MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS

COMPLEX TRAINING

METHODOLOGICAL RECOMMENDATIONS

for applicants of higher education
specialty 121 "Software engineering"
of the study program "Software engineering"
of the first (bachelor's) level

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S. Kuznets KhNUE
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Methodological recommendations on the organization and conduct of complex training are provided. The content of the main tasks and the complex training report are given.

It is recommended for applicants of specialty 121 "Software Engineering" of the "Software Engineering" study program of the first (bachelor's) level.

INTRODUCTION

Methodological recommendations for comprehensive training were developed in accordance with the end-to-end practice program and the educational and professional training program for bachelors in specialty 121 "Software engineering" of the first (bachelor) level .

The essence of the complex training comes down to mastering the skills of creating IT projects, starting from defining the purpose of the project to the stage of its implementation, including procedures for monitoring its implementation. Practical tasks of the training will allow applicants to form and consolidate relevant professional competences and master decision-making skills regarding the creation of software products (systems) and team work on the project.

The target audience of the training is applicants of the fourth year of the specialty 121 "Software engineering" of the first (bachelor) level .

The purpose of the comprehensive training is the formation of practical skills for the full cycle of software product development, which a bachelor of software engineering should possess .

To achieve the goal, the following tasks have been defined:

form a team to work on an IT project, distribute roles and responsibilities;

conduct an analysis of the field of the future IT project, determine the business problem and ways to solve it;

create a knowledge base with shared team access to work on the project;

develop a product vision and project glossary;

justify technologies for product development;

build models of business processes;

determine functional and non-functional requirements for the software product;

develop information support;

design the user interface of the software product;

write software product code;

test the software product.

The practical tasks of the training will allow you to form and consolidate relevant professional competences and form applicants' skills in subject area analysis, defining requirements for a software product, designing a database, user interface, writing code and testing a software product.

Learning outcomes and competencies that applicants acquire during the training are listed in the table. 1.

Table 1

Learning outcomes and competencies

Learning outcomes	Competences
LO02	GC02, SC05, SC09
LO06	GC02, SC10, SC11
LO07	GC01, GC02, SC06, SC08, SC11
LO09	GC02, GC03, SC01
LO10	SC01
LO11	SC01
LO12	SC02, SC03
LO14	GC02, GC03, SC01, SC02, SC13
LO15	SC10, SC11, SC13
LO18	GC02, GC06, SC13
LO19	GC02, SC04
LO23	GC03, GC04

where,

LO02. Know the code of professional ethics, understand the social significance and cultural aspects of software engineering and adhere to them in professional activities.

LO06. Ability to select and use software development methodology according to the task.

LO07. To know and to apply in practice the fundamental concepts, paradigms and basic principles of functioning of language, tool and computing software engineering tools.

LO09. Know and be able to use methods and tools for collecting, formulating and analyzing software requirements.

LO10. Conduct a pre-design survey of the subject area, system analysis of the design object.

LO11. Select input data for design, guided by formal methods of requirements description and modeling.

LO12. Apply effective software design approaches in practice.

LO14. Apply in practice software tools for domain analysis, design, testing, visualization, measurement and documentation of software.

LO15. Motivated choice of programming languages and development technologies to solve developing and maintaining software the problems.

LO18. Know and be able to apply information technologies for data processing, storage and transmission.

LO19. Know and be able to apply software verification and validation methods.

LO23. Be able to document and present the results of software development.

GC01.Ability to think abstractly, analyze and synthesize.

GC02.Ability to apply knowledge in practical situations.

GC03.Ability to communicate in the state language both orally and in writing.

GC04. Ability to communicate in a foreign language both orally and in writing.

GC10. Ability to act in a socially responsible and conscious manner.

SC01. Ability to identify, categorize and formulate software requirements.

SC02. Ability to participate in the design of software, including modeling (formal description) of its structure, behavior and processes of operation.

SC03. Ability to develop architectures, modules and components of software systems.

SC04. Ability to formulate and ensure software quality requirements in accordance with customer requirements, terms of reference and standards.

SC05. Ability to comply with specifications, standards, rules and guidelines in the professional field when implementing life cycle processes.

SC06. Ability to analyze, select and apply methods and tools to ensure information security (including cyber security).

SC08. Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.

SC09. Ability to evaluate and take into account economic, social, technological and environmental factors affecting the field of professional activity.

SC10. The ability to accumulate, process, and systematize professional knowledge about creating and maintaining software and recognize the importance of lifelong learning.

SC11. Ability to implement phases and iterations of the life cycle of software systems and information technologies based on appropriate software development models and approaches.

SC13. Ability to reasonably choose and master tools for software development and maintenance.

ORGANIZATION OF TRAINING

Training is a form of problem-based learning that is focused on working out and consolidating effective behavior patterns, maximum active participation of listeners (participants), mutual exchange of experiences, and the use of effective group interaction. Complex training has an interdisciplinary nature and is the final stage in the preparation of bachelors in the management of complex systems.

Methods used during training:

Case method (from the English "case" — case) is an interactive method of learning aimed at the formation of knowledge, skills, personal qualities, based on the analysis and solution of a real or simulated problem situation in the context of professional activity, presented in the form of a case;

work in small groups - creates opportunities for the participation of each applicant in making team decisions, ensures the formation of personal qualities and experience in the formation of professional and social communication of teamwork;

Team Building games are game methods for increasing team cooperation. They help participants feel a sense of belonging to the team, develop leadership skills and contribute to the formation of a positive work environment. Such games allow you to solve tasks and solve problems together, which helps to improve cooperation and build an effective team. They stimulate interaction, communication and mutual understanding between participants, as well as strengthen the sense of solidarity and mutual support;

discussions - held with the participation of a trainer who acts as a moderator and coordinator, directs and controls the course of the discussion;

brainstorming is a method of collective problem solving based on stimulation of creative activity, in which applicants express as many possible solution options, including non-trivial ones. Then the best solutions that can be used practically are selected from the received options.

team presentations are a form of presentation of material when a formed team of applicants jointly (in turn) presents information (in this case, about the results of a certain stage of training) to an audience of applicants who, after the presentation, ask questions to team members. Control over the progress of the presentation and its discussion is performed by the teacher;

group discussion is an interactive learning method that allows you to analyze the opinions, positions and attitudes of group members in the process of direct communication .

surveying is a method of obtaining information from applicants through their written survey through a system of pre-prepared questions (questionnaires). Questionnaire survey can be face-to-face, in which the teacher is present when filling out the questionnaires , and absent, when the receipt of questionnaires, collection and analysis of the received information takes place remotely, via the Internet.

