



# Pre-diploma Practice

## Syllabus

### Course Requisites

**Cycle of Higher Education** *First cycle of higher education (Bachelor's degree)*

**Field of Study** *12 Information Technologies*

**Speciality** *121 Software engineering*

**Educational program** *Software Engineering of Multimedia and Information Retrieval Systems*

**Discipline status** *Normative*

**Study form** *Full-time*

**Year of study, semester** *4 year (8 semester)*

**ECTS workload** *6 credits*

**Testing and assessment** *Credirt*

**Course Schedule** *5 weeks, according to the University Order*

**Language** *English*

**Course Instructors** *PhD, Associate Professor, Vasyl Yurchyshyn, [VasylPZKS@gmail.com](mailto:VasylPZKS@gmail.com)*

**Access to the course** *<https://campus.kpi.ua/>*

### Outline of the Course

#### 1. Course description, goals, objectives, and learning outcomes

*Pre-diploma practice is one of the important practical disciplines of training specialists in higher education. Practice is one of the final stages of training in the educational and professional field of training in higher education institutions (HEIs) of Ukraine.*

*Pre-diploma practice is a mandatory component of the educational and professional bachelor's training program in the specialty 121 Software engineering of the educational program "Software Engineering of Multimedia and Information Retrieval Systems" is aimed at the student acquiring professional skills and the ability to carry out independent engineering work.*

*The purpose of the credit module is to form students' ability to systematize, expand and consolidate professional knowledge; to form the initial competencies of conducting independent professional work; to conduct independent design and construction works and experiments.*

*The essence of practice is to involve students in independent professional work, familiarization with the methodology of design and construction work in academic and specialized institutes, leading companies.*

*The subject of pre-diploma practice is deepening the skills of independent engineering work, expanding the scientific and technical worldview of students, researching the chosen problem and the ability to connect it with the theoretical direction of research, to determine the structure, logic and content of the future thesis.*

*Completion of pre-diploma practice contributes to the formation of **general (GC)** and **professional competences (PC)** in students, necessary for solving practical tasks of professional activity:*

*GC 01 Ability to abstract thinking, analysis and synthesis.*

*GC 02 Ability to apply knowledge in practical situations.*

*GC 05 Ability to learn and use modern knowledge.*

*GC 06 Ability to search, process and analyze information from various sources.*

*PC 01 Ability to identify, classify and formulate software requirements.*

*PC 02 Ability to participate in software design, including its structure, behavior and functioning processes modeling (formal description).*

*PC 03 Ability to develop software systems architectures, modules and components.*

*PC04 Ability to formulate and ensure software quality requirements in accordance with customer requirements, specifications and standards.*

*PC 05 Ability to follow specifications, standards, rules and recommendations in the professional field during the life cycle processes implementation.*

*PC 06 Ability to analyze, select and apply methods and tools to ensure information security (including cybersecurity).*

*PC 07 Knowledge of information data models, the ability to create software for data storage, retrieval and processing.*

*PC 08 Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.*

*PC 09 Ability to estimate and take into account economic, social, technological and environmental factors affecting the field of professional activity.*

*PC 10 Ability to accumulate, process and systematize professional knowledge about software creation and maintenance, and determination of the importance of lifelong learning.*

*PC 11 Ability to implement phases and iterations of the life cycle of the software systems and information technology based on appropriate models and approaches to software development.*

*PC 12 Ability to carry out the system integration process, apply change management standards and procedures to maintain software integrity, overall functionality and reliability.*

*PC 13 Ability to reasonably select and master software development and maintenance tools.*

*PC 14 Ability to algorithmic and logical thinking.*

*PC 15 Ability to apply fundamental and interdisciplinary knowledge to build advanced retrieval algorithms.*

*PC 16 Ability to develop algorithms for implementing statistical data analysis methods.*

*PC 17 Ability to develop software for information retrieval systems.*

*PC 18 Ability to develop methods for mathematical problems numerical solutions using software.*

