STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Technology of high purity and nanomaterials		**1010704281010722272**
Field of study: **Chemical Technology**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **4 / 8**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **part-time**	
No. of hours: Lecture: **20** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **1**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **2 100%** **2 100%**

Responsible for subject / lecturer:

dr hab. inż. Sławomir Borysiak
email: Slawomir.Borysiak@put.poznan.pl
tel. 61 665-35-49
Faculty of Chemical Technology
ul. Berdychowo 4, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of chemistry, physics and mathematics.
2	**Skills**	The ability to acquire information from literature, database, other carefully selected sources.
3	**Social competencies**	Understanding the need for further education and improve their professional competences.

Assumptions and objectives of the course:

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

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has a well-established knowledge in the field of structure and applications of materials with special properties, biomaterials and nanomaterials. - [K_W09]
2. Student has a well-established knowledge in the field of technology of advanced materials, 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 competencies:

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

Assessment methods of study outcomes

Rating of completion test

Course description

Definition and types of purity materials. The importance of purity in the production of materials with special properties. Shaping the purity at the stage of material formation. Structural defects and their relevance to the physico-chemical properties of materials. Diffusion doping. 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. 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. Biomedical materials. Types of biomedical materials. General information on biomedical 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.

Basic bibliography:

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 bibliography:

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.

Result of average student's workload

Activity	Time (working hours)
1. The presence at lectures	20
2. Preparation for completion test	10
3. Participation in consultations related to the implementation of the education process	5

Student's workload

Source of workload	hours	ECTS
Total workload	35	2
Contact hours	25	2
Practical activities	0	0