



"Disposal of packages"

Work program of the educational component (Syllabus)

Details of the educational component

Higher education level	<i>Second (Master's)</i>
Field of Knowledge	<i>G - Engineering, Manufacturing and Construction</i>
Speciality	<i>G11 Mechanical Engineering</i>
Educational program	<i>OPP Engineering of Innovative Industry Equipment Engineering of innovative industrial equipment</i>
Status of the educational component	<i>Custom</i>
Form of study	<i>full-time (full-time)</i>
Year of preparation, semester	<i>1st year, spring semester</i>
Scope of the educational component	<i>5(150)</i>
Semester control / control measures	<i>Exam</i>
Class schedule	<i>3 hours per week (1 hour of lectures, 2 hours of practical classes)</i>
Language of instruction	<i>Ukrainian</i>
Information about the course leader / teachers	<i>Lecturer, practical classes: Associate Professor, Ph.D. SHYLOVYCH Tetiana Borysivna, https://cpsm.kpi.ua/shilovich-tetyana-borisivna.html?tmpl=component</i>
Course placement	<i>Sikorsky Platform: https://do.ipk.kpi.ua/course/view.php?id=3251</i>

Program of the educational component

1. Description of the educational component, its purpose, subject of study and learning outcomes

The problem of accumulation and disposal of waste has existed since the emergence of large human settlements. This problem arose most acutely after World War II in Western Europe and the United States, when new packaging materials began to be introduced, the number of packaged products in supermarkets and ready-made food in fast food establishments increased. For the first time, the problem of packaging waste disposal arose against the background of competition between cardboard and plastic packaging for fresh fish and meat products and dates back to the period of the 1960s-70s. The second stage began after the end of the energy crisis of 1970. At the beginning of the 21st century, the struggle for a clean environment and the desire to create conditions for "zero waste" continues.

Ukraine is among the countries with the highest absolute volumes of waste generation and accumulation. Every year they are formed 700-720 million. tons (up to 75% is waste from the development of mineral deposits). The total mass of waste accumulated on the territory of Ukraine in surface storage facilities exceeds 25 billion tons. tons, which per 1 km² of area is about 40 thousand square meters. Tons. Waste is accumulated in the form of sludge storage facilities, waste heaps, dumps, and various landfills. The area of land occupied by them is about 160 thousand square meters. hectare. As a result of the hypertrophied development of the mining industry in Ukraine, waste generated during the development of deposits and mineral processing dominates (13 and 14 %, respectively). A significant part is waste from chemical and metallurgical processing of raw materials. As a result of the life of one resident of Ukraine,

one ton of waste is generated per year. Only a third of the total amount of waste is disposed of, which indicates significant resource reserves.

The subject of the educational component "Disposal of Packaging" is methods and processes of disposal of packages made of various materials.

The solution of this problem is determined by the level of training of specialists working in the field of engineering and computer-integrated technologies for designing innovative industry equipment.

To successfully solve the problems of calculating the processes of packaging disposal, specialists must be fluent in information, be able to solve the problems of sorting, moving, grinding and useful use of secondary raw materials.

The purpose of the educational component "Disposal of packaging"

The purpose of studying this **educational component** is to form a complex of knowledge among students about the methods of disposal of packaging from various materials, a set of skills and abilities necessary for carrying out complex measures for the processing and disposal of packaging materials, to carry out calculations of equipment for processing. In accordance with the goal, the training of masters in this specialty requires strengthening the formation of the following competencies in students:

Integral competence:

Ability to solve complex problems and problems in the field of mechanical engineering, which involves research of processes, equipment and/or innovation in this field and is characterized by uncertainty of conditions and requirements

- Ability to generate new ideas (creativity) (GC 06),

According to the requirements **of the program of the educational component "Disposal of Packaging"**, students after mastering it must demonstrate the following program learning outcomes:

- Analyze engineering objects, processes and methods (PRN 05);
- determine the method of disposal of packages and the necessary preparatory and basic technological processes of disposal.
- methods of disposal of packaging and related technologies;
- justify the method of disposal of a certain packaging product based on the analysis of the properties of the packaging material; justify schemes and equipment for disposal. packaging based on the analysis of material properties, type of packaging product and calculations of technological equipment;
- determine measures for the collection of production waste and used packaging, using knowledge of the handling of used packaging of various products.

