

**COURSE SPECIFICATION**

Course code	full-time programme:	M#2-S1-ME-312
	part-time programme:	
Course title in Polish	Podstawy obróbki plastycznej	
Course title in English	Fundamentals of metal forming	
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 inż. Tomasz Milek
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 III
	part-time programme	
Pre-requisites	Technical Drawing, Material Science I	
Examination required (YES/NO)	NO	
ECTS value	1	

Mode of instruction		lecture	class	laboratory	project	seminar
No. of hours per semester	full-time programme	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 a fundamental theoretical knowledge of cold and hot metal forming processes by using different machinery.	MiBM1_W06 MiBM1_W07
	W02	Having successfully completed this course, students will be able to use a acquired theoretical knowledge to select a type of metal forming technology in order to manufacture mechanical elements of a given shape.	MiBM1_W06 MiBM1_W07
Competence	K01	Students are aware of the need to critically assess and update their expertise from metal forming and by exchanging knowledge and experiences with other metal forming experts	MiBM1_K01

COURSE CONTENT

Type of instruction	Topics covered
lecture	Introduction to metal forming : definition, advantages of disadvantages, classifications of metal forming processes on basis different criterias, examples of metal forming products, applications, elastic and plastic deformations of material. Classification of forming methods of draw pieces, classification of processes of shaping on presses, discussion of selected processes: deep drawing, redrawing, blanking, bending (definitions, schematic representations, methods, degrees of deformations, technological parameters, advantages and limitations). Selected problems of forming methods from sheets: total coefficient of deep drawing, types of shearing processes, the most significant sheet-bending processes course of V- and U-die bending processes. Discussion of drawing processes: definitions, schematic representation of the wire drawing process, methods of tube drawing process - schemes and characteristic of processes, degrees of deformation, drawing machines , advantages and limitations of drawing process. Rolling: classifications on the basis of kinematics, tool geometry, and workpiece geometry; schematic representations for longitudinal, cross and skewed rolling; flat rolling and profile rolling; geometrical relationship for longitudinal rolling; degrees of deformation of material after rolling ; gripping condition; discussion of forward slip phenomenon; advantages and limitations of rolling process. Extrusion process: classification depending upon the direction of material flow in relation to the tool movement direction, definitions, schematic representations, degrees of deformation, advantages and limitations of extrusion process. Forging process, classifications, definitions, schematic representations, machines, advantages and limitations of forging process.

ASSESSMENT METHODS

Outcome code	Methods of assessment (<i>Mark with an X where applicable</i>)					
	Oral examination	Written examination	Test	Project	Report	Other
W01			X			
W02			X			
K01						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

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										
2.	Other contact hours (office hours, examination)	2										h
3.	Total number of contact hours	17										h
4.	Number of ECTS credits for contact hours	0,7										ECTS
5.	Number of independent study hours	8										h
6.	Number of ECTS credits for independent study hours	0,3										ECTS
7.	Number of practical hours	0										h
8.	Number of ECTS credits for practical hours	0,0										ECTS
9.	Total study time	25										h
10.	ECTS credits for the course <i>1 ECTS credit = 25-30 hours of study time</i>	1										ECTS

READING LIST

1. Miłek T.: Techniques of production. Kielce University of Technology, Kielce 2012 (www.wmibm-moodle.tu.kielce.pl)
2. Lange K: Handbook of metal forming, McGraw-Hill Book Company
3. Lascoe O. D.: Handbook of fabrication processes, ASM International, Ohio, 1988
4. Golatowski T.: Design of deep drawing process and press-forming dies Selected problems. Warsaw: Warsaw University of Technology, 1984 (in Polish)
5. Pacanowski J.: Design of deep drawing process of axisymmetric draw pieces and design press-forming dies T1 Methods and directives for deep drawing of axisymmetric draw pieces, Kielce: Kielce University of Technology, 2018 (in Polish)
6. Marciniak Z Limit strains in deep drawing process of sheet metals, Warsaw: WNT, 1971 (in Polish)
7. Erbel J i inni.: Encyklopedia technik wytwarzania stosowanych w przemyśle maszynowym. Tom I, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001
8. Łuksza J.: Elementy cięgarstwa, Wydawnictwo Naukowo-Dydaktyczne AGH, Kraków 2001
9. Morawiecki M., Sadok L., Wosiek E.: Przeróbka plastyczna. Podstawy teoretyczne, Wydawnictwo Śląsk, Katowice 1986.
10. Muster A.: Kucie matrycowe. Projektowanie procesów technologicznych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2002.





11. Pacanowski J., Chałupczak J.: Projektowanie procesów kucia matrycowego oduwek kołowo-symetrycznych na młotach i prasach korbowych. Wydawnictwo Politechniki Świętokrzyskiej w Kielcach, Kielce 2011.
12. Pater Z., Samołyk G.: Podstawy technologii obróbki plastycznej metali, Politechnika Lubelska, Lublin 2013.
13. Sińczak J. i inni: Podstawy procesów przeróbki plastycznej. Wydawnictwo Naukowe AKAPIT Kraków 2010.
14. Pacanowski J.: Design of deep drawing process of axisymmetric drawpieces and design press-forming dies T1 Methods and directives for deep drawing of axisymmetric drawpieces, Kielce: Kielce University of Technology, 2018 (in Polish)
15. Sińczak J. i inni: Metal forming processes. Laboratory exercises. Wydawnictwo naukowe AKAPIT, Kraków 2001 (in Polish)..
16. Richert J.: Innovative methods of metal forming processes. Wydawnictwa AGH 2010 (in Polish).
17. Żaba K., Mamala A.: Metal forming of non-ferrous metals. Laboratory exercises. Rolling and drawing. Wydawnictwa AGH, Kraków 2011 (in Polish).