A favorable atmosphere for learning in a training group is provided by the rules that each participant must follow, for example:

- "I" - address (speak for oneself);
- "Raised hand" (do not interrupt, speak in turn);
- Mutual respect (respect each other and the right to one's own opinion);
- "2 minutes" (for the performance and comments of the participants);
- "Stop" (if further discussion is unpleasant or dangerous for you);
- Turn off the sound of the phone.

The rules are accepted by all members of the group so that everyone can:

work in comfortable conditions;

get information yourself and not interfere with others getting information in a way that is convenient for everyone;

frankly, without fear to express their thoughts;

to allow spontaneous, unpremeditated expressions, which will bring the training closer to real life; 6

to be sure that the information provided by him will be used only in the interests of the participants.

The rules assume that they are offered by the coach. After discussion, the rules are fixed and accepted in the Group. if further rules are violated, they will be reminded about it. Rules can be adopted daily at the beginning of work.

The training includes three parts: introductory and final, which in turn are divided into certain stages (Table 2).

Table 2

The structure of complex training

Task	Methods / types of activity	Number of hours	Independent work	Number of hours
1. The introductory part				
1. Acquaintance with the purpose, tasks and competences obtained during the training. Determination of criteria for evaluation of results	Presentation	1	Review of literary sources on the stages of development of software products	1
2. Division of applicants into teams	Team Building game "Complex puzzle"	1	Formation of the project team	1
3. Coordination of the work schedule, determination of rules of conduct and discussion of expectations from the training.	Method "Circle of ideas"	1	Acquaintance with the rules of conduct during training	1
4. Familiarization with the subject area of the project and identification of problems that must be solved during the creation of a software product.	Case	1	Review of literary sources related to the subject area of the project	1
That's all		4		4
2. The main part				
Stage 2.1. Analysis of the subject area				
1. Development of the project knowledge base structure for stage 2.1	Work in small groups	-	Creating and setting up project pages in Confluence and placing the results of stage 2.1 there	1
2. Distribution of duties and responsibilities between team members at stage 2.1	Work in small groups	-	Forming a list of roles and their assigned responsibilities at stage 2.1	1
3. Developing a product vision	Case Work in small groups Brainstorming	1	Review of literary sources regarding the structure and content of the product vision. Creation of a Vision in the form of "Product Vision Board"	2
4. Development of a glossary	Case Work in small groups	-	Search the Internet for the interpretation of terms from the glossary. Creating the "Glossary" table	1

5. Justification of the choice of technology stack and C ASE - software product development tools	Work in small groups	-	Search for information on the Internet. Creation of a comparison table for choosing a stack of technologies and C ASE tools	1
6. Defining the list of incoming and outgoing messages	Case Work in small groups	-	Review of literary sources related to the subject area of the project. Creating a list of messages	1
7. Designing message forms	Case Work in small groups	1	Creating forms for incoming and outgoing messages	1
8. Modeling business processes and functions	Case Work in small groups	1	Creating a model of business processes, a model of a tree of CASE functions is a tool	2
9. Preparation of the presentation based on the results of stage 2.1	Work in small groups	-	Creating a CASE presentation is a tool	1
10. Presentation of the results of the team's work at stage 2.1	Team presentation Group discussion	2	Discussion of the results of the teams' presentation	1
11. Evaluation of team work results at stage 2.1	Work in small groups	-	Providing feedback by filling in a form with team ratings	1
That's all		6		13
Stage 2.2. Definition of requirements for the software product and database design				
1. Development of the project knowledge base structure for stage 2.2	Work in small groups	-	Creating and setting up project pages in Confluence and placing the results of stage 2.2 there	1
2. Distribution of duties and responsibilities between team members	Work in small groups	-	Consolidation of responsibilities for the assigned roles in the team at stage 2.2	1
3. Modeling the use case diagram	Case Work in small groups	1	Creating a case diagram is a tool	1
4. Development of specifications for use cases	Case Work in small groups	1	Creating a specification for each use case in tabular form	1
5. Development of an additional specification	Case Work in small groups	1	Creating an additional specification in the form of a table	1
6. Analysis of database elements	Case Work in small groups	-	Creating a "Data Dictionary" table	1
7. Analysis of limitations to the database	Case Work in small groups	1	Creating a table with restrictions to the database	1

8. Designing a logical and physical database model	Case Work in small groups	1	CASE database - a tool	1
9. Projecting sketches of screen forms of the software product	Case Work in small groups	1	Create a wireframe / mockup CASE - tool	1
10. Presentation preparation	Work in small groups	-	Creation of a presentation based on the results of stage 2.2 CASE - tool	1
11. Presentation and discussion of the results of each team's work	Team presentation Group discussion	2	Discussion of the results of the presentation	1
12. Evaluation of team work results at stage 2.2	Work in small groups	-	Providing feedback by filling in a form with team ratings	1
That's all		8		12
Stage 2.3. Software product development and testing				
1. Development of the project knowledge base structure for stage 2.3	Work in small groups	-	Creating and setting up project pages in Confluence and placing the results of stage 2.3 there	1
2. Distribution of duties and responsibilities between team members at stage 2.3	Work in small groups	-	Consolidation of responsibilities for assigned roles in the team at stage 2.3	1
3. Software development	Case Work in small groups	10	Writing code using selected technologies	7
4. Testing of own software product	Case Work in small groups	2	Creating test cases and performing testing	2
5. Correction of found bugs in own software product	Case Work in small groups		Writing code	2
6. Testing the software product of another team	Case Work in small groups	2	Creating test cases and performing testing	2
7. Development of a bug report based on the results of testing another team's software product	Case Work in small groups	-	Creation of a bug report based on a template with screenshots of detected bugs	2
8 . Preparation of a presentation based on the results of software product development	Work in small groups	-	Creating a presentation Case is a tool	1
9 . Preparation of a presentation based on the results of testing another team's software product	Work in small groups	-	Creating a presentation Case is a tool	1
10. Preparation of a report based on the results of the training	Work in small groups	-	Creation of a training report with documentation on the developed software product	2

11. Presentation and discussion of the results of each team	Team presentation Group discussion	2	Discussion of the results of the presentation	1
That's all		16		22
3. The final part				
1. Presentation and discussion of the results of testing another team's software product	Presentation Group discussion	2	Discussion of the results of the presentation	1
2. General evaluation of the results of the teams' work at stage 2.3 and testing	Work in small groups	-	Filling out the form with team ratings	1
3. Summary and completion of comprehensive training	Feedback Questionnaire	-	Discussion of expectations and fears stated at the beginning of the training. Providing feedback by filling out a questionnaire	1
That's all		2		3
Together		36		54

CONTENT OF TRAINING TASKS

1. The introductory part

1.1. Familiarization with the training

The introductory part of the training is intended to acquaint applicants with general information about complex training, its structure and content, orienting applicants to teamwork using interactive learning methods.

