COURSE DESCRIPTION CARD - SYLLABUS

Course name

Polymer

Course

Field of study

Material Engineering

Year/Semester

2/4

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polisch

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Mechanicznej

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student should obtain knowledge of mechanical, chemical and processing properties and applications of the plastics and rubber

Course objective

Building of polymer materials. Components and classification of polymer materials. Thermoplastic polymers: polyolefins, polyvinyl chloride, plastics styrene and acrylate, polyamides, polycarbonate, polyacetal, thermoplastic rubber. Thermosetting polymers: phenoplasts and aminoplasts. Chemosetting polymers: unsaturated polyester, epoxy resins, rubber.

Course-related learning outcomes

Knowledge

1. The student should characterize the basic types of polymeric materials - [K_W08, K_W10, K_W14]

2. The student should explain the influence of the structure of polymers on their properties - [K_W03, K_W08, K_W10, K_W14]

Skills

1. The student is able to select a polymer material for specific applications - [K_U01, K_U16, K_U21]

2. The student is able to determine the relationships between the structure and properties of polymers - [K_U01, K_U21]

Social competences

1. The student is able to work in a group - [K_K03]

2. The student is aware of the role of polymeric materials in the modern economy and everyday life - [K_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Test exam? 20 questions, each has three answers, one answer is correct, for a correct answer 1 point. Ratings: 20 points ? very good, 19? 18 points db +, 17? 16 points db, 15? 14 points dst +, 13? 12 points dst. 11 and less points ndst.

Laboratory: Credit based on a written answer concerning the content of each performed laboratory exercise, a report on each laboratory exercise prepared according to the instructor's instructions. To obtain credit for the exercises, all laboratories must be passed (positive grade from the answers and the report).

Programme content

Lecture:

1. Advantages and disadvantages of polymeric materials.

2. Chemical classification of polymers.

3. Rheological and technological classification of polymers: elastomers, plastomers, thermoplastics, thermosetting and chemosetting.

4. Physical states of polymers.

5. Destruction, degradation, depolymerization of polymers.

6. Geometric structure of macromolecules.

7. Influence of chemical structure on processing and functional properties of polymers: length of macromolecules, polarity of macromolecules, degree of cross-linking.

8. Configuration of macromolecules: isotactic, syndiotactic and atactic polymers.

9. Crystalline-amorphous structure of polymers: factors determining the crystallization ability of polymers, the influence of crystallinity on the properties of polymers.

10. Characteristics of auxiliaries: fillers, plasticizers, stabilizers, lubricants, antistatic agents, flame retardants, blowing agents, pigments and dyes.

11. Properties and application of large-scale polymeric materials from the group of thermoplastics: polyolefins, poly (vinyl chloride), polystyrene and styrene copolymers, poly (methyl methacrylate), fluoropolymers, thermoplastic polyesters, aliphatic and aromatic polyamides, polycarbonates.

12. Properties and application of large-scale polymeric materials from the thermosetting group: phenoplasts and aminoplasts.

13. Properties and application of large-scale chemically hardened polymeric materials: unsaturated polyester resins, epoxy resins.

14. Properties and application of polyurethanes.

Lab:

1. Flame identification of polymers.

2. Research on the density of polymers.

3. Investigation of polymers by infrared spectroscopy.

4. Study of the exothermic effect of copolymerization.

4. Production of polymers with a cellular structure (foaming and sintering).

5. Testing the porosity of materials with a cellular structure.

6. Examination of air permeability by polymers with cellular structure.

7. Investigation of the melt flow rate of polymers.

8. Investigation of the oxygen index of polymers.

9. Flammability tests of UL-94 polymers.

10. Testing the hardness of elastomers and plastomers.

11. Testing the strength properties in the static tensile test

12. Test of resistance to shock loads.

13. Testing the content of fillers in polymers.

Teaching methods

1.Lecture: multimedia presentation, presentation illustrated with examples given on the blackboard.

2. Laboratory exercises: practical exercises, performing experiments, discussion, team work, case studies.

Bibliography

Basic

1. Kelar K., Ciesielska D.: Fizykochemia polimerów ? wybrane zagadnienia, Wyd. Politechnika Poznańska 1998

2. Żuchowska D.,Polimery konstrukcyjne, WNT, W-wa, wyd. II, 2002

3. Pieluchowski J., Puszyński A.: Technologia tworzyw sztucznych, WNT, Warszawa, 1998

Additional

. Rabek J. F.,Współczesna wiedza o polimerach, Wydawnictwo Naukowe PWN, Warszawa 2008

Breakdown of average student's workload

	Hours	ECTS
Total workload	104	5,0
Classes requiring direct contact with the teacher	64	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,0

[1] delete or add other activities as appropriate