COURSE DESCRIPTION CARD - SYLLABUS

Course name
Forming technologies [S1MiBM2>TeF2]

Course

Field of study
Mechanical Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Basic in the field of the basics of machine construction, production technology and material processing. Logical thinking, analyzing the occurring phenomena, using the knowledge obtained from scientific, technical and popular science literature. Understanding the need to learn and acquire new knowledge.

Course objective

Getting to know the principles of designing products manufactured by forming technologies in terms of the processability of their construction. Learning about the basic phenomena and processes related to obtaining metals and their alloys and shaping products (castings) from them.

Course-related learning outcomes

Knowledge:
1. Has knowledge in the field of product design in accordance with the principles of technology and with the use of the basics of computer aided design. - [K_W06]
2. Has knowledge of machines and technological devices, including the design of instrumentation and machines, construction and principle of operation of drives. He knows the issues of diagnostics, operation and ergonomics. - [K_W07]

3. Has knowledge of materials science with elements of chemistry, including engineering materials - comparison of their structure, properties and applications. He knows the rules of selecting engineering materials, shaping their structure and properties - [K_W08]

Skills:
1. Can select and use manufacturing technology to shape the form, structure and products of products. - [K_U14]
2. Can select machines and technological devices for the implementation of production machines, analyze and evaluate their justification from ergonomics tests, select subassemblies, plan and supervise maintenance tasks for the assessment of the reliable operation of machines and examine machine diagnostics based on the principles of vibroacoustics. - [K_U15]
3. Can to plan and organize individual and team work.

Social competences:
1. The student is able to work in a group - [K_K03]
2. Can think and act in an entrepreneurial way - [K_K06]
3. The student is able to convey information about plastic processing and casting in a generally understandable way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test carried out on the end of the term (in case of a credit min. 50.1% correct). Up to 50.0% - unsatisfactory (2.0) = F, from 50.1% to 60.0% - Satisfactory (3.0) = E, from 60.1% to 70.0% - Satisfactory plus (3,5) = D, from 70.1 to 80 - Good (4.0) = C, from 80.1% to 90.0% - Good plus (4,5) = B, from 90.1% - Very good (5,0) = A.
Laboratories:
Passing on the basis of an oral or written answer concerning the content of each performed laboratory exercise, a report on each laboratory exercise according to the instructions of the laboratory teacher. In order to pass the laboratories, all exercises must be passed (positive grade on the answers and passed reports).
Project:
Passing based on the assessment of the project and oral answer regarding the project.
The project has been completed correctly, the student is able to answer questions about the content contained in the project and is able to describe the technological process.

Programme content

Lecture:
Basic theoretical knowledge about plastic shaping of metals and their alloys (plasticity conditions, mechanism of plastic deformation). Materials susceptible to plastic processing. Changing the properties of materials when shaping products using plastic processing methods. Technological operations for shaping sheet metal products. Technological operations for shaping products from bars. General information about tool materials and technological lubricants (taking into account the aspects of friction in plastic forming). Defects in products and methods of preventing them. The role of instrumentation in the production process. Tool wear. Strengthening curve. Methods of analysis of shaping processes. Modeling the shaping process. Pressing. Forging. Bending. Cutting. Spinning. Surface burnishing. Rolling. Unconventional shaping methods. Classification of metal plastic machines. Mechanical presses. Hydraulic presses. Hammers. Screw presses. Roll or roll forming machines. Division of machines by area of application.
Laboratories:
1. Characteristics of metal plastic machines located at ZOiOP.
2. Cutting sheet metal using guillotine, circular shears, punching machines and cutting dies.
3. Stamping a cylindrical die using a hydraulic press.
4. Free forging by drop hammer and die forging by screw press; extrusion using a hydraulic press.
5. Stamping a rectangular extrusion using a hydraulic press.
6. Longitudinal and transverse rolling using laboratory rolling mills.
7. Determination of basic properties of materials (tension test and ERICHSEN test).
Project:
Transfer of project topics. Examples of the design of equipment for shaping products from metal sheets

and bars. Individual consultations.
Development of the casting technology design (project content: structural drawing of the part, drawing of the raw casting, number of springs, minimum module (s) of the sprue (s), dimensions of the sprue (s) and its solidification module, calculation of the pouring time and cross-sectional area of the filler system, drawing concept of casting technology.

Course topics

none

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the board, solving problems.
Laboratories: performing experiments, solving problems, discussion, working in a team.
Project: Performing calculations to design technological processes. Case studies, based on materials received from the lecturer. Discussion and teamwork.

Bibliography

Basic:
1. Matysiak W. Plancak M., Terminologia obróbki plastycznej, Poznań 2021.
2. Matysiak W., Plancak M., Oprzyrządowanie do procesów obróbki plastycznej metali, wydawnictwo Politechniki Poznańskiej, Poznań, 2023.
3. Z. Marciniak: KONSTRUKCJA TŁOCZNIKÓW, Ośrodek Techniczny A. Marciniak, Warszawa, 2002.
4. M. Ustasiak, P. Kochmański: OBRÓBKA PLASTYCZNA Materiały pomocnicze do projektowania, Politechnika Szczecińska, Szczecin, 2004.
5. A. Muster : KUCIE MATRYCOWE, Projektowanie procesów technologicznych, Oficyna Wydawnicza Politechniki Poznańskiej, Warszawa 2002.
6. M. Perzyk i inni, Odlewnictwo. WNT, Warszawa 2004.
7. E. Fraś, Krystalizacja metali PWN Warszawa 2003.
8. M. Perzyk i inni, Materiały do projektowania procesów odlewniczych. PWN Warszawa 1990.

Additional:
1. Morawiecki M., Sadok L., Wosiek E.: Teoretyczne podstawy technologicznych procesów przeróbki plastycznej, Śląsk, Katowice, 1977
4. Erbel S., Golatowski T., Kuczyński K., Marciniak Z. i inni: Technologia obróbki plastycznej na zimno. Warszawa: SIMP-ODK 1983. Muster A.: KUCIE MATRYCOWE.
5. Praca zbiorowa red. J. Sobczak, Poradnik Odlewnika. Odlewnictwo Współczesne, Tom 1 MATERIAŁY, Wydawnictwo Stowarzyszenia Technicznego Odlewników Polskich, Kraków 2013.
6. J. Campbell, Complete Casting Handbook, Metal Casting Processes, Metallurgy, Techniques and Design,wyd.2, Elsevier Butterworth-Heinemann, 2015.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	90	3,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50