COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automation in materials technologies [S1ZiIP2>AwTM]

Course

Field of study
Management and Production Engineering

Year/Semester
2/4

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
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

Lecturers

Prerequisites

Student should have knowledge of the typical equipment used in material technologies.

Course objective

Student should obtain knowledge about selected issues in automation of materials processes and automated devices in foundry, metal forming and processing of plastics.

Course-related learning outcomes

Knowledge:
Student has knowledge about manufacturing technologies mainly used in the machinery industry. It applies to metallurgy and foundry processes, plastic forming, and plastics processing.
Student has knowledge about the automation and robotization of production processes, including the structure of numerical control and automatic regulation.

Skills:
Student is able to develop assumptions regarding the selection of automation systems and robotization of production processes and make a choice of a justified degree of automation and robotization.

Social competences:
The student understands the social aspects of processes automation and problems associated with their use.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Written colloquium at the end of the semester, contains 2 to 5 questions of any kind of presented technologies (credit in case of obtaining at least 50 % correct answers).
Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.
Laboratory classes
Passing on the basis of written tests and oral answers in the field of automated devices used in foundry, metal forming and processing of plastics, properly made reports. All laboratory exercises must be passed with positive note

Programme content

1. General informations about the automation of technological processes.
2. Devices and technological equipment that are applied in manufacturing processes.
3. Examples of automation of manufacturing processes in materials technologies.

Course topics

Lecture
1. General information about elements used to automate technological processes. Structure and control systems.
2. A series of manipulators used in injection molding technique, grip types for injection part, suction pads.
3. Interaction of injection molding machine with manipulator.
4. Examples of automation in process used for making of labeled containers.
5. Examples of automation in plastic overmolding technique.
6. Construction and working principles of steel sheet feeder devices as well as semi-finished product feeders used in metal forming.
7. Construction and working principles of devices for straightening and feeding of metal belt.
8. Characteristics of material feeders applied in metal forming.
9. Modern machines dedicated for automation in metal forming processes.
10. Description of automation methods in foundry technology: processing of molding sands, mold technology, die-casting, high-pressure die-casting and thixotropic method of castings manufacturing. Manipulators and robots used in the treatment of various foundry processes.
11. The examples of foundry automated machines and equipment with manipulators and robots: molding sand processing station, molding lines, a circus and high-pressure die-casting machines.
Laboratory classes:
1. Start-up and control operation of blow molding machine for containers manufacturing.
2. Control operation of 4-axis robot. Control operation of suction feeder for pellets.
3. Start-up and control operation of feeding station for semi-finished products in metal forming technological lines.
4. Start-up and control operation of station for straightening and feeding of metal belt.
5. Development of the electrical schematic of the controller on the contact elements of the molding sand processing station.
6. Program writing in ladder language the Siemens controller, controlling the molding station, visualization of the manufacturing process of molding sand in an automated system.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on a board.
Laboratory classes: demonstration of machine and equipment operation, performing experiments, solving tasks, discussion, teamwork.

Bibliography

Basic:
1. K. Wilczynski, Wybrane zagadnienia przetwórstwa tworzyw sztucznych, Oficyna Wydawnicza PW, Warszawa, 2011.
2. Chudzikiewicz R., Mechanizacja i automatyzacja odlewni, WNT, Warszawa 1980.
3. Golatowski T.: Mechanizacja i automatyzacja w tłocznictwie, WNT, Warszawa 1978.
4. Bociąga E.: Specjalne metody wtryskiwania tworzyw termoplastycznych, WNT,Warszawa 2008.

Additional:
1. Fedoryszyn A., Smyk K., Ziółkowski Z., Maszynoznawstwo odlewnicze, Wyd. AGH Kraków, 2008.
2. Dobrucki W.: Zarys obróbki plastycznej metali. Katowice: Śląsk 1975.
3. Erbel S., Golatowski T., Kuczyński K., Marciniak Z. i inni: Technologia obróbki plastycznej na zimno. Warszawa: SIMP-ODK 1983.
4. Frącz W.: Przetwórstwo tworzyw polimerowych, Wyd. Poli. Rzeszowskiej, Rzeszów 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00