2. Pre-requisites and post-requisites of the educational component (place in the structural and logical scheme of education according to the relevant educational program)

The study **of the educational component "Packaging Disposal"** is based on the principles of integration of various knowledge gained by students during the previous semester of the master's degree in the study **of the educational components "Packaging Equipment", "Packaging Equipment Engineering"**. **The educational component "Recycling of Packaging"** is **an educational component of professional training**, which should provide solutions to complex problems in the field of engineering, rational use of material and energy resources.

3. Content of the educational component

Introduction. The purpose and objectives **of the educational component**. Packaging and the environment. Features of the disposal of various types of packaging waste. Plastics. Paper and cardboard. Metals. Problems of disposal and ways to solve them in Ukraine and abroad. The main methods of disposal of packaging waste. Classification of equipment for the collection and processing of used packaging. Methods and equipment for sorting and enrichment of processed materials. Crushing and grinding

equipment. Main structural diagrams of equipment of various types. Equipment for grinding materials by cutting. Equipment and methods for separation of solid phases. Equipment and equipment for mixing materials. Equipment for processing polymeric materials using rollers and calenders. Equipment for pressing products from recycled materials. Extrusion lines for the production of granules, polymer films, sheet, profile and other products. Thermal disposal. Creation and introduction of new biomaterials that decompose under the influence of external factors.

4. Training materials and resources

Basic literature

1. *Disposal of Packaging: Textbook on Academic Discipline [Electronic resource] : teaching aids for students studying under the program of training masters in the field of knowledge 13 – Mechanical Engineering; specialty 131 – "Applied Mechanics", specialization "Engineering, computer modeling and design of packaging equipment" / T.B. Shilovych; Igor Sikorsky Kyiv Polytechnic Institute. – Electronic text data (1 file: 3.95 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2018. – 51 p. Access: <http://ela.kpi.ua/handle/123456789/25143>*
2. *Shilovych T.B. Disposal of Packaging Practicum for Students' Independent Work [Electronic resource]: textbook. / - Kyiv: "KPI them. I. Sikorsky", 2018. – 13 p. Stamp – recommended by the Academic Council of NTUU "KPI" (Minutes No. 9 of 24.05.2018) – Electronic text data (1 file: 1.28 MB). – Title from the screen. – Access : <http://ela.kpi.ua/handle/123456789/25142>*
3. *Shilovych T.B., Simonchuk E.P. Disposal of packaging. Practicum on the academic discipline. [Electronic resource]: study. Manual. for students studying under the Master's program in the field of knowledge 13 – Mechanical Engineering; in the specialty 131 – "Applied Mechanics", specialization – "Engineering, Computer Modeling and Design of Packaging Equipment" / KPI. Igor Sikorsky; compiled by T.B. Shilovych, E.P. Simonchuk – Electronic text data (1 file: 2.16 MB). – Kyiv: KPI. Igor Sikorsky, 2018. – 36 p. Vulture provided by the Methodological Council of KPI. Igor Sikorsky (protocol No. 6 of 21.02.2019) at the request of the Academic Council of the Faculty of Engineering and Chemistry (protocol No. 1 of 28.01.2019) Title from the screen. – Access : <http://ela.kpi.ua/handle/123456789/26683>*
4. *Shroeder V.L., Krivoshey V.M., Kulyk N.V. Polymer packaging, new book. Kyiv, IAC "Upakovka", 2021.- 580 p.*
5. *Ryzhkov S.S., Kharitonov Yu.M., Blagodatnyi V.V. Technologies of waste disposal and recovery: methodical instructions of waste management and management. Part 4. Technologies of solid waste processing: a textbook / Petruk V. G., Vasylykivskiy I. V., Ishchenko V. A., Petruk R. V. – Vinnytsia: VNTU, 2016. – 233 p. – Access mode: <http://ishchenkov.vk.vntu.edu.ua/file/de5442aa1b9f5021f0110fed4688e6db.pdf>*
6. *Mishchenko V.S., Vyhovska G.P. Organizational and Economic Mechanism of Waste Management in Ukraine and Ways of Its Improvement. –Kyiv: SPE "Publishing House "Naukova Dumka" of the National Academy of Sciences of Ukraine, 2009, 294 p.*
7. *Kovalenko I.V., Malinovskiy V.V. Basic processes, machines and devices of chemical production. – K. Inres: Volya, 2006.-264 p.*

