

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>(-)</b>		Code <b>1010135211010512020</b>
Field of study <b>Enviromental Engineering Extramural Second-</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>1 / 1</b>
Elective path/specialty <b>Heating, Air Conditioning and And</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time,part-time) <b>part-time</b>	
No. of hours Lecture: <b>20</b> Classes: <b>-</b> Laboratory: <b>10</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art		ECTS distribution (number and %)
<b>Responsible for subject / lecturer:</b>  dr hab. inż. Andrzej Urbaniak email: -andrzej.urbaniak@cs.put.poznan.pl tel. 61 665 2905 Wydział Informatyki ul. Piotrowo 3, 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Basic terms of control engineering and informatics
2	<b>Skills</b>	Student skills to describe the dynamic characteristics of objects and processes
3	<b>Social competencies</b>	He has a needs of continously of knowledge actualization
<b>Assumptions and objectives of the course:</b> 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		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Student knows basic terms utilized in optimization problems - [K2_W01] 2. Student understands the neccessity 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]		
<b>Skills:</b>		
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]		
<b>Social competencies:</b>		
1. STUDENT: undestands the neccessity of interdisciplinary group colaboration - [K2_K03] 2. He aprobrates the neccessity of complex processes automation - [K2_K07] 3. He understands the improtance of new information technology in environemtal engineering - [K2_K01]		
<b>Assessment methods of study outcomes</b>		

Lecture: written test of knowledge Laboratory exercises: activity of exercises realization, evaluation of preparation to the problem solving, written exercises protocols		
<b>Course description</b>		
<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>		
<b>Basic bibliography:</b>		
1. G. Olsson, G. Piani: Computer in automation and control. Prentice Hall, New York 1995. 2. 2. 2. 1. Koczyk H., Antoniewicz B., Sroczan E., Nowoczesne wyposażenie techniczne domu jednorodzinego, PWRiL Poznań 1998 r.		
<b>Additional bibliography:</b>		
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		
<b>Result of average student's workload</b>		
<b>Activity</b>	<b>Time (working hours)</b>	
1. Participation in lectures	20	
2. Participation in laboratory exercises	10	
3. Preparation to laboratory exercises and its reporting	20	
4. Preparation for exam	20	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	70	3
Contact hours	30	2
Practical activities	10	1