At the beginning of the training, a general meeting of applicants is organized, at which the trainer familiarizes the audience with the purpose and tasks of the training, shows its relationship with the educational program and previous educational components, explains the learning outcomes and competencies that the applicants will receive during the training. The trainer also informs the applicants about the form and criteria for evaluating the training results.

1.2. Distribution of applicants by teams

The next step of the introductory part is **the formation of teams** of applicants to work on a project to create a software product. When forming teams, the trainer and applicants discuss the specifics of a product and

outsourcing IT company; determine which technical and non-technical specialties are available in IT companies. [ ]

Technical specialists - in whose profession the key role is played by the code, working with it, fixing errors and configuring the internal component of the product or service in general.

Technical specialties include:

A front-end developer is a specialist responsible for developing the interface (appearance) of the site. That is, it makes the resource the way the user sees it.

A back-end developer is a specialist whose duties include setting up the internal component of the site - the part that the user does not see, but which is responsible for its functioning.

An embedded programmer is a software developer who, among other things, deals with its implementation and testing at various stages of development. The profession is at the intersection of programming and hardware engineering. Specialists work in the fields of robotics, medical equipment, aviation, weapons and space.

A QA engineer is a person who tests a project at various stages of its creation and development. His task is to detect errors and inaccuracies in time, in order to quickly eliminate them and avoid accumulation.

A software tester is a specialist who tests a finished software product, detects bugs, malfunctions, and more. If QA checks the project at each stage of its creation (the team made the "skeleton" of the project - QA tests, added new functions - QA checks), then the software tester reviews the final product.

A database developer is a specialist in the development of databases, their implementation, maintenance and constant modernization.

A system/business analyst is a wide-ranging specialist who is engaged in the automation of processes related to software development. He conducts subject area research, analyzes and evaluates customer information technology requirements, procedures, or problems, and develops and implements proposals, recommendations, and plans for improving current or future software systems. His work begins at the time of setting the task and ends with the complete elimination of errors discovered during testing during development.

A game developer is a specialist in the field of game development with a wide list of tasks. He can write game code, develop visuals, work on the concept, take control of the entire development process, and so on.

A mobile developer is a specialist in the development of applications and games for mobile devices.

A special place among technical specialists is given to the role of TeamLead (from the English TeamLead) - this is an IT specialist who manages his team of developers, owns the technical side, participates in work on the project architecture, reviews code, and also develops some special complex tasks on the project.

Non-technical specialties are an area in IT where professionals are responsible for communications, advertising a manufactured product or service, promoting a product in the market, building relationships within a team, and finding qualified personnel. The main ones include:

PM (Project Manager) is a specialist who fully manages the project. Organization of work, strategy planning, allocation of priorities, control over the execution of tasks and quick resolution of problems are the main tasks of a PM.

A recruiter is a specialist who is responsible for a quick search, high-quality selection and closing of vacancies.

The HR manager is connected at the stage of adaptation of a new employee. He works with the company's employees and develops corporate culture. His goal is to build a team. He also invents interesting and motivating events within the company.

Brand-manager - works to ensure that the company is recognizable on the market, modern and attractive to future customers. Finds partners for cooperation.

Event manager – a specialist who organizes events: conferences, seminars and other events. Organization and time management are the main characteristics of an Event manager.

PR manager – responsible for public relations, image and reputation of the company, presents it at various events and meetings. You must have a tendency to public, marketing and advertising skills.

A copywriter is a specialist who creates unique texts, starting from short slogans and ending with voluminous articles.

The main requirement when forming a team is cross-functionality. Cross-functionality means that team members with different skills and experience work towards a common goal. A cross-functional team is a small team that can complete each stage of a project by working together without resorting to the help of other specialists. During the training, tasks related to various specialties will be performed, therefore, when forming a team, it should be taken into

account that each applicant will perform several roles. For the cohesion of the created team, the development of cooperation skills and mutual understanding, it is advisable to use the "Complex puzzle" team building method. This is a game that involves assembling a complex puzzle as a team. Each participant is given a piece of the puzzle and must cooperate with the others to achieve the common goal of completing the puzzle, which requires interaction, planning and cooperation between the participants.

1.3. Schedule and rules of work during training

The next task of the introductory part is **the organizational issues** of the training. The trainer discusses and agrees the schedule of work on the project with the teams. Next, the rules of behavior of applicants during the training are defined.

An important task of the training course is **to discuss the expectations** of the applicants. To activate applicants during the discussion of this issue, you can play the game "Circle of Ideas". Every team creates a table with two columns. In the first column, everyone describes their expectations, and in the second - their fears. At the final stage, they return to this table so that the participants analyze which hopes and fears have come true and which have not.

1.4. Familiarization with the subject area of the project

The last task of the introductory part is **to get acquainted** with **the subject area** of the future project and the problems that must be solved during the creation of a software product. Each team receives its task, which is related to certain tasks to be performed during the training, given in the appendix. AND.

2. The main part

2.1. Analysis of the subject area

2.1.1. Development of the structure of the knowledge base of the project for the stage.

It is necessary to create a project in Confluence , to which invite all team members and **necessarily the trainer** . To fill the knowledge base, create pages: about the team, stage 1, stage 2, stage 3. For page 1 of the stage, create nested pages

for each task of the stage (Table 2). The results obtained during the execution of the tasks of the stage are placed on the corresponding pages in the Confluence knowledge base .

2.1.2. Distribution of duties and responsibilities between team members at the stage.

The team independently distributes the roles and duties assigned to it for stage 2.1 (see Table 2), taking into account the time required for their implementation. The result of the distribution is drawn up in a table where the role, task, and full name of the performer are indicated (Table 3). Among the team members, it is necessary to identify a applicant who will additionally perform the duties of a team leader.

Table 3

Roles and responsibilities of team members (P)

Role	Duties, fixed by role	Name of the member teams
Project manager	Creating a knowledge base in Confluence	Andriy Stetsenko
Business analyst	vision	Harkava Hanna Iryna Pavlenko
	Glossary	Vadim Petrenko
	List of incoming / outgoing documents	Iryna Pavlenko
	Forms of documents	Harkava Hanna Iryna Pavlenko
	Modeling of business processes and functions	Harkava Hanna Andriy Stetsenko
Architect	Rationale for choosing a technology stack	Vadim Petrenko

2.1.3. Developing a product vision.

The team members familiarize themselves with the material related to the forms, structure and content of the vision, discuss in more detail the problems that must be solved during the training according to the variant of the subject area. The tabular form " THE PRODUCT VISION BOARD ". The team brainstorms to discuss the content of each part of the document. Based on its results, the Vision document is formed.

2.1.4. Glossary development.

In this task, it is necessary to develop a glossary of project terms, which will be used in the future for a common understanding of them by all interested

parties of the project. The glossary is created as a table (Table 4). It defines the terms related to the definition of the main concepts and categories of the subject area, users of the software product, incoming and outgoing messages, documents.

