



## DIPLOMA DESIGN (Syllabus)

### Реквізи Details of the academic

<i>Level of higher education</i>	<i>First (bachelor's)</i>
Branch of knowledge	12 Information technologies
Specialty	123 Computer engineering, 121 Software engineering
Educational program	Computer systems and networks
Discipline status	Normative
Form of education	full-time/part-time
Year of training, semester	4th year, spring semester
Scope of the discipline	6 credits, 180 hours
Semester control/ control measures	State certification (defense of bachelor's diploma project)
Timetable	
Language of teaching	English
Information about the course leader / teachers	Professor of the department OT, Ph.D., prof. V. P. Simonenko, svp@comsys.kpi.ua Senior lecturer of the department From A. V. Simonenko, comsys.spz@gmail.com
Placement of the course	<i>Regulations and methodological recommendations for the implementation of diploma projects for obtaining a bachelor's degree under the educational and professional program "Computer systems and networks" specialty 123 "Computer engineering", for obtaining a bachelor's degree under the educational and professional program "Computer systems software engineering" " specialty 121 "Software engineering" <a href="http://comsys.kpi.ua/">http://comsys.kpi.ua/</a></i>

### Programa

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

During the diploma project, the student prepares an attestation work - a bachelor's diploma project (hereinafter "the project"), which is the final stage of education at the bachelor's educational level. Based on the results of the preparation and defense of the project, the examination board (hereinafter EC) issues a decision on awarding the student with the appropriate qualification and educational degree.

The discipline provides the following program learning outcomes of the educational and professional program Computer Systems Software Engineering: PRN2-PRN21

Subject of academic discipline: bachelor diploma project.

Interdisciplinary connections. Diploma design is based on all disciplines studied within the curriculum of the bachelor's degree.

The purpose of studying the discipline is the formation of students' abilities

- Summarize, consolidate and deepen the knowledge gained during the entire period of study at the university, and use it for informed project decision-making;
- Acquiring an overview of the performance of pre-project search and comparative analysis of information, when choosing the most acceptable topologies, protocols, algorithms and programs according to economic and technical characteristics;

- To inculcate knowledge and skills in the design of systems as a whole and to practically consolidate the skills of developing its basic components: software, information and technical support for automated design complexes (CAD), information and reference systems, computer networks, artificial intelligence systems, distance learning systems, etc.;
- Gain experience in designing project and graphic materials, drafting explanatory notes, specifications, information on software and other design documentation.

The main tasks in studying the discipline. According to the requirements of the educational and professional program, students must receive:

Knowledge:

- modern information technologies and information environments;
- methods of systematization and analysis of information;
- methodologies and technologies for designing and implementing computer systems and networks;
- computer systems design processes and standards;
- available means of components and technologies for building computing systems and networks;
- specialized programming languages and technologies;
- technologies for deploying software systems and creating software for computing systems and networks;
- methods of developing mathematical models of objects, methods of modeling distributed systems using modern application software packages;
- methods of solving practical problems within the framework of the relevant specialty. Skills:
- analyze requirements for modern high-performance computer systems;
- use methods of evaluating the performance of computing systems;
- learn basic architectural concepts and analyze the suitability of specific operating systems for designing effective programs;
- use modern technologies for designing and implementing computer systems and networks, choose available components, tools and technologies for their construction;
- use IT infrastructure management technologies, select components of the existing IT infrastructure to build a new infrastructure;
- automate the processes of deployment of IT infrastructure and necessary software;
- choose means of building components of integrated computer systems and networks, implement control algorithms using modern programming technologies;
- to solve practical problems related to the construction of computer systems and networks. Experience:
- design of management systems;
- hardware and software development based on microcontrollers;
- creation of a project of real-time systems according to the technical task.

## **2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational program)**

Post-requisites: design and implementation of integrated information systems, creation of appropriate documentation in the form of an explanatory note and graphic material for the project.

Content of the academic discipline

The main tasks of diploma design:

- systematization, consolidation and expansion of theoretical knowledge obtained in the process of studying

under the bachelor's educational program, and their practical use in solving specific problems

engineering, scientific, economic, social and industrial issues in a certain field of professional activity;

- development of experience of independent work, mastering the methodology of research and experimentation, physical or mathematical modeling, use of modern information technologies in the process of solving tasks that are provided for in the project task;

- determination of compliance of the level of training of the higher education applicant with the requirements of the educational program, his readiness and ability to work independently in the conditions of the market economy, modern production, progress of science, technology and culture.

The project should be based on the knowledge and skills acquired during the study of the disciplines during the entire period of study at the higher education institution and may be partially based on the results of the course design. The project may include research, design, calculation, and experimental works.

Project topics are determined in accordance with the following directions:

- Scientific interest of the manager in the field of computer science and computer engineering;
- Scientific and research directions that the department is engaged in;
- Ensuring the educational process;
- Implementation of economic contractual topics;
- Professional interests of the executor.

