

## SYLLABUS OF A MODULE

Polish name of a module	<b>RECYKLING TWORZYW POLIMEROWYCH</b>
English name of a module	<b>PLASTICS RECYCLING</b>
ISCED classification - Code	0715
ISCED classification - Field of study	<i>Mechanics and metal trades</i>
Languages of instruction	<i>English</i>
Level of qualification:	<i>1 – BSc (EQF 6)</i>
Number of ECTS credit points	6
Examination:	<i>A - assignment</i>
Available in semester:	<i>A – autumn only</i>

### Number of hours per semester:

Lecture	Tutorials	Laboratory	Seminar	E-learning	Project
15	0	30	0	0	0

## **MODULE DESCRIPTION**

### **Module objectives**

- O1. To acquaint students with the methods and technologies of plastics recycling.
- O2. Acquisition by students of practical skills in designing and conducting the processing process with the use of secondary materials and the ability to carry out processing in a manner that enables recycling.

### **PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Knowledge of materials science, polymer materials and methods of their processing.
2. Knowledge of the basic technologies of processing polymer materials.
3. Ability to work independently and in a group.
4. The ability to correctly interpret and present your own actions.

### **LEARNING OUTCOMES**

- LO 1 – student has knowledge of the methods of recycling polymer materials,
- LO 2 – student is able to propose the type of recycling and choose the right method of recycling and prove the validity of the adopted solution,
- LO 3 – student knows the general principles of operation, operation and selection of machines used in the plastics processing and their plastics recycling.

## MODULE CONTENT

Type of classes – lecture	Number of hours
Lec 1 - Introduction to recycling of plastics.	1
Lec 2-3 - Production of plastics in the world and in Europe.	2
Lec 4-5 - Plastics application segments.	2
Lec 6-7 - Statistical presentation of polymer waste.	2
Lec 8-9 - Classification of polymer waste.	2
Lec 10 - Identification and traceability of plastic products.	1
Lec 11 - Energy recovery. Raw material and material recycling.	1
Lec 12 - Sorting and identification of waste.	1
Lec 13 - Waste shredding. Washing and drying of waste.	1
Lec 14 - Machines and devices used in the recycling process. Methods of manufacturing of regranulates.	1
Lec 15- Recycling of rubber.	1
<b>Sum</b>	<b>15</b>
Type of classes– laboratory.	Number of hours
Lab 1-2 - Identification and sorting of plastic waste.	2
Lab 3-4 - Shredding of plastics using a mill.	2
Lab 5-10 - Manufacture of injection molded parts from recycled materials.	6
Lab 11-13 - Testing the properties of obtained molded parts.	3
Lab 14-15 - Structure of recycled molded parts.	2
Lab 16-21 Manufacture of plastic parts from plastics mixed with other materials	6
Lab 22-27 Investigations of properties of obtained plastic parts with other materials	6
Lab 28-30 Analyze of structure and obtained data from exercises	3
<b>Sum</b>	<b>30</b>

## TEACHING TOOLS

1. - lecture with the use of multimedia presentations
2. - demonstration of technological processes
3. - exercise stations equipped with machinery and laboratory equipment

## WAYS OF ASSESSMENT ( F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - evaluation of reports on the implementation of exercises covered by the curriculum
F4. - assessment of activity during classes
S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture

\*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

## STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
<b>1. Contact hours with teacher</b>		
1.1	Lectures	15
1.2	Tutorials	0
1.3	Laboratory	30
1.4	Seminar	0
1.5	Project	0
1.6	Examination	5
Total number of contact hours with teacher:		<b>50</b>
<b>2. Student's individual work</b>		
2.1	Preparation for tutorials and tests	10
2.2	Preparation for laboratory exercises, writing reports on laboratories	35
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	10
2.5	Preparation for examination	10
2.6	Individual study of literature	35
Total number of hours of student's individual work:		<b>100</b>
Overall student's workload:		<b>150</b>
<b>Overall number of ECTS credits for the module</b>		<b>6 ECTS</b>
Number of ECTS points that student receives in classes requiring teacher's supervision:		<b>1.8 ECTS</b>
Number of ECTS credits acquired during practical classes including laboratory exercises and projects:		<b>2.6 ECTS</b>

## BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1.	Francesco La Mantia, Handbook of Plastics Recycling, iSmithers Rapra Publishing, 2002 - 442
2.	James H. Clark, José Aguado Alonso, José Aguado Villalba, José Aguado, David P. Serrano, D. A. Serrano, Feedstock Recycling of Plastic Wastes, Royal Society of Chemistry, 1999 - 192
3.	Anna Fråne, Åsa Stenmarck, Stefán Gíslason, Søren Løkke, Malin zu Castell Rüdénhausen, Hanne L Raadal, Margareta Wahlström, Future solutions for Nordic plastic recycling, Nordic Council of Ministers, 2015 - 46
4.	Trevor M. Letcher, Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention, and Solutions, Academic Press, 2020 - 686
5.	Lizzi Andersen, Kenneth Sandberg, Per Lundqvist, Jens Thulin, Janus Kirkeby, Trine Lund Neidel, Asbjørn Weidling, Plastic sorting at recycling centres: Guideline, Nordic Council of Ministers, 2015 - 5
6.	Manas Chanda, Salil K. Roy, Plastics Fabrication and Recycling, CRC Press, 2016 - 216

**MODULE COORDINATOR (NAME, SURNAME, E-MAILADDRESS)**

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