Table 4

Glossary of the project

Term	Description of the term
1. Basic concepts and categories of the subject area	
2. System users	
3. Input and output documents	

2.1.5. Rationale for choosing a technology stack for designing and developing a software product.

The next task is the analysis of the tools that can be used to develop the project (programming languages, DBMS, frameworks, libraries, Case-tools, etc.). For this, the team collects and analyzes information from the Internet. Based on the results of the analysis, tables are created with comparative characteristics of the technology stack (Table 5) and a consolidated table with the selected technologies for the project (Table 6).

Table 5

Comparative characteristics of technologies

Characteristic	Stack 1	Stack 2	. . .
Characteristics 1			
Characteristic 2			
Characteristic 3			
. . .			

Table 6

Technologies that will be used in the project

Name	Selected technology
A programming language	
DBMS	
Framework	
. . .	

2.1.6. Definition of the list of incoming and outgoing messages.

Based on additional analysis of the subject area, the team determines the list of output messages/documents that users need to solve their tasks. Next, the team defines the list of input messages/documents necessary to obtain results (output messages/documents). A table with a list of incoming/outgoing messages/documents is created (Table 7).

Table 7

List of incoming / outgoing messages / documents

No. z/p	Name of the message / document	Incoming / outgoing

2.1.7. Design of message forms.

For a predefined list of incoming and outgoing messages, the team develops forms. If there are standard forms for incoming messages/documents, then ready-made forms are used in the project. When designing document forms, it should be taken into account that any document contains three zones:

1 zone - **header zone** , intended for unambiguous details that are common to the entire document;

2nd zone – **content (table, informational)** includes groups of multi-valued requisites: reference signs, grouping signs and basic requisites;

Zone 3 is **the registration zone** , in which, as a rule, the signatures of officials are located.

Single-valued details have one value per document, multi-valued details - several values in the document.

For the original document, the first zone must contain the name of the document and the date on which it was created or the period for which it was created; for the incoming document, its unique number is another mandatory requisite.

2.1.8. Modeling of business processes and functions.

Modeling of the business process and functions for the subject area of the project is carried out with the help of pre-selected CASE tools. IDEF 0, Process notations are used to model business processes landscape , EPC , BPMN . For modeling functions – tree diagrams of functions, environment of functions.

2.1.9.-2.1.11. Presentations of the results of the stage.

applicants prepare a presentation of the results of Stage 2.1 of the training, in which the results of each task of the stage should be shown. With a prepared presentation, the team performs in a group. The presentation is followed by a discussion of the presented results. Group applicants ask questions to team members. Next, each team carries out a rating evaluation of the presented team results. The evaluation results are filled in the appropriate form (Appendix B).

2.2. Determination of requirements for software and database design

2.2.1. Development of the structure of the knowledge base of the project for the stage.

In the project created at the previous stage in Confluence , for stage 2 page, you need to create nested pages for each task of the stage (see Table 2). The results obtained during the execution of the tasks of the stage are placed on the corresponding pages in the Confluence knowledge base in the form of documents, tables or diagrams.

2.2.2. Distribution of duties and responsibilities between team members.

The team independently distributes the roles and duties assigned to it for stage 2.2 (see Table 2), taking into account the time required for their implementation. The result of the distribution is drawn up in the table as during stage 2.1 (see table 3).

2.2.3. Modeling a use case diagram.

Modeling of use cases is carried out with the aim of determining the functional requirements for the project, determining - What the created software product will do. Modeling of the diagram is carried out using the CFSE tool selected in the previous stage.

2.2.4. Development of specifications for use cases.

A use case diagram begins by describing what the system will do. However, for the actual design of the system, more detailed data will be required, which is reflected in their specifications. The purpose of developing a specification is to specify in detail what users will do with the system and what the system itself does.

Specifications are being developed for the usage options identified in the diagram. The specifications are developed in tabular form according to the template (Table 8).

Table 8

Use case specification < Name >

Usage option <ID>	<Use case name, in the form of a verb with explanatory words>
Context of use	<Description of a set of functions combined by a context>
The characters	<List of actors>
Prerequisites	<Description of actions to be performed before executing the use case>
Trigger	<Description of the event that triggers the execution of the use case>
Scenario	The main one 1. Actor <action> 2. System <action> 3. Actor <action> . . .
Post-conditions	<Set of states guaranteed by the system regardless of the success of the use case execution>

2.2.5. Development of an additional specification.

The additional specification is an important addition to the use cases, because together they fix all the necessary requirements for the software (functional and non-functional), which make up the complete technical requirements for the system. The additional specification is created in tabular form according to the template (Table 9).

Table 9

Additional specification

Requirement ID	The name of the requirement
1. Usability	
SUPP-01	Time required to train regular users
SUPP-02	Time required to train advanced users
. . .	. . .
2. Reliability	
. . .	Accessibility
. . .	Average uptime
. . .	. . .
. . .	
. . .	. . .

2.2.6. Analysis of database elements

Based on the analysis of the details of the outgoing and incoming documents, a data dictionary containing information about the elements of the projected database is created. The data dictionary is designed as a table according to a template that contains: name, identifier, type and length and purpose of the element (Table 10).

Table 10

Data dictionary

No for/p	Element title	Identifier	Type and length	Purpose of the element

2.2.7. Analysis of limitations to the database.

For all the entities of the developed system, the specification of the limitations of the attributes of the entities should be specified. Restrictions to the database are drawn up as a table according to the template, which contains: the name of the attribute or aggregate, limits / permissible values, structure (format), condition, default value (Table 11).

Table 11

Limiting Attributes (Example)

No	Attribute or aggregate title	Limits or permissible values	Structure (format)	Condition	Default value
1	Employee. Personnel number	From 100 to 1000	9999	NOT NULL	-
2	Employee. Phone	-	(99) 999-99-99		-
3	Execution of works. Date	-	-	-	Current date

2.2.8. Designing a logical and physical database model.

The design of the logical and physical data model is carried out on the basis of a previously conducted analysis of the permeation area. Models are created using CASE - the tool selected at the previous stage.

2.2.9. Projecting sketches of screen forms of the software product.

In this task, it is necessary to design sketches of all screen forms of the software product and create appropriate wireframes or mockups using the CASE tool selected at the previous stage.

2.2.10 - 2.2.12. Presentation of the results of the stage.

applicants prepare, discuss and evaluate the presentation of the results for Stage 2.2 similarly to the previous stage.

2.3. Software product development and testing

2.3.1. Development of the structure of the knowledge base of the project for stage 2.3.

In the project created in step 2.1 in Confluence , for the page of step 3, you need to create nested pages for each task of the step (see Table 2). The results obtained during the execution of the tasks of the stage are placed on the corresponding pages in the Confluence knowledge base .

