

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Recycling of materials</b>		Code <b>1010702231010702652</b>
Field of study <b>Chemical Technology</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>2 / 3</b>
Elective path/specialty <b>Composites and Nanomaterials</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>15</b> Classes: <b>-</b> Laboratory: <b>-</b> Project/seminars: <b>-</b>		No. of credits <b>2</b>
Status of the course in the study program (Basic, major, other) <b>basic</b>		(university-wide, from another field) <b>university-wide</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>2 100%</b> <b>2 100%</b>
<b>Responsible for subject / lecturer:</b>  dr inż. Dominik Pauksza email: Dominik.Pauksza@put.poznan.pl tel. 61 665-3549 Faculty of Chemical Technology ul. Berdychowo 4 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Students have the necessary knowledge in the field of chemistry and polymer processing. They are able to formulate and solve simple tasks within the subject.
2	<b>Skills</b>	Students are able to search the necessary information from literature, databases and other sources.
3	<b>Social competencies</b>	Students are aware of the need for further development of their professional, personal and social skills. They are able to assess the outcomes of their activities.
<b>Assumptions and objectives of the course:</b> The main aims of the lectures are as follows: - provide students with the methods of materials recycling, - present the most important problems with legislation, economy and ecology related to the subject, - teach the students about the recycling technologies of most common polymers and other materials.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. Students have a knowledge of newest methods of structure and properties analysis materials, necessary to describe products and substrate of chemical industry - [K_W04, K_W05] 2. Students have expanded knowledge of environmental problems associated with chemical processes. - [K_W08]		
<b>Skills:</b> 1. Students are able to independently assess and determine the direction for further education (on the basis of acquired information from literature, databases and other sources), and to pursue self-directed learning. - [K_U01] 2. Students have the ability to adapt the knowledge of polymer processing technology to solve problems in the field of polymer recycling and to plan new technological processes. - [K_U12] 3. Students can rationally plan the use of recycled materials, guided by the principles of environmental protection and sustainable development. - [K_U13]		
<b>Social competencies:</b> 1. Students shape their awareness of the limitations of science related to chemical technology and environmental protection - [K_K02]		

<b>Assessment methods of study outcomes</b>		
Written test and a presentation on the subject matter		
<b>Course description</b>		
<p>The most important topics of lectures on polymer recycling are given below.</p> <p>The importance of materials recycling. Ecological and economical aspects of reused plastics. The system of waste management in Poland and in Europe. Life Cycle Assessment (LCA) of plastics, especially in packaging industry. Recycling in the automobile industry. The main sources of used plastics: car industry, electrochemical industry, civil engineering (e.g. profiles, rain-pipes, PVC windows), food industry containers and other. Rubber and tyre recycling.</p> <p>Identification and segregation of polymers. The methods of polymers recycling and recovery, especially for polyolefines, polyesters, PVC and others. Biodegradable polymers: types, technologies, application, biodegradation. Devising polymer recycling technologies.</p> <p>Composites recycling, as well as metals, paper and cardboard packages. The recycling of hazardous, radioactive and toxic materials. Legal aspects of recycling, raw materials and energy recovery. Devising technologies connected with materials recycling.</p>		
<b>Basic bibliography:</b>		
<ol style="list-style-type: none"> <li>1. L. A. Lucia, O. J. Rojas ? ?The Nanoscience and Technology of Renewable Biomaterials?, Wiley Publications, UK 2009</li> <li>2. H. F. Lund - The McGraw-Hill RECYCLING HANDBOOK, USA, The McGraw-Hill Companies, 2001</li> <li>3. A. L. Andrady ? ?Plastics and the Environment?, Wiley-Interscience, 2003</li> <li>4. A. Azapagic, A. Emsley, I. Hamerton ? ?Polymers, the Environment and Sustainable Development?, J. Wiley &amp; Sohns Ltd. 2003</li> <li>5. M. Chanda, S. K. Roy ? ?Plastics and Fabrication and Recycling?, CRS Press Taylor&amp;Francis Group, 2008</li> </ol>		
<b>Additional bibliography:</b>		
<ol style="list-style-type: none"> <li>1. Proceedings of the Central-European Conference RECYCLING AND RECOVERY OF THE POLYMER MATERIALS, SCIENCE ? INDUSTRY, Wrocław/Szczecin, 2000-2013</li> </ol>		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. Lectures	15	
2. Participation in the consultation	25	
3. Preparation for written test	20	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	60	2
Contact hours	45	0
Practical activities	0	0