

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Control theory		Code 1010332211010331168
Field of study Automatic Control and Robotics	Profile of study (general academic, practical) general academic	Year /Semester 1 / 1
Elective path/specialty -	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: 45 Classes: - Laboratory: - Project/seminars: 15		No. of credits 5
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 5 100% 5 100%
Responsible for subject / lecturer: dr inż. Krzysztof Walas email: krzysztof.walas@put.poznan.pl tel. 61 665 2809 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Knowledge of algebra, basics of probability theory and control theory for continuous systems.
2	Skills	Is able to use mathematical apparatus of algebra and set theory.
3	Social competencies	Readiness to work in groups and ability to solve problems currently unknown to the student.
Assumptions and objectives of the course: Improvement of theoretical and practical skills related to modelling of discrete event systems and hybrid systems (with discrete and continuous dynamics). Update 2017: Gaining competences in coping with uncertainty in control system through the use of elements of machine learning.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has organized and extended knowledge on design and analysis of control systems. - [K_W02]		
Skills:		
1. Is able to determine models of compound systems and processes and to use them to analyse and design automation and robotics systems. - [K_U04]		
Social competencies:		
1. Is able to think and act in creative and entrepreneurial manner. - [K_K05]		
Assessment methods of study outcomes		
Written examination, tests written/oral, projects.		
Course description		

<p>Lectures: Introduction to discrete event systems, languages and automata; operations on automata; finite state automata; analysis of discrete event systems; supervisory control timed and hybrid models; stochastic automata with time; Petri Nets -- analysis and applications; Markov chains; Update 2007: Markov Decision Processes; Elements of Machine Learning.</p> <p>Projects: preparation to simulation of discrete event systems, design of a model of a selected device, analysis and software verification of the designed models.</p>		
<p>Basic bibliography:</p> <p>1. Cassandras C. G., Lafortune S.: Introduction to Discrete Event Systems Second Edition, Springer US 2008 2. A. Zimmermann.: Stochastic Discrete Event Systems Modeling, Evaluation, Applications, Springer-Verlag Berlin Heidelberg 2008</p>		
<p>Additional bibliography:</p> <p>1. Update 2017: K. Walas and A. Kasinski.: Discrete event controller for urban obstacles negotiation with walking robot, in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2012, pp. 181?186. 2. Update 2017: G. A. D. Lopes, B. Kersbergen, T. J. J. van den Boom, B. De Schutter, R. Babuska, IEEE TRANSACTIONS ON ROBOTICS, VOL. 30, NO. 3, JUNE 2014 3. Synthesising robust and optimal parameters for cardiac pacemakers using symbolic and evolutionary computation techniques. Kwiatkowska, Mereacre, Paoletti and Patane, HSB?16 4. M. Kwiatkowska, A. Mereacre, N. Paoletti, A. Patane, Synthesising Robust and Optimal Parameters for Cardiac Pacemakers Using Symbolic and Evolutionary Computation Techniques, Hybrid Systems Biology: Fourth International Workshop, HSB 2015, Madrid, Spain, September 4-5, 2015</p>		
<p>Result of average student's workload</p>		
<p>Activity</p>	<p>Time (working hours)</p>	
1. Lectures	45	
2. Projects	15	
3. Tutorials	9	
4. Preparation to the projects	46	
<p>Student's workload</p>		
<p>Source of workload</p>	<p>hours</p>	<p>ECTS</p>
Total workload	115	5
Contact hours	69	3
Practical activities	46	2