2.3.2. Distribution of duties and responsibilities between team members at the stage.

The team independently distributes the roles and duties assigned to it for stage 2.3 (see Table 2), taking into account the time required for their implementation. The distribution result is drawn up in the table as during stage 2.1.

2.3.3. Software development.

Software development is one of the most labor-intensive tasks. In the development process, applicants use advanced technologies, appropriate programming languages, DBMS, frameworks, libraries, Case-tools, etc.

2.3.4. Testing of own software product.

An important task of creating a high-quality software product is its testing. To carry out testing, test cases must be developed and based on them, testing of one's own software product should be carried out (Table 12). Screenshots must be taken for the bugs found.

Table 12

Template for creating test cases

No	Requirement No	Brief description	Priority	Description of the test case	Expected result	Notes

For the bugs found in the software product, it is necessary to make a bug report according to the template in the form of a table (Table 13).

Table 13

Defect report template

Identifier	Brief description	Detailed description	Steps of reproduction	Creativity	Importance	Urgency	Symptom	Opportunity to bypass	Comment	Appendices

2.3.5. Correction of found bugs in own software product.

To correct the bugs found in the software, a bug report compiled based on the results of testing is used.

2.3.6. Testing another team's software product.

The list of teams for mutual testing is provided by the coach at the beginning of stage 2.3. To test another team's application, you need to compile test cases that will be used during its testing (see Table 13).

2.3.7. Development of a bug report based on the results of testing another team's software product.

A bug report is being developed for bugs discovered during testing of another team's software product. A bug report is created based on a template in the form of a table (see Table 14).

2.3. 8 , 2.3.11. Preparation and discussion of the presentation based on the results of the development of the software product

The team formalizes the results obtained during stage 2.3 in the form of a presentation, which will be presented for discussion in the group at the end of the third stage.

2.3.10. Preparation of a report based on the results of the training.

The team prepares a report based on the results of the training. The structure of the report is presented in the Appendix. IN.

2.3.9. Preparation of a presentation based on the results of testing another team's software product

The team presents the results obtained during the testing of the other team's software product in the form of a presentation.

3. The final part

3.1. Presentation and discussion of the results of testing another team's software product.

The presentation is made by a representative of the team who tested the software product of another team. the test results are discussed in the group.

3.2. General assessment of team work results at stage 2.3.

The results of the tasks of stage 2.3 are evaluated by other teams according to the rating system.

3.3. Summary and completion of the comprehensive training.

At the end of the training, an analysis of the success of the training is carried out from the point of view of the obtained learning results, it is found out what was useful for the participants, helped them to change some views, maybe even behavior. The evaluation promotes self-analysis of the participants in the process, stimulates the birth of new ideas, helps to understand the extent to which the participants have achieved the goal, and helps to adjust the plans for the next classes. The method of evaluation is a questionnaire of training participants.

ASSESSMENT FORMS AND METHODS

The university uses a cumulative (100-point) evaluation system.

applicant control during the training is carried out in the form of end-to-end monitoring of the degree of activity, effectiveness and competence formation. This control covers the practical part of the training and consists of the following elements (Table 1 4) according to the subject of the corresponding training day.

Table 14

Task performance results	Maximum score
1. The results of the tasks of stage 2.1 according to the rating evaluation of all teams participating in the training and the coach	20
2. The results of the tasks of stage 2.2 according to the rating evaluation of all teams participating in the training and the coach	20
3. General results of tasks of stage 2.3, including :	60
3.1. For the development and testing of their software product based on the rating of all teams participating in the training	20
3.2. For developing and testing your software product from the trainer	10
3.2. For the quality of the software product created by testers from another team	10
3.3. For testing the software product of another team from the coach	10
3.4. For the training report (availability of all documentation for the developed product and preparation of the report)	10
EVERYTHING	100

The maximum score for each stage is 100%, the minimum is 60% of the number of points for the stage (see Table 3).

The rating evaluation of the results of training tasks at each stage is carried out taking into account the following requirements:

- each team after the discussion, assigns ratings from 1 to 10 for the performance results of the members of other teams (except for your own team

);

- grades are ranked, the team with the best results gets the highest grade ;

- ratings are placed in the evaluation form, the advantages and disadvantages of the presented results must be indicated in the "Remarks" column;

- Forms with evaluation results are sent by Timlid to the coach.

According to the results of the rating evaluation of the training teams and the points from the coach himself , the coach forms an assessment (points) for each stage and communicates them to all participants.

The distribution of the points received by the team among the team members is carried out as follows:

the total score in points for the results of all training tasks is determined;

the obtained total score in points is multiplied by the number of team members;

the received total score is distributed among the team members independently according to the results of each participant's contribution to the total , but the difference between the participants' scores should not exceed 10%;

the coach can give Timlid additional points (from 0 to 10 points) based on the results of the team's work; the coach determines the maximum score per group.

General and evaluations of each Team Lead member forwards to the trainer, after which the trainer determines the score of each participant based on the results of the training.

Thus, the system of current control during the training is allowed to assess the degree of formation of competencies directly in the participants educational process, as well as the degree of effectiveness of the training itself.

CONCLUSIONS

Comprehensive training allows applicants to acquire and improve practical skills for solving the following tasks:

perform an analysis of the subject area, identify problems in it and find ways to solve it, and create a "Vision" document;

to model business processes according to different notations using CASE tools;

analyze and model functional and determine non-functional product requirements;

design databases,

design the user interface;

develop and test a software product;

work in different roles in a team.

Thus, complex training as an interactive form of conducting classes helps each of its participants become more professionally competent; develop communication and teamwork skills, which are so necessary for future software engineering specialists.

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Content

APPENDICES

Appendix A

DESCRIPTION OF SUBJECT AREAS

1. Insurance company

You work for an insurance company. Your task is to record the contracts concluded by the insurance company.

The company has various branches throughout the country. Each branch is characterized by a name, address and telephone number. The company's activities are organized as follows: various persons contact you with the purpose of concluding an insurance contract. Depending on the objects accepted for insurance and the risks insured, a contract is concluded for a certain type of insurance (for example, motor vehicle theft insurance, home property insurance, voluntary medical insurance). When concluding the contract, you record the date of conclusion, insurance amount, type of insurance, tariff rate, branch where the contract was concluded, etc.

It should be taken into account that contracts are concluded by insurance agents. In addition to information about agents (surname, first name, patronymic, address, phone, etc.), you also need to store the branch where the agents work. In addition, you need to be able to calculate wages for agents. The salary is a certain percentage of the insurance payment (the insurance payment is the insurance amount multiplied by the tariff rate). The percentage depends on the type of insurance under which the contract is concluded.

2. Hotel

You work in a hotel. Your task is to record the services provided to hotel customers.