Further reading

8. *Magazine "Packaging". Access mode <http://upakjour.com.ua>*
9. *The problem of the state of the legislation of Ukraine on waste management /Sas A.S., Shilovych T.B.//Materials of reports of the XI Scientific and Practical Conference of Young Scientists "Innovative Packaging Technologies" Supplement to the journal "Packaging". - Kyiv, - 2015. - P.77-81.*

10. *Waste disposal and recovery. Textbook / V.M. Kropyvnyi, O.V. Medvedeva, A.V. Kropyvna, O.V. Kuzyk // General Editorial Board of V.M. Kropyvnyi. – Kropyvnytskyi: CSTU, Electronic Edition, 2020. – p. 440.*

Information resources on the Internet

1. Vernadsky National Library Access mode <http://www.nbu.gov.ua>
2. Electronic Archive of KPI <https://ela.kpi.ua/>
3. Website of the Department of Chemical Engineering, <http://cpsm.kpi.ua/mr.html>
4. Electronic campus of KPI. Igor Sikorsky, <http://login.kpi.ua/>
5. Sikorsky distance learning platform <https://sikorsky-distance.kpi.ua/>
6. It is possible to conduct On-Line classes using Zoom platforms

Educational content

5. Methods of mastering the educational component

Lectures

Lectures are aimed at:

- *providing modern, holistic, interdependent knowledge on **the educational component** "Packaging Disposal", the level of which is determined by the target setting for each specific topic;*
- *ensuring the creative work of students together with the teacher during the lecture;*
- *education of students' professional and business qualities and the development of independent creative thinking;*
- *formation of students' necessary interest and provision of direction for independent work;*
- *determination at the current level of development of science in the field of modern methods and processes of disposal;*
- *reflection of methodological processing of the material (highlighting the main provisions, conclusions, recommendations, clear and adequate to their formulation);*
- *use of visual materials for demonstration, combining, if possible, them with the demonstration of results and samples;*
- *presentation of research materials in a clear and high-quality language in compliance with structural and logical connections, explanation of all newly introduced terms and concepts;*
- *accessibility for perception by this audience.*

No. s/p	Title of the topic of the lecture and a list of main questions (list of didactic tools, references to literature and tasks on the SRS)	Hours
1	Introduction. The purpose and objectives of the educational component. Packaging and the environment. The place of packaging in human life <i>References: [1] p.4-6</i> <i>Tasks on the SRS. To investigate the impact of pollution from used packaging on the environment (based on the Internet and periodicals) [8], etc.</i>	1
2	Features of the disposal of various types of packaging waste. Industrial and domestic consumption waste Solid waste and its composition, impact on the environment. The concept of secondary raw materials. Ways of waste generation in the field of production and after the use of packaging. Industrial waste.. Ways of their formation. Environmental impact. Ways to reduce used packaging. Plastics. Paper and cardboard. Metals. <i>References: [1] p.7-13</i>	1

