

SYLLABUS OF A MODULE

Polish name of a module	Automatyka i robotyka w procesach produkcyjnych
English name of a module	Automatic control and robots
ISCED classification - Code	0710
ISCED classification - Field of study	<i>Engineering & engineering trades</i>
Languages of instruction	<i>English</i>
Level of qualification:	<i>1 – BSc (EQF 6)</i>
Number of ECTS credit points	<i>6</i>
Examination:	<i>A - assignment</i>
Available in semester:	<i>S – Spring only</i>

Number of hours per semester:

Lecture	Tutorials	Laboratory	Seminar	E-learning	Project
30		30			

MODULE DESCRIPTION

MODULE OBJECTIVES

01. Introducing students to the fundamentals of robotics and industrial automation.
02. Students acquire the ability to program the automatic control units.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of physics and electronics.
2. Knowledge of safety rules during use machinery and technological equipment.
3. Ability to perform mathematical operations to solve the task.
4. Ability to use various sources of information including instructions and technical documentation.
5. The ability to work independently and in a group.
6. Ability to correctly interpret and present own actions.

LEARNING OUTCOMES

- LO 1 – Knows the construction and operation principles of the PLC, and its applicability in automation systems,
- LO 2 – Can program the PLC in the basic scope in LD language,
- LO 3 – Knows the basic kinematic pairs and is able to build a digital model of a robot structure,
- LO 4 – Can discuss the results and make conclusions

MODULE CONTENT

Type of classes – lecture	Number of hours
LECTURES	
Lec 1,2 – Fundamentals of analog and digital technology	2
Lec 3,4 – Basic sensors and actuators in automation systems	2
Lec 5,6 – Construction, principle of operation, selection and applications of PLCs	2
Lec 7,8 – Drain / source IN/OUT in PLC	2
Lec 9,10 – Operations in GX Developer environment	2
Lec 11,12 – Basic programming functions of PLCs	2
Lec 13,18 – Programming of timers, counters. Data acquisition and internal data transfer	6
Lec 19,20 – Arithmetic operations	2
Lec 21, – Construction, principle of operation of robots and manipulators	1
Lec 22 – DH parameters identification of manipulator and robot.	1
Lec 23,24 – Catia Dmu Kinematics - fundamentals	2
Lec 25,26 – Digital mockups	2
Lec 27,30 – Structures and possible robot applications	4
Sum	30
Type of classes– laboratory.	Number of hours
Lab 1, 2 – Operations in GX Developer environment	4
Lab 3, 4 – Basic programming functions of PLCs	4
Lab 5, 6 – Programming of timers, counters	4
Lab 7 – Data Acquisition and internal data transfer	4
Lab 8, 9 – Fundamentals of solids and assemblies DS. CATIA.	4
Lab 10, 11 – Dmu Kinematics –digital mockups	4
Lab 12, 13 – Modeling of various kinematic pairs	3
Lab 14, 15 – Modeling of robotic structures	3
Sum	30

TEACHING TOOLS

1. – Lecture using multimedia presentations
2. – FX3U controllers with control panels
3. – Computer workstations with software

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - evaluation of reports on the implementation of exercises covered by the curriculum
F4. - assessment of activity during classes
S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture - exam

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1. Contact hours with teacher		
1.1	Lectures	30
1.2	Tutorials	
1.3	Laboratory	30
1.4	Seminar	
1.5	Project	
1.6	Examination	5
Total number of contact hours with teacher:		65
2. Student's individual work		
2.1	Preparation for tutorials and tests	
2.2	Preparation for laboratory exercises, writing reports on laboratories	30
2.3	Preparation of project	
2.4	Preparation for final lecture assessment	30
2.5	Preparation for examination	10
2.6	Individual study of literature	30
Total number of hours of student's individual work:		100
Overall student's workload:		165
Overall number of ECTS credits for the module		6 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		2 ECTS
Number of ECTS credits acquired during practical classes including laboratory exercises and projects:		4 ECTS

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1.	J.J. Craig: Introduction to Robotics. Pearson 2005
2.	Siciliano Bruno, Khatib Oussama: Handbook of Robotics. Springer 2008.
3.	Reza N. Nazar: Theory of Applied Robotics: Kinematics, Dynamics and Control. Springer 2007.
4.	Shimon Y. Nof: Handbook of Industrial Robotics. John Wiley & Sons 1999.
5.	Kyle Johns, Trevor Taylor: Professional Microsoft Robotics Developer Studio. Wrox, Wiley Publishing Inc. 2008.
6.	Thomas R. Kurfess: Robotics and Automation Handbook. CRC Press 2005.
7.	Hough Jack: Automating Manufacturing Systems with PLCs. Hugh Jack 2004.
8.	FX3u Documentation
9.	Catia V5 documentation

MODULE COORDINATOR (NAME, SURNAME, E-MAILADDRESS)

Dr inż. Michał Tagowski, michalt@itm.pcz.pl