COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optimization and Control in Environmental Engineering [N2IŚrod1>OiSwIŚ]

Course

Field of study
Environmental Engineering

Year/Semester
1/1

Area of study (specialization)
Heating, Air Conditioning and Air Protection

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
8

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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Prerequisites

1. Basic terms of control engineering and informatics. 2.Student skills to describe the dynamic characteristics of objects and processes. 3.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.

2. Student understands the neccessity aplication of optimization and control in environmental engineering.
3. Student utilizes the mathematical modeling and simulation methods.
4. Student knows possibilities to utilization of computer tools for monitoring and control.

Skills:
1. Student formulates the optimization tasks with one or multi criteria.
2. Student describes the demands for SCADA systems for objects and processes in environmental engineering.
3. Student describes the proper action of devices and processes in algorithmic way.

Social competences:
1. Student undestands the neccessity of interdisciplinary group colaboration.
2. Student aprobates the neccessity of complex processes automation.
3. Student understands the improtance of new information technology in environemtal engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written exam in the scope of the whole lecture
- theoretical questions (up to 10) with different point values
- a simple example in the field of formulation of linear optimization problems and graphical solutions
Assessment: point scale: assessment proposal; review of work - possibly oral part (only if at least 33% of points are obtained):
Score:
up to 50% insufficient (F)
51% - 60% sufficient
61% -70% a satisfactory plus
71% -80% good
81% -90% a good plus 3
from 91% very good
Laboratories:
- credit based on class participation
- assessment of preparation for individual exercises
- preparation of reports on tests carried out

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

Lecture with simple calculation examples. Multimedia presentations.

Bibliography

Basic:
1. 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
2. Poradnik eksploatatora oczyszczalni ścieków, Dymaczewski Z., Sozański M.M., (red.), Wyd. PZiTS, Poznań 2011 r.
3. Sroczan E.M., nowoczesne wyposazenie tecgniczne domu jednorodzinnego, Instalacje elektryczne, Państ. Wyd. Rolnicze i Leśne, Poznań 2004 r.
4. G. Olsson, G. Piani: Computer in automation and control. Prentice Hall, New York 1995. 2.

Additional:
1. T. Łukaszewski, A. Urbaniak, Informatyka w ochronie środowiska, Wyd. P.P., Poznań 2001.
2. Olsson G., Newell B., Wastewater Treatment Systems - Modelling, Diagnosis and Control, IWA Publ. 1999
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 4
4. Albert Ting-pat So, Intelligent building systems, Kluwer Acad. Publ., Boston – London 1999

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	28	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	47	2,00