

SYLLABUS

Course description

Course code		Course	MECHATRONIKA I AUTOMATYKA		
MB/O/1/ST/B1.15			MECHATRONICS AND AUTOMATICS		
Language of instruction		English			
Academic year		2023/2024			
field of study:		Mechanics and machine construction			
field of specialisation:		All			
Educational level		first-cycle studies			
Education profile		General academic			
Mode of study		Full-time studies			
Semester(s)		4			
Affiliation with a group of classes		Core subjects			
Course status		Obligatory			
Types of classes, instruction hours, ECTS credits		Types of classes	Number of instruction hours	Number of ECTS credits	
		Lecture	30[h]	5 ECTS	
		Classes	30[h]		
Linkage of the course		with the education profile	related to the conducted scientific activity in the discipline to which the field of study is assigned		5 ECTS
		with qualifications	it serves the student's acquisition of engineering competences		5 ECTS
		with science discipline	Mechanical engineering		5 ECTS
Form of teaching		Traditional – classes organized at the University /classes conducted using online learning methods and techniques			
Prerequisites		Mathematics, physics, electrical engineering and electronics			
Department		Faculty of Mechanical Engineering, UTH Rad			
Coordinator		Dr hab. inż. Andrzej Puchalski, prof. UTH			
The website of the basic organizational unit		www.mechaniczny.uniwersytetradom.pl			
E-mail address, phone number of the coordinator		andrzej.puchalski@uthrad.pl , 7603			

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:	<p>LECTURE</p> <p>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. (6h). Sensors. Electric actuators. DC and BLDC motors. Micro stepper motors (6h). Embedded systems. Architecture of microcontroller systems. Construction, principle of operation and advantages of industrial programmable controllers. Principles of PLC programming. Operator panels (12h). Robotics. Classification, structure of robots. Principles of control and programming of industrial robots. Applications of industrial robots. (6h).</p> <p>LABORATORY</p> <p>Testing the properties of sensors in the LabVIEW environment. Programming a servo/DC motor in LabVIEW using the MyRIO controller. Simulation studies of models of dynamic systems in the Matlab/Simulink environment. 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.</p>
Didactic (educational) methods:	<ul style="list-style-type: none"> • 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:	<p>The condition for passing the course is to achieve all the required learning outcomes specified for the subject.</p> <p>Lectures are passed on the basis of a written test.</p> <p>Completion of the laboratory requires the performance of exercises and obtaining positive grades from entrance cards and reports.</p> <p>The method of calculating the final grade for the course is specified in the regulations.</p>

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	Defines 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_WG02 K_WG08 K_WG19	Lecture	Test	Pass a subject
W2	Uses knowledge to analyze and synthesize simple and complex mechatronic systems	K_WG11 K_WG12 K_WG18	Lecture	Test	Pass a subject
U1	Recognizes and selects elements and assembles and launches mechatronic systems implementing various physical processes	K_UW02 K_UW08 K_UW10 K_UK16	Lecture/lab	Test	Pass a subject
U...					

K1	Prepares the assumptions and action plan for the implemented experiments and projects and discusses, presents and reports the results of the team tasks	K_KK02 K_KO03 K_KO04 K_KR05	Lab	Test	Pass a subject
K...					

Literature and teaching aids	
<ol style="list-style-type: none"> 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].		
	Other contact hours (IGK)	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in ... lectures	X	X	30 [h]
Participation in classes/laboratory classes	X	X	30[h]
Meeting with teachers during their duty hours	2 [h]	X	X
Preparation for lectures/classes/.... , Preparation for ... credit / exam	X	63 [h]	X
Total student workload	2 [h]/ 0,1 ECTS	63 [h]/ 2,5ECTS	60 [h]/ 2,4ECTS
ECTS credits for the course	125 h/ 5 ECTS		

Additional information, comments
<p>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.</p> <p>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, przewlekłe chorych).</p>

