COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automation of energy processes [S1Energ2>APE]

Course

Field of study
Power Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

He has the knowledge in the scope of physics, essential to understand basic visions appearing in systems of the electric supply of technological processes connected with processing energy. He has the rudimentary knowledge from the scope of bases of automation and the computer science and the technology of processes in energetics. He is able to use actually selected methods and devices enabling the measurement of parameters of typical processes appearing in energetics. He is able to use principles of programming on the general level. He poses an ability of the effective self-education in the field of energetics. A consciousness of the need to expand its competence, he is ready to pick the cooperation up in frames of team unit.

Course objective

Acquainting the automation of processes with chosen systems in energetics as well as achieving abilities of working algorithms out and of programs of controlling with chosen processes programmed using the logical controllers.

Course-related learning outcomes

Knowledge:

1. Student knows the construction and principle of operation of steam power plant power units and has knowledge about the process of electricity production in conventional sources.
2. Student knows methods for simulating phenomena in energy systems.
3. Student has elementary knowledge in the field of automatic control systems of technological processes in power plants and combined heat and power plants, including regulation of: temperature, pressure, water and steam flow rate, liquid level in tanks.
4. Student knows and understands the connections between theoretical issues and real objects.
5. Student knows and understands the methods of measuring controlled and control quantities characteristic of control algorithms in power plant technological systems.

Skills:
1.Student is able to apply knowledge in the field of automation of energy processes necessary to determine the essential parameters of the system controlling the temperature, pressure, water and steam flow control.
2. Student is able to determine the correct operation of basic elements of process control systems in power plants and combined heat and power plants.
3. Student is able to apply knowledge of the theory of process control related to energy conversion to design simple automatic control systems used in power plants.
4. Student is able to use catalog cards and application notes to select the appropriate components of the designed energy system.
5. Student is able to implement the device / energy object control algorithm

Social competences:
1. Student understands the non-technical (including ecological) effects of their actions and its impact on the environment, especially in terms of.
2. Student is able to demonstrate an incentive initiative to solve the problem effectively.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
- evaluation of the knowledge and skills listed on the written test, 50% of the maximum points required.
Laboratory classes
- preparation of a report on laboratory exercises. Assessment of the correct operation of the constructed models.

Programme content

Systems for automatic regulation of basic power plant parameters.
Study of the dynamics of selected power plant equipment in the Matlab/Simulink environment.

Course topics

Lecture
Automatic steam pressure and temperature control system. Generated power control system. Ways to regulate the work of the steam turbine. Automatic drum water level adjustment system. Automatic pressure regulation system in the boiler's combustion chamber. Automatic combustion control system.

Laboratory classes
Introduction to modeling in the Simulink environment.
Frequency and power regulation in the power system.
Modeling the dynamics of a coal mill.
The boiler as an object for regulating the water level in the drum..

Teaching methods

Lecture
Lecture with multimedia presentation supplemented with examples given on the board.
Laboratory classes
Activating method, independent model creation in the Simulink environment.

Bibliography

Basic:
1. J. Rakowski, Automatyka cieplnych urządzeń siłowni, WNT W-wa 1983
2. J. Kostro, Elementy, urządzenia i układy automatyki, WSiP W-wa 1983
3. R. Janiczek, Eksploatacja elektrowni parowych, WNT W-wa 1980
4. Z. Domachowski, Regulacja automatyczna turbozespołów cieplnych, Wydawnictwo PG 2011

Additional:
1. S. Brock i inni, Sterowniki programowalne, Wyd. Politechniki Poznańskiej, 2000
2. A. Urbaniak, Podstawy automatyki, Wyd. Politechniki Poznańskiej, 2001
3. B. Ceran, Modelowanie własności dynamicznych średnio-bieżnego młyna węglowego, Energetyka w kierunku nowej polityki energetycznej, cykl Rynki surowców i energii TOM 2 - Prawo - Bezpieczeństwo - Technika, Poznań-Zielona Góra 2020, 393 - 401.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
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)	25	1,00