

FACULTY OF CHEMISTRY

SUBJECT CARD**Name of subject in Polish** Synteza „inteligentnych” polimerów**Name of subject in English** Fabrication of “smart” polymers**Main field of study (if applicable):** Chemical Nano-Engineering**Specialization (if applicable):****Profile:** academic**Level and form of studies:** 2nd level, , full-time**Kind of subject:** obligatory**Subject code****Group of courses** NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		30		
Form of crediting			/ crediting with grade*		
For group of courses mark (X) final course					
Number of ECTS points	2		1		
including number of ECTS points for practical classes (P)			1		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1		0.7		

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of organic and inorganic chemistry from 1st level of studies.
2. Basic laboratory skills and ability for teamwork

SUBJECT OBJECTIVES

C1 To provide students with a general knowledge of polymerization reactions as well as relation between materials structure and their physicochemical properties.

C2 To familiarize students with main classes of smart polymers and their potential in various aspects of modern life and industry.

C3 Widening the knowledge about the latest achievements in smart polymers field.

C4 To acquaint students with some practical aspects of polymerization (selected methods, polymerization mixture composition, reaction parameters, preparation procedures) important for fabrication of polymers with designed purposes.

SUBJECT EDUCATIONAL EFFECTS

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relating to knowledge:

Student, who has completed the course:

PEU_W01 has gained knowledge of structure and techniques of various polymers synthesis for special applications

PEU_W02 knows relations between polymers structure, properties and applications of those materials and can design polymerization process for fabrication of final products

PEU_W03 is familiar with main groups of smart polymers and their application in various fields

relating to skills:

PEU_U01 is able to select and apply basic methods of polymer synthesis to obtain materials having designed properties

PEU_U02 can evaluate the basic parameters of synthesis influencing polymer structure and morphology

PEU_U03 is able to prepare a final report describing performed block of experiments and obtained results summarized by detailed analysis of properties in relation to polymer structure and synthesis method

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Polymers – definition, basic knowledge of polymers, types of polymerizations Irregularities in polymerization reactions, random character of polymerizations Special types of polymerizations (ROMP, ATRP etc.), polymers topology, controlling polymerization kinetics, controlling polymers' composition and physical properties. Part I Special types of polymerizations (ROMP, ATRP etc.), polymers topology, controlling polymerization kinetics, controlling polymers' composition and physical properties. Part II Physical means of controlling the properties of polymers and “plastics” Thermosensitive polymers and their applications Temperature swing sorption, grafted polymers. Organizing the polymer architecture around template - Molecularly Imprinted Polymers (MIP) Application of MIPs to separation science and catalysis Polymeric carriers for biomolecules Properties of such polymers and requirements towards carrier-enzyme system Synthetic polymers for solid phase syntheses, polymeric scavengers Ion-exchangers and their applications (ion-exchange, catalysis) Polymeric fibres, membranes for separation processes (also hybrid materials) Polymers for ion-exchange chromatography, separation of aminoacids	30
	Total number of hours	30

Laboratory		Number of hours
Lab 1	Synthesis of stimuli-responsive hydrogels.	30

	Internal phase emulsion polymerization (HIPE) as a method used for formation of polymeric materials with unique porous structures. Basic characterization of obtained materials.	
	Total hours	30

TEACHING TOOLS USED

- N1. Lectures with multimedia presentations
 N2. Performing experiments with different laboratory equipment and instruments
 N3. Preparation of report including analysis and interpretation of obtained results

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_U01-U03	2 graded summary reports
F2	PEU_U01-U02	Final colloquium
P1 (lecture)	PEU_W01-W03	Written test (minimum examination pass mark is 53 %)
P 2 (laboratory) Grade = (F1 + F2)/2		

PRIMARY AND SECONDARY LITERATURE

[1] M. Chanda, S.K. Roy, "Industrial Polymers, Specialty Polymers, and Their Applications", Boca Raton etc., CRC Press/Taylor & Francis Group, 2009.

[2] F. Mohammad (Ed), "Specialty Polymers: Materials And Applications", I. K. International Pvt Ltd, Anshan Ltd, Tunbridge Wells, 2007.

[3] L.H. Sperling, "Introduction to Physical Polymer Science", 4th ed., Hoboken, NJ, John Wiley & Sons, 2006.

[4] F. Billmeyer, "Textbook of Polymer Science", 3rd ed., New York [etc.], John Wiley & Sons, 1984.

[5] K. Dorfner (Ed.), "Ion exchangers", Walter de Gruyter, New York, 1991 (or later reprints).

[6] M. Komiyama, T. Takeuchi, T. Mukawa, H. Asanuma, „Molecular Imprinting: From Fundamentals to Applications”, Weinheim, Wiley-VCH 2003.

SECONDARY LITERATURE:

[1] R.M. Ottenbrite, K. Park, T. Okano (Eds.), "Biomedical Applications of Hydrogels Handbook", Springer Science & Business Media New York, 2010.

[2] R. Barbucci (Ed.), "Hydrogels. Biological Properties and Applications", Springer-Verlag Italia, Milan 2009.

[3] N.R. Cameron, D.C. Sherrington, "High internal phase emulsions (HIPEs) — Structure, properties and use in polymer preparation", in: Biopolymers Liquid Crystalline Polymers Phase Emulsion, Advances in Polymer Science, vol 126, Springer, Berlin, Heidelberg 1996.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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