engaged in engineering activities
2. is able to communicate on specialized topics with diverse audiences dealing with energy process control issues
3. can independently plan and implement their own lifelong learning and guide others in this area

Social competences:
1. is ready to fulfill social obligations, inspire and organize activities for the benefit of the social environment, especially in the aspect of the influence of modern control systems on the quality of the combustion process
2. is ready to initiate an action in the public interest
3. is ready to think and act in an entrepreneurial manner

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture - written exam. Obtaining credit from a minimum of 51% of the points possible to get. There is a possibility of an oral question to raise the grade. Laboratory classes - final test checking the student"s knowledge in a practical way

Programme content

Control of processes of non-stationary transport of liquids and gases. Constitutive equations. Currently used mathematical models of fluid transport systems. Technical measures necessary for their implementation. Analysis and synthesis of control systems for basic thermal energy processes. Analysis of control systems for heat and flow processes in a combined heat and power plant. Software of modern modular measuring and control systems. Technical and economic issues related to the implementation of design works, construction and operation of control systems, with particular regard to the specifics of industrial energy and distributed, local CHP systems.

Teaching methods

Lectures will be conducted using a multimedia presentation.
As part of the laboratory, students will work using the LabVIEW programming environment implemented in the computer lab.

Bibliography

Basic
1.Chruściel M., LabVIEW w praktyce, Wydawnictwo BTC, Legionowo 2008
2. Piekarski M., Poniewski M., Dynamika i sterowanie procesami wymiany ciepła i masy, WNT, Warszawa, 1994
Additional
1. Tłaczała W., Środowisko LabView w eksperymencie wspomaganym komputerowo, WNT, Warszawa 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
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)	15	0,50