	<i>Tasks on the CPC. To investigate the percentage composition of the production of packaging from various materials (according to the materials of the Internet network, [8].) in Ukraine and other countries of the world, to draw up the results of research in the form of diagrams.</i>	
3	Disposal problems and ways to solve them in Ukraine and abroad. <i>Principles of organizing the collection and recycling of used packaging abroad and recycling of used packaging abroad on the examples of some countries. Certification. References:[1,9]</i> <i>Tasks on the CPC. To analyze the latest legislative acts and reports of the Ministry of Ecology and Natural Resources of Ukraine on the disposal of waste containers and packaging [8].</i>	1
4	Legislative framework. International norms. <i>Education of citizens and involvement in the mass collection of used packaging. Management of waste recycling. Eco-labeling. References:[1] p.28-29</i> <i>Tasks on the SRS. Create an action plan (on the example of a school, institute, university) in order to inform the population about the correct collection of packaging waste.</i>	1
5	The main methods of disposal of packaging waste. <i>The main stages of the cycle: transportation, storage, sorting, burial, incineration without obtaining energy. Waste disposal by thermal methods (cracking, pyrolysis, depolymerization, etc.) with the production of valuable low molecular weight products. Processing and disposal of plastic waste, cullet and glass materials, wood, paper and cardboard References:[1], p.22-26.</i> <i>Tasks on the SRS. Make a list of goods that are made or can be made from secondary raw materials.</i>	1
6	<i>Classification of equipment for the collection and recycling of used packaging. References: [1], p. 20-22.</i> <i>Tasks on the SRS. Describe solid waste disposal schemes</i>	1
7	General information and characteristic design diagrams of equipment with mechanical, air, magnetic and hydraulic sorting. <i>Determination of equipment performance. Comparative characteristics of various layout schemes of the sorting and beneficiation line. Equipment for the formation of the raw material mixture. Calculation of the main technological parameters of the equipment. References: [1], p. 34-36</i> <i>Tasks on the SRS. Work out an additional 1-2 schemes of sorting lines by literature</i>	1
8	<i>Crushing and grinding equipment. Basic design diagrams of equipment of various types. Structural diagrams of percussion, crushing, splitting and abrasion types of equipment are characteristic. Calculation of the main devices and mechanisms for performing auxiliary operations. References: [7], pp. 3-21.</i> <i>Tasks on the CPS. Work out an additional 1-2 schemes using crushing and grinding equipment [6].</i>	1

9	Equipment for grinding materials by cutting method . Equipment for cutting cardboard and paper. Equipment for grinding film and rigid materials. calculation of the main parameters of the equipment. References: [7], p. 6-10. Tasks on the SRS. Work out an additional 1-2 schemes using grinding materials by cutting.	1
10	Equipment and methods of separation of solid phases by mechanical purification; cleaning with cloth filters; electric cleaning, wet cleaning. Calculation of the main technological parameters. References: [1] Tasks on the SRS. To study the most common methods of separation of solid phases in Ukraine and abroad.	1
11	Equipment and equipment for mixing powder, liquid and paste materials. Layout and design diagrams of mixing equipment. Calculation of the main technological parameters of the equipment. References: [6], p.80-85. Tasks on the SRS. Additionally, work out the schemes of technological lines for mixing.	1
12	Equipment and methods for separation of solid phases. Calculation of the main technological parameters of equipment References:[1], p.40-41 Tasks on the SRS. Perform calculations of technological parameters of calenders .	1
13	Equipment for pressing products from recycled materials. Layout diagrams of presses for flat and extrusion pressing. References: [3], p.34. Tasks on the CPS. Determine the range of products made from recycled materials [9-10].	1
14	Extrusion lines for the production of granules, polymer films, sheet, profile and pipe products, cables, fibers. Layout and construction diagrams of extrusion lines. Literature: [3], pp. 30-34. Tasks on the CPS. Determine the range of products from recycled materials that are produced by the extrusion method [1-3]	1
15	Disposal of polyolefin waste Literature: [1], p.44-45. Tasks on the CPS. Determine the locations of processing plants [14, 15-16]	1
16	Advantages of biomaterials for packaging. New degradable materials Stimulation and organization of collection and recycling of waste packaging in the world and in Ukraine and abroad. References: [1], p.47-48. Tasks for the SRC. To identify resources for the production of biomaterials in Ukraine [8]	1
	Just	16

*In the system of professional training of masters in this **educational component**, practical classes occupy 65% of the classroom load. Being an addition to the lecture course, they lay and form the foundations of the master's qualification in the field of mechanical engineering and industrial engineering, namely the calculation of thermal processes in industry equipment. Constructive thinking and the ability to use special terminology allow you to test knowledge, so this type of work is an important means of prompt feedback. Practical classes should perform not only cognitive and educational functions, but also contribute to the growth of students as professional workers in the field of industrial engineering.*

The main tasks of the cycle of practical classes:

- *to help students systematize, consolidate and deepen theoretical knowledge in the field of modern methods for calculating heat exchange processes in equipment;*
- *to teach students techniques for solving practical problems, to promote the acquisition of skills and abilities in performing calculations, graphic and other tasks;*
- *to teach them to work with reference literature;*
- *to form the ability to learn independently, that is, to master the methods, methods and techniques of self-study, self-development and self-control.*

No. s/p	Title of the topic of the practical lesson and a list of main questions (list of didactic support, references to literature and tasks on the SRS)	Hours
1	<i>The process of shredding waste thermoplastics References: [3] p.6-10. Tasks on the SRS. To work out schemes of technological lines for grinding materials</i>	4
2	<i>. EQUIPMENT AND METHODS FOR SEPARATION OF SOLID PHASES BY MECHANICAL METHOD References: [3] p. 10-15. Tasks on the SRS. Work out the designs of the screens.</i>	4
3	<i>REGULATORY FRAMEWORK FOR WASTE MANAGEMENT IN UKRAINE Bibliography: [3] p. 15-18. Tasks on the SRS. To work out the content of the EU directives on waste management</i>	4
4	<i>RECYCLING OF POLYETHYLENE AND POLYOLEFINS References: [3] p. 19-22. Tasks on the SRS. Work out the method of processing other polymers</i>	4
5	<i>DISPOSAL BY THERMAL METHODS References: [3] p. 23-27. Tasks on the SRS. To work out the method of heat production at waste incineration plants</i>	4
6	<i>RECYCLING OF POLYVINYL CHLORIDE References: [3] p. 27-30. Tasks on the SRS. Work out ways to process other polymers</i>	4
7	<i>EXTRUSION OF WASTE POLYMERS References: [3] p.30-34. Tasks on the SRS. Work out the list of extrusion equipment</i>	4
7	<i>Modular control work</i>	2
	<i>Just</i>	30

Laboratory classes

The curriculum does not provide for laboratory work

6. Independent work of a student

Independent work takes 70% of the time to study the educational component, including preparation for the exam. The main task of students' independent work is to master scientific knowledge in areas that are not included in the list of lecture questions through personal search for information, the formation of an active interest in a creative approach in educational work. In the process of independent work within the framework of the educational component, the student must learn to deeply analyze modern approaches to the development and implementation of the latest technologies for calculating heat exchange equipment, based on its technological purpose and operating parameters. He must master the basic techniques and methods of calculation.

No. s/p	Name of the topic submitted for independent study	Number of IWS hours
1	<i>To investigate the impact of pollution by used packaging on the environment (based on the Internet and periodicals) [8], etc. Main results of European experience in regulating packaging waste management. References: [2]</i>	9
2	<i>To study the percentage composition of the production of packaging from various materials (according to the Internet) in Ukraine and other countries of the world, to draw up the results of research in the form of diagrams. References: [8]</i>	9
3	<i>To analyze the latest legislative acts and reports of the Ministry of Environmental Protection and Natural Resources of Ukraine on the disposal of waste, containers and packaging. Create an action plan (on the example of a school, institute, university) in order to inform the population about the correct collection of packaging waste. To analyze the latest legislative acts in Ukraine regarding environmental protection and their implementation</i>	9
4	<i>Analyze the EU Environmental Protection Directives using open sources of information</i>	9
6	<i>Make a list of goods that are made or can be made from secondary raw materials. Internet, other information resources</i>	9
7	<i>To study the most common methods of separation of solid phases in Ukraine and abroad [9]. To work out a scheme for processing polyvinyl chloride. [9], p.23.</i>	9
8	<i>Identify resources for the production of biodegradable materials in Ukraine [9]. Prepare a report on packaging disposal facilities in our country and abroad. [9-14], periodicals, Internet. To study the development of the biomaterials market.</i>	6
9	<i>Prepare an article or conference report on the topics of the course</i>	10
10	<i>Preparation for the MCR</i>	4
11	<i>Exam</i>	30
	<i>Total hours</i>	104

Policy and control

7. Policy of the educational component

Rules for attending classes and behavior in the classroom

Attendance at classes is a mandatory component of assessment. Students are obliged to take an active part in the educational process, not to be late for classes and not to miss them without a good reason, not to interfere with the teacher's conduct, not to be distracted by actions not related to the educational process.