*PC 19 Ability to develop software for multimedia and mulsemedia systems.*

*PC 20 Ability to apply the acquired fundamental mathematical knowledge to develop calculation methods in the multimedia and information retrieval systems creation.*

*PC 21 Ability to identify, analyze and document software requirements for multimedia and information retrieval systems*

*PC 22 Ability to create innovative startup projects, calculate basic technical and economic indicators and develop business models of multimedia software and information retrieval systems innovative startup projects that have commercial potential for investment.*

Completion of pre-diploma practice contributes to students' formation of the following **program learning outcomes (PLO)** according to the educational program:

*PLO 01 To analyze, purposefully search and select the necessary information and reference resources and knowledge to solve professional problems, taking into account modern advances in science and technology.*

*PLO 02 To know the professional ethics code, understand the social significance and cultural aspects of software engineering and adhere to them in professional activities.*

*PLO 03 To know the software life cycle basic processes, phases and iterations.*

*PLO 04 To know and apply professional standards and other regulatory documents in the field of software engineering.*

**PLO 05** To know and apply relevant mathematical concepts, domain methods, system and object-oriented analysis and mathematical modeling for software development.

**PLO 06** Ability to select and use the appropriate task of software development methodology.

**PLO 07** To know and to apply in practice the fundamental concepts, paradigms and basic principles of the functioning of language, instrumental and computational tools of software engineering.

**PLO 08** To know and to be able to develop a human-machine interface.

**PLO 09** To be able to use collecting, formulating and analyzing software requirements methods and tools.

**PLO 10** To conduct a pre-project survey of the subject area, system analysis of the design object.

**PLO 11** To select initial data for design, guided by formal methods of describing requirements and modeling.

**PLO 12** To apply effective approaches to software design in practice.

**PLO 13** To know and apply methods of developing algorithms, designing software and data and knowledge structures.

**PLO 14** To apply in practice instrumental software tools for domain analysis, design, testing, visualization, measurement and documentation of software.

**PLO 15** To choose programming languages and development technologies to solve the problems of creating and maintaining software.

**PLO 16** To have the software development, design approval and all types of software documentation release skills.

**PLO 17** To be able to apply methods of component software development.

**PLO 18** To know and be able to apply information technology of processing, storage and transmission of data.

**PLO 19** To know and be able to apply software verification and validation methods.

**PLO 20** To know approaches to evaluation and quality assurance of software.

**PLO 21** To know the tools, analyze, select, skillfully apply the information security (including cybersecurity) and data integrity means in accordance with the applied tasks and software systems.

**PLO 22** To know and be able to apply methods and tools of project management.

**PLO 23** To be able to document and present the software development results.

**PLO 24** To be able to calculate the software systems economic efficiency.

**PLO 25** To know and to be able to use fundamental mathematical tools in the algorithms construction and modern software development.

**PLO 26** To be able to develop and use methods and algorithms for the mathematical problems approximate solution during the multimedia and information retrieval systems design.

**PLO 27** To be able to use statistical data analysis methods.

**PLO 28** To know the mathematical and algorithmic basics of computer graphics and to be able to apply them to develop multimedia software.

**PLO 29** To know the principles of using the latest multimedia technologies, mulsemedia and immersive technologies.

**PLO 30** To know and to be able to develop business plans for investment projects of developing and implementing multimedia and information retrieval systems software that have commercial potential for investment.

**PLO 31** To be able to identify, analyze and document software requirements for multimedia and information retrieval systems.

**PLO 32** To be able to develop and analyze full cycle models for multimedia and information retrieval systems software creation.

**PLO 33** To be able to organize a software product management complete cycle.

**PLO 34** To be able to create innovative startup projects of designing multimedia and information-search systems software that have commercial potential for investment.

**PLO 35** To be able to develop and analyze business models of innovative startup projects of developing multimedia and information retrieval systems software that have commercial potential for investment.

