APPROVED
Head of the Phystech School of Applied Mathematics and Informatics
A.M. Raygorodskiy

Work program of the course (training module)

course:	Workshop on Software Development/Практикум по разработке программ
major:	Applied Mathematics and Informatics
specialization:	Computer Science/Информатика
	Phystech School of Applied Mathematics and Informatics
	Chair of Algorithms and Programming Technologies
term:	3
qualification:	Bachelor

Semesters, forms of interim assessment:

5 (fall) - Grading test

6 (spring) - Grading test

Academic hours: 120 AH in total, including:
lectures: 0 AH.
seminars: 0 AH.
laboratory practical: 120 AH.

Independent work: 240 AH.

In total: 360 AH, credits in total: 8

Author of the program: Y.A. Ivanova, assistant

The program was discussed at the Chair of Algorithms and Programming Technologies 04.06.2021

<p align="center">**Annotation**</p>

The aim of this course is to acquire basic management and management skills at all stages of development.

An industrial software product from architecture design, code writing to automation of testing and deployment. The course covers the basics of modern approaches to work with the team, setting development requirements, building a software testing process,

continuous delivery / integration, risk planning and automation of the development process. Practical lessons of the course practice the practice of applying the acquired knowledge over real a project developed by the participants themselves.

1. Study objective

Purpose of the course

Obtaining primary professional skills and professional experience in the field of web application development. The practice is carried out for the purpose of practical training of students and is aimed at the formation, consolidation, development of practical skills and competencies in the profile of the educational program. During the internship, students gain experience in their specialty, close to real work in industrial projects.

Tasks of the course

Students are given the following tasks:
- study of technologies required for the implementation of the project;
- learning the best practices for writing code in the programming language used;
- studying the best approaches to building the architecture of web applications;
- development of a web application, according to the description of the project;
- preparation of a report on the results of practice.

2. List of the planned results of the course (training module), correlated with the planned results of the mastering the educational program

Mastering the discipline is aimed at the formation of the following competencies:

Code and the name of the competence	Competency indicators
Gen.Pro.C-2 Use modern IT and software tools to perform professional tasks in compliance with information security requirements	Gen.Pro.C-2.1 Apply modern computing tools and Internet services in professional settings
	Gen.Pro.C-2.2 Apply numerical mathematical methods and use software applications for scientific problem-solving in professional settings
	Gen.Pro.C-2.3 Fulfill basic information security requirements
Gen.Pro.C-4 Collect and process scientific and technical and/or technological data for fundamental and applied problem-solving	Gen.Pro.C-4.1 Apply scientific research and intellectual analysis methods for professional problem-solving
	Gen.Pro.C-4.2 Search for primary sources of scientific and technical and/or technological information in professional settings
	Gen.Pro.C-4.3 Prepare abstracts, reports, bibliographies, and reviews of information in professional settings
	Gen.Pro.C-4.4 Use computer and network skills to obtain, store, and process scientific (technical, technological) information
Gen.Pro.C-5 Participate in fundamental and applied research and development activities; independently devise new theoretical research methods (including mathematical research methods) and work with cutting-edge scientific equipment (measuring, analytical, technological)	Gen.Pro.C-5.1 Perform tasks in the field of theoretical and experimental research and development activities
	Gen.Pro.C-5.2 Acquire new knowledge by studying literature, scientific articles, and other sources
	Gen.Pro.C-5.3 Use modern experimental scientific research (measuring and analytical, technological) equipment
Pro.C-1 Assign, formalize, and solve tasks	Pro.C-1.1 Locate, analyze, and summarize information on current research findings within the subject area

| Pro.C-1 Assign, formalize, and solve tasks, develop and research mathematical models of studied phenomena and processes, systematically analyze scientific problems, obtain new scientific outcomes | Pro.C-1.2 Make hypotheses, build mathematical models of the studied phenomena and processes, evaluate the quality of the developed model |
| | ПК-1.3 Apply theoretical and/or experimental research methods to a specific scientific task and interpret the obtained results |

3. List of the planned results of the course (training module)

As a result of studying the course the student should:

know:

- Have an idea of modern technologies in the field of web application development;
- different approaches to building the architecture of web applications;
- technologies for deploying applications on remote servers and cloud platforms;
- up-to-date tools for storing source code and controlling its versions.

be able to:

- Conduct a review of the available libraries and technologies that can be used to implement the project;
- to use the selected technologies and be able to combine them in solving the assigned task;
- apply modern guidelines for code style and architecture;
- to build activities based on the fulfillment of technological requirements and standards, to adhere to legal and ethical standards adopted in professional activities;
- to draw up and present the results of the work performed.

master:

- Skills to search for technical documentation for various technologies and libraries;
- the skill of converting technical specifications for a project into specific tasks for implementation.

