COURSE SPECIFICATION

Course code	full-time programme:	**M#2-S1-ME-209**
	part-time programme:	
Course title in Polish	**Materiałoznawstwo I**	
Course title in English	**Material Science I**	
Valid from (academic year)	**2024/2025**	

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**first-cycle**
Type of education	**academic**
Mode of study	**full-time programme**
Specialism	**all**
Department responsible	**Department of Metal Science and Manufacturing Processes**
Course leader	**dr hab. inż. Marek Konieczny, prof. PŚk**
Approved by	**dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering**

COURSE OVERVIEW

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

Mode of instruction		**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	full-time programme	**15**		**15**		
	part-time programme					

LEARNING OUTCOMES

Category of outcome	**Outcome code**	**Course learning outcomes**	**Corresponding programme outcome code**
Knowledge	W01	On completion of the course, students will have an in-depth knowledge of metals and alloys used in mechanical engineering.	MiBM1_W08

Skills	U01	On completion of the course, students will be able to select appropriate materials for their practical application.	MiBM1_U01
	U02	On completion of the course, students will be able to select appropriate metal engineering materials to ensure proper operation of the machine.	MiBM1_U14
Competence	K01	The student is ready to critically evaluate his knowledge and the need to obtain new information both from the literature and from experts in the field of materials science.	MiBM1_K01
	K02	The student is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the safety of other people and the impact on the environment and the responsibility related to these issues.	MiBM1_K02

COURSE CONTENT

Type of instruction lecture	Topics covered
lecture	Bonds between atoms and intermolecular bonds. 7 crystallographic systems, 14 types of crystal lattice. Indicating directions and crystallographic planes in regular and hexagonal systems. The phenomenon of allotropy. The structure of real crystals. Lattice defects: point, line and surface and their influence on the properties of metals. Elastic and plastic deformation. The mechanism of plastic deformation: slip and twinning. The role of dislocation in plastic deformation. Deformation of mono and polycrystals. The phenomenon of anisotropy. Investigation of mechanical properties: tensile test, hardness measurements, impact strength, creep, fatigue. Strengthening the metal by plastic deformation. Recrystallization. Diffusion. Crystallization. Metal alloys - basic concepts. Phase equilibrium systems. Basic phase transformations in alloys, taking place with the participation of the liquid phase: eutectic and peritectic transformation. Influence of the allotropic transformation on the phase equilibrium system. Eutectoid and peritectoid transformation. Deviations from phase equilibrium systems.
laboratory	Performing 7 laboratory exercises: • Characteristics of metals. • Investigation of mechanical properties - tensile test. • Investigation of mechanical properties - hardness and toughness measurements. • Metallographic preparation. • Solidification of metals and alloys. • Phase diagrams of alloys. • Strengthening metals by plastic deformation. Recrystallization.

ASSESSMENT METHODS

Outcome code	Methods of assessment *(Mark with an X where applicable)*					
	Oral examination	Written examination	Test	Project	Report	Other
W01			X		X	
U01			X		X	
U02			X		X	

K01						X
K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	The pass mark is a minimum of 50% for the final in-class test.
laboratory	non-examination assessment	The pass mark is a minimum of 50% for the final in-class test and each post-lab report.

OVERALL STUDENT WORKLOAD

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
1.	Scheduled contact hours	L	C	Lb	P	S	L	C	Lb	P	S	h
		15		15								
2.	Other contact hours (office hours, examination)	2		2								h
3.	**Total number of contact hours**	**34**										h
4.	**Number of ECTS credits for contact hours**	**1,4**										ECTS
5.	**Number of independent study hours**	**16**										h
6.	**Number of ECTS credits for independent study hours**	**0,6**										ECTS
7.	**Number of practical hours**	**25**										h
8.	**Number of ECTS credits for practical hours**	**1,0**										ECTS
9.	**Total study time**	**50**										h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**2**										ECTS

READING LIST

1. Askeland D.R.: The Science and Engineering of Materials.
2. Callister W.D.: Materials Science and Engineering: An Introduction
3. Ashby M.F., Jones D.R.: Engineering Materials: part 1 and 2.
4. Budinski K.G., Budinski M.K.: Engineering Materials Properties and Selection.
5. Konieczny M.: Metal Science Laboratory.