

# JAVA-BASED WEB APPLICATIONS

## COURSE SYLLABUS

<b>Code and name of specialty</b>	121 Software Engineering	<b>Institute / faculty</b>	Faculty of Computer Science and Software Engineering
	122-Computer Science		
	126-Information Systems and technologies		
<b>Program name</b>	Software Engineering	<b>Department</b>	Software Engineering and Management Information Technologies
	Computer Science and Intelligent Systems		
	Information Systems Software		
<b>Type of program</b>	Educational and Professional	<b>Language of instruction</b>	Ukrainian, English

## LECTURER

**Full name, e-mail**

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**Ph.D., Associate Professor, Associate Professor of Software Engineering and Information Technology Management. Has prepared and published more than 40 publications, 1 article in publications indexed in Scopus, 2 textbooks, 2 guidelines for making practice tasks.**  
**h-index = 3, i10-index = 0 y Google Academy-[https://scholar.google.com/citations?user= OAzyFg8AAAAJ&hl=ru](https://scholar.google.com/citations?user=OAzyFg8AAAAJ&hl=ru); identifier ORCID-[https://orcid.org/ 0000-0002-3361-3212](https://orcid.org/0000-0002-3361-3212)).**  
**Leading lecturer of the courses:** Advanced Java programming course (*Bachelors*) (*Ukrainian*), Java-based web applications (*Bachelors*) (*Ukrainian*), Architecture and Design of Software (part 1) (*Bachelors*) (*English and Ukrainian*), Architecture and Design of Software (part 2) (*Bachelors*) (*English and Ukrainian*).

## GENERAL DESCRIPTION OF THE COURSE

**Summary**

The discipline «Java-based web applications» is study discipline from the cycle “Optional student disciplines of the profile training” of preparation level "bachelor" on specialty 126 “Information Systems and Technologies”. It is taught in the fifth semester in the amount of 90 hours (3 ECTS credits), in particular: lectures - 16 hours, laboratory classes - 32 hours, independent work - 42 hours. Final control – credit. Teaching the discipline provides the development of a system of knowledge and practical skills necessary for a modern Java-developer to work in projects to create web applications of varying complexity and purpose.

<b>Course objectives</b>	The course objective is to provide the knowledge needed to create, debug and deploy web applications created using Java, including Servlets, Java Server Pages, Java Standard Tag Library, session management, cookie management, and e-mail organization through Google Mail, practice skills of creating and deploying web projects worked with client-server databases.						
<b>Types of classes and control</b>	Lectures, laboratory classes, consultations. Final control – credit.						
<b>Terms</b>	5						
<b>Student workload (credits) / Type of course</b>	5 / Selective	<b>Lectures (hours)</b>	16	<b>Workshops (hours)</b>	32	<b>Independent work (hours)</b>	42
<b>Program competencies</b>	<p>121-GC 2. Ability to apply knowledge in practical situations.</p> <p>121-PC15. Ability to develop architectures, modules and components of software systems.</p> <p>121-PC19. Knowledge of information data models, the ability to create software for data storage, retrieval and processing.</p> <p>121-PC20. Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.</p> <p>121-PC26. Ability to algorithmic and logical thinking.</p> <p>122-GC1. Ability to abstract thinking, analysis and synthesis.</p> <p>122-GC2. Ability to apply knowledge in practical situations.</p> <p>122-GC6. Ability to learn and master modern knowledge.</p> <p>122-GC7. Ability to search, process and analyze information from various sources.</p> <p>122-GC8. Ability to generate new ideas (creativity).</p> <p>122-PC3. Ability to think logically, build logical conclusions, use formal languages and models of algorithmic calculations, design, develop and analyze algorithms, evaluate their efficiency and complexity, solvability and insolvability of algorithmic problems for adequate modelling of subject areas and creation of software and information systems.</p> <p>122-PC8. Ability to design and develop software using different programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, methods and algorithms of calculations, data structures and management mechanisms.</p> <p>122-PC10. Ability to apply methodologies, technologies, and tools to manage the life cycle processes of information and software systems, information technology products and services according to customer requirements.</p> <p>122-PC12. Ability to ensure the organization of computational processes in information systems of various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.</p> <p>126-GC 1. Ability to abstract thinking, analysis and synthesis.</p> <p>126-GC 2. Ability to apply knowledge in practical situations.</p> <p>126-GC 3. Ability to understand the subject area and professional activity.</p> <p>126-GC 5. Ability to learn and master modern knowledge.</p> <p>126-PC 1. Ability to analyze the object of design or operation and its subject area.</p> <p>126-PC 4. Ability to design, develop and use tools for the implementation of information systems, technologies and infocommunications (methodological, informational, algorithmic, technical, software and others).</p>						

