



Web technologies and development of web systems

Working program of the academic discipline (Syllabus)

Details of the academic discipline

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| Level of higher education | <i>First (undergraduate)</i> |
| Branch of knowledge | <i>12 Information technologies</i> |
| Specialty | <i>121 Software engineering</i> |
| Educational program | <i>Software Engineering of Multimedia and Information Retrieval Systems</i> |
| Discipline status | <i>Elective</i> |
| Form of education | <i>Daytime</i> |
| Year of training, semester | <i>3th year of training, 6th semester</i> |
| Scope of the discipline | <i>Lectures: 36 hours, computer workshop: 18 hours, independent work: 44 hours.</i> |
| Semester control/ control measures | <i>Assessment, modular control work, calendar control</i> |
| Lessons schedule | <i>According to the schedule for the fall semester of the current academic year (http://roz.kpi.ua/)</i> |
| Language of teaching | <i>English</i> |
| Information about head of the course / teachers | <i>Head of the course: Peschanskyi Vladyslav Yuriyovych, vladpeschansky@gmail.com</i> |
| Placement of the course | <i>Google classroom: https://classroom.google.com/c/NTkyNjg0ODg3ODc5?cjc=yssbkro</i> |

Program of educational discipline

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

The study of the discipline "Web technologies and development of web systems" allows students to develop the competencies necessary for solving practical tasks of professional activities related to the development of software for network and mobile systems.

The purpose of study of the discipline "Web technologies and development of web systems" formation of students' knowledge and skills in the development of web systems using modern web technologies, including HTML, CSS, JavaScript and other tools.

Subject of discipline "Web technologies and development of web systems" are technologies for developing software products for network and mobile systems using the Java Script and HTML languages.

Studying the discipline "Web technologies and development of web systems» forms professional competences (PC) in students of education, necessary for solving practical tasks of professional activity related to the development, improvement and support of intelligent information systems for processing multimedia data:

PC01 Ability to identify, classify and formulate software requirements.

PC03 Ability to develop software systems architectures, modules and components.

PC13 Ability to reasonably select and master software development and maintenance tools.

PC17 Ability to develop software for information retrieval systems.

PC19 Ability to develop software for multimedia and mulsemedia systems.

Program learning outcomes (PLO) according to the educational program:

PLO09 To be able to use collecting, formulating and analyzing software requirements methods and tools.

PLO15 To choose programming languages and development technologies to solve the problems of creating and maintaining software.

PLO18 To know and be able to apply information technology of processing, storage and transmission of data.

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

The successful study of the discipline "Web technologies and development of web systems" is preceded by the study of the disciplines "Programming. Part 1. Object-oriented programming and design patterns", "Fundamentals of computer systems and networks", "Databases", "Fundamentals of programming", "Algorithms and data structures", "Components of software engineering" of the bachelor's curriculum in the specialty 121 Software Engineering.

Theoretical knowledge and practical skills obtained during mastering the discipline "Web technologies and development of web systems" ensure the successful study of the disciplines "Software of multimedia systems", "Standardization and development technologies of multimedia and information-search software products", "Software of information-search systems", completion of pre-diploma practice, completion of course projects and diploma projects in the specialty 121 Software engineering .

Content of the academic discipline

The discipline "Web technologies and development of web systems" involves the study of the following topics:

Topic 1. Basics of web technologies: HTTP, HTML, CSS and JavaScript.

Topic 2. Development of the client part of web applications: JavaScript frameworks and libraries.

Topic 3. Introduction to server development: Nodejs, MongoDB.

Topic 4. Web servers and their configuration.

Topic 5. Development of the server part of web applications: client and server interaction, REST API.

Topic 6. Front-end frameworks and libraries: React

Topic 7. Web application testing: client and server side testing, automated testing.

4. Educational materials and resources

Basic literature:

1. Peschansky V. Materials of the course "Web technologies and development of web systems". Provided to registered students.

Additional literature:

2. Lei, K., Ma, Y. and Tan, Z., 2014, December. Performance comparison and evaluation of web development technologies in php, python, and node. js. In 2014 IEEE 17th international conference on computational science and engineering (pp. 661-668). IEEE.

