COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to manufacturing [S1IMe1E>WdTW]

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
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
45

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

Lecturers

Prerequisites

Knowledge of basic physical and chemical properties of polymeric materials and metals.

Course objective

Learning the fundamental manufacturing techniques used in the mechanical engineering, such as: machining, plastics processing, metal forming, and casting.

Course-related learning outcomes

Knowledge:
1. The student is able to characterize the fundamental manufacturing techniques used in the mechanical engineering.
2. The student is able to identify the relationships between specific manufacturing technologies and the characteristic features of the products obtained through these processes.
2. The student is able to describe the structure and applications of tools used in manufacturing techniques.

Skills:
1. The student is able to select an appropriate manufacturing technology for simple products depending on the specified requirements.

2. The student is able to manufacture a simple product in accordance with occupational health and safety (OHS) regulations.
3. The student is able to assess the quality of manufactured products and identify the causes of possible defects.
4. The student is able to perform measurements using basic measuring instruments.

Social competences:
1. The student is aware of the importance of manufacturing techniques for the economy, society, and the natural environment.
2. The student is able to communicate information about manufacturing techniques in a generally understandable manner.
3. The student understands the need for continuous learning and professional development.
4. The student is able to cooperate and work in a team, taking on different roles within the group.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written assessment of theory from lectures in the form of a test in electronic and conventional form consisting of 10-15 questions. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%). Ongoing monitoring of preparation for laboratories, optional final laboratory test in written form. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%).

Programme content

The course covers fundamental issues related to manufacturing techniques used in mechanical engineering, with particular emphasis on polymer processing, casting technologies, metal forming, and machining. During the lectures, students become familiar with the physicochemical and technological properties of engineering materials, the principles of selecting manufacturing technologies, and the influence of process parameters on product properties.
Laboratory classes are practical in nature and include the implementation of basic technological processes used in plastics processing, casting, metal forming, and machining. Students acquire skills in operating machines and tools, setting process parameters, manufacturing simple products, and assessing the quality of their workmanship in accordance with occupational health and safety regulations.

Course topics

Lecture:
1. Physicochemical and technological properties of polymeric materials.
2. Technologies used for processing of thermoplastic and thermosetting polymeric materials .
3. Coating of metals with polymeric materials.
4. Foundry molds - raw materials and methods of making them.
5. Physico-chemical phenomena during filling molds with liquid casting material.
6. Overview of casting methods.
7. Phenomena during metal forming
8. Basic techniques used for metal forming.
9. Basic concepts related to machining of metals.
10. Tools in machining.
Laboratory:
1. Injection molding technology.
2. Extrusion technology.
3. Lamination technology.
4. Thermoforming technology.
5. Manufacturing products from polymer materials using FDM technology.
6. Preparation and testing of basic properties of molding sands.
7. Hand molding method of sand casting.
8. Die casting.
9. Special casting methods (investment casting and casting in shell molds).
10. Application of computer technology in foundry.
11. Locksmith works and measurements of end products

12. Drilling
13. Turning
14. Milling
15. Bending
16. Machines used in metal forming and characteristics of forming processes.

Teaching methods

Lectures and presentations, application examples, case studies, manufacturing basic products of polymeric materials and metals using various technologies; teamwork, discussion.

Bibliography

Basic:
Dominick V. Rosato, Donald V. Rosato and Matthew V. Rosato. (2004). Plastic Product Material and Process Selection Handbook. Elsevier. 10.1016/B978-1-85617-431-2.X5000-2
Sebastião V. Canevarolo, Jr. (2020). Polymer Science - A Textbook for Engineers and Technologists. Elsevier. 10.1016/C2018-0-01770-3.
Nigel Mills, Mike Jenkins and Stephen Kukureka. (2020). Plastics - Microstructure and Engineering Applications. Elsevier. 10.1016/C2017-0-00694-8.
Christian Bonten. (2020). Plastics Technology - Introductions and Foundations. Hanser. 10.1016/C2019-0-01366-0.
Ulf Bruder. (2019). User's Guide to Plastic. Hanser. 10.1016/C2018-0-01800-9.
Ram K. Gupta. (2023). Specialty Polymers - Fundamentals, Properties, Applications and Advances. Taylor & Francis. 10.1201/9781003278269.
John Campbell: Complete Casting Handbook: Metal Casting Processes, Metallurgy, Techniques, Second Edition, 2015
Jackowski J.: Podstawy odlewnictwa. Ćwiczenia laboratoryjne, Wyd. PP, Poznań 1993.
Tabor A.: Odlewnictwo. Wyd.Politechniki Krakowskiej, Kraków 2009.
Grzesik. W.: Podstawy skrawania materiałów konstrukcyjnych, WNT, Warszawa 2018.

Additional:
J.T Haponiuk: Tworzywa sztuczne w praktyce. Wyd. Verlag Dashofer, W-wa 2008r.
J. Rabek: Polimery i ich zastosowania interdyscyplinarne. Tom 1 i 2, PWN 2021
Czasopisma: Plastics Review, Rubber Review, Plast News, Tworzywa Sztuczne, Mechanik.
Braszczyński J. : Teoria procesów odlewniczych. PWN , Warszawa 1989
Peter Beeley, Foundry Technology, Butterworth-Heinemann, 2nd Edition,2001.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00