COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optimization and Control in Environmental Engineering

Course

Field of study

Environmental Engineering

Year/Semester

I/2

Area of study (specialization)

Heating, Air Conditioning and Air Protection

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

18

Laboratory classes

10

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

prof. dr hab. inż. Andrzej Urbaniak

email: -andrzej.urbaniak@cs.put.poznan.pl

tel. 61 665 2905

Wydział Informatyki

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic terms of control engineering and informatics.Student skills to describe the dynamic characteristics of objects and processes.He has a needs of continously of knowledge actualization

Course objective

To teach the proper formulation of optimization problems with one or multicriteria ones.

The pesentation of new directions in the field of processes control in environmental engineering. Preparation for effective cooperation with computer and control engineers for automation

Course-related learning outcomes

Knowledge

1. Student knows basic terms utilized in optimization problems - [K2_W01]

2. Student understands the neccessity aplication of optimization and control in environmental engineering - [K2_W01, K2_W07]

3. Student utilizes the mathematical modeling and simulation methods - [K2_W07]

4. Student knows possibilities to utilization of computer tools for monitoring and control - [K2_W07]

Skills

1. Student formulates the optimization tasks with one or multi criteria - [K2_U09]

2. Student describes the demands for SCADA systems for objects and processes in environmental engineering - [K2_U10]

3. Student describes the proper action of devices and processes in algorithmic way - [K2_U08, K2_U09]

Social competences

1. STUDENT: undestands the neccessity of interdisciplinary group colaboration - [K2_K03]

2. He aprobates the neccessity of complex processes automation - [K2_K07]

3. He understands the improtance of new information technology in environemtal engineering - [K2_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written test of knowledge

Laboratory exercises: activity of exercises realization, evaluation of preparation to the problem solving, written exercises protocols

Programme content

Optimization problems and its technical applications. Formulation of optimization problems with one criterion. Multicriteria optimization problems. Optimization methods (analytical and numerical approach). Simplex method. Nonlinear optimization.

Computer control systems: classification, Programmable Logic Controllers (PLC), microcontrollers, embedded systems. Process monitoring (examples of solutions). Control of water treatment and wastewater treatment processes. Air conditioning control (examples of solutions). Intelligent building systems (BMS).

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board.

2. Laboratory exercises

Bibliography

Basic

1. G. Olsson, G. Piani: Computer in automation and control. Prentice Hall, New York 1995. 2.

2. Urbaniak A., Komputerowe wspomaganie eksploatacji obiektów i procesów w systemach zaopatrzenia w wodę i oczyszczania ścieków,Wyd. Komitetu Inżynierii Lądowe i Wodnej PAN, Warszawa 2016

3. Poradnik eksploatatora oczyszczalni ścieków, Dymaczewski Z., Sozański M.M., (red.), Wyd. PZiTS, Poznań 2011 r

Additional

1. Olsson G., Newell B., Wastewater Treatment Systems - Modelling, Diagnosis and Control, IWA Publ. 1999

2. T. Łukaszewski, A. Urbaniak, Informatyka w ochronie środowiska, Wyd. P.P., Poznań 2001.

3. Olszanowski A., Sozański M.M., Urbaniak A., Voelkel A. (red.), Remediacja i bioremediacja zanieczyszczonych wód i gruntów oraz wykorzystanie modelowania i technik informatycznych w inżynierii środowiska, Wyd. PP, Poznań 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	28	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	22	1

[1] delete or add other activities as appropriate