4. Content of the course (training module), structured by topics (sections), indicating the number of allocated academic hours and types of training sessions

4.1. The sections of the course (training module) and the complexity of the types of training sessions

№	Topic (section) of the course	Types of training sessions, including independent work			
		Lectures	Seminars	Laboratory practical	Independent work
1	Preparatory stage			15	30
2	Review and analysis of modern tools and technologies			15	30
3	Implementation of the project			15	30
4	Results presentation			15	30
5	Preparatory stage			15	30
6	Review and analysis of modern tools and technologies			15	30
7	Implementation of the project			15	30
8	Results presentation			15	30
AH in total				120	240
Exam preparation		0 AH.			
Total complexity		360 AH., credits in total 8			

4.2.   Content of the course (training module), structured by topics (sections)

Semester: 5 (Fall)

1. Preparatory stage

Acquaintance with the topic and goals of the practice. Selection of individual projects by students, development of technical specifications.

2. Review and analysis of modern tools and technologies

Study of available technologies, tools, libraries for project implementation. Selection and justification of the technologies used. Formulation of tasks for the implementation of the project. Planning the timing of their implementation.

3. Implementation of the project

Work directly on the implementation of the project: writing the source code C++, deploying the application on the cloud platform.

4. Results presentation

Preparation of a report on the work performed in presentation format, presentation of a report at the final lesson.

Semester: 6 (Spring)

5. Preparatory stage

Selection of individual projects by students, development of technical specifications.

6. Review and analysis of modern tools and technologies

Study of available technologies, tools, libraries for project implementation. Selection and justification of the technologies used. Formulation of tasks for the implementation of the project. Planning the timing of their implementation.

7. Implementation of the project

Work directly on the implementation of the project: writing the source code Python, deploying the application on the cloud platform.

8. Results presentation

Preparation of a report on the work performed in presentation format, presentation of a report at the final lesson.

5. Description of the material and technical facilities that are necessary for the implementation of the educational process of the course (training module)

Classroom with a projector.

6. List of the main and additional literature, that is necessary for the course (training module) mastering

Main literature
1. Подготовка и защита бакалаврской работы, магистерской диссертации, дипломного проекта [Электронный ресурс], учеб. пособие / Ю. Н. Новиков. — СПб., Лань, 2019.— URL: https://e.lanbook.com/book/122187 (дата обращения: 29.01.2021). - Полный текст (Режим доступа : из сети МФТИ / Удаленный доступ)

Additional literature

1. Искусство писать научные статьи, научно-практическое руководство / Е. З. Мейлихов. — Долгопрудный, Интеллект, 2020.— URL: http://books.mipt.ru/book/301312 (дата обращения: 18.12.2020). - Полный текст (Режим доступа : из сети МФТИ / Удаленный доступ)

7. List of web resources that are necessary for the course (training module) mastering

Not used

8. List of information technologies used for implementation of the educational process, including a list of software and information reference systems (if necessary)

Software: Any Python integrated development environment (for example: PyCharm).

9. Guidelines for students to master the course

The basis of the content of the student's independent work during the implementation of the project is the development of various technologies in the field of developing web applications, writing the source code to implement the assigned task, deploying and configuring the application on a remote server. When completing an individual assignment, the student must combine practical work on the subject of the assignment with a theoretical study of the issue using the recommended information resources.

Assessment funds for course (training module)

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1. Competencies formed during the process of studying the course

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	ПК-1.3 Apply theoretical and/or experimental research methods to a specific scientific task and interpret the obtained results

2. Competency assessment indicators

As a result of studying the course the student should:

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master:
- Skills to search for technical documentation for various technologies and libraries;
- the skill of converting technical specifications for a project into specific tasks for implementation.

