COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metal materials and plastics [N1MiBM2>MMiTS]

Course

Field of study
Mechanical Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
8

Laboratory classes
16

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. Is able to indicate the use of particular engineering materials
2. Is able to distinguish individual engineering materials and indicate their mechanical properties
3. Has advanced knowledge in the field of research, selection and properties of engineering materials specific to mechanics and machine construction
4. Is able to use analytical, simulation and experimental methods to identify, formulate and solve engineering problems characteristic of mechanics and machine construction

Skills:
1. Is able to indicate the use of particular engineering materials
2. Is able to distinguish individual engineering materials and indicate their mechanical properties
3. Is able to explain the processes occurring in the material during its processing

Social competences:
1. Demonstrates creativity in solving problems related to engineering materials
2. Is able to independently develop knowledge about modern materials
3. Can work in a team

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written assessment consisting of open questions scored on a scale of 0-1. Passing is obtained after obtaining at least 51% of the points. The written assessment is carried out at the end of the semester.
Laboratories: periodic written tests at the beginning of each laboratory class. Question format: open.

Programme content

Lecture:
Metal materials:
- introduction, classification of metal materials in engineering,
- the relationship between the microstructure of metal materials and their technological properties,
- the impact of manufacturing technology on the mechanical and physicochemical properties of engineering materials,
- technology of producing engineering materials and their application,
- basic processes for treatment of metal engineering materials,
- technological tests of 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

Course topics

none

Teaching methods

- delivery methods: lecture, explanation, clarification
- practical methods: laboratory exercises

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	24	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	51	2,00