



MOBILE APPLICATION DEVELOPMENT

Syllabus

Details of the academic discipline

Level of higher education	<i>First (Bachelor)</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>Selective</i>
Form of education	<i>Full-time</i>
Year of training, semester	<i>3rd year of training, 5th semester</i>
Scope of the discipline	<i>Lectures: 36 hours, computer workshop: 18 hours, independent work: 66 hours.</i>
Semester control/ control measures	<i>Credit, modular control work, calendar control</i>
Lessons schedule	<i>According to the