Your activity is organized as follows: the hotel provides rooms to customers for a certain period. Each room is characterized by capacity, comfort (luxury, semi-luxury, ordinary) and price. Your customers are various individuals about whom you collect certain information (surname, first name, patronymic, some comment, etc.). The room is assigned to the client if there are free seats in the rooms suitable for the client according to the parameters specified above. When settling, the date of settlement is fixed. When leaving the hotel, the date of release is remembered for each seat.

It is necessary to store information not only on the fact of handing over the number to the client, but also on making room reservations. In addition, a system of discounts is provided for regular customers, as well as for certain categories of customers. Discounts can be combined.

3. Lombard

You work in a pawn shop. Your task is to account for the services provided to the pawnbroker's customers.

The activities of your company are organized as follows: various persons contact you with the purpose of receiving funds against the pledge of certain goods. You ask the last name, first name, patronymic and other passport data of each client who comes to you. After evaluating the value of the goods brought as collateral, you determine the amount you are ready to hand over to the client, as well as your commissions. In addition, determine the term of return of money. If the client agrees, then your agreements are fixed in the form of a document, the money is issued to the client, and the goods remain with you. If the money is not returned within the specified period, the product becomes your property.

After the transfer of ownership rights to the goods, the pawnbroker can sell the goods at a price lower or higher than that declared at the time of delivery. The price can change several times, depending on the market situation (for example, the owner of a pawn shop can arrange a sale of winter clothes at the end of winter). In addition to the current price, you need to store all possible price values for this product.

4. Sale of goods

You work in a company engaged in wholesale and retail sales of goods. Your task is to record the sale of goods.

The activities of your company are organized as follows: Your company trades in goods from a certain spectrum. Each of these products is characterized by a name, wholesale price, retail price and reference information. Buyers contact your company. For each of them, you remember standard data in the database (name, address, telephone, contact person, etc.) and draw up a document for each agreement, remembering the quantity of goods purchased by the buyer and the date of purchase.

Usually, buyers buy not one product, but several at once within the framework of one transaction. The company also decided to provide discounts depending on the number of purchased goods and their total cost.

5. Keeping orders

You work in a company engaged in the wholesale sale of various goods. Your task is to record customer orders.

The activities of your company are organized as follows: Your company trades in goods from a certain spectrum. Each of these products is characterized by a price, reference information and a sign of the presence or absence of delivery. Customers contact your company. For each of them, you save standard data in the database (name, address, telephone, contact person, etc.) and draw up a document for each agreement, remembering the quantity of goods purchased by the customer and the date of purchase.

Delivery of different goods can be carried out in different ways, different in price and speed. It is necessary to store information about the ways in which each product can be delivered and information about the type of delivery (and, accordingly, the cost of delivery) chosen by the client when concluding the agreement.

6. Employment Bureau

You work in an employment office. Your task is to keep records of the employment services provided.

The activities of your office are organized as follows: Your office is ready to look for employees for various employers and vacancies for jobseekers of specialists of various profiles. When a customer-employer contacts you, his standard data (name, type of activity, address, telephone, etc.) are recorded in the database. When a prospective client contacts you, his standard data (surname, first name, patronymic, qualification, profession, other data) are also recorded in the database. A document is drawn up for each fact of satisfaction of the interests of both parties. The applicant, employer, position and commissions (bureau income) are indicated in the document.

It turned out that the database does not quite accurately describe the work of the bureau. Only the agreement is recorded in the database, and information on open vacancies is not stored. In addition, in order to automatically search for options, it is necessary to maintain a "types of activity" directory.

7. Notary office

You work in a notary office. Your task is to record the services rendered to clients.

The activities of your notary office are organized as follows: Your firm is ready to provide a certain set of services to the client. For order, you have formalized these services by listing them with a description of each service. When a client contacts you, his standard data (name, type of activity, address,

telephone, etc.) are recorded in the database. A document is drawn up for each fact of service provision to the client. The document indicates the service, transaction amount, commissions (office income), description of the agreement.

Several services may be provided to the client within the framework of one agreement. The cost of each service is fixed. In addition, the company provides various types of discounts within the framework of one agreement. Discounts can be combined.

8. Spare parts sales company

You work in a company that sells spare parts (parts) for cars. Your task is to record the supply of parts by suppliers.

The main part of the activity is related to work with suppliers. The company has a certain set of suppliers, for each of which the name, address and telephone number are known. You buy parts from these suppliers. Each detail, along with the name, is characterized by an article number and price. Some of the suppliers may supply the same spare parts (same article number). Each fact of purchase of spare parts from the supplier is recorded in the database, and the date of purchase and the number of purchased parts are mandatory to remember.

The price of a spare part may vary from delivery to delivery. Suppliers inform you in advance about the date of the price change and about its new value. It is necessary to store not only the current value of the price, but also the entire history of price changes.

9. Advanced training courses

You work in an educational institution and organize advanced training courses.

You have at your disposal information about the formed groups of students. Groups are formed depending on the specialty and department. Each of them includes a certain number of students. Classes are provided by a staff of teachers. For each of them, you have standard profile data (surname, first name, patronymic, phone number, etc.) and work experience registered in the database. As a result of the distribution of the load, you receive information about how many hours of classes each teacher spends with the corresponding groups. In addition, information about the type of classes (lectures, practice), the subject and the fee for 1 hour is also stored.

The amount of hourly payment depends on the subject, the type of lesson, and the level of the teacher's qualification. In addition, each teacher can teach not all subjects, but only some.

10. Determination of electives for students

You work in a higher educational institution and organize optional courses.

You have at your disposal information about students, including standard questionnaire data (surname, first name, patronymic, address, telephone, etc.). The teachers of your department must provide optional classes in some subjects. For each elective, there is a certain number of hours and type of lessons (lectures, practice, laboratory work). As a result of working with students, you have information about which of them signed up for which electives. There is a certain minimum amount of optional subjects that each student must take. At the end of the semester, you enter information about the grades received by students on exams.

Some of the electives may last more than one semester. In each semester, the volume of lectures, practicals and laboratory work in hours is set for the subject. The final grade for the subject is taken as the last grade received by the student.

11. Distribution of the educational load

You work in a higher educational institution and deal with the distribution of the workload among the teachers of the department.

You have at your disposal information about the teachers of the department, which includes, along with questionnaire data, also information about their academic degree, administrative position held, and work experience. The teachers of your department must provide classes in some subjects. There is a certain number of hours for each of them. As a result of workload distribution, you should have the following information: "Such and such a teacher conducts classes on such and such a subject with such and such a group."

All conducted classes are divided into lecture, practical and laboratory classes. Each type of activity has its own number of hours. In addition, load data must be stored for several years.

12. Distribution of additional duties

You work in a commercial company and deal with the distribution of additional one-off jobs. Your task is to track the progress of additional work.

