

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name of subject in Polish:	Środki pomocnicze do polimerów				
Name of subject in English:	Polymer additives				
Main field of study (if applicable):	Chemical Technology				
Specialization (if applicable):	Technology of Fine Chemicals				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	TCC024011				
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)	60				
Form of crediting	Examination				
For group of courses mark (X) final course					
Number of ECTS points:	2				
including number of ECTS points for practical (P) classes	0				
including number of ECTS points for direct teacher-student contact (BK) classes	1				
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES 1. Basic knowledge of inorganic, organic and physical chemistry at 1 st level of studies. 2. Basic knowledge in the area of polymers and plastics. 3. Ability to use original chemical literature and look through available electronic resources.					
SUBJECT OBJECTIVES C1 Acquaint students with the significance of polymer additives and their influence on plastics properties. C2 Introducing the categorization of polymer additives. C3 Widening the knowledge about the latest trends in polymer additives industry. C4 Acquaint students with the hazards involved in application of various polymer and polymer-based additives.					
SUBJECT LEARNING OUTCOMES Relating to knowledge: Any person who has got a credit of the subject: PEK_W01 – has gained knowledge of structure and techniques of various polymers (synthetic and natural) synthesis and modification. PEK_W02 – has basic knowledge of choice and application of polymer additives, as well as polymer-based additives applied in various fields of industry. PEK_W03 – knows relations between the type of additives and plastics properties. PEK_W04 – is capable of developing the plastics properties and extrapolation of applications for particular polymer composition. PEK_W05 – understands ecological and economic fallout of polymers and plastics applications.					
PROGRAMME CONTENT					
Lectures				Number of hours	
Lec 1	Introduction to synthetic polymers.			2	
Lec 2	Introduction to natural polymers.			2	

Lec 3	Techniques of natural polymer synthesis – possibilities of targeting the syntheses for industrial purposes.	2
Lec 4	Techniques of synthetic polymer synthesis – polymerization additives. Copolymerization and polymer crosslinking.	2
Lec 5	Polymer-based additives for food, printing, detergents industries and modelling clays.	2
Lec 6	Introduction to processing of plastics – processing aids.	2
Lec 7	Functional additives and polymers properties stabilizers.	2
Lec 8	Polymer-based additives for construction and fuel industries, road building and maintenance.	2
Lec 9	Modifiers of functional properties of polymers.	2
Lec 10	Preparation methods for polymers with additives.	2
Lec 11	Polymers for medicine – requirements and examples of applied additives for polymers and pharmaceuticals.	2
Lec 12	The problems and hazards involved in application of polymer additives.	2
Lec 13	Possible ways of polymers degradation, problems of recycling and polymer wastes.	2
Lec 14	Polymer-based additives for chemical industry (cosmetics and synthetic fibers) and metallurgy. Polymer additives producers.	2
Lec 15	Forum to discuss the latest trends in polymer additives.	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 number	Way of evaluating learning outcomes achievement
F1	PEK_W01-W05	Written exam
F2	PEK_W04-W05	Participation in discussions (problem solving)

$$C = (0.8F1 + 0.2F2)$$

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] L.H. Sperling, "Introduction to physical polymer science", 4th ed., Hoboken, NJ: John Wiley & Sons, 2006.
 [2] F. Billmayer, "Textbook of Polymer Science", 3rd ed., New York [etc.]: John Wiley & Sons, 1984.
 [3] Jan C.J. Bart, "Additives in Polymers", John Wiley & Sons Ltd, 2005.
 [4] "Handbook of plastic and rubber additives" [Dokument elektroniczny] /Handbook of Plastics and Rubber Additives, Volumes 1-2 (2nd Edition) Michael and Irene Ash.
 [5] S. Al-Malaika (Ed.), "Reactive Modifiers for Polymers", Blackie Academic and Professional, Chapman and Hall, London, 1997, ISBN 0-7514 0265 6.

SECONDARY LITERATURE:

- [1] M. Bryjak, I. Gancarz, Polymers in Medicine, wyd. PWR, 2010.

- [2] Podstawy recyklingu tworzyw sztucznych : praca zbiorowa / pod red. Marka Kozłowskiego, Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej, 1998.
- [3] Tworzywa Sztuczne, środki pomocnicze i specjalne zastosowania polimerów, W. Szlezynger, Z. Brzozowski, tom 3, Fosze, 2013.

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

Dr inż. Anna Jakubiak-Marcinkowska, anna.jakubiak@pwr.edu.pl

Dr hab. inż. Dorota Jermakowicz-Bartkowiak, dorota.jermakowicz-bartkowiak@pwr.edu.pl