Rules for assigning incentive and penalty points

It is provided for the provision of additional points for the publication of abstracts (5 points for abstracts for all co-authors) and scientific articles according to the profile of the credit module (10 points per article for all co-authors), but not more than 20 points per 1 student.

Deadline and retake policy

In case of debts from the educational component or any force majeure circumstances, students should contact the teacher through the available (provided by the teacher) communication channels to solve problematic issues and agree on an algorithm of actions for working out.

Academic Integrity Policy

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the absence of references when using printed and electronic materials, quotes, opinions of other authors. Hints and cheating are unacceptable when writing tests, conducting classes; passing the exam for another student; copying materials protected by the copyright system without the permission of the author of the work.

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

Academic Conduct and Ethics Policy

Students should be tolerant, respect the opinions of others, formulate objections in the correct form, and constructively maintain feedback in the classroom.

The norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

8. Types of control and rating system for assessing learning outcomes (RSO)

Distribution of study time by types of classes and tasks from **the educational component** according to the working curriculum:

Semester	Study time		Distribution of training hours				Control measures		
	Loans	Acad. H.	Lecture	Practical	Lab. Rob.	SRS	MCW	RR	Semester control
2	5	150	16	30	-	104	1	–	Exam

The student's rating in the educational component consists of the points that he receives for:

The student's rating in **the educational component** consists of points that he receives for work in practical classes, for performing modular tests and for an exam.

Semester control is an exam.

System of rating (weight) points and evaluation criteria

Rating Score System and Evaluation Criteria:

Completing tasks in practical classes.

The weight score for completing 7 tasks in practical classes is 5 points each.

Criteria for evaluating the implementation of the practical task

Completeness and signs of task completion	Points
The task is completed in full	5

<i>Minor deficiencies in paragraph 1</i>	<i>4</i>
<i>Untimely completion of the task</i>	<i>3</i>
<i>Untimely completion of the task, shortcomings under clause 1</i>	<i>2</i>
<i>Poor performance of the task</i>	<i>1</i>
<i>Failure to complete the task</i>	<i>0</i>

Performing a modular control.

The weight score of the MCW is 15 points.

Criteria for evaluating the implementation of the MCW

<i>Completeness and signs of task completion</i>	<i>Points</i>
<i>The MCR is completed in full</i>	<i>15</i>
<i>Minor deficiencies in paragraph 1</i>	<i>14-12</i>
<i>Significant deficiencies in paragraph 1</i>	<i>9</i>
<i>Incomplete completion of the task</i>	<i>8-5</i>
<i>Poor performance of the task</i>	<i>4-1</i>
<i>Failure to complete the task</i>	<i>0</i>

Conditions for admission to semester control: minimum positive grade for practical work 17 points / enrollment of all practical tasks / positive assessment with MCW (more than 8 points) semester rating of at least 25 points.

Semester control: exam work.

The weight score of the exam work is 50 points out of 2 tasks.

Criteria for evaluating the performance of the exam work

<i>Completeness and signs of task completion</i>	<i>Points</i>
<i>The work is done in full</i>	<i>50</i>
<i>Minor deficiencies in paragraph 1</i>	<i>49-44</i>
<i>Significant deficiencies in paragraph 1</i>	<i>43-36</i>
<i>Incomplete completion of the task</i>	<i>20-35</i>
<i>Poor performance of the task</i>	<i>1-19</i>
<i>Failure to complete the task</i>	<i>0</i>

Thus, the rating semester scale from the educational component is:

$$R = 5 \cdot 7 + 15 + 50 = 100 \text{ points}$$

According to the results of educational work for the first 7 weeks, the "ideal student" should score 15 points. At the first attestation (8th week), the student receives "enrolled" if his current rating is at least 7 points.

According to the results of educational work for 13 weeks of study, the "ideal student" should score 50 points. At the second attestation (14th week), the student receives "enrolled" if his current rating is at least 25 points.

The maximum amount of points is 100. Obtaining an exam from the educational component "automatically" is not provided.

A prerequisite for admission to the exam is a rating that is at least 50% of the performance of practical work and MCW, i.e. at least 25 points.