3. Brown, E., 2019. Web development with node and express: leveraging the JavaScript stack. O'Reilly Media.

4. De Leeuw, JR, 2015. jsPsych: A JavaScript library for creating behavioral experiments in a Web browser. Behavior research methods, 47, pp. 1-12.

5. Carter, B., 2014, December. HTML Educational Node. js System (HENS): An Applied System for Web Development. In 2014 Annual Global Online Conference on Information and Computer Technology (pp. 27-31). IEEE.

6. Mikowski, M. and Powell, J., 2013. Single page web applications: JavaScript end-to-end. Simon and Schuster.

7. Yue, C. and Wang, H., 2009, April. Characterizing insecure JavaScript practices on the web. In Proceedings of the 18th international conference on World wide web (pp. 961-970).

8. Chaniotis, IK, Kyriakou, KID and Tselikas, ND, 2015. Is Node. js a viable option for building modern web applications? A performance evaluation study. Computing, 97, pp. 1023-1044.

Educational content

Methods of mastering an educational discipline (educational component)

| No | Type of training session | Description of the training session |
|----|--|--|
| 1 | Lecture 1. Introduction. Assessment of the level of knowledge. Basic classes in Javascript, HTML and CSS | Description of the discipline. Assessment of the level of prior knowledge. An introduction to the basics of Javascript, HTML and CSS. Tasks on self-study: item 6No1. |
| 2 | Lecture 2. Designing a website, installing the necessary software. | Defining the main points of designing your own website, installing Nodejs, npm, react, mongodb. Tasks on self-study: item 6No2. |
| 3 | Computer workshop 1 (part 1). Designing your own future | Designing your own future site, deciding on a theme, |

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| | <i>site</i> | <i>future features and approximate design. Tasks on self-study: item 6No3.</i> |
| 4 | <i>Lecture 3. Creating a local MongoDB database, connecting it to the created server, basic API.</i> | <i>Creating a local MongoDB database using Compass, connecting it to the created server using the mongod package, a basic API based on the Express framework. Tasks on self-study: item 6No4.</i> |
| 5 | <i>Lecture 4. Authorization on the backend using Passport.</i> | <i>Implementation of authorization on the backend using the Passport package. Tasks on self-study: item 6No5.</i> |
| 6 | <i>Computer workshop 1 (part 2). Creation of a presentation, activity diagrams and use cases based on the project.</i> | <i>1) Thesis describe use cases and features. 2) Draw a usage diagram (yes, users must have roles, such as admin, user). 3) Draw an approximate design (schematically). 4) Prepare the report in the form of a presentation. Tasks on self-study: item 6No6.</i> |
| 7 | <i>Lecture 5. Development of a basic interface using React.</i> | <i>Basic UI development using React. Creating a side menu. Basic concepts of single-page sites. Tasks on self-study: item 6No7.</i> |
| 8 | <i>Lecture 6. Implementations of authorization on the site.</i> | <i>Implementations of authorization on the site. Tasks on self-study: item 6No8.</i> |
| 9 | <i>Computer workshop 2 (part 1). Beginning of work on the frontend part.</i> | <i>Beginning of work on the frontend part. Creation of a basic project, installation of dependencies, creation of a template of the future interface. Tasks on self-study: item 6No9.</i> |
| 10 | <i>Lecture 7. Creation of a management system and user registration.</i> | <i>Creation of a management system and user registration. Connect to an existing API. Tasks on self-study: item 6No10.</i> |
| 11 | <i>Lecture 8. Creating a system of roles. Admin, User, Unregistered user.</i> | <i>Creating a system of roles. on the frontend with different levels of access to the displayed material. The following roles are provided: Admin, User, Unregistered user. Tasks on self-study: item 6No11.</i> |
| 12 | <i>Computer workshop 3 (part 1). Beginning of work on the backend part.</i> | <i>Beginning of work on the backend part. Creating a database, creating a basic API. Tasks on self-study: item 6No12.</i> |
| 13 | <i>Lecture 9. Designing entities</i> | <i>Design of entities for the main part of the site and their</i> |

