

**Practice****Educational component work program (Syllabus)****Academic discipline requirements****Level of higher
education****Second (Master's)**

Discipline	<i>13Mechanical Engineering</i>
Specialty	<i>131Applied mechanics</i>
Educational program	<i>OPP Packaging and Packaging Equipment Engineering</i>
Statuseducational component	<i>Required</i>
Form of study	<i>full-time (daytime)/full-time (evening)/correspondence/distance/mixed</i>
Year of training, semester	<i>2nd year, fall semester</i>
Amounteducational component	<i>14(420)</i>
Semester control/control measures	<i>test</i>
Class schedule	<i>8 weeks</i>
Language of instruction	<i>Ukrainian</i>
Information about the course leader/teachers	<i>http://intellect.cpsm.kpi.ua/profile/hdg3</i>
Course placement	<i>Sikorsky Platform</i>

Academic discipline program**1. Descriptioneducational component, its purpose, subject of study and learning outcomes**

Students' internship is an integral part of the process of graduate training of masters in specialty 131 Applied Mechanics, specialization Engineering of Packaging and Packaging Equipment. Internship takes place on the basis of modern enterprises and organizations with which cooperation agreements have been concluded.

According to the curriculum of the specialty, pre-diploma (III semester, 8 weeks) internships for students are provided for by the curriculum.

Subject of the educational component "Practice" – *is the study of modern technologies of industrial mechanical engineering, design of machines and devices, devices, technological processes, conducting scientific research, an independent approach to solving engineering problems; study of the labor rationing system, scientifically based and promising areas for increasing the productivity of equipment for the production of chemical, silicate, polymer materials and products; basics of management and marketing, study of the main technical and economic indicators of enterprises of chemical, silicate, polymer materials and products; familiarization with the state of labor protection.*

On the basis of internship programs, work programs are developed in accordance with the conditions of internship enterprises.

The work program includes:

- *a calendar schedule that displays deadlines;*
- *processing and obtaining passes at the enterprise;*

- passing a safety training course with mandatory registration in the company's logbook;
- performance of individual tasks according to the work program;
- report preparation;
- diary design;
- submitting a report, etc.

Goaleducational component "Practice"

The purpose of studying this discipline is to form in masters a complex of knowledge in the field of modern technologies for the production of chemical, silicate, polymer materials and products, scientific developments of equipment for chemical, polymer and silicate enterprises, a complex of skills and abilities necessary for conducting scientific research in this direction. In accordance with the purpose, the preparation of masters in this specialty requires strengthening the competencies formed in students:

- Ability to identify, pose and solve engineering, technical and scientific problems (ZK 01);
- Ability to communicate with representatives of other professional groups at different levels (with experts from other fields of knowledge/types of economic activity) (ZK 05);
- Ability to learn and master modern knowledge (ZK 06);
- Ability to think abstractly (ZK 08);
- Ability to work in a team (ZK 09);
- Ability to act socially responsible and conscious (GC 10);
- Based on knowledge of sustainable development issues, engineers solve problems (ZK 11);
- The ability to describe, classify, and model a wide range of technical objects and processes, based on a deep knowledge and understanding of the theories and practices of mechanical engineering, as well as knowledge of related sciences (FC 02);
- Ability to work independently and function effectively as a team leader (FC 03);
- Ability to engineer packaging equipment to ensure its performance under operational loads and environmental influences (FC 04);
- Ability to search and analyze scientific and technical information regarding technological equipment engineering (FC 06);
- Ability to master new types of equipment and technology in the packaging industry and related industries (FC 09);
- Ability to carry out design activities in the field of packaging equipment (FC 10);

1.2. According to the requirements of the program **educational component** "P"tactics», after mastering it, students must demonstrate the following program learning outcomes:

Knowledge:

- Apply specialized conceptual knowledge of the latest methods and techniques for designing, analyzing, and researching structures, machines, and/or processes in the field of mechanical engineering and related fields of knowledge (PRN 01);
- Independently set and solve innovative problems, argue and defend the results obtained and decisions made (PRN 05);
- Clearly and unambiguously present the results of research and projects, convey one's own conclusions, arguments, and explanations in the state and foreign languages, orally and in writing, to colleagues, students, and representatives of other professional groups at various levels (PRN 07);
- Master modern knowledge, technologies, tools and methods, in particular through independent study of professional literature, participation in scientific and technical and educational events (PRN 08);

- *Organize the work of a group when performing tasks, complex projects, scientific research, understand the work of others, give clear instructions*(PRN 09);
- *Search for the necessary information in scientific and technical literature, electronic databases and other sources, assimilate, evaluate and analyze this information* (PRN 10);
- *Be able to determine areas of professional activity to ensure sustainable development* (PRN 14);
- *Be able to choose and define processes and equipment for packaging products in consumer packaging, for group packaging, fastening, transportation, and dismantling* (PRN 15);

Skill:

- *Select the type and rational design of packaging equipment and its components based on an analysis of the features of the packaging technological process and the packaged product* (PRN 18);
- *Knowledge of packaging methods for various types of products and packaging equipment* (PRN21);
- *Develop management and/or technological solutions under uncertain conditions and requirements, evaluate and compare alternatives, analyze risks, and predict possible consequences* (PRN 25);
- *Organize the safe operation of packaging equipment based on technological regulations and using safety rules* (PRN 27);

And also additionally:

- *Formation of skills for independent work in solving engineering problems in mechanical engineering, deepening theoretical knowledge and practical skills for working in work teams.*
2. *Study of modern technological methods of metalworking and assembly.*
 3. *Study of the labor rationing system, scientifically based and promising plans for increasing labor productivity.*
- *Management and marketing. Study of the main technical and economic indicators of mechanical engineering enterprises.*
 - *Familiarization with the state of labor protection.*
 - *Study of the experience of organizing rationalization and inventive work.*
 - *Obtaining organizational skills in working in a work team while working as a backup for a foreman, designer, or technologist.*

As a result of the internship, students must:

- *know the full range of tasks that are solved in production during the preparation and manufacture of machines and devices, the latest equipment, technology and progressive work methods; methods and means of team management;*
- *be able to target the team to solve the tasks set, rationally distribute the workload, based on the qualifications and business qualities of the workers; conduct a patent search; develop new technological processes and equipment for their implementation;*
- *ensure compliance with labor and environmental protection requirements by subordinates;*
- *acquire skills in organizational work with people and managing large production teams;*
- *drawing up task plans and schedules of production activities of the brigade, unit, shift, group, sector;*
- *calculation and analysis of technical and economic indicators of the workshop;*
- *control of compliance with labor protection requirements;*
- *design of machines and devices, devices, technological processes, conducting scientific research, independent approach to solving engineering problems.*

4. Prerequisites and postrequisites of the educational component (place in the structural and logical scheme of training according to the relevant educational program)

To consolidate and deepen the knowledge acquired at a higher education institution (HEI), supplement it with new information based on in-depth analysis and implementation of technological processes, workshop equipment, labor organization, safety techniques, and gain practical experience working on modern procurement, machining, and assembly equipment.

To acquire and strengthen skills in solving design, technological, technical, economic and organizational issues in real production conditions. To become familiar with all types of technical documentation in detail, the procedure for its development, design and production use. To study issues and systems of product quality management in production.

Based on the data obtained during the internship, students prepare a report of 25-30 pages on sheets of 210*297 mm (A4) format with the assignment of graphic material.

The report must reflect:

- Individual designs and kinematic diagrams of the machine being designed;
- Basic parametric and strength calculations;
- Equipment modernization issues;

5. Individual tasks;

- Calculations that confirm the machine's performance;
- Issues of economics, safety and labor protection when servicing machines.

6. Content of the educational component

The place of practice is factory workshops where the production of a wide range of plastic and rubber products and parts is established, factory laboratories, design bureaus, departments of the chief mechanic and chief technologist, which are associated with such production.

During the internship, the student must work in the department of the chief technologist (CTO) and in the department of the chief mechanic (CM) or in the design bureau.

Working at VGT, the student must acquire skills in production specialties. Two weeks of compensation are provided for work at VGT. During this time, the student can perform the duties of a backup mechanic or shop technologist, operator, or design technician.

Two weeks of compensation is provided for work at VGM. It is permitted to enroll a student in a full-time position if the work of this position meets the needs of the program.

The student's time balance may be as follows:

1. Organizational activities - issuing passes, safety briefing, distribution to workplaces - 2 days.
2. Work in the department of the chief technologist - 24 days.
3. Work in the chief mechanic's department - 24 days.
4. Preparation of the report and passing the test – 6 days.

Total - 56 days (8 weeks).

Patent developments and technical information on the topic of the diploma project.

Technical documentation for the project according to the requirements of the ESKD and standards.

Issues of improving working conditions, safety, automation, aesthetic appearance, minimum machine weight and ease of repair, etc. Calculation and explanatory note for a typical basic machine.

Justification of its choice, direction of modernization of its processes. Description of the design and principle of operation of the machine. Complementary equipment.

Parametric calculations of machines (power, geometry, kinematics, etc.), calculations for the strength of key components and parts.

Thermal calculations (machine heating, cooling devices).

Clarification of the technological operating mode of the designed machine and the line as a whole (temperature, rotation frequency, speed, pressure, etc.).

Unification and standardization of prefabricated units.

Nomenclature of technological documentation for the project. Main documents of the ESTD. Stage of manufacturing machines in the workshop, assembly of machines, adjustment, verification tests of work in the line.

Devices for mechanical processing of parts. Assembly of main components. Measures to maintain the operability of machines.

Costs of manufacturing the machine. Material intensity of construction. Labor intensity of construction. Wages. Indirect overhead costs. Installation costs, transportation costs, cost of business premises. Operating costs. Energy. Repairs. Depreciation of workshops and general workshop costs.

7. Educational materials and resources

Basic literature

1. Technology of production of materials and products for construction purposes. Textbook [Electronic resource]: a textbook for bachelor's degree applicants in the educational program "Engineering and computer-integrated technologies for designing innovative industry equipment" specialty 133 "Industrial mechanical engineering" / Igor Sikorsky Kyiv Polytechnic Institute; compilers: V. Yu. Shcherbina, D. G. Shvachko, L. N. Gur'eva. - Electronic text data (1 file: 16.56 MB). - Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2024. - 188 p. - Title from the screen.**URI**<https://ela.kpi.ua/handle/123456789/66516>
2. Hydraulic presses. Press equipment [Electronic resource]: training manual for bachelor's degree applicants in the educational program "Packaging and packaging equipment engineering", "Engineering and computer-integrated technologies for designing innovative industry equipment" spec. 131 "Applied mechanics", 133 "Industrial mechanical engineering" / Igor Sikorsky Kyiv Polytechnic Institute; compilers: V. I. Sivetsky, D. G. Shvachko. – Electronic text data (1 file: 4.12 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2023. – 147 p. – Screen title.<https://ela.kpi.ua/handle/123456789/62813> (under review)
3. Equipment for casting, pneumatic-vacuum forming [Electronic resource]: a teaching aid for bachelor's degree applicants in speciality 131 "Applied mechanics", 133 "Industrial mechanical engineering" / Igor Sikorsky Kyiv Polytechnic Institute; compiled by: V. I. Sivetsky, D. G. Shvachko. – Electronic text data (1 file: 4.5 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2023. – 140 p. – Screen title. <https://ela.kpi.ua/handle/123456789/62812> (under review)
4. Rolling machines. [Electronic resource]: training manual for bachelor's degree applicants in the educational program "Packaging and packaging equipment engineering", "Engineering and computer-integrated technologies for designing innovative industry equipment" speciality 131 "Applied mechanics", 133 "Industrial mechanical engineering" / Igor Sikorsky Kyiv Polytechnic Institute; compilers: Sivetsky V.I., Sidorov D.E., Shvachko D.G.– Electronic text data (1 file: 4.12 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2023. – 120 p. – Screen title. <https://ela.kpi.ua/handle/123456789/62811>
5. AutoLISP in the design of technological equipment [Electronic resource]: a textbook for students of the master's degree in the educational and scientific program "Engineering and computer-

integrated technologies for the design of innovative industry equipment", specialty 133 "Industrial mechanical engineering" and the program "Engineering of packaging and packaging equipment", specialty 131 "Applied mechanics" / V. Yu. Shcherbyna, O. V. Gondlyakh, A. O. Chemerys, D. G. Shvachko ; Igor Sikorsky Kyiv Polytechnic Institute. - Electronic text data (1 file:). - Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2024. - 175 p. - Title from the screen. **URI** <https://ela.kpi.ua/handle/123456789/67865>

Information resources on the Internet

1. <https://studfile.net/preview/5532354/page:4/>
2. <http://ep3.nuwm.edu.ua/4741/1/V55.pdf>
3. <http://bibliograph.com.ua/spravochnik-33/36.htm>
4. <https://studfile.net/preview/5241906/page:14/>
5. https://studopedia.su/9_43580_materlali-i-virobi-z-mIneralnih-rozplavlv.html
6. <http://um.co.ua/8/8-8/8-80177.html>
7. <https://studfile.net/preview/5241906/page:27/>
8. <http://bibliograph.com.ua/spravochnik-76/>
9. *The working program of the credit module (syllabus) is in the "Campus" system, on the "Sikorsky" platform and on the website of the department (faculty);*
10. *Tutorials:*
<https://ela.kpi.ua/items/b2b108f6-cc47-40d4-9cf4-f40af6b650fe>
<https://ela.kpi.ua/handle/123456789/62811>

Educational content

8. Methodology for mastering the educational component

Materials used for designing parts of chemical engineering. Kinematic diagrams of mechanisms and machines. Calculations of components and parts using CAD. Drawing up a passport of a typical machine and its kinematic diagram, detailed description, structure and operation of the machine, specification of links, characteristic pairs and parts that are manufactured in series (bearings, gears, etc.), materials, modules, number of teeth, standard numbers, names of main parts, their mass and dimensions, lubrication map and diagram, calculation of lubricant consumption. Design of bearing housings, worms and worm wheels, cylindrical and bevel gears, risers, bearings, shafts, working parts of the machine. Design of the simplest components: reducers, assembly rolls, worms with a cylinder, rotors, etc. Designs of machines for processing silicate, polymer materials and other chemical raw materials. Technological processes for the production of machines for flexible technologies. Structure and organization of the design bureau. Stages of machine design. Tasks of the designer. Techniques in work, sequence of machine design. Layout of components and the machine as a whole. Drawing up a calculation and explanatory note. Physico-chemical and structural properties of materials used for the manufacture of machines. Methods of calculating the strength of machines adopted at this enterprise.

Tool production technology. Metal cutting technology. Heat treatment of parts. Assembly work. Assembly of lever mechanisms, connecting rods, couplings, reducers, mixers, rollers, colanders, etc. Devices for stamping. Post-assembly testing. Technical and economic indicators of the machine assembly process.

5.1 Occupational health and safety

Before completing the internship, students must: study the organization of the labor protection service at the enterprise; know the basic safety measures during the operation, repair and installation of

equipment in order to develop these issues when designing machines and devices and undergo a briefing on safety techniques in the workplace.

5.2 Individual tasks

The individual task is the design of parts and assembly units, their calculations, including using computers in relation to the enterprise. The topic of the tasks corresponds to the curriculum of the main master's courses.

Approximate topics of individual tasks:

1. *Container labeling line using labeling devices.*
2. *Bulk materials dosing line with disc and rotary feeders.*
3. *Bulk materials dosing line with screw and plate feeders.*
4. *Bulk materials dosing line with belt and plate feeders.*
5. *Bulk materials dosing line with vibrating feeders.*
6. *Bulk materials dosing line with periodic weighing batchers.*
7. *Dosing line for bulk materials using continuous weighing feeders.*
8. *Liquid dosing line by volume.*
9. *Liquid dosing line by level.*
10. *Line for packaging individual products in heat-shrinkable film.*
11. *Product packaging line in a modified gas environment.*
12. *Liquid packaging line in cardboard and multilayer packaging. **
13. *Line for applying markings to cardboard and film packaging using printing methods. **
14. *Product packaging line in bag-forming machines (collar and flow-pack).*
15. *Line for packaging products in stretch film.*
16. *Plastic materials dosing line.*
17. *Liquid dosing line with weighing dispensers.*
18. *Dosing line for viscous liquids.*
19. *Line feeders and orientators for artificial products.*
20. *Glass and plastic container capping line.*

5.3 Lectures, discussions and excursions during practice

In practice, students must attend lectures organized by practice supervisors from the enterprise.

Recommended lectures and talks:

1. History of the enterprise, its structure, organization and development prospects.
2. New materials for making machines and the latest achievements in the field of mechanical engineering.
3. Design procedure and stages.
4. Issues of production economics.

Excursions are held to the departments and laboratories of the enterprise, and other enterprises of industry specialization.

Policy and control

9. Policy of the educational component of the curriculum

Rules for class attendance and behavior in class

Students undergo internships in design bureaus of enterprises and institutions.

Approximate time balance:

1. Organizational activities - issuing passes, safety briefing, distribution to workplaces - 2 days.
 2. Work in the department of the chief technologist - 24 days.
 3. Work in the chief mechanic's department - 24 days.
 4. Preparation of the report and passing the test – 6 days.
- Total - 56 days (8 weeks).

Rules for assigning incentive and penalty points

- Incentive points can be awarded by the teacher exclusively for performing creative works in the discipline or for additional completion of online specialized courses with obtaining the appropriate certificate:
 - <https://www.port.ac.uk/study/courses/beng-hons-innovation-engineering>;
 - Other courses may be credited upon agreement with the instructor.
- Penalty points are not provided within the framework of the academic discipline.

Deadline and Rescheduling Policy

In the event of academic discipline arrears or any force majeure circumstances, students should contact the teacher via available (provided by the teacher) communication channels to resolve problematic issues and agree on an algorithm of actions for completion.

Academic Integrity Policy

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the lack of references when using printed and electronic materials, quotes, opinions of other authors. Hints and copying when writing tests, conducting classes are unacceptable; taking credit 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". More details: <https://kpi.ua/code>

Academic Conduct and Ethics Policy

Students should be tolerant, respect the opinions of others, formulate objections in a correct form, and provide constructive feedback in class.

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". More details: <https://kpi.ua/code>

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

Distribution of study time by types of classes and tasks with educational component:

Semester	Study time		Distribution of teaching hours				Control measures		
	Loans	academic year	Lectures	Practical (seminar)	Lab work	CRC	MKR	abstract	Semester control
3	14	420	-	-	-	420	-	-	test

A student's rating for the educational component consists of the points he receives for:

Student rating from educational component consists of the points he receives for his work in practice. Semester control test.

Rating (weighting) points system and evaluation criteria

The internship rating R has two components. The first (starting Rc) characterizes the student's internship work and its result - the quality of the explanatory note, thesis, and graphic material. The second component Rz characterizes the quality of the student's defense of the internship report.

The scale size of the starting component Rc is 50 points, and the protection component Rz is –50 points.

7.1 Starting component Rc:

- Timeliness of implementation of the internship schedule – 16-5 points;
- modernity and justification of decisions made – 10-5 points;
- correct application of analysis and calculation methods – 8-4 points;
- quality of design, fulfillment of requirements of regulatory documents (report, abstracts) – 8-4 points;
- quality of graphic material and compliance with standards – 8-4 points.

7.2 Component of the R-protection from the internship report:

- quality of the report with presentation – 12-6 points;
- degree of mastery of the material – 12-5 points;
- the degree of justification of the decisions made – 12-5 points;
- ability to defend one's opinion – 12-2 points.

The rating of the maximum points of a student R in practice consists of two components: $R = R_c + R_z = 50 + 50 = 100$ points. If $R < 60$ points, then the student is not allowed to defend the practice.

7.3 The sum of the scores of the two components is converted into a credit score according to the rating scores R is translated according to the table:

Number of points	Rating
95...100	<i>perfectly</i>
85...94	<i>very good</i>
75...84	<i>good</i>
65...74	<i>satisfactorily</i>
60...64	<i>enough</i>
$RD < 60$	<i>unsatisfactorily</i>
<i>Admission conditions not met</i>	<i>not allowed</i>

11. Additional information on the educational component

Approximate list of questions that will be assessed

1. What is the student's responsibility for completing the internship?
2. OhDescribe the line where container labeling is used using labeling devices.
3. What is the role of a packaging engineer in industrial production?
4. OhDescribe a line for dosing bulk materials with disc and rotary feeders.
5. What modern metalworking technologies are used in practice?
6. OhDescribe the design of dosing bulk materials with screw and plate feeders.
7. What modern metalworking technologies are used in practice?
8. 2.OhDescribe a line that uses feeders and orientators for artificial products.
9. What modern metalworking technologies are used in practice?
10. What are the main functions of the Chief Technologist's Department?
11. What modern metalworking technologies are used in practice?
12. What is the purpose of completing a master's degree internship?
13. What modern metalworking technologies are used in practice?

14. 2. Oh Describe a line that uses the sealing of glass and plastic containers.
15. What modern metalworking technologies are used in practice?
16. What are the main stages of completing the internship?
17. What management and marketing skills are acquired during the internship?
18. How is occupational safety reflected in the internship program?
19. What is the importance of practice in preparing a master's thesis?
20. Oh characterize the dosing line for bulk materials with belt and plate feeders.
21. What is the importance of practice in preparing a master's thesis?
22. Which divisions of the company are required to be familiarized with during the internship?
23. How are the results of students' practice evaluated?
24. Oh Describe a line that uses dosing of bulk materials with vibrating feeders.
25. What management and marketing skills are acquired during the internship?
26. Oh Describe a line where dosing of bulk materials is used by periodic weighing batchers.
27. How is a lesson plan formed during teaching practice?
28. Oh Describe a line where continuous weighing feeders are used to dispense bulk materials.
29. What is the importance of studying the labor rationing system in practice?
30. Oh Describe the line where volumetric dosing of liquids is used.
31. How is a drawing of a component or unit drawn up according to standards?
32. Oh Describe a line where liquid dosing by level is used.
33. What is a patent search and how is it carried out in practice?
34. Oh Describe a line that uses shrink wrap for packaging individual products.
35. What methods are used to modernize the technological process?
36. Oh Describe a line that uses modified atmosphere packaging.
37. How are the technical and economic indicators of an enterprise analyzed?
38. Oh Describe a line that uses liquid packaging in cardboard and multilayer packaging.
39. What are the occupational health and safety requirements when working with packaging equipment?
40. Oh Describe the line where marking is used on cardboard and film containers using printing methods.
41. What factors are taken into account when choosing the type of packaging machine?
42. Oh Describe a line that uses packaging of products in bag-forming machines (collar and flow-pack).
43. How is automation taken into account in the design of packaging equipment?
44. Oh Describe a line that uses stretch film packaging.
45. How is the strength calculation of components and parts performed?
46. Oh Describe the line where plastic material dosing is used.
47. What is parametric machine calculations?
48. Oh Describe a line where liquid dosing by weighing dispensers is used.
49. What documents are included in the technical documentation according to the ECCD?
50. Oh Describe the line where the dosing of viscous liquids is used.

Approved by the department ____KhPSM____ (minutes No. 17 dated 04.06.2025)

Agreed Methodological Commission of the Faculty of Chemical Engineering (Minutes No. 11 dated 06/27/2025)