To obtain a credit score, the sum of all rating points *R* received during the semester is converted according to the table:

Score	Score
95...100	<i>Perfectly</i>
85...94	<i>Very good</i>
75...84	<i>well</i>
65...74	<i>Satisfactory</i>
60...64	<i>enough</i>
<i>RD < 60</i>	<i>Disappointing</i>
<i>Not met the conditions of admission</i>	<i>not allowed</i>

9. Additional information on the educational component

Approximate list of questions submitted for semester control

1. The concept of household waste.
2. To characterize the main legislative documents of Ukraine regarding waste disposal.
3. Features of plastic disposal.
4. Features of paper and cardboard disposal.
5. Features of metal disposal.
6. The concept of secondary raw materials.
7. Production waste in the production of packaging.
8. Disposal problems and ways to solve them in Ukraine and abroad.
9. Eco-labeling of packaging.
10. The main methods of disposal of packaging waste.
11. The main stages of the recycling cycle are: transportation, storage, sorting, burial, incineration without obtaining energy.
12. Waste disposal by thermal methods (cracking, pyrolysis, depolymerization, etc.) with the production of valuable low molecular weight products.
13. Classification of equipment for the collection and recycling of used packaging
14. Structural diagrams of equipment with mechanical sorting are characteristic.
15. Structural diagrams of equipment with magnetic sorting are characteristic.
16. Structural diagrams of equipment with hydraulic sorting are characteristic.
17. Crushing and grinding equipment. Basic design diagrams of equipment of various types.
18. Equipment for grinding materials by cutting.
19. Equipment for cutting cardboard and paper.
20. Equipment for grinding film and rigid materials. calculation of the main parameters of the equipment.
21. Equipment and methods of separation of solid phases by mechanical cleaning.
22. Equipment for processing polymeric materials using rollers and calenders.
23. Equipment for pressing products from recycled materials. Extrusion lines for the production of granules, polymer films, sheets.
24. Thermal disposal.
25. Creation and introduction of new biomaterials that decompose under the influence of external factors.
26. Advantages of biomaterials for packaging.

Approximate list of questions submitted for modular control work

1. Analyze the features of plastic disposal.
2. Analyze the features of paper and cardboard disposal.
3. Analyze the features of metal disposal.

4. To give an idea of secondary raw materials.
5. Analyze what production waste is generated during the production of packages.
6. To analyze what problems of disposal exist and ways to solve them in Ukraine and abroad.
7. To provide a classification of eco-labeling of packaging.
8. The main methods of disposal of packaging waste.
9. The main stages of the recycling cycle are: transportation, storage, sorting, burial, incineration without obtaining energy.
10. Waste disposal by thermal methods (cracking, pyrolysis, depolymerization, etc.) with the production of valuable low molecular weight products.
11. Classification of equipment for the collection and recycling of used packaging
12. Structural diagrams of equipment with mechanical sorting are characteristic.
13. Structural diagrams of equipment with air sorting are characteristic.
14. Structural diagrams of equipment with magnetic sorting are characteristic.
15. Structural diagrams of equipment with hydraulic sorting are characteristic.
16. Crushing and grinding equipment. Basic design diagrams of equipment of various types.
17. Equipment for grinding materials by cutting.
18. Equipment for cutting cardboard and paper.
19. Equipment for grinding film and rigid materials. calculation of the main parameters of the equipment.
20. Equipment and methods of separation of solid phases by mechanical cleaning.
21. Equipment and methods of cleaning with cloth filters.
22. Equipment and method of electrical cleaning.
23. Wet cleaning equipment and method.
24. Equipment for processing polymeric materials using rollers and calenders.
25. Equipment for pressing products from recycled materials. Extrusion lines for the production of granules, polymer films, sheets.
26. Thermal disposal.
27. Creation and introduction of new biomaterials that decompose under the influence of external factors.
28. Advantages of biomaterials for packaging.

Work program of the educational component (syllabus):

Compiled by Assoc. Prof., Ph.D., Shilovych T.B.

Approved by the Department of ___CPSM___ (Minutes No. 17 dated 04.06.2025)

Approved by the ICF Methodological Commission (Minutes No. 11 dated 27.06.2025.)