COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metal materials and plastics [S1MiBM2>MMiTS]

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
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

The student has basic knowledge of the types of engineering materials and their applications. Basic knowledge of physics, chemistry, materials science. Logical thinking, using information obtained from the library and the Internet. Understanding the need to learn and acquire new knowledge.

Course objective

The aim of the course is to expand students' knowledge about the properties of individual groups of engineering materials (metals and plastics) and their applications in the construction and operation of machines and tools. Learning about the advantages and disadvantages of polymers, the influence of structure on the basic properties of polymers, and directions of application.

Course-related learning outcomes

Knowledge:
1. Student knows the classification of engineering materials
2. Student can describe the properties of engineering materials
3. Student can describe the methods of testing the properties of engineering materials specific to mechanics and mechanical engineering

Skills:
1.Student can indicate the application of particular engineering materials
2.Student is able to select and carry out testing of engineering materials depending on the requirements
3.Student is able to explain the processes occurring in the material during its processing processes

Social competencies:
1 Student is aware of the knowledge to solve the tasks set, and in case of difficulties in solving them independently, he is able to consult an expert
2. Student is able to independently develop knowledge of modern materials
3. Student is able to work in a team taking different roles

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test (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).

Programme content

The relationship between the microstructure of metal materials and their properties. Influence of materials processes (casting, forming and heat treatment) on microstructure. The influence of structure on the properties of polymeric materials. Physicochemical properties of plastics. Selected methods of materials testing.

Course topics

Lecture:
Metal materials:
- introduction, classification of metal materials,
- the relationship between the microstructure of metal materials and their properties,
- the influence of materials processes (casting, forming and heat treatment) on the microstructure,
- basic processing of metal materials and their application,
- test methods for metal materials

Plastics:
- introduction, characteristics of properties,
- the influence of structure on the properties of polymeric materials
- physicochemical properties of plastics
- properties and applications of large-volume polymer materials from the thermoplastic group: polyolefins, poly(vinyl chloride), polystyrene and styrene copolymers, poly(methyl methacrylate), fluorine polymers, thermoplastic polyesters, aliphatic and aromatic polyamides, polycarbonates.
- testing methods for plastic products
Lab:
Metal materials:
1. The influence of applied manufacturing technology on microstructure, properties and application of alloy and non-alloy steels.
2. Shaping the properties of ferrous metal alloys using metal forming methods.
3. Shaping the properties of ferrous metal alloys by casting methods.
4. The influence of manufacturing technology on microstructure and properties of non-ferrous alloys
5. Materials with special properties - composites, superalloys.
Plastisc:
1. Production of porous materials - foams, sinters
2. Assessment of the properties of porous materials - apparent density, tightness, porosity, permeability
3. Identification of polymeric materials

4. The influence of structure on technological properties - determining the cross-linking exotherm, MFR
5. Density of polymer materials - research methods depending on the form of the raw material

Teaching methods

Lecture: multimedia presentation, discussion
Laboratories: performing experiments, solving problems, discussion, working in a team.

Bibliography

Basic:
[1] Inżynieria materiałowa. Stal. Marek Blicharski, PWN
[2] Wstęp do inżynierii materiałowej. Marek Blicharski, WNT 2012
[3] Materiały inżynierskie i projektowanie materiałowe. Leszek A. Dobrzański, WNT 206
[4] Materiały w budowie maszyn. Pod redakcją Andrzeja Barbackiego. Wydawnictwo PP 2006
[5] Sikora R.: Tworzywa wielkocząsteczkowe . Rodzaje, właściwości i struktura
[6]. D. Żuchowska:Materiały konstrukcyjne
[7] Broniewski T. Metody badań materiałów polimerowych
[8] Kelar K., Ciesielska D.: Fizykochemia polimerów ? wybrane zagadnienia, Wyd. Politechnika Poznańska 1998

Additional:
[1] Materiały inżynierskie. Michael F. Ashby, WNT 1996
[2] Dobór materiałów w projektowaniu inżynierskim. Michael F. Ashby, WNT 1998
[3] Galina H.: Fizykochemia polimerów.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00