



### MODULE DESCRIPTION

Module code	full-time studies:	<b>Z-ZIP1-E-504</b>
	part-time studies:	<b>Z-ZIPN1-E-504</b>
Module name	<b>Recycling Principles</b>	
Module name in Polish	<b>Podstawy recyklingu</b>	
Valid from academic year	<b>2019/2020</b>	

### MODULE PLACEMENT IN THE SYLLABUS

Field of study	<b>MANAGEMENT AND PRODUCTION ENGINEERING</b>
Level of education	<b>1st degree</b>
Studies profile	<b>General</b>
Form and method of conducting classes	<b>Full-time and Part-time</b>
Specialisation	<b>All</b>
Unit conducting the module	<b>Department of Production Engineering</b>
Module co-ordinator	<b>Magdalena Rybaczewska-Błażejowska, PhD, DSc</b>
Approved by:	<b>Dariusz Bojczuk, PhD, DSc</b>

### MODULE OVERVIEW

Type of subject / group of subjects	<b>Basic</b>
Module status	<b>Compulsory</b>
Language of conducting classes	<b>English</b>
Module placement in the syllabus - semester	<b>Semesetr V</b>
Initial requirements	<b>No requirements</b>
Examination (YES/NO)	<b>NO</b>
Number of ECTS credit points	<b>2</b>

Method of conducting classes		Lecture	Classes	Laboratory	Project	Other
Per semester	full-time studies:	<b>20</b>			<b>15</b>	
	part-time studies:	<b>12</b>			<b>9</b>	

## TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student has advanced knowledge of the EU directives and Poland's legislation as regards waste management and recycling.	ZIP1_W03
	W02	A student has advanced knowledge on life cycle of products, waste classification, segregation and management. In addition, a student has knowledge on the placing recycling products and services in the conditions of market economy.	ZIP1_W15
	W03	A student knows both national and international cases of exemplary organisation of the recycling process.	ZIP1_W18
Skills	U01	A student uses the acquired knowledge solve dilemmas appearing in waste management. In addition, a student analyses the issues concerning waste management and suggests directional activities in this respect.	ZIP1_U01
	U02	A student can use theoretical knowledge from the field of recycling to analyse the waste segregation process.	ZIP1_U15
	U03	A student understands the relations between engineering decisions and their impact on the environmental and social aspects, taking into account intellectual property law, including the appreciation of new products and services.	ZIP1_U15 ZIP1_U18
Social competences	K01	Understands the relationship between engineering and non-technical activities, with particular emphasis on the effects of waste management on the environment and society.	ZIP1_K02 ZIP1_K05

## TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	<ol style="list-style-type: none"> <li>1. Issues of European and Polish waste management law, especially in the field of recycling - key concepts, waste hierarchy, waste classification, planning in waste management.</li> <li>2. Characteristics of waste - production levels, the morphological composition, quantitative and qualitative indicators.</li> <li>3. Eco- logistics of waste - methods and stages of obtaining secondary raw materials.</li> <li>4. Sorting of municipal waste and recovery of selected secondary raw materials - analysis of sample sorting lines.</li> <li>5. Recycling of selected waste streams, including paper and cardboard, glass cullet, plastics, metals; the possibility of depriving of end-of-waste status.</li> <li>6. The process of organic waste recycling - material, biological and technological conditions; adopted goals.</li> <li>7. Characteristics of other waste management processes – examples of circular waste management solutions.</li> </ol>

Project	<ol style="list-style-type: none"> <li>1. Discussion of the topics and scopes of projects related to the issue of waste recycling. Presentation of EASETECH software. Division into teams. Release of initial assumptions of projects.</li> <li>2. Quantitative and qualitative analysis of waste. Determination of the weight and volume index. Modeling of morphology, physical and chemical properties of waste in EASETECH. Assigning codes.</li> <li>3. Waste eco-logistics. Modeling the process of collecting and transporting of waste in EASETECH. Selection of waste containers and means of transport. Calculations.</li> <li>4. Recycling of waste. Modeling the recovery process and the use of secondary raw materials in manufacturing processes. Choosing the relevant infrastructure in EASETECH.</li> <li>5. Presentation of projects by teams, discussion, evaluation. Summary of the work of the whole group.</li> </ol>
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### **METHODS OF ASSESSING TEACHING RESULTS**

Symbol	Methods of checking the learning outcomes <i>(select X)</i>					
	Oral exam	Written exam	Test	Project	Statement	Other
W01			X	X		
W02			X	X		
W03			X	X		
U01				X		
U02				X		
U03				X		
K01			X	X		

### **FORM AND CONDITIONS OF PASSING**

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Obtaining at least 51% of the test marks at the end of the class or presenting a final report on a given topic.
Project	Credit with grade	Execution and presentation of the project.

## STUDENT WORKLOAD

Balance of ECTS points												
No.	Type of student's activity	Student's workload										Unit
		full-time					part-time					
		Lc	C	Lb	P	O	Lc	C	Lb	P	O	
1.	Participation in the activities	20			15		12			9		h
2.	Other (consultation, exam)	2			2		2			2		h
3.	<b>Number of hours of a student's as- sisted work</b>	<b>39</b>					<b>25</b>					h
4.	<b>Number of ECTS credit points which are allocated for assisted work</b>	<b>1,6</b>					<b>1,0</b>					ECTS
5.	<b>Number of hours of a student's un- assisted work</b>	<b>11</b>					<b>25</b>					h
6.	<b>Number of ECTS credit points which a student receives for unassisted work</b>	<b>0,4</b>					<b>1,0</b>					ECTS
7.	<b>Work input connected with practical classes</b>	<b>21</b>					<b>21</b>					h
8.	<b>Number of ECTS credit points which a student receives for practical classes</b>	<b>0,8</b>					<b>0,8</b>					ECTS
9.	<b>Total number of hours of a stu- dent's work</b>	<b>50</b>					<b>50</b>					h
10.	<b>Punkty ECTS za modul</b> <i>1 ECTS=25 hours</i>	<b>2</b>										ECTS

## LITERATURE

1. Rhyner Ch., Schwartz L., Wenger R., Kohrell M. (2017), *Waste management and resource recovery*, Lewis Publishers, London.
2. Stahel W. (2019) *The Circular Economy: A User's Guide*, Taylor & Francis Ltd.
3. Vaughn, J. (2009) *Waste management*, ABC-CLIO Inc.
4. Williams P. T. (2005), *Waste Treatment and Disposal*, Wiley Online.
5. Worrell E. and Reuter M. A. (2014), *Handbook of Recycling: State-of-the-art for Practitioners, Analysts, and Scientists*, Elsevier Inc.