**PLO 36** To be able to manage the creation and implementation of software projects in accordance with international standards.

**PLO 37** To know and to be able to manage the creation and implementation of software projects according to the standards PMBOK, SWBOK, BPMCBOK.

**PLO 38** To be able to apply programming technologies for multimedia and information retrieval systems software development.

**PLO 39** To know the types of search engines, the principles of their construction, the methods and algorithms for performing different kinds of information retrieval in them.

**PLO 40** To know and be able to apply in practice the methods and criteria for estimating the effectiveness of information retrieval.

**PLO 41** To know and be able to apply in practice the methods of search engine optimization (SEO).

**PLO 42** To know the basic presentation models of textual and multimedia information and methods of its pre-processing for use in the design of information retrieval systems.

**PLO 43** To know and be able to use in practice the existing software resources and libraries for processing of textual information and multimedia data in information retrieval systems.

**PLO 44** To know the most common query languages used in the development of information retrieval systems.

## **2. Discipline prerequisites and postrequisites (place in the structural and logical education scheme according to the relevant educational program)**

Successful completion of the pre-diploma practice is preceded by the study of the disciplines of the bachelor's training plan in the specialty 121 Software Engineering.

Completion of pre-diploma practice will ensure the implementation of independent engineering work and preparation of materials for writing a diploma project in the specialty 121 Software engineering; experience in designing, developing, deploying, integrating, testing, implementing and operating software for various purposes.

## **3. Content of the academic discipline**

The organization and conduct of pre-diploma practice are regulated by the following documents:

- contracts with enterprises regarding pre-diploma internships for students;
- an order by the university on sending students to pre-diploma practice and appointing supervisors from the university;
- curriculum and work program of pre-diploma practice;
- diaries and individual tasks for students to complete pre-diploma practice;
- journal of students' visits to pre-diploma practice;
- schedules of visits to pre-diploma practice bases and their supervisors for the purpose of control;
- student reports on the implementation of the pre-diploma practice program;
- examination information regarding credit from pre-diploma practice.

Students are sent to pre-diploma practice in accordance with the order of the university. The order determines the type of pre-diploma practice, the terms and place of its completion, the distribution and confirmation of students according to the supervisors from the department, etc. The form of the order is determined by the current regulations of National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

## **4. Educational materials and resources**

### **Basic references:**

1. Regulations on the organization of the educational process at Igor Sikorskyi KPI: approved by the order of the Rector, ORDER No. 7-124 dated 07/20/2020. [electronic resource] - Access mode - <https://document.kpi.ua/regulations>. - Title from the screen. - Ukrainian language.

2. *The regulations on the procedure for the practice of higher education applicants of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute" were approved by the order of the Rector, ORDER No. 7/172 dated 09/24/2020. [electronic resource] . – Access mode - [https://document.kpi.ua/files/2020\\_7-172.pdf](https://document.kpi.ua/files/2020_7-172.pdf). - Title from the screen. - Ukrainian language.*

3. *Methodological recommendations on the organization of students' practice and the preparation of practical work programs of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute" [Text] / Composer: N.M. Lapenko, I.L. Spivak, I.V. Fedorenko, O.M. Shapovalova; in general ed. P.M. Yablonsky. - K.: KPI named after Igor Sikorskyi, 2018. – 29 p.*

4. *Law of Ukraine On Higher Education: / Verkhovna Rada of Ukraine; Bulletin of the Verkhovna Rada (VVR), 2014, No. 37-38, Article 2004 -. – Kyiv, 2018. – Title from the screen.*

5. *Provisions on internships for students of higher educational institutions of Ukraine: Order of the Ministry of Education of Ukraine dated 08.04.1993 No. 93 (Amended by Order of the Ministry of Education No. 351(v0351281-94) dated 20.12.94.*

6. *Provisional regulation on the organization of the educational process in KPI named after Igor Sikorskyi [Text] / Composed by V.P. Golovenkin; in general ed. Yu.I. Yakymenko – Kyiv: KPI named after Igor Sikorskyi, 2017. – 156 p.*

