

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject (-)		Code 1010102221010512020
Field of study Environmental Engineering Second-cycle	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty Heating, Air Conditioning and Air Protection	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 30 Classes: - Laboratory: 15 Project/seminars: -		No. of credits 4
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art		ECTS distribution (number and %)
Responsible for subject / lecturer: dr hab. inż. Andrzej Urbaniak email: -andrzej.urbaniak@cs.put.poznan.pl tel. 61 665 2905 Wydział Informatyki ul. Piotrowo 3, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic terms of control engineering and informatics
2	Skills	Student skills to describe the dynamic characteristics of objects and processes
3	Social competencies	He has a needs of continuously of knowledge actualization
Assumptions and objectives of the course: To teach the proper formulation of optimization problems with one or multicriteria ones. The presentation of new directions in the field of processes control in environmental engineering. Preparation for effective cooperation with computer and control engineers for automation		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows basic terms utilized in optimization problems - [K2_W01] 2. Student understands the necessity application 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 competencies:		
1. STUDENT: understands the necessity of interdisciplinary group coloboration - [K2_K03] 2. He aprobrates the necessity of complex processes automation - [K2_K07] 3. He understands the improtance of new information technology in environemtal engineering - [K2_K01]		
Assessment methods of study outcomes		

Lecture: written test of knowledge		
Laboratory exercises: activity of exercises realization, evaluation of preparation to the problem solving, written exercises protocols		
Course description		
<p>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.</p> <p>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).</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. G. Olsson, G. Piani: Computer in automation and control. Prentice Hall, New York 1995. 2. 2. Poradnik eksploatatora oczyszczalni ścieków, Dymaczewski Z., Sozański M.M., (red.), Wyd. PZiTS, Poznań 2011 r. 3. G. Olsson, G. Piani: Computer in automation and control. Prentice Hall, New York 1995. 2. 4. Poradnik eksploatatora oczyszczalni ścieków, Dymaczewski Z., Sozański M.M., (red.), Wyd. PZiTS, Poznań 2011 r. 		
Additional bibliography:		
<ol style="list-style-type: none"> 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 4. Olsson G., Newell B., Wastewater Treatment Systems - Modelling, Diagnosis and Control, IWA Publ. 1999 5. T. Łukaszewski, A. Urbaniak, Informatyka w ochronie środowiska, Wyd. P.P., Poznań 2001. 6. 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 		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Participation in laboratory exercises	15	
3. Preparation to laboratory exercises and its reporting	25	
4. Preparation for exam	20	
Student's workload		
Source of workload	hours	ECTS
Total workload	90	4
Contact hours	45	2
Practical activities	15	2