

Pre-graduate internship

Educational component work program (Syllabus)

Academic discipline requirements

Level of higher education	<i>First (bachelor's)</i>
Discipline	<i>13Mechanical Engineering</i>
Specialty	<i>133 Industrial mechanical engineering</i>
Educational program	<i>Engineering of equipment for the production of polymer and building materials products</i>
Status educational 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>
Amount educational 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	http://intellect.cpsm.kpi.ua/profile/hdg3
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.

Goal educational 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 technologies of industrial mechanical engineering, which produce polymer, silicate and construction products and materials, scientific developments of equipment for the

production of polymer, silicate and construction products and materials, 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:

- ability to apply knowledge in practical situations (GC 2);
- the ability to act socially responsible and conscious (ZK 8);
- the ability to motivate people and move towards a common goal (GC 9);
- ability to work in a team (GC 11).

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:

- Knowledge:
- knowledge and understanding of the principles of technological, fundamental and engineering sciences that underlie the branch of mechanical engineering of the relevant industry (PH1);
- knowledge and understanding of mechanics and mechanical engineering and the prospects for their development (RN 2);
- Skills:
- perform engineering calculations to solve complex tasks and practical problems in industrial mechanical engineering (RN 4);
- analyze engineering objects, processes, and methods (PH 5);
- understand the problems of occupational safety and legal aspects of engineering activities in the industrial mechanical engineering sector, skills in predicting the social and environmental consequences of implementing technical tasks (RN 10);
- communicate freely with the engineering community orally and in writing in the state and foreign languages (RN11);
- apply technical control tools to evaluate the parameters of objects and processes in industrial mechanical engineering (RN12);
- understand the structures and services of industrial mechanical engineering enterprises (RN13).

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, supplement it with new information based on in-depth analysis and study 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 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-mnneralni-rozplavl.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);*

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. Grafted crusher with complex cheek swing
2. Grafted crusher with simple cheek swing
3. Coarse grinding cone crusher
4. Medium Grinding Cone Crusher
5. Hammer crusher
6. Roller crusher
7. Wet grinding runners
8. Dry grinding runners
9. Pendulum mill
10. Pipe mill
11. Electrostatic precipitator

12. Single chamber ball mill
13. Inertial grate screen
14. Eccentric vibrating screen
15. Bag filter
16. Double chamber ball mill
17. Drum dryer
18. Bag filter
19. Drum filter
20. Filter press
21. Shell and tube heat exchangers.
22. Reactors.
23. Drum dryer.
24. Belt dryer.
25. Recirculating dryer.
26. Cooling bath.
27. Air cooling device.
28. Calibrating nozzles.
29. Tunnel furnace.
30. Worm machine.
31. Casting machine.
32. Blow molding machine.
33. Vacuum forming machine.
34. Formator-vulcanizer.
35. Hydraulic press.
36. Waltz.
37. Rotary mixer.
38. Disc mixer.
39. Two-stage mixer.
40. Pneumatic loader.
41. Rotary shredder.
42. Lines for the production of sheets, pipes, films and other thermoplastic products

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.

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 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
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.

Semester control test.

Rating (weighting) points system and evaluation criteria

The rating score for pre-graduate practice R has two components. The first (starting Rc) 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 Rz characterizes the quality of the student's defense of the pre-graduate practice 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 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: $R = R_c + R_z = 50 + 50 = 100$ 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	<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>

9. Additional information on the educational component

Approximate list of questions that will be assessed

1. OhDescribe the design of a chip crusher with complex jaw swing.
2. Ohcharacterize the design of a simple cheek-swinging graft
3. OhDescribe the design of a coarse cone crusher.
4. Ohcharacterize the design of a cone crusher Medium grinding cone crusher
5. OhDescribe the design of a hammer crusher.
6. OhDescribe the design of a roller crusher.
7. Ohcharacterize the design of wet grinding runners
8. Purpose and functions of the head for extrusion blow molding.
9. OhDescribe the design of dry grinding runners.
10. Provide a structural diagram and describe the principle of operation of the cooling device for the mixer rotors.
11. Describe the sequence of calculating the parameters of the machine and pneumatic-vacuum systems.

12. *OhDescribe the design of a pendulum mill.*
13. *OhDescribe the design of a tube mill.*
14. *OhDescribe the design of an electrostatic precipitator.*
15. *OhDescribe the design of a single-chamber ball mill.*
16. *OhDescribe the design of an inertial grate screen.*
17. Provide a structural diagram and describe the principle of operation of the unloading device of a rotary mixer.
18. *OhDescribe the design of a vibrating eccentric screen.*
19. *OhDescribe the design of a bag filter.*
20. *OhDescribe the design of a two-chamber ball mill.*
21. *OhDescribe the design of a drum dryer.*
22. *OhDescribe the design of a bag filter.*
23. *OhDescribe the design of a drum filter.*
24. *Describe the principle of operation and the cycle diagram of operation. Performance of a rotary mixer.*
25. Provide a structural diagram and describe the principle of operation of the unloading device of a rotary mixer.
26. Describe the essence and list the varieties of pneumatic vacuum forming methods.
27. Describe the essence and list the varieties of pneumatic vacuum forming methods.
28. Provide a structural diagram and describe the principle of operation of double-worm thrust bearing assemblies.'barley mixer.
29. Provide a structural diagram and describe the principle of operation of an oscillating mixer.
30. *OhDescribe the design of a blow molding machine.*
31. *OhDescribe the design of a vacuum forming machine.*
32. *OhDescribe the design of a hydraulic press.*
33. *OhDescribe the design of the roller.*
34. Provide a kinematic diagram of the blade mixer drive.
35. *OhDescribe the design of a rotary mixer.*
36. *OhDescribe the design of a disc mixer.*
37. *OhDescribe the design of a two-stage mixer.*
38. *OhDescribe the design of a pneumatic loader.*
39. *OhDescribe the design of a rotary grinder.*

Work programeducational component (syllabus):

Compiledassistant, Shvachko D.G.

Approvedby the department ____KhPSM____ (minutes No. 17 dated 04.06.2025)

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