## **Educational content**

### **5. Methods of mastering an educational discipline (educational component)**

*Pre-diploma practice can take place at an enterprise, organization or educational institution.*

*Management of the pre-diploma internship is carried out by the department teacher responsible for the pre-diploma internship, supervisor of the graduation qualification work from the university side, and by the supervisor from the number of specialists according to the specialty profile.*

*The head of pre-diploma practice from the department ensures the implementation of all organizational measures before the start of pre-diploma practice: briefing on the procedure for passing pre-diploma practice; provision of necessary documents to student interns: referral to pre-diploma practice, diary of pre-diploma practice.*

*The supervisor of the final qualification thesis provides advice on issues related to writing the thesis.*

*The pre-diploma internship begins with mandatory safety training for all students at the enterprise and workplaces, familiarization with the rules of the internal procedure.*

*Regulations on conducting pre-diploma practice for higher education applicants of KPI named after Igor Sikorskyi (Order No. 7-172 of 09/24/2020 regulates the duties of the head of practice and the student.*

#### **The head of practice from the department have to:**

- develop work programs of pre-diploma practice and coordinate them with the bases of pre-diploma practice no later than two weeks before the start of pre-diploma practice;*
- warn students about issuing a medical certificate about health (if necessary) 7 days before the start of pre-diploma practice;*
- no later than 7 days before the start of the pre-diploma practice, provide the pre-diploma practice databases with lists of students-interns for issuing temporary passes;*
- prepare and provide a student or a group of students with a referral for pre-diploma practice; when two or more students are referred for pre-diploma practice, appoint a senior group member who is an assistant to the head of pre-diploma practice;*

- hold meetings with students and familiarize them with work programs of pre-diploma practice; issue diaries to students with individual tasks and a calendar plan for pre-diploma practice; ensure the timely arrival of students at pre-diploma practice bases and monitor the completion of pre-diploma practice;
- systematically, at least once a week, advise students and monitor the stages of individual task performance according to the calendar plan; to help the head of pre-diploma practice from the enterprise in compiling the characteristics of each student;
- participate in taking credits from pre-diploma practice;
- check that all students return passes, literature and property to the enterprise;
- draw up a log of going to work, as well as conduct a briefing on safety techniques, if students undergo pre-diploma practice in the structural units of the university;
- submit a report to the dean's office on the results of pre-diploma practice with suggestions for its improvement.

**University students are obliged to:**

- before the beginning of the pre-diploma practice, receive from the head of the pre-diploma practice of the department a referral to the pre-diploma practice, a work program of the pre-diploma practice and a diary of the pre-diploma practice;
- arrive on time at the pre-diploma practice base;
- to fully perform all the tasks stipulated by the work program of the pre-diploma practice and the instructions of its supervisors;
- to know and strictly follow the rules of labor protection, safety and industrial sanitation and the internal rules of the enterprise;
- to be responsible for the work done;
- to prepare a report in a timely manner and make a credit for the pre-diploma practice.

The main document, according to which the pre-diploma practice is monitored, is the diary of the pre-diploma practice, which is issued by the department. The diary contains an individual assignment, a calendar plan for the pre-diploma internship, and weekly entries. Heads of pre-diploma practice from the department and base of pre-diploma practice check the diary every week and write down their comments. The head of the diploma project supervises the implementation of an individual task. After the end of the pre-diploma practice period, the supervisor from the pre-diploma practice base provides feedback on the student's pre-diploma practice in the diary and evaluates its results with a grade, the thesis supervisor writes feedback on the status of the diploma project in the diary.