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| | <i>for the main part of the site.</i> | <i>implementation in the database and REST API. Tasks on self-study: item 6/No13.</i> |
| 14 | <i>Lecture 10. Implementation of designed entities in the database and REST API.</i> | <i>Implementation of designed entities in the database and REST API. Tasks on self-study: item 6/No14.</i> |
| 15 | <i>Computer workshop 4 Module 1, frontend knowledge test.</i> | <i>Module 1, frontend knowledge test. Execution of the task issued for one day, on the implementation of a corresponding small exclusively front-end site. Tasks on self-study: item 6/No15.</i> |
| 16 | <i>Lecture 11. Creating a user interface on the site for displaying entities.</i> | <i>Creation of a user interface on the site for displaying entities. Tasks on self-study: item 6/No16.</i> |
| 17 | <i>Lecture 12. Special details of site design</i> | <i>Special details of the site design. Creating the main components of the user interface using Antd. Tasks on self-study: item 6/No17.</i> |
| 18 | <i>Computer workshop 5. Module 2, backend knowledge test.</i> | <i>Module 2, backend knowledge test. Execution of the task issued for the day, on the implementation of the corresponding database and API. Tasks on self-study: item 6/No18.</i> |
| 19 | <i>Lecture 13. Implementation of authorization through third-party systems (Google)</i> | <i>Implementation of authorization through third-party systems (Google) Tasks on self-study: item 6/No19.</i> |
| 20 | <i>Lecture 14. Implementation of Lazy Load</i> | <i>Implementation of Lazy Load Tasks on self-study: item 6/No20.</i> |
| 21 | <i>Computer workshop 3. (part 2). Continuation of work on own site.</i> | <i>Continuation of work on own site. Creation of the entire designed structure of the database. Tasks on self-study: item 6/No21.</i> |
| 22 | <i>Lecture 15. Use of Redux global storage, Context, Local Storage</i> | <i>Use of global storage such as Redux, Context, Local Storage to save sessions. Tasks on self-study: item 6/No22.</i> |
| 23 | <i>Lecture 16. Using the Atlas cloud storage</i> | <i>Using Atlas cloud storage to access stored data from any device. Tasks on self-study: item 6/No23.</i> |
| 24 | <i>Computer workshop 2 (part 2). Protection of the front-</i> | <i>Completion of work on the frontend. Protection of the</i> |

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| | <i>end part.</i> | <i>front-end part.</i> <i>Tasks on self-study: item 6No24.</i> |
| 25 | <i>Lecture 17. Hosting of the created website</i> | <i>Hosting of the created website for access to it from any device.</i> <i>Tasks on self-study: item 6No25.</i> |
| 26 | <i>Computer workshop 3 (part 3). Protection of the backend part.</i> | <i>Completion of work on the backend. Protection of the backend part.</i> <i>Tasks on self-study: item 6No26.</i> |

- **Independent work of a student/graduate student**

The discipline "Web technologies and development of web systems" is based on independent preparations for classroom classes on theoretical and practical topics.

| <i>Nos/p</i> | <i>The name of the topic submitted for independent processing</i> | <i>Number of hours</i> | <i>literature</i> |
|--------------|---|------------------------|-------------------|
| 1 | <i>Preparation for the lecture 1</i> | 2 | 1 |
| 2 | <i>Preparation for lecture 2</i> | 2 | 1 |
| 3 | <i>Preparation for computer workshop 1 (part 1)</i> | 3 | 1 |
| 4 | <i>Preparation for the lecture 3</i> | 2 | 1 |
| 5 | <i>Preparation for the lecture 4</i> | 2 | 1 |
| 6 | <i>Preparation for computer workshop 1 (part 2)</i> | 3 | 1 |
| 7 | <i>Preparation for the lecture 5</i> | 2 | 1 |
| 8 | <i>Preparation for the lecture 6</i> | 2 | 1 |
| 9 | <i>Preparation for computer workshop 2 (part 1)</i> | 3 | 1 |
| 10 | <i>Preparation for the lecture 7</i> | 2 | 1 |
| 11 | <i>Preparation for the lecture 8</i> | 2 | 1 |
| 12 | <i>Preparation for computer workshop 3 (part 1)</i> | 3 | 1 |
| 13 | <i>Preparation for the lecture 9</i> | 2 | 1 |
| 14 | <i>Preparation for lecture 10</i> | 2 | 1 |
| 15 | <i>Preparation for the computer workshop 4</i> | 3 | 1 |
| 16 | <i>Preparation for lecture 11</i> | 2 | 1 |
| 17 | <i>Preparation for lecture 12</i> | 2 | 1 |
| 18 | <i>Preparation for the computer workshop 5</i> | 3 | 1 |
| 19 | <i>Preparation for lecture 13</i> | 2 | 1 |
| 20 | <i>Preparation for lecture 14</i> | 2 | 1 |

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| 21 | <i>Preparation for computer workshop 3 (part 2)</i> | 3 | 1 |
| 22 | <i>Preparation for lecture 15</i> | 2 | 1 |
| 23 | <i>Preparation for lecture 16</i> | 2 | 1 |
| 24 | <i>Preparation for computer workshop 1 (part 2)</i> | 3 | 1 |
| 25 | <i>Preparation for lecture 17</i> | 2 | 1 |
| 26 | <i>Preparation for computer workshop 3 (part 3)</i> | 3 | 1 |
| 27 | <i>Preparation for modular test</i> | 5 | 1 |

- **Policy and control**

7. Policy of academic discipline (educational component)

Attending lectures is not mandatory.

Attending computer workshop classes may be occasional and for consultation/protection of computer workshop works.

Rules of behavior in classes: activity, respect for those present.

Adherence to the policy of academic integrity.

Rules for protecting the work of the computer workshop: the work must be done in accordance with the tasks set.

8. Types of control and rating system for evaluating learning outcomes (RSO)

During the semester, students perform 5 computer workshops. The maximum number of points for each computer workshop: 15 points.

Points are awarded for:

- quality of performance of the computer workshop: 0-14 points;*
- timely presentation of work for defense: 0-1 points.*

Performance evaluation criteria:

14 points – the work is done qualitatively, in full;

12-13 points – the work is done qualitatively, in full, but has shortcomings;

10-11 points – the work is completed in full, but contains minor errors;

1-9 points – the work is completed in full, but contains significant errors;

0 points - the work is not completed in full.

Criteria for evaluating the timeliness of work submission for defense:

Each week after the specified deadline subtracts one point from the maximum score.

The maximum number of points for performing and defending computer practicals:

RS = 15 points × 5 computers. practice = 75 points.

The modular test consists of 1 theoretical question and 1 practical task. The maximum number of points for a theoretical question is 10 points.

Evaluation criteria for a theoretical question:

Assessment criteria for the practical task:

10 points – the answer is correct, complete, well-argued;
6-9 points - in general, the answer is correct, but has shortcomings;
1-5 points – there are significant errors in the answer;
0 points - there is no answer or the answer is incorrect.

The maximum number of points for a practical task is 15 points.

Assessment criteria for the practical task:

14–15 points – the answer is correct;
12–13 points – the answer is generally correct, but has flaws;
9–11 points – there are significant errors in the answer;
0 points - there is no answer or the answer is incorrect.

$R = R_S = R_{\text{comp. practical}} + R_{\text{modular test}} = 75 \text{ points} + 25 \text{ points} = 100 \text{ points}.$

Semester control: credit

Conditions for admission to the semester control: with a semester rating (RC) of at least 60 points and the enrollment of all computer practical work, the student receives credit "automatically" according to the table (Table of correspondence of rating points to grades on the university scale). Otherwise, he must retake practicals until he reaches 60.

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

| Scores | Rating |
|------------------------------|------------------|
| 100-95 | Perfectly |
| 94-85 | Very good |
| 84-75 | Fine |
| 74-65 | Satisfactorily |
| 64-60 | Enough |
| Less than 60 | Unsatisfactorily |
| Admission conditions not met | Not allowed |

Working program of the academic discipline (syllabus):

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Adopted by Computer Systems Software Department (protocol № 8 from 25.01.23)

Approved by the Faculty Board of Methodology (protocol № 6 from 27.01.23)