

## SYLLABUS OF A MODULE

Polish name of a module	
English name of a module	<b>Automatic control and Robots</b>
ISCED classification - Code	0715
ISCED classification - Field of study	<i>Mechanics and metal traders</i>
Languages of instruction	<i>English</i>
Level of qualification:	<i>1 – BSc (EQF 6)</i>
Number of ECTS credit points	4
Examination:	<i>A - assignment</i>

### Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
30	0	30	0	0	0

## MODULE DESCRIPTION

### MODULE OBJECTIVES

- O1. Introducing students to the fundamentals of robotics and industrial automation.
- O2. Introducing students with methods of kinematics analysis, analysis of trajectories and working space of manipulators and robots.
- O3. Students acquire the ability to program the automatic control units.

### PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The ability to perform mathematical operations to solve the tasks.
2. The ability to use various sources of information, including instructions and technical documentation and standards.
3. The ability to use a personal computer.
4. The ability to build algorithms of actions leading to solutions of simple engineering issues.
5. The ability to work independently and in a group.
6. The ability to correctly interpret own actions.

### LEARNING OUTCOMES

- LO 1 – The student knows the basic functions and possibilities of using PLC controllers in automation.
- LO 2 – The student is able to select, configure and program the PLC controller in the field of basic automation applications.
- LO 3 – Is able to set priorities for the implementation of the task specified by him or others

## MODULE CONTENT

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

### 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

<b>F1. - assessment of preparation for exercises</b>
<b>F2. - assessment of the ability to apply the acquired knowledge while performing the exercises</b>
<b>F3. - assessment of activity during classes</b>
<b>S1. - assessment of problem-solving skills and presentation</b>

\*) 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
<b>1. Contact hours with teacher</b>		
1.1	Lectures	30
1.2	Tutorials	0
1.3	Laboratory	30
1.4	Seminar	0
1.5	Project	0
1.6	Consulting teacher during their duty hours	5
1.7	Examination	0
Total number of contact hours with teacher:		65
<b>2. Student's individual work</b>		
2.1	Preparation for tutorials and tests	0
2.2	Preparation for laboratory exercises, writing reports on laboratories	25
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	0
2.5	Preparation for examination	5
2.6	Individual study of literature	5
Total number of hours of student's individual work:		35
Overall student's workload:		100
<b>Overall number of ECTS credits for the module</b>		4 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,6 ECTS
Number of ECTS credits acquired during practical classes including laboratory exercises and projects:		2,2 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, DEPARTMENT, E-MAIL ADDRESS)**

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