

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Technology of Polymers</b>		Code
Field of study <b>Chemical and Process Engineering</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>30</b> Classes: - Laboratory: <b>30</b> Project/seminars: -		No. of credits <b>5</b>
Status of the course in the study program (Basic, major, other) <b>major</b>		(university-wide, from another field) <b>university-wide</b>
Education areas and fields of science and art Technical sciences Technical Sciences		ECTS distribution (number and %) <b>6 100%</b> <b>6 100%</b>
<b>Responsible for subject / lecturer:</b>  Prof. dr hab. inż. Ewa Andrzejewska ewa.andrzejewska@put.poznan.pl tel. 616653637 Faculty of Chemical Technology ul. Piotrowo 3 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Knowledge of the basic principles of general and organic chemistry
2	<b>Skills</b>	Student knows and applies good practices of laboratory work, is able to operate the scientific equipment. He or she is able to search for information in scientific literature, databases and other properly chosen sources.
3	<b>Social competencies</b>	He or she is conscious of the effects of engineering activity
<b>Assumptions and objectives of the course:</b> Gaining of basic knowledge about polymers, polymeric materials, their production, properties and applications.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> Student has a basic knowledge of polymer chemistry and polymeric materials technology. <b>K_W04, K_W05, K_W13</b>		
<b>Skills:</b> Student has the ability of analyzing and interpreting of the results of experiments from the area of polymer technology. Student has the ability of presenting the results of laboratory exercises in concise and proper manner. Student is able to apply basic laboratory techniques for synthesis and processing of polymers <b>K_U07, K_U08</b>		
<b>Social competencies:</b>		

Student is conscious of limitations of science and technology in the area of polymer chemistry.  
 Student is conscious of limitation of his knowledge and understands the need of further continuous education in area of polymer chemistry.  
 Students can work in a team and are aware of their responsibility for their work and responsibility for the results of the teamwork  
 K\_K01, K\_K02, K\_K04

**Assessment methods of study outcomes**

Written exam from the lecture subjects, evaluation of laboratory exercises and reports.

**Course description**

Basic information about polymers (monomer, polymer, repeat unit, polymerization degree), reactions used in production of polymers (chain- and step-growth polymerization)  
 Popular monomers and polymers therefrom (properties, applications): polyolefines, vinyl polymers, rubbers, polyesters, polyamides, polyurethanes, epoxide resins, specialty polymers.  
 Structure of polymers (linear, branched, cross-linked), thermoplastic and duroplastic polymers and their properties, naturally occurring polymers.  
 Polymeric materials – definition, ingredients, composites.  
 Molecular weight of polymers, types of molecular weight.  
 Degradation, depolymerisation and destruction of polymers.  
 Structure of polymers, tacticity.  
 Radical polymerization, initiation, propagation, termination, molecular weight control..  
 Kinetics of radical polymerization, autoacceleration.,  
 Ionic polymerization. Mechanism, living polymerization.  
 Coordination polymerization, Ziegler-Natta catalysts, mechanism of polymerization.  
 Copolymerization; reactivity coefficients, types of copolymers.  
 Industrial methods of polymer synthesis (mass, emulsion, solution, suspension polymerization).  
 Polycondensation – types of polycondensation, comparison of radical polymerization and polycondensation, features of the process, equilibrium and non-equilibrium polycondensation, Carothers equation.  
 Industrial methods of polycondensation.  
 Polyaddition, features and examples.  
 Crosslinking of polymers, , methods of crosslinking, vulcanization.  
 Polymeric chain structure, , crystallinity of polymers  
 Physical states and characteristic temperatures of polymers.  
 Mechanical propertiers of polymers, viscoelasticity.  
 Basic methods of polimer processing, modification of polymers.  
 Principles of polimer recycling.

**Basic bibliography:**

- . J. Pielichowski, A. Puszyński „Chemia Polimerów” TEZA, Kraków, 2004
- 2. J. Pielichowski, A. Puszyński „Technologia tworzyw sztucznych”, WNT, Warszawa, 1994

**Additional bibliography:**

- 1. . Praca zbiorowa pod red. Z. Floriańczyka i S. Penczka „Chemia polimerów” tom I i II, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1995 i 1997.
- 2. W. Szlezyngier „Tworzywa sztuczne” Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1996.

**Result of average student's workload**

Activity		Time (working hours)
1. lecture		30
2. preparation for laboratory		15
3. laboratory		30
4. exam preparation, exam		30
<b>5. reports preparation</b>		15
Student's workload		
Source of workload	hours	ECTS
Total workload	120	5
Contact hours	60	3
Practical activities	30	1