It is recommended to choose topics related to design automation, organization of computing processes in computer systems, complexes and networks using modern automated systems, modeling, organization of computing processes in computer systems, management of computer systems and networks, forecasting, visualization, development information search systems, expert systems, databases, web technologies, and issues of data analysis and processing, forecasting, management, ecology, etc.

In general, the subject of the project is not determined by the directions listed above and can be proposed by the student within the "Computer Engineering" or "Software Engineering" specialty.

Projects can be complex. Complex projects take place when developing or using complex and multifunctional software, or when implementing time-consuming design solutions. They are performed by two or even more students. At the same time, as a rule, the general part of the works is the software system as a whole, and the division of project works consists in different sections of the subject area, or consists in the implementation of various system functions and design stages.

### 3. Educational materials and resourcesBase

1. *Provisions and methodological recommendations for the implementation of diploma projects for obtaining a bachelor's degree under the educational and professional program "Computer systems and networks" specialty 123 "Computer engineering", for obtaining a bachelor's degree under the educational and professional program "Software engineering of computer systems" specialty 121 "Software engineering" /author. Stirenko S. G., Simonenko V. P., Simonenko A. V., NTUU "KPI" / website of the department of OT <http://comsys.kpi.ua/>*

## Education content

### Methods of mastering an educational discipline (educational component)

Organizationally, the project implementation process consists of the following stages:

- preparatory, which begins with the student choosing a topic and receiving an individual task from the supervisor regarding issues that must be resolved during pre-diploma practice on the chosen topic (familiarization with the state of the problem, collection of factual materials, conducting the necessary observations, experiments, research, etc.), includes mastering programs of pre-diploma practice and ends with the preparation and defense of a report on its completion;

- the main one, which begins immediately after the defense of the practice report and ends approximately two weeks before the project defense, when the project is presented for preliminary defense. At this stage, the project must be fully implemented, checked by the manager and consultants;
- final, which includes receiving feedback from the supervisor and reviews. The completed project with the supervisor's feedback is submitted by the student to the graduation department no later than one week before the day of the defense. The head of the department, based on the results of the interview with the student and review of the submitted materials, makes a decision on admission to the defense and signs the title page of the student's project. The decision of the head of the department is formalized in the relevant minutes of the department meeting;
- preparation for the presentation at the meeting of the EC and the same procedure for project protection.

The project consists of a text part and a graphic part. The textual part of the project should in a concise and clear form reveal the creative idea of the project, contain an analysis of the current state of the problem, methods of solving project tasks, justification of their optimality, methods and results of calculations, a description of the conducted experiments, analysis of their results and conclusions from them; contain the necessary illustrations, sketches, graphs, charts, tables, diagrams, drawings, etc. It should not contain generally known provisions, redundant descriptions, derivation of complex formulas, etc. The graphic part contains at least three graphic materials.

Structurally, the student's report at the EC meeting can be divided into three parts, each of which represents an independent content block, but in general they are logically connected and characterize the content of the conducted research.

In the first part of the report, it is necessary to present the topic of the project, give a description of the relevance of the chosen topic, give a description of the problem, and also formulate the goal and tasks of the project.

In the second part of the report, it is necessary to provide a description of each section of the project. At the same time, pay special attention to the methods by which the actual material was obtained and the final results.

In the third part of the report, general conclusions should be presented.

#### Самостійна робота студента (СРС)

№	Thema	Hours
1	Review and analysis of available solutions on the subject of project task	15
2	Description of the subject environment	10
3	Definition of the subject and tasks of diploma design	5
4	Definition of input and output data	5
5	Determination of methods and means for solving problems of diploma	15
6	Description of the database structure	10
7	Development of a system or subsystem	20
8	Development of information base	15
9	Detailed design of system elements	20
10	Creation of system software	20
11	Creation of graphic materials for project	20
12	Writing and design of an explanatory note to project	20
13	Preparation of a report to defend the project	5
Total		180

#### Policy and control

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

The student is obliged to:

- timely choose the topic of the project and receive a preliminary task for the project and recommendations from the supervisor regarding the selection and processing of materials during the pre-diploma practice;
- regularly, at least once a week, inform the manager about the status of the project implementation according

to the calendar plan, provide the necessary materials for inspection at his request;

- independently implement an individual project or an individual part of a complex project;
- when developing questions, take into account modern achievements of science and technology, use advanced methods of scientific and experimental research, make reasonable and optimal decisions using a systematic approach;
- to be responsible for the correctness of decisions, justifications, calculations, quality of design of textual and graphic material, their compliance with the methodological recommendations of the graduation department regarding the performance of attestation works, current normative documents and standards of higher education;
- adhere to the calendar plan of project implementation, the established rules of conduct in laboratories and classrooms, respond in a timely and adequate manner to the comments and recommendations of the project manager and consultants;
- submit the project for review to the manager and consultants within the set deadline and, after eliminating their comments, return it to the manager for his feedback;
- get all the necessary signatures on the title page of the project, as well as the resolution of the head of the graduation department on admission to the defense;
- personally submit the project accepted for defense to the reviewer; at his request, provide the necessary explanations on issues;
- familiarize yourself with the content of the manager's feedback and review and prepare (if necessary) reasoned answers to their comments when defending the project in the EC. It is forbidden to make any changes or corrections to the project after receiving the manager's feedback and review;
- pass the preliminary defense of the project at the department;
- submit to the department a project prepared and approved for defense with the manager's feedback and a review at least one week before its defense in the EC;
- arrive on time for the defense of the project or warn the head of the graduation department and the head of the EC (through the EC secretary) about the impossibility of attending the defense, indicating the reasons for this, and then providing documents certifying the validity of the reasons. In the absence of such documents, the EC may decide not to certify the student as one who did not appear at

