COURSE DESCRIPTION CARD - SYLLABUS

Course name
Technology of special purpose materials and nanomaterials [N1TCh2>TMSPiN]

Course

Field of study
Chemical Technology

Year/Semester
4/8

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of chemistry, physics and mathematics.The ability to acquire information from literature, database, other carefully selected sources.Understanding the need for further education and improve their professional competences.

Course objective

Knowledge related to structure, method of preparation and unique properties of materials, biomaterials and nanomaterials.Knowledge related to the properties and latest technologies of advanced materials nanomaterials and biomaterials.

Course-related learning outcomes

Knowledge:
1. Student has a well-established knowledge in the field of structure and applications of materials with special properties. [K_W09]
1. Student has a well-established knowledge in the field of structure and applications of materials with special properties inmedicine and pharmacy. [K_W09]
2. Student has a well-established knowledge in the field of technology of advanced materials and

nanomaterials and receiving biomaterials and nanomaterials. [K_W13]
3. The student has knowledge in the field the latest technology of materials with special properties and nanomaterials. [K_W09]

Skills:
1. Student has a well-established knowledge in the field of technology solutions for advanced materials, biomaterials, and nanomaterials [K_U12]
2. The student can explain the basic phenomena associated with technological processes of preparation of materials with special properties and also can explain phenomenon during their functioning [K_U16]

Social competences:
1. Student is conscious of limitation of his knowledge and understands the need of further continuous education. [K_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Stationary form: Written exam consisting of 4 - 8 open questions concerning the issues presented in the lecture or a test consisting of 40-60 closed questions (including >40% of open questions) (the student obtains a pass with at least 51% of points) or oral answer on the issues presented in the lecture. Online form: on the eKursy platform a test consisting of 40-60 closed questions (including >40% open questions) on the issues presented in the lecture (the student obtains a pass with at least 51% of points) or an oral answer on the issues presented on the lecture conducted in "live view" mode with the web camera on, in direct contact with the teacher via the platform eKursy.

Programme content

Issues related to technology of special purposematerials and nanomaterials

Course topics

Definitions and types of materials with special properties. Special-purpose materials that are used in electronics, aerospace, printing, aerospace, medicine, classical and digital photography. Technology of materials used in photolithography. Resist polymer using photocrosslinking reactions, photodegradation and transformation of functional groups. Negative and positive photoresists. The application of polymer resists. Technology of integrated circuits and printed circuit boards. Self-organizing materials and their application in the preparation of thin films and liquid crystal displays. Technology of materials used in optoelectronics. Technologies of thermochromic and photochromic materials. Properties and application of thermochromic and photochromic materials. Electroluminescent and photoluminescent materials. Engineering intelligent materials. Intelligent gels. Technology of piezoelectric and pyroelectric materials. Types of piezoelectric materials. Application of piezoelectric and pyroelectric materials. The technology of liquid crystal materials. The liquid crystal compounds in the electric field. Liquid crystal thermography. Application of liquid crystal materials. Characteristics of materials used in medicine, dentistry and pharmacy. Types of biomaterials: metallic, ceramic, polymeric, carbon, composite. Criteria for the selection of materials in medicine. Biocompatibility of materials and the main criteria for the production of biomaterials. Technology of dental prostheses, tendons, joints, bones, blood vessels. Materials and methods for the preparation of endoprostheses. Preparation of contact lenses, artificial hearts, heart starters. Angioplasty. Materials for the manufacture of catheters and stents. Bioresorbable implants. Types of implants. Procedures existing during medicines technology, with particular emphasis on methods of improving the quality and effectiveness of medicines and their purity. Drug carriers. Preparation and application of polymer microcapsules and microspheres.Nanomaterials: types. Properties and application. Methodological basis of nanotechnology - the method of preparation, classification and characterization of nanostructures. Nanometals. Nanoceramics. Nanolayers. Nanofibers. Nanotubes. Nanocomposites. Powder nanomaterials. Methods for the preparation of nanomaterials. Preparation and types of nanostructures. Characterization of nanostructures..

Teaching methods

Lecture with multimedia presentation. In special cases, the online form of the lecture is allowed.

Bibliography

Basic:
1. Z. Floriańczyk, S. Penczek, Chemia Polimerów, t.III, Polimery naturalne i polimery o specjal-nych właściwościach, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001
2. K. Kurzydłowski, M. Lewandowska, Nanomateriały inżynierskie konstrukcyjne i funkcjonalne, PWN, Warszawa 2010
3. A Graja, Niskowymiarowe przewodniki organiczne, WNT, Warszawa 1989.
4. W. Królikowski, Polimerowe materiały specjalne., Wyd. Politechniki Szczecińskiej, 1909.

Additional:
1. A.L. Dobrzański, Materiały inżynierskie i projektowanie materiałowe., WNT, Warszawa 2006
2. F. Wojtkun, J.P. Sołncew, Materiały specjalnego przeznaczenia, Wyd. Polit. Radomskiej, 2001.

Breakdown of average student's workload

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