SYLLABUS

Course description

<table>
<tr><td colspan="2">Course code</td><td rowspan="2">Course</td><td colspan="4">MECHATRONIKA I AUTOMATYKA</td></tr>
<tr><td colspan="2">ME/O/1/ST/B13</td><td colspan="4">MECHATRONICS AND AUTOMATICS</td></tr>
<tr><td colspan="3">Language of instruction</td><td colspan="4">English</td></tr>
<tr><td colspan="3">Academic year</td><td colspan="4">2025/2026</td></tr>
<tr><td colspan="3">field of study:</td><td colspan="4">Mechanical engineering</td></tr>
<tr><td colspan="3">field of specialisation:</td><td colspan="4">All</td></tr>
<tr><td colspan="3">Educational level</td><td colspan="4">first-cycle studies</td></tr>
<tr><td colspan="3">Education profile</td><td colspan="4">General academic</td></tr>
<tr><td colspan="3">Mode of study</td><td colspan="4">Full-time studies</td></tr>
<tr><td colspan="3">Semester(s)</td><td colspan="4">4</td></tr>
<tr><td colspan="3">Affiliation with a group of classes</td><td colspan="4">B. Core subjects</td></tr>
<tr><td colspan="3">Course status</td><td colspan="4">Obligatory</td></tr>
<tr><td colspan="3" rowspan="3">Types of classes, instruction hours, ECTS credits</td><td>Types of classes</td><td>Number of instruction hours</td><td colspan="2">Number of ECTS credits</td></tr>
<tr><td>Lecture</td><td>30[h]</td><td colspan="2" rowspan="2">5 ECTS</td></tr>
<tr><td>Classes</td><td>30[h]</td></tr>
<tr><td rowspan="3">Linkage of the course</td><td>with the education profile</td><td colspan="3">related to the conducted scientific activity in the discipline to which the field of study is assigned</td><td>5 ECTS</td></tr>
<tr><td>with qualifications</td><td colspan="3">it serves the student's acquisition of engineering competences</td><td>5 ECTS</td></tr>
<tr><td>with science discipline</td><td colspan="3">Mechanical engineering</td><td>5 ECTS</td></tr>
<tr><td colspan="3">Form of teaching</td><td colspan="4">Traditional – classes organized at the University /classes conducted using online learning methods and techniques</td></tr>
<tr><td colspan="3">Prerequisites</td><td colspan="4">Mathematics, physics, electrical engineering and electronics</td></tr>
<tr><td colspan="3">Department</td><td colspan="4">Faculty of Mechanical Engineering, UTH Rad</td></tr>
<tr><td colspan="3">Coordinator</td><td colspan="4">Dr hab. inż. Andrzej Puchalski, prof. UTH</td></tr>
<tr><td colspan="3">The website of the basic organizational unit</td><td colspan="4">http://wm.uniwersytetradom.pl</td></tr>
<tr><td colspan="3">E-mail address, phone number of the coordinator</td><td colspan="4">andrzej.puchalski@urad.edu.pl, 7603</td></tr>
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LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	Knowledge of the basics of designing, manufacturing, testing as well as operating mechatronic devices equipped with sensors, programmable signal processing systems and communication systems as well as actuators. Ability to describe and analyze dynamic systems. Ability to design and run programmable automation systems.
Curriculum Content:	LECTURE Introduction and basic concepts. Modeling of automation systems - transfer function method, state variable method. Time and frequency characteristics of automation systems. Basic dynamic elements. Stability of linear dynamical systems. Quality indicators. Regulators. Sensors. Electric actuators. DC and BLDC motors. Micro stepper motors. Embedded systems. Architecture of microcontroller systems. Construction, principle of operation and advantages of industrial programmable controllers. Principles of PLC programming. Operator panels. Robotics. Classification, structure of robots. Principles of control and programming of industrial robots. LABORATORY Testing the properties of sensors and programming a servo/DC motor with Arduino microcontroller. Testing the educational QArm robot with computer vision. Programming and commissioning of a controller in a drive actuator system with a stepper motor. Configuration and programming of the PLC to work with the selected model. Project presentation
Didactic (educational) methods:	• problem methods (problem lecture, conversational lecture), • simulation methods, • practical methods (demonstration, laboratory exercises, project method, simulation
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning outcomes specified for the subject. Lectures are passed on the basis of a written test. Completion of the laboratory requires the performance of exercises and obtaining positive grades from entrance cards and reports. The method of calculating the final grade for the course is specified in the regulations.

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	Knows the concepts of mechatronics, automation and robotics and describes the principle of operation, construction and applications of sensors, actuators as well as microcontrollers and PLC	K_WG08	Lecture	Test	Pass a subject
U1	Can recognize and select elements and assembles and launches mechatronic systems implementing various physical processes	K_UW08	Lecture/lab	Test	Pass a subject
K1	Is ready to prepares the assumptions and action plan for the implemented experiments and projects and discusses, presents and reports the results of the team tasks	K_KK01 K_KK02	Lab	Test	Pass a subject

Literature and teaching aids
1. Mechatronics : principles and applications, Onwubolu, Godfrey C., Offord ELSEVIER 2005+ 2. Mechatronics, Isermann R., Springer-Verlag Gmbh 2011 3. Mechatronics : A Foundation Course, De Silva, Clarence W., CRC Press ; Taylor & Francis Group 2010 4. The Fundamentals of Control Theory, Douglas ., Copyright © 2019 Brian Douglas 5. Fundamentals of Automatic Process Control, Uttam Ray Chaudhuri, Utpal Ray Chaudhuri, CRC Press 2019 6. Sensors and Actuators in Mechatronics Design and Applications, Pawlak AM., Taylor & Francis 2007 7. Simatic S7-1200- getting started, Siemens 2009 8. S7-1200 Programmable controller System Manual, Siemens 2022 9. Lecture and tutorial materials, Puchalski A., E-script: Lab. Mechatronics UTH Radom 2023

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits		
Attendance, participation	Student workload [h].	
	Student's self-study hours Classes without a teacher (ZBN**)**	Classes
Participation in lectures/classes/lab	X	30 [h] / 30 [h]
Preparation for lectures/classes/lab , Preparation for ... credit / exam	10 [h] / 35 [h] 10 [h] / 10 [h]	X
Total student workload Preparation for ... credit / exam	65 [h]/ 2,6 ECTS	60 [h]/ 2,4 ECTS
ECTS points per subject	5 ECTS	

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).