**6. Independent work of student**

During the pre-diploma internship, the student must complete the following amount of work:

1. Determination of the object and subject of research taking into account the base of pre-diploma practice (enterprise/institution).
2. Together with the supervisor of the thesis, form the content of the individual task.
3. Determination of the terms and scope of the necessary theoretical studies and calculations.
4. Collection and systematization of information about the object of research.
5. Description of the research object model.
6. Evaluation of relationships between model elements.
7. Clarifying the topic of the thesis. Formulation of the statement of the problem for writing a thesis.
8. Analysis and selection of methods and technologies for the implementation of the given task.

## 9. Forming a report on pre-diploma practice.

### Policy and control

#### 7. Policy of academic discipline (educational component)

##### **Requirements for the report on pre-diploma practice:**

After completing the pre-diploma practice, students must submit a written report together with the diary to the head of the pre-diploma practice from the department within the set deadline (no later than three days after the end of the pre-diploma practice) for verification, review and admission to the defense. The written review of the head of pre-diploma practice from the department and the head of the diploma project are entered in the student's diary.

The pre-diploma practice report must contain information on the student's performance of the pre-diploma practice program and the individual assignment. Systematization of the collected materials is carried out by the student during the pre-diploma practice and is completed during the time specially allocated for this purpose, in accordance with the pre-diploma practice program.

##### **The structure and content of the sections of the report on pre-diploma practice:**

The report on pre-diploma practice consists of the following sections or documents:

1. Title page of the report (according to the sample).
2. Content of the report on pre-diploma practice.
3. Introduction with a brief overview of the problem area for which the diploma project is being carried out, a brief argumentation of the relevance of the declared research, a brief annotation of the sections of the report.
4. Formalization of the statement of the task of the diploma project (object, subject and goal of the research, the final result of the completion of the diploma project).
5. The first full version of the diploma project with all completed sections and appendices. The diploma project consists of the following elements:
  - Title page of the prescribed sample;
  - Tasks for the development of a diploma project;
  - Abstract
  - Content;
  - List of conventional designations, abbreviations and terms;
  - Introduction;
  - The main part with a list of sections;
  - Conclusions;
  - References;
  - Appendix A to the diploma project - Demonstration version of the software (architecture, brief description of functionality, programming language, results of the software, etc.).
  - Appendix B to the diploma project - Presentation of the first full version of the diploma project with all Sections completed.
6. Conclusions to the report.

##### **Summary of practice:**

The report is defended by the student at the commission appointed by the head of the department. The commission consists of heads of pre-diploma practice from the department and two teachers of the

department. The commission accepts credit during the first 3-5 days after the end of the pre-diploma practice.

In order to be admitted to credit for pre-diploma practice, the student must submit to the committee (no later than three days before the end of the practice) for verification and review:

- 1) report on pre-diploma practice;
- 2) presentation of a report on pre-diploma practice;
- 3) diary of pre-diploma practice.

#### **8. Types of control and rating system for evaluating learning outcomes**

**Current control:** checking the pre-diploma practice diary every week.

**Calendar control:** checking the execution of four classes of tasks according to the calendar plan.

**Semester control:** defense of the report on pre-diploma practice, credit.

Conditions for admission to the semester control: minimum positive assessment for the performance of an individual task - 60 points.

Evaluation criteria:

- 1) Availability of documents: report on pre-diploma practice; presentation of a report on pre-diploma practice; diary of pre-diploma practice - 60 points.
- 2) Protection of the pre-diploma practice report and completion of the individual pre-diploma practice task.

Evaluation criteria:

- 1) complete completion of an individual task - 40 points;
- 2) incomplete completion of an individual task - 10-20 points;
- 3) sufficient correspondence of the content of the individual task - 0 - 5 points.

Table of correspondence of rating points to grades on the university scale:

Points	Grade
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactorily
64-60	Enough
< 60	Unsatisfactorily
Admission conditions are not met	Not admitted

#### **Course syllabus:**

Is created by PhD, Associate Professor Vasyl Yurchyshyn

**Adopted by** Computer Systems Software Department (protocol № 12 from 26.04.23)

**Approved by** the Faculty Board of Methodology (protocol № 10 from 26.05.23)