



## COURSE SPECIFICATION

Course code	full-time programme:	<b>M#2-S2-ME-EM-211</b>
	part-time programme:	
Course title in Polish	<b>Bezpieczeństwo w eksploatacji maszyn</b>	
Course title in English	<b>Machinery Safety</b>	
Valid from (academic year)	<b>2024/2025</b>	

## GENERAL INFORMATION

Programme of study	<b>MECHANICAL ENGINEERING</b>
Level of qualification	<b>second-cycle</b>
Type of education	<b>academic</b>
Mode of study	<b>full-time programme</b>
Specialism	<b>Machine Operation and Maintenance</b>
Department responsible	<b>Department of Mechatronics and Weapons Engineering</b>
Course leader	<b>dr hab. Jakub Takosoglu, prof. PŚk</b>
Approved by	<b>dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering</b>

## COURSE OVERVIEW

Course type	<b>specialism-related</b>	
Course status	<b>compulsory</b>	
Language of instruction	<b>English</b>	
Semester of delivery	full-time programme	<b>Semester II</b>
	part-time programme	<b>Semester II</b>
Pre-requisites		
Examination required (YES/NO)	<b>YES</b>	
ECTS value	<b>2</b>	

Mode of instruction		lecture	class	laboratory	project	seminar
No. of hours per semester	full-time programme	<b>15</b>			<b>15</b>	
	part-time programme					

## LEARNING OUTCOMES





Category of outcome	Outcome code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	The student has structured advanced knowledge of the safety of machines and devices, and also has knowledge of safety standards and machine directives in the design, designing and operation of safety systems using electrical, pneumatic and hydraulic systems.	MiBM2_W04 MiBM2_W06
	W02	The student has structured advanced knowledge in the field of mechatronics, control of electric, pneumatic and hydraulic drives, has practical knowledge in the field of operation and safety of devices used in industry, including detailed knowledge of the design of safe control systems in the field of mechanical engineering.	MiBM2_W07
Skills	U01	The student is able to design, model, perform calculations, conduct simulation studies, conduct laboratory studies and prepare design documentation. Knows the operational requirements of machines and devices.	MiBM2_U02 MiBM2_U04 MiBM2_U11
	U02	The student is able to use and practically apply standards concerning the safety of machines and devices, is able to read electrical, pneumatic and hydraulic diagrams, is able to design safe control systems for electrical, hydraulic and pneumatic systems.	MiBM2_U03
	U03	The student is able to work in a team, is able to organize and configure a laboratory stand in accordance with guidelines, is able to prepare a schedule for conducting laboratory tests.	MiBM2_U15
Competence	K01	The student is ready to critically evaluate his/her knowledge and the possibility of acquiring new information in the field of design and operation of safe control systems for machines and devices in the field of mechanics and mechanical engineering.	MiBM2_K01

**COURSE CONTENT**

Mode of instruction	Topics covered
lecture	<p>Introduction to the issue of safety in the operation of machinery: machine safety, safety functions, functional safety, identification of the source of danger at workstations, risks related to mechanical hazards, safety of automated systems, protective measures, safety elements/parts, reliability, redundancy, monitoring, level of safety assurance, defect, danger zone, accident, risk, risk assessment and analysis. Overview of standards on the safety of machinery and equipment.</p> <p>Machinery Directive. Practical use of standards in the field of safe control of machinery and equipment.</p> <p>Distributed control systems (DCS). Safety integrated systems (SIS). Programmable logic controllers (PLC). Supervisory Control and Data Acquisition (SCADA). Hybrid PLC controllers. Safety of control systems: safe stopping, holding, motion blocking, safe venting and protection against uncontrolled start-up, pressure limitation, two-hand control, safety functions for servo systems, press protection.</p> <p>Safe control systems for electrical systems.</p> <p>Safe control systems for pneumatic systems.</p> <p>Safe control systems for hydraulic systems.</p>





project	<p>Students in groups are tasked with designing a control system based on the rapid control prototyping technique or designing a virtual object controlled by a real controller based on the hardware in the loop simulation technique.</p> <p>The project includes the following activities:</p> <ul style="list-style-type: none"> <li>• Development of a conceptual model.</li> <li>• Selection of components.</li> <li>• Simulation testing of the designed systems.</li> <li>• Creation of the designed system in the laboratory.</li> <li>• Starting the system and testing it in laboratory conditions.</li> <li>• Analysis of the obtained results and conclusions.</li> <li>• Preparation of technical documentation.</li> </ul>
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### ASSESSMENT METHODS

Outcome code	Methods of assessment					
	Oral examination	Written examination	Test	Project	Report	Other
W01			X			
W02			X			
U01				X		X
U02				X		X
U03				X		X
K01						X

### ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	Positive completion of the final test. Obtaining at least 50% of the points.
project	non-examination assessment	Project preparation and its positive defense.

### OVERALL STUDENT WORKLOAD

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
		L	C	Lb	P	S	L	C	Lb	P	S	
1.	Scheduled contact hours	15			15							h
2.	Other contact hours (office hours, examination)	4			2							h
3.	<b>Total number of contact hours</b>	<b>36</b>										h
4.	<b>Number of ECTS credits for contact hours</b>	<b>1,4</b>										ECTS
5.	<b>Number of independent study hours</b>	<b>14</b>										h
6.	<b>Number of ECTS credits for independent study hours</b>	<b>0,6</b>										ECTS
7.	<b>Number of practical hours</b>	<b>25</b>										h



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8.	<b>Number of ECTS credits for practical hours</b>	<b>1,0</b>		ECTS
9.	<b>Total study time</b>	<b>50</b>		h
10.	<b>ECTS credits for the course</b> <i>1 ECTS credit = 25-30 hours of study time</i>	<b>2</b>		ECTS

#### READING LIST

- Standards: EN 61508; EN 62061; EN ISO 13849-1; EN 61800-5-2; EN ISO 4414
- Machinery Directive 2006/42/EC.
- Regulation 2023/1230/EU.
- Machinery Directive Guide 2006/42/EC. European Commission Enterprise and Industry.
- Guides and technical information from companies: FESTO, Omron, ABB, Pilz, Sick, Siemens, Metal Work, Schneider etc.



Politechnika Świętokrzyska  
Kielce University of Technology

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Wydział Mechatroniki  
i Budowy Maszyn