The company has a certain number of employees, each of whom receives a certain salary. From time to time, there is a need to perform some additional

work that is not included in the scope of the main job duties of employees. In order to bring order in this field of activity, you divided all types of additional work by classes, deciding on the amount of payment based on the fact of their completion. When additional work of a certain type occurs, you appoint a person in charge, fixing the start date. Upon completion, you fix the date and pay an additional amount to the salary, taking into account your classification.

Some of the additional works are quite time-consuming and, at the same time, time-bound, which requires the involvement of several workers in their implementation. It also turned out that the duration of work in each specific case is different. Accordingly, it is necessary to plan in advance the duration of work and the number of employees employed to perform the work.

13. Equipment maintenance

Your company is engaged in the repair of machine tools and other industrial equipment. Your task is to record the repair services provided.

Your company's clients are industrial enterprises equipped with various complex equipment. In case of equipment breakdowns, they contact you.

Repair work at your company is organized as follows: all machines are classified by manufacturing countries, years of manufacture and brands. All types of repairs differ in name, duration in days, cost. Based on these data, you record the type of machine and the start date of the repair for each repair.

It is necessary not only to divide machines by type, but to have information about how many times a particular machine has been repaired.

14. Tourist company

You work in a travel company. Your company works with customers by selling them passes. Your task is to record the services rendered to clients.

Work with clients in your company is organized as follows: some standard data is collected from each client who comes to you - surname, first name, patronymic, address, telephone, etc. After that, your employees find out from the client where he would like to go on vacation. At the same time, he is shown various options, including the country of residence, features of the local climate, available hotels of different classes. Along with this, the possible length of stay and the cost of the ticket are discussed. If you managed to come to an agreement and find an acceptable option for the client, you register the fact of the sale of the voucher (or vouchers, if the client buys several vouchers at once), fixing the date of departure. Sometimes you decide to give the client some discount.

The company works with several hotels in several countries. Tickets are sold for one, two or four weeks. The price of the ticket depends on the duration of the tour and the hotel. The discounts provided by the company are fixed. For example, when buying more than 1 ticket, a 5% discount is given. Discounts can be combined.

15. Freight transportation

You work in a company engaged in the transportation of goods. Your task is accounting for the cost of transportation.

Your company carries out transportation on various routes. For each route, you defined some name, calculated the approximate distance and set some payment for the driver. Information about drivers includes surname, first name, patronymic, seniority, etc. For calculations, you save complete information about transportation (route, driver, dates of departure and arrival). A premium is paid to drivers for certain transports.

Your company has decided to introduce a flexible payment system. Yes, payment to drivers should now depend not only on the route, but also on the experience of the driver. In addition, it should be taken into account that transportation can be carried out by two drivers.

16. Recording of telephone conversations

You work in the sales department of a telephone company. The company provides subscribers with long-distance telephone lines. Your task is to record long-distance telephone conversations.

Subscribers of the company are legal entities that have a telephone point, a personal identification number, and a bank account. The cost of negotiations depends on the city to which the call is made and the time of day (day, night). Each subscriber's call is automatically recorded in the database. At the same time, the city, date, duration of the conversation and time of day are remembered.

Your company has decided to introduce a flexible system of discounts. Yes, the cost per minute is now reduced depending on the duration of the call. The size of the discount is different for each city.

17. Accounting of internal office costs

You work in the accounting department of a private firm. The company's employees have the opportunity to make small purchases for the company's needs by submitting a goods receipt to the accounting department. Your task is to track intra-office expenses.

Your company consists of departments. Each department has a name. Each department has a certain number of employees. Employees can make purchases according to the types of expenses. Each type of expenses has a name, some description and the maximum amount of funds that can be spent on this type of expenses per month. With each purchase, the employee issues a document indicating the type of expenses, date, amount and department.

It is necessary to store data on expenses not only for the department as a whole, but also for individual employees. Norms for spending funds are not set as a whole, but for each department for each month. Money not used in the current month can be used later.

18. Library

You are the head of the library. Your library has decided to make money by renting out some books that are available in a small number of copies. Your task is to record the rental of books to readers.

Each book available for rent has a title, author, and genre. Depending on the value of the book, you determined for each of them the deposit value (the amount paid by the client when renting the book) and the rental value (the amount the client pays when returning the book, receiving back the deposit). Readers come to the library. All readers are registered in the card file, which contains standard questionnaire data (surname, first name, patronymic, address, telephone, etc.). Each reader can contact the library several times. All requests from readers are recorded, while the date of issue and the expected date of return are remembered for each issue of the book.

The cost of renting a book should depend not only on the book itself, but also on the term of its rental. In addition, it is necessary to add a system of fines for damage caused to the book and a system of discounts for some categories of readers.

19. Car rental

You are the head of commercial service at a car rental company. Your task is the accounting of car rentals.

Your fleet includes a certain number of cars of different brands, prices and types. Each car has its own rental price. Customers come to the rental office. All clients undergo mandatory registration, during which standard information is collected about them (surname, first name, patronymic, address, telephone, etc.). Each customer can contact the rental office several times. All customer appeals are recorded, while the date of issue and the expected date of return are remembered for each transaction.

The cost of renting a car should depend not only on the car itself, but also on the term of its rental, as well as on the year of manufacture. It is also necessary to introduce a system of fines for returning a car in an improper form and a system of discounts for regular customers.

20. Issuance of loans by the bank

You are the head of the information and analytical center of a commercial bank. One of the essential activities of your bank is the granting of loans to legal entities. Your task is to record loan repayments.

Depending on the terms of obtaining a loan, the interest rate and the repayment period, all credit operations are divided into several main types. Each of these species has its own name. The loan can be obtained by a legal entity (client), upon registration, the following information is provided: name, type of property, address, telephone, contact person, etc. Every fact of loan issuance is registered by the bank, while the loan amount, the client and the date of issuance are recorded.

The used system does not allow monitoring the dynamics of loan repayments. To eliminate this shortcoming, you decided to take into account the date of the actual return of money in the system. It is also necessary to take into account that the loan can be repaid in parts, and fines are charged for the delay in returning the loan.

21. Investment of free funds

You are the head of an analytical center of an investment company. Your company invests in securities.

Your clients are companies that trust you to manage their free cash for a certain period. You need to choose the type of securities that will allow both you and your client to make a profit. When working with a client, information about the company is very important for you - name, type of ownership, address, phone, etc.

It is necessary to keep a history of quotations of each security. In addition, there is also an opportunity to invest money in bank deposits.

22. Employment of theater actors

You are the commercial director of the theater, and your responsibilities include all organizational and financial work related to attracting actors and concluding contracts. You keep records of the employment of actors in performances.

You put it this way: every year the theater stages different plays. Each show has a certain budget. You engage actors to participate in specific

performances in certain roles. You conclude a personal contract with each of the actors for a certain amount. Each of the actors has some work experience, some of them have been awarded various awards and titles.

