STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Foundations of robotics		**1010334251010330827**

Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**(brak)**	**3 / 5**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**part-time**

No. of hours	No. of credits
Lecture: **30** Classes: **12** Laboratory: **22** Project/seminars: **-**	**9**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

dr inż. Jarosław Warczyński, doc.
email: jarslaw.warczynski@put.poznan.pl
tel. 61 665 2374
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge from the field of mathematics necessary for analysis and simulation of dynamical systems in time domain. Knowledge from the selected fields of physics necessary to understand basic physical phenomena encountered in elements, devices and systems of control and robotics and their environment. Systematized theoretical background from the field of analytical mechanics necessary to understand issues of modelling and construction of mechanical systems.
2	**Skills**	K_U01: Student is able to gain information from literature, data basis and other springs. Has skills in selfeducation aimed in levering and actuation of professional competences. K_U03: Student can elaborate documentations and presentations of results achieved in solving engineering tasks. Student can elaborate algorithms for solving simple engineering tasks, implement, test and deploy them in chosen programming environment under selected operation systems on the PC computer.
3	**Social competencies**	K_K04: Student is aware of the necessity of professional approach to technical tasks, closely reading documentations, taking in account environmental conditions for elements and devises to function in. Student is also aware of the necessity of preserving principles of professional ethics, paying regard to different opinions and cultures.

Assumptions and objectives of the course:

Acquaintance of knowledge about robot control algorithms and about controlling robot interactions with environment .

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. [K_W07] - [-]
2. [K_W16] - [-]
3. [K_W19] - [-]
4. [K_W21] - [-]

Skills:

1. [K_U05] - [-]
2. [K_U08] - [-]
3. [K_U17] - [-]
4. [K_U21] - [-]

Social competencies:
1. [K_K02] - [-]
2. [K_K06] - [-]

Assessment methods of study outcomes
Examinations and exercises.

Course description
Statics of robots. Robot control systems: Independent joint control. Point-to?point mo-tion control. Path motion control. Inverse dynamics control. Computed torque feedfor-ward control Manipulator interaction with environment: Compliance control. Force con-trol with inner position loop. Force control with inner velocity loop. Hybrid position/force control. Impedance control. Adaptive robot control. Basics of the trajectory planning and robot programming.

Basic bibliography:

1. Buratowski, T.: Podstawy robotyki. AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków, 2006.
2. Craig, J.J.: Wprowadzenie do robotyki. Mechanika i sterowanie, WNT 1993.
3. Fu, K.S R.C. Gonzalez, C.S.G. Lee: Robotics: Control, Sensing, Vision, and Intelligence, McGraw-Hill Book Comp.1989.
4. Jezierski, E.: Dynamika robotów. WNT, Warszawa, 2006.

Additional bibliography:

1. McKerrow, Ph. J.: Introduction to Robotics, Addison-Wesley 1991.
2. Morecki, A., Knapczyk, J.: Podstawy robotyki. Teoria i elementy manipulatorów. WNT, Warszawa, 1999.
3. Paul, R.P: Robot Manipulators: Mathematics, Control, and Programming, Boston MIT Press 1981.
4. Spong, M. W., M. Vidysagar: Dynamika i sterowanie robotów WNT Warszawa 1997.

Result of average student's workload

Activity	**Time (working hours)**

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	114	5
Contact hours	69	3
Practical activities	36	2