3. List of typical control tasks used to evaluate knowledge and skills

Not provided.

4. Evaluation criteria

5th semester:

1. News feed website
A news parser which works on grouping similar news categories together and from several journals and platforms such as: bbc, reuters, skynews and others.
Implementation was using Flask framework, JavaScript, HTML/CSS and Docker.
Users are able to like, dislike, signup, login and save posts to their profiles.
2. Bike sharing service
Aims to provide affordable, auto-managed renting options, designed specifically for students in Phystech, but can also be generalized and easily scaled to any university. It supports balance top-up, bike selection and scheduling (weekly based), ride gift cards. besides that it is offered as a mobile experience for users through a web app, with the same features from the original API but in a more handy and interactive interface.
3.A social media platform (similar to Facebook and Instagram)
Implemented by using Flask framework, HTML/CSS and Docker.
Users can: Log in to their account, see their personal information and modify them; Search for another person by name and add him to friends ; Send messages to friends ; Publish posts visible to friends; See news feed; Leave comments to visible posts
4.Online shop website using Flask and Python
The items of the website was parsed from various online stores such as bbcicecream.eu, palmangels.com. What was implemented: Login; Filters of different type of clothes(Shirt,tshirt,pants,accessories); Cart; Wishlist; Interactive front end design

6th semester:

1.Online shopping website
Develop a website for online shopping platform using Flask framework. The purpose of this system is to provide a facility to the different manufacturers for selling their products and to the customers for shopping online. Website should have 3 types of users with different functionality: Customer, Seller, Admin.
2.Social media website
Develop a website for social media platform using Flask framework. The purpose of this system is to provide a communication facility to the people. Website should have 2 types of users with different functionality: Admin, User.
3.Restaurant management website
Develop a website for restaurant management platform using Flask framework. The purpose of this system is to automate the daily activity of a restaurant and to provide a service facility both to the restaurant workers and to the customers. This restaurant management system website can be used by the employees in a restaurant to handle the clients, their orders, reservation and can help them easily find free tables or place orders. Website should have 2 types of users with different functionality: Admin, User.
4. Cars leasing website
Develop a website for car leasing platform using Flask framework. The purpose of this system is to provide a facility for automated car leasing. Website should have 2 types of users with different functionality: Admin, User.

excellent

10 comprehensive, systematized, deep knowledge of the curriculum of the discipline and the ability to confidently apply them in practice when solving specific problems, free and correct justification of decisions made;

9 systematic, deep knowledge of the curriculum of the discipline and the ability to confidently apply them in practice when solving specific problems, the correct justification of decisions made;

8 deep knowledge of the curriculum of the discipline and the ability to apply them in practice when solving specific problems, the correct justification of decisions made;

good

7 firmly knows the material, correctly and essentially sets out it, knows how to apply the knowledge gained in practice, but admits some inaccuracies in the answer or in solving problems;

6 knows the material, correctly presents it, knows how to apply the acquired knowledge in practice, but admits some inaccuracies in the answer or in solving problems;

5 knows the basic material, correctly presents it, knows how to apply the knowledge gained in practice, but admits inaccuracy in the answer or in solving problems;

satisfactorily

4 fragmented, fragmented nature of knowledge, insufficiently correct wording of basic concepts, violation of logical sequence in the presentation of program material, but at the same time he owns the main sections of the curriculum necessary for further training and can apply the acquired knowledge in the standard situation;

3 the nature of knowledge is sufficient for further training and can apply the acquired knowledge on the model in a standard situation;

unsatisfactory

2 does not know most of the main content of the curriculum of the discipline, makes gross errors in the wording of the basic concepts of the discipline and does not know how to correctly use the knowledge gained in solving typical practical problems.

1 does not know the wording of the basic concepts of the discipline and does not know how to use the knowledge gained in solving typical practical problems.

5. Methodological materials defining the procedures for the assessment of knowledge, skills, abilities and/or experience

Differentiated credit is carried out in the format of project protection. During the course, students can use the discipline program.