Within the framework of one performance, several actors are involved in the same role. The contract determines the basic salary of the actor, and based on the results of the performances actually performed, the actor is awarded a bonus. In addition, it is necessary to store information for several years in the database.

23. Paid polyclinic

You are the head of the planning service of a paid polyclinic. Your task is to record the services rendered to clients of the polyclinic.

Doctors of various specialties who have different qualifications work in the polyclinic. Patients visit the polyclinic every day. All patients undergo mandatory registration, during which standard questionnaire data (surname, first name, patronymic, year of birth) are entered into the database. Each patient can visit the polyclinic several times, needing different medical assistance. All patient visits are recorded, a diagnosis is established, the cost of treatment is determined, and the date of the visit is remembered.

When applying to the polyclinic, the patient is examined and treated by various specialists. The total cost of treatment depends on the cost of those consultations and procedures that are prescribed to the patient. In addition, discounts are provided for certain categories of citizens.

24. Analysis of the dynamics of the company's financial reporting indicators

You are the head of the information and analytical center of a large company. Your task is to track the dynamics of indicators for your company's branches.

The structure of the company includes several branches. Each branch has standard characteristics (name, details, telephone, contact person). The work of the branch can be evaluated as follows: at the beginning of each reporting period, a certain set of indicators is calculated using some formulas based on financial statements. The importance of indicators is characterized by some numerical constants (weight). The value of each indicator is measured in some system of units.

Some indicators are measured in hryvnias, some in dollars, some in euros. For the convenience of working with indicators, it is necessary to save changes in exchange rates relative to each other.

25. Accounting by the television company of the cost of advertising that was broadcast

You are the head of the commercial service of a television company. Your task is to account for the provided advertising services.

The work is structured as follows: customers ask to place their advertisement in a certain program on a certain day. Each commercial has a certain duration. Bank details, phone number and contact person for negotiations are known for each customer. Transmissions have a certain rating. The cost of a minute of advertising in each specific program is known (determined by the commercial service, based on the rating of the program and other considerations).

It is also necessary to store information about agents who have concluded contracts for advertising. The salary of advertising agents is a certain percentage of the total cost of advertising that was broadcast.

26. Online store

You are an employee of the commercial department of a company that sells various products over the Internet. Your task is to record the sale of goods to customers.

Your company's work is organized as follows: some products are presented (offered for sale) on the company's Internet site. Each of them has a name, price and unit of measurement (pieces, kilograms, liters), etc. You try to collect data from your customers in order to conduct research and optimize the operation of the store. At the same time, the standard questionnaire data, as well as the telephone and e-mail address for communication, are of decisive importance for you. In case of purchase of goods in the amount of more than UAH 50,000. the client enters the category of "regular clients" and receives a 2% discount on each purchase. For each sale, you automatically record the customer, goods, quantity, date of sale, date of delivery.

Sometimes there are problems related to the lack of information about the availability of the necessary goods in the warehouse in the required quantity. In addition, customers usually buy not one type of product, but several types within the framework of one order. Based on the total cost of the order, the company provides additional discounts.

27. Jewelry workshop

You work in a jewelry workshop. Your task is to record the sale of manufactured jewelry to customers.

Your workshop manufactures custom-made jewelry for private individuals. You work with certain materials (platinum, gold, silver, various precious stones, etc.). When a potential client approaches you, you determine exactly what product he needs. All products made by you belong to a certain type (earrings, rings, brooches, bracelets, etc.), are made of a certain material, have a certain weight and price (which includes the cost of materials and work).

Jewelry can consist of several materials. In addition, the workshop provides discounts to regular customers.

28. Hair salon

You work in a hair salon. Your task is to record the services rendered to clients.

Your barbershop cuts customers according to their wishes and some catalog of different types of haircuts. Yes, for each haircut, the name, gender (male, female), cost of work are defined. To bring order, you, as far as possible, create a customer database, remembering their profile data (surname, first name, patronymic, etc.). Starting with the fifth haircut, the client moves into the permanent category and receives a 3% discount for each subsequent haircut. After the regular work is finished, the type of haircut, the client and the date of the work are recorded.

A branch has appeared in your hairdressing salon, and you would like to see, including, accounting for the services provided by branches. In addition, the cost of a haircut can change over time. It is necessary to save not only the last price, but also all the data regarding the change in the price of a haircut.

29. Dry cleaning

You work in a dry cleaner. Your task is to record the services rendered to clients.

Your dry cleaner accepts items from the public for stain removal. To bring order, you, as far as possible, compile a customer database, remembering their profile data (surname, first name, patronymic). Starting from the 3rd visit, the client becomes a regular client and receives a 3% discount when cleaning each subsequent item. All services provided by you are divided into types that have a name, type and cost, which depends on the complexity of the work. Working with the client first consists in determining the scope of work, the type of service and, accordingly, its cost. If the customer agrees, he leaves the item (recording the service, customer and date of receipt) and picks it up after processing (recording the return date).

Your dry cleaner has a branch, and you would like to see, including, the accounting of services provided by branches. In addition, you decided to make allowances for the urgency and complexity of the work.

30. Leasing of retail space

You work in a large shopping center that rents out its retail space to a merchant. Your task is to record the leased retail space.

The operation of your shopping center is structured in this way: as a result of planning, you have determined a certain number of sales points within your building that can be rented out. For each of the retail outlets, important data are the floor, area, availability of air conditioning and the cost of rent per day. You collect standard data from all potential customers (name, address, phone, details, contact person, etc.). When a potential client appears, you show him available spaces. When you reach an agreement, you draw up the contract, recording the point of sale, the client, the rental period (term) in the database.

As a result of the operation of the database, it became clear that some customers rent several outlets at once. In addition, you need to collect information about the monthly payments received from tenants.

Appendix B
EVALUATION FORMS

Evaluation form

1 (2) stage of training

Number and name of the team that evaluates _____

Team, which is evaluated		Rating (1-0)	Topic	Remark
No	Name			
1				Pros and cons:
2				
3				
4				
5				
6				
7				
8				
9				
10				

Evaluation form

3rd stage of training

Number and name of the team that evaluates _____

Part 1 – demonstration of software products:

Team, which is evaluated		Rating (1-0)	Topic	Remark
No	Name			
1				Pros and cons:
2				
3				
4				
5				
6				
7				
8				
9				
10				

Part 2 – external testing:

Number of the team whose product you tested _ _____

Rating for the tested product (from 1 to 10 points) _____

Appendix B

CONTENTS OF THE REPORT

EDUCATIONAL EDITION

COMPLEX TRAINING

METHODOLOGICAL RECOMMENDATIONS

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of the study program "Software engineering"
of the first (bachelor's) level

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