protection of the project without valid reasons, with subsequent expulsion from the university. If the student was not able to warn in advance about the impossibility of his presence at the defense of the project, but during the period of work the EC provided the necessary supporting documents, the EC can postpone the date of the project defense.

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

#### **(RSO) in the discipline "Diploma Design"**

The result of project protection is formalized in the protection protocol. The project evaluation is determined by the following indicators:

1. Evaluation of the software product created by the student;
2. Assessment of protection;
3. Evaluation of documents prepared for protection.

In accordance with these components, the following project evaluation criteria were developed:

The project is rated as "excellent" if:

When implementing the project:

- modern software tools are used;
- a modern user interface has been implemented;
- in-depth knowledge of at least one of the professional training disciplines is used;
- The obvious advantage of the project is:
  - mastering and justified application of original software tools;
  - study and presentation in the program of a subject area that is difficult to formalize;

◦ study and use of the latest information technologies.

In defense, the student:

- clearly and fully reports on the purpose of the project and tasks implemented by the developed program;
- defines the users of the software system, the level of access and system functions provided to each user;
- describes input and output information for each task implemented in the system;
- justifies the use of software tools;
- explains the essence of the used methods of task implementation and justifies their choice;
- competently presents and explains algorithm schemes (if any);
- demonstrates and explains key fragments of the dialogue between the software system and the user and the results of solving all assigned tasks;
- answers questions fully, knows how to professionally defend his point of view. The following documents are attached to the project according to the relevant requirements:

An explanatory note in which:

- the content fully corresponds to the task;
- the material is well structured, presented comprehensively, clearly and competently;
- the design strictly complies with regulatory requirements.

Algorithm scheme drawing:

- that describes the algorithm of the entire system, or
- the main method implemented in the system, or
- a fragment of the software module containing features of the software implementation that the speaker wants to draw attention to;
- executed as a drawing in strict accordance with the design standards of the algorithm scheme.

Poster:

- contain illustrations for the report;
- are performed in accordance with the standards adopted for the design of posters.

Feedback from the project manager.

Review by an external reviewer (cannot be a teacher of the graduate department).

The project is rated as "good" if:

When implementing the project:

- modern software tools are used;
- a modern user interface has been implemented, but the dialogue is not optimally structured from the point of view of user convenience or forms of output and placement of information;
- used knowledge and skills obtained while studying one of the special disciplines.

In defense, the student:

- reports on the completed project in the same way as specified in the criteria for the "excellent" rating, but allows minor errors and inaccuracies;
- knows how to professionally defend his point of view;
- generally answers questions correctly, but makes minor mistakes and inaccuracies. The following documents are attached to the project according to the relevant requirements:

An explanatory note in which:

- the content fully corresponds to the task;
- the material is not quite well structured;
- the material is presented clearly and concisely, but there are stylistic errors;
- design with minor deviations from regulatory requirements.

Drawing of the scheme of the algorithm that:

- has content that meets the requirements proposed for the "excellent" rating;
- executed as a drawing with minor deviations from the design standards of the algorithm scheme.

Poster:

- contain illustrations for the report;
- are performed with minor deviations from the standards adopted for the design of posters.

Feedback from the project manager.

Review by an external reviewer (cannot be a teacher of the graduate department).

The project is rated "satisfactory"

When implementing the project:

- correctly made calculations that do not require the use of numerical methods;
- a real practical task was implemented, but without the use of modern software and computer technologies.

In defense, the student:

- reports generally correctly, but the report is constructed illogically, vaguely, contains inaccuracies;
- answers questions incompletely, makes mistakes and inaccuracies. The following documents are attached to the project according to the relevant requirements:

An explanatory note in which:

- the content corresponds to the task, but the material is poorly structured, unclearly presented, there are grammatical errors;
- registration with deviations from regulatory requirements.

Drawing of the scheme of the algorithm that:

- has content that meets the requirements proposed for the "excellent" rating;
- executed as a drawing with a deviation from the design standards of the algorithm scheme.

Poster:

- contain illustrations for the report;
- performed with deviations from the standards adopted for the design of posters.

Feedback from the project manager.

Review by an external organization (review by a teacher of another department is possible).

### **Working program of the academic discipline (syllabus):**

Compiled by Professor OT, Ph.D., prof. Simonenko V. P., ct. teacher A. V. Simonenko

Approved by the Department of Computer Engineering (protocol No. 10 dated 05/25/2022)

Agreed by the Methodical Commission of the Faculty (protocol No. 10 dated 06/09/2022)