<p><b>Learning outcomes</b></p>	<p>121-PO13. Know and apply methods of algorithm development, software design and data and knowledge structures.</p> <p>121-PO17. Be able to apply methods of component software development.</p> <p>121-PO18. Know and be able to apply information technology processing, storage and transmission of data.</p> <p>121-PO23. Be able to document and present the results of software development.</p> <p>122-PLO9. Develop software models of subject areas, choose a programming paradigm from the standpoint of convenience and quality of its application to implement methods and algorithms that solve problems in the computer science field.</p> <p>122-PLO10. Use tools for developing client-server applications, design conceptual, logical, and physical models of databases, develop and optimize database queries, create distributed databases, repositories and showcases of databases, and knowledge bases, including those based on cloud services, using web programming languages.</p> <p>126-PLO 3. To use basic knowledge of informatics and modern information systems and technologies, programming skills, technologies of safe work in computer networks, methods of creation of databases and Internet resources, technologies of development of algorithms and computer programs in high-level languages with application of project-oriented programming to solve problems of design and use of information systems and technologies.</p> <p>126-PLO 4. Conduct a systematic analysis of design objects and justify the choice of structure, algorithms and methods of information transfer in information systems and technologies.</p> <p>126-PLO 6. Demonstrate knowledge of the current level of information systems technology, practical skills of programming and use of applied and specialized computer systems and environments for their implementation in professional activities.</p> <p>126-PLO 7. Justify the choice of technical structure and develop appropriate software that is part of information systems and technologies.</p>
<p><b>Teaching and learning methods</b></p>	<p>The main method of teaching during lectures is the explanatory-illustrative method. To intensify cognitive activity, students' speeches and organization of discussions on certain issues of lectures are provided. The course of laboratory works implements a project approach to learning. This involves the creation from class to class of a web application in Java on an individual topic, which implements the manipulation of data stored in the client-server database using web pages.</p>
<p><b>Forms of assessment (continuous assessment CAS, final assessment FAS)</b></p>	<p>Assimilation of the theory is tested in the form of a rapid survey during lectures (CAS), a survey or automated testing at the beginning of laboratory work (CAS). Control of mastering the material for self-study involves the preparation and defense of abstracts on individual topics (2 abstracts) (CAS). The level of practical skills is tested in laboratory work, which is mainly performed on an individual basis (CAS). Final / semester control is carried out in the form of a test, which involves the development of a web application for an individual task in a limited time (FAS)</p>

## ASSESSMENT AND GRADING

Ranges of points corresponding to grades	Total score (points) for all types of learning activities	ECTS grading scale	The national grading scale	Allocation of grade points	Assimilation of theory (topics of independent work)	30 points
	90-100	A	excellent		Working out the tasks of the laboratory workshop	50 points
	82-89	B	good			
	74-81	C				
	64-73	D	satisfactory		Passing credit	20 points
	60-63	E				
	35-59	FX	Unsatisfactory (with the exam retake option)		Summary	100 points
	0-34	F	Unsatisfactory (with mandatory repetition of the course)			

### Course policy

Students are required to attend classes according to the schedule. In the absence of a student at the lecture, he works out a syllabus of lectures before the next lesson. Participation in laboratory work involves the need to repeat the lecture material and self-study of recommended sources. At the beginning of the laboratory there is an experience of students for the materials of lectures and independent work. Performing laboratory tasks requires prior preparation and advance processing of all necessary materials for productive discussions during the lesson and their operational implementation. All laboratory work is required to obtain a final grade in the discipline. An important element of training is the need to adhere to the schedule of presentation of laboratory results and abstracts. For delay in execution without an officially confirmed reason, the score is reduced.

## COURSE STRUCTURE AND CONTENT

### Topic 1

Basics of developing web applications used Java. Purpose and current state of development of Java EE technologies. Construction of a typical Web-application and a stack of technologies for its creation. A typical scheme for creating and deploying web applications in Java. (2 hour)

### Laboratory class 1

Research of technology stack of Java to create web applications. (4 hour) (PT78)

### Independent work

Learn the features of installing software components according to the selected stack of web application development technologies in Java.

<b>Topic 2</b>	Servlets. Purpose and life cycle of servlets. Methods of servlets, features of creation. Principles of application of servlets. Interfaces for storing query and response parameters. Servlet context. Transfer parameters to servlets. Servlet addressing settings. Servlet redirect and forward. (2 hour)	<b>Laboratory class 2</b>	Research of principles of application of servlets for creation of web pages. (4 hour) (PT78)	Development of a servlet life cycle diagram. Development of a diagram of the web application development process.
<b>Topic 3</b>	Java Server Pages (JSP). Purpose, structure, syntax and life cycle of JSP. Organization of interaction of servlets and JSP. Features of construction and debugging of projects with JSP. (2 hour)	<b>Laboratory class 3</b>	Research of principles of work with JSP. (6 hour) (PT79)	Development of JSP life cycle diagram. Development of the diagram of interaction of servlets and JSP.
<b>Topic 4</b>	The purpose of JSTL. Purpose and characteristics of JSTL tag groups. Expression Language (EL). Features of data acquisition in EL constructions. (2 hour)	<b>Laboratory class 4</b>	Research of principles of use of EL and JSTL at creation of JSP. (4 hour) (PT79)	Typical examples of JSTL applications for various purposes. Advantages of using JSTL.
<b>Topic 5</b>	Development of web applications for working with databases. Typical project structure for working with relational databases. Schemes of interaction of components of the Java web application at implementation of data manipulation. Use Maven to reduce costs when developing web applications. (4 hour)	<b>Laboratory class 5</b>	Research of principles of creation of web applications for work with databases. (6 hour) (PT80)	The structure of web application projects according to the stack of development technologies.
<b>Topic 6</b>	Purpose of ServletFilter, typical situations of their using. Java components for working with sessions and cookies. Java components for maintaining system logs. (2 hour)	<b>Laboratory class 6</b>	Research of components for implementation of authentication and support of sessions. (4 hour) (PT81)	Analysis of the features of personalization and data protection in well-known typical web applications.
<b>Topic 7</b>	Java Mail Service as a component of Java EE. Basic concepts for organizing email sending. Implementation of Java mailing via Google. (2 hour)	<b>Laboratory class 7</b>	Research of Java components for the organization of e-mail sending. (4 hour) (PT82)	Options for organizing e-mail.

## RECOMMENDED READING

### Compulsory

- 1 Java EE 8 specifications. [Electronic resource]. Access mode: <https://www.oracle.com/java/technologies/java-ee-8.html>
- 2 Sahin Kevin. (2020). The Java Web Scraping Handbook. ScrapingBee, 115 p.
- 3 Wagner Gerd, Diaconescu Mircea. (2017). Building Back-End Web Apps with Java, JPA and JSF. web-engineering. info, 161 p.
- 4 Murach Joel, Urban Michael. (2014). Murach's Java Servlets and JSP, 3rd Edition. Mike Murach & Associates, 758 p.
- 5 Basham, B., Sierra, K., Bates, B. (2008). Head First Servlets and JSP. Second Edition. O'Reilly Media, Inc., 498 p.
- 6 Layka Vishal. (2014). Learn Java for Web Development: Modern Java Web Development 1st ed. Edition. Apress, 489 p.
- 7 Hunter Jason, Crawford William. (2001). Java Servlet Programming: Help for Server Side Java Developers (Java Series) Second Edition. O'Reilly Media, 782 p.
- 8 Kishori Sharan. (2014). Beginning Java 8 APIs, Extensions and Libraries: Swing, JavaFX, JavaScript, JDBC and Network Programming APIs (Expert's Voice in Java). 1st Edition. Apress, 808 p.
- 9 Deepak, V. (2012). Java EE Development with Eclipse. Birmingham: Packt Publishing Ltd., 409 p.

### Recommended

#### INFORMATION RESOURCES IN INTERNET

- 1 Jakarta E. E. [Guidlins on Java EE \(metanit.com\)](https://metanit.com/java/javaee/). [Electronic resource]. Access mode: <https://metanit.com/java/javaee/>
- 2 Jsp Tutorials. Java Servlet. [Electronic resource]. Access mode: <https://o7planning.org/10979/servlet-jsp>.
- 3 Lesson: JDBC Basics. [Electronic resource]. Access mode: <https://docs.oracle.com/javase/tutorial/jdbc/basics/index.html>
- 4 <https://www.javaguides.net/>
- 5 <https://www.javatpoint.com/>

## ACADEMIC INTEGRITY

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to show discipline, politeness, friendliness, honesty, responsibility

The content of this syllabus is consistent with the course program.