Module title **Automatic Control and Robots**		
Field of study: **Mechanical Engineering**	Type of study: **stacjonarne**	Course code:
Course:	Degree: **I stopnia**	Year: **II** Semester: **IV**
Type of classes: **Lecture, laboratory**	Hours per week: **2L, 2Lab**	No of ECTS credits: **4 ECTS**

Module Desription

Targets

T1. Introducing students to the fundamentals of robotics and industrial automation.

T2. Introducing students with methods of kinematics analysis, analysis of trajectories and working space of manipulators and robots.

T3. Students acquire the ability to program the automatic control units.

PREREQUISITES & ADDITIONAL REQUIREMENTS

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 – Can identify DH parameters of robots and manipulators,

LO 2 – Knows how to solve the task of simple and inverse kinematics,

LO 3 – Knows the construction and operation principles of the PLC, and its applicability in automation systems,

LO 4 – Can program the PLC in the basic scope in LD language,

LO 5 – Knows the basic kinematic pairs and is able to build a digital model of a robot structure,

LO 6 – Can discuss the results and make conclusions

MODULE CONTENT

LECTURES	hours
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**
LABORATORIES	**hours**
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

TEACHERS

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

SOURCE LITERATURE

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