

**Pre-graduate internship****Educational component work program (Syllabus)****Academic discipline requirements****Level of higher
education*****First (bachelor's)***

Discipline	<i>13Mechanical Engineering</i>
Specialty	<i>131Applied mechanics</i>
Educational program	<i>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>4th year, spring semester</i>
Amounteducational component	<i>6(180)</i>
Semester control/control measures	<i>test</i>
Class schedule	<i>5 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. *Description*** *educational component, its purpose, subject of study and learning outcomes*

Students' internships are an integral part of the bachelor's degree training process. Internships are held at modern enterprises and organizations with which cooperation agreements have been concluded.

According to the curriculum of the specialty, pre-diploma (VII semester, 5 weeks) internships for students are provided for by the curriculum.

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 "Pre-graduate internship"

The purpose of studying this educational component is to form in bachelors a complex of knowledge in the field of modern packaging technologies, scientific developments of packaging equipment, a complex of skills and abilities necessary for conducting scientific research in this

direction. In accordance with the purpose, the training of bachelors in this specialty requires strengthening the competencies formed in students:

- Knowledge and understanding of the subject area and understanding of professional activity (ZK2);
- Ability to identify, pose and solve problems (ZK3);
- Ability to apply knowledge in practical situations (GC4);
- Ability to work in a team (GC5);
- Determination and persistence in the tasks set and responsibilities undertaken

(ZK6)

ZK9 Skills in using information and communication technologies.

- The ability to analyze materials, structures, and processes based on the laws, theories, and methods of mathematics, natural sciences, and applied mechanics (FC1);
 - The ability to make the optimal choice of technological equipment, complete technical complexes, and have basic understanding of the rules of their operation (FC4);
 - Ability to present the results of one's engineering activities in compliance with generally accepted norms and standards (FC9).

1.2. According to the requirements of the program of the academic discipline "Pre-graduate Practice", after mastering it, students must demonstrate the following program learning outcomes:

- identify, pose and solve problems (SK3);
- understand the principles of operation of automated technological control systems equipment, in particular microprocessor-based, to select and use optimal automation tools (PH11);
 - skills in the practical use of computer-aided design (CAD), production planning (CAM) and engineering research (CAE) systems (RN12);
 - assess the technical and economic efficiency of production (PH13);
 - to make the optimal selection of equipment and technical equipment complexes (PH14);
 - take into account when making decisions the main factors of man-made impact on the environment and the main methods of environmental protection, labor protection and life safety (PH15);
 - communicate freely on professional issues orally and in writing in the state and foreign languages, including knowledge of special terminology and interpersonal communication skills (RN16).

And also additionally:

- Formation of skills for independent work in solving engineering problems in the packaging industry, deepening theoretical knowledge and acquiring practical skills for working in work teams

2. 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 in higher education, to supplement it with new information on the basis of in-depth analysis and development of technological processes, workshop equipment, labor organization, safety techniques, to 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;*

3. Individual tasks;

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

4. 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 - 14 days.*
- 3. Work in the chief mechanic's department - 14 days.*
- 4. Preparation of the report and passing the test - 5 days.*

Total - 35 days (5 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.

5. 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> Kyrkach N.F. Calculations and design of machine parts. Kharkiv. Osnova, 1991.
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-l-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/handle/123456789/62811>

Educational content

6. 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 with the use of computers in relation to the enterprise. The topic of the tasks corresponds to the curriculum of the main undergraduate courses.

Approximate topics of individual tasks:

1. Unit for labeling containers using labeling devices.
2. Machine for dosing loose materials with disc and rotary feeders.
3. Machine for dosing bulk materials with screw and plate feeders.

4. Machine for dosing bulk materials with belt and plate feeders.
5. Unit for dosing loose materials with vibrating feeders.
6. Unit for dosing loose materials with periodic weighing dispensers.
7. Unit for dosing loose materials with continuous weighing feeders.
8. Unit for dosing liquids by volume.
9. Liquid dosing machine by level.
10. Machine for packaging individual products in shrink film.
11. Machine for packaging products in a modified gas environment.
12. Machine for filling liquids into cardboard and multi-layer packaging. *
13. Unit for applying markings to cardboard and film packaging using printing methods. *
14. Unit for packaging products in bag-forming machines (collar and flow-pack).
15. Machine for packaging products in stretch film.
16. Plastic material dosing machine.
17. Liquid dosing machine with weighing dispensers.
18. Machine for dosing viscous liquids.
19. Machine feeders and orientators for artificial products.
20. Machine for capping glass and plastic containers.

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

7. Educational component policy

Rules for class attendance and behavior in class

Students undergo internships in design bureaus of enterprises and institutions.

Approximate time balance:

1. Organizational activities, safety briefing and introduction to the enterprise - 2 days.
2. Familiarization with the equipment of the enterprise, the student's main workplace, visits to workshops, departments and laboratories - 7 days.
3. Completion of an individual task (work at the workplace) - 21 days.
4. Preparation of the report and preparation of the practical assessment - 5 days.

Total - 35 days

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>

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

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

Semester	Study time		Distribution of teaching hours				Control measures		
	Loans	academic year	Lectures	Practical (seminar)	Lab work	CRC	MKR	abstract	Semester control
8	6	180	-	-	-	180	-	-	test

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

A student's rating for the educational component consists of the points he receives for his work in practice. The semester test is a credit.

Rating (weighting) points system and evaluation criteria

The rating score for pre-graduate practice R has two components. The first (starting R_c) characterizes the student's work on pre-graduate practice and its result - the quality of the explanatory note, thesis and graphic material. The second component R_z characterizes the quality of the student's defense of the pre-graduate practice report.

The scale size of the starting component R_c is 50 points, and the protection component R_z is –50 points.

7.1 Starting component R_c :

- Timeliness of completion of the pre-graduate internship work 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 defense of the pre-graduate 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 pre-diploma practice consists of two components: $R = R_c + R_3 = 50 + 50 = 100$ points. If $R < 60$ points, 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	perfectly
85...94	very good
75...84	good
65...74	satisfactorily
60...64	enough
$RD < 60$	unsatisfactorily
Admission conditions not met	not allowed

9. Additional information on the educational component

Approximate list of questions that will be assessed

1. How does the container labeling unit work using labeling devices.
2. How a machine for dosing bulk materials with disc and rotary feeders works.
3. How does a machine for dosing bulk materials with screw and plate feeders work?
4. How does a machine for dosing bulk materials with belt and plate feeders work?
5. How a unit for dosing loose materials with vibrating feeders works.
6. How does a unit for dosing bulk materials with periodic weighing batchers work?
7. How does a unit for dosing bulk materials with continuous weighing feeders work?
8. How does a unit for dosing liquids by volume work?
9. How does a liquid level dosing machine work?
10. How a machine for packaging individual products in heat-shrinkable film works.
11. How a machine for packaging products in a modified gas environment works.
12. How does a machine for filling liquids into cardboard and multilayer packaging work? *
13. How does the unit for applying marking to cardboard and film packaging using printing methods work? *
14. How does the unit for packaging products in bag-forming machines (collar and flow-pack) work?
15. How does a machine for packaging products in stretch film work?
16. How does a plastic material dosing machine work?
17. How does a liquid dosing machine work with weighing dispensers?
18. How does a viscous liquid dosing machine work?
19. How the machine works feeders and orientators for artificial products.
20. How does a glass and plastic container capping machine work?
21. Describe the methods of producing sheet glass.
22. Characteristics of materials obtained by the stone casting method.
23. Technological stages of manufacturing cast stone products.
24. Fibrous materials obtained from mineral melts and their manufacture.
25. Characteristics and nomenclature of reinforced concrete products.
26. Gypsum, its characteristics and use in the construction industry.
27. What are the main classes of building materials do you know? Give examples.

28. *What is the principle of modular construction and what are its advantages?*
29. *What are the requirements for modern building materials?*
30. *Describe the cement production process and its main stages.*
31. *Name the main types of gypsum binders and their applications.*
32. *What types of building lime are there and how is it made?*
33. *What raw materials are used to make ceramic bricks?*
34. *What is the difference between semi-dry and plastic methods of forming ceramic products?*
35. *What stages does the ceramic tile production technology include?*
36. *How is building glass made? What are its types?*
37. *used in construction?*
38. *What are the features of cast stone products? What are the stages of manufacturing reinforced concrete structures?*
39. *How are aerated concrete products made and where are they used?*
40. *What are fiberboard panels and in what structures are they used?*
41. *What environmental requirements are imposed on modern production of building materials?*
42. *Raw materials for the production of ceramic tiles.*
43. *Technological scheme for preparing raw materials for the production of ceramic tiles by the liquor method.*
44. *Ceramic tiles, their characteristics and manufacturing features.*
45. *Road bricks, characteristics, manufacturing.*
46. *Drainage ceramic pipes, their characteristics and manufacturing features.*
47. *Sanitary ware, its characteristics and manufacturing features.*
48. *Types and characteristics of glass building products.*
49. *Raw materials for glass production.*
50. *Preparation of raw materials for the production of building glass.*

Work program educational component (syllabus):

Compiled assistant, Shvachko D.G.

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)