

Attachment no. 4. to the Program of Studies

FACULTY of CHEMISTRY

SUBJECT CARD**Name of subject in Polish** **Zaawansowane materiały polimerowe w chemii i medycynie****Name of subject in English** Advanced polymers for chemical and medical applications**Main field of study (if applicable):** **Biosciences****Specialization (if applicable):****Profile:** academic**Level and form of studies:** 2nd level, full-time**Kind of subject:** optional**Subject code** W03BSS-SM2104W**Group of courses** NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	50				
Form of crediting (Examination / crediting with grade)	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical classes (P)					
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,3				

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of inorganic, organic and physical chemistry.
2. Basic knowledge in the area of polymers.

SUBJECT OBJECTIVES

- C1 To provide students with a general knowledge of special polymerization methods as well as their potential in preparation of designed materials for chemistry and medicine.
- C2 To familiarize students with relations between polymerization processes and polymer morphologies, structure and resulting properties.
- C3 To acquaint students with main requirements for polymeric materials according to designed applications.
- C4 Widening the knowledge about the latest achievements in the field of advanced materials for chemistry and medicine.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

Upon completion of this course, student:

PEU_W01 has gained knowledge of special polymerization methods for formation of designed polymeric materials,

PEU_W02 knows relations between polymerization processes, polymer morphologies, structure and resulting properties,

PEU_W03 can list and describe main requirements for polymeric materials according to particular applications in the field of chemistry and medicine,

PEU_W04 is able to describe main groups of advanced polymers applied in modern chemistry and medicine,

PEU_W05 knows the potential of advanced polymeric materials in various fields,

PEU_W06 has gained knowledge about importance of polymers in green technologies,

PEU_W07 can compare advanced polymers with other types of materials used in various fields.

relating to skills:

Upon completion of this course, student:

PEU_U01 can evaluate known special polymerization methods and their potential for various applications,

PEU_U02 is able to distinguish the main requirements for polymeric materials according to particular applications in chemistry and medicine,

PEU_U03 is able to describe main groups of advanced polymers designed for given chemical and medical applications

PEU_U04 can give examples of green technologies in polymeric field.

relating to social competences:

PEU_K01 is able to teamwork on specified problems.

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Polymers in chemistry and medicine – introduction to polymers, main fields of application and resulting demands on their structure and morphologies.	2
Lec 2	Controlled syntheses in formation of designed polymer structures.	2
Lec 3	Biopolymers – new applications of well-known polymers.	2
Lec 4		2
Lec 5	Bioinspired polymers - from the idea to potential applications.	2
Lec 6	Molecularly imprinting technology (MIT).	2
Lec 7	Automated techniques of designed polymeric structures' and MIPs' fabrication.	2
Lec 8	Design of MIP for chemical and medical applications.	2
Lec 9	Nature vs. industrial processes – advanced composites of natural and synthetic components.	2
Lec 10	Stimuli-responsive materials of various types.	2
Lec 11	Advanced polymers in sensors technology.	2
Lec 12	Advanced polymers vs. other materials in chosen medical applications.	2

Lec 13	Green technologies and polymers.	2
Lec 14	Problems of polymers biodegradation.	2
Lec 15	Forum to discuss the latest trends in advanced polymers in chemistry and medicine.	2
	Total hours	30

TEACHING TOOLS USED

N1. Expository lecture.
N2. Multimedia presentation.
N3. Interactive lecture - problem solving.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01-07	Active participation in lecture
F2	PEU_W01-07 PEU_U01-04 PEU_K01	Presentation of chosen advanced polymeric material
$P = (0.2F1 + 0.8F2)$		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] W. F. Reed, A. M. Alb (Eds.), “Monitoring Polymerization Reactions: From Fundamentals to Applications”, John Wiley & Sons 2014.
- [2] K. Matyjaszewski, “Controlled/Living Radical Polymerization”, Oxford University Press Inc 2007.
- [3] M. Komiyama, T. Takeuchi, T. Mukawa, H. Asanuma, „Molecular Imprinting: From Fundamentals to Applications”, Weinheim, Wiley-VCH 2003.
- [4] I. Galaev, B. Mattiasson (Eds.), “Smart polymers: applications in biotechnology and biomedicine”, CRC Press (Taylor & Francis) 2008.
- [5] F. Mohammad (Ed), “Specialty Polymers: Materials And Applications”, I. K. International Pvt Ltd, Anshan Ltd, Tunbridge Wells, 2007.

SECONDARY LITERATURE:

- [1] S. Li, Sh. Cao, S.A. Piletsky, A.P.F. Turner (Eds.), “Molecularly imprinted catalysts: principles, syntheses, and applications”, Elsevier 2015.
- [2] R. M. Ottenbrite, K. Park, T. Okano (Eds.), “Biomedical Applications of Hydrogels Handbook”, Springer Science & Business Media New York, 2010.
- [3] Z. Gu (Ed.), “Bioinspired and Biomimetic Polymer Systems for Drug and Gene Delivery”, Chemical Industry Press and Wiley-VCH Verlag GmbH & Co. KGaA 2015.
- [4] R. Breslow (ed.), “Artificial Enzymes”, Wiley-VCH Verlag GmbH & Co. KGaA 2005.
- [5] S. Thomas, S. Gopi, A. Amalraj (Eds), ” Biopolymers and Their Industrial Applications: From Plant, Animal, and Marine Sources, to Functional Products”, Elsevier 2020.
- [6] A. Khan, S.M. Rangappa, S. Siengchin, A.M. Asiri (Eds.), “Biofibers and Biopolymers for Biocomposites. Synthesis, Characterization and Properties”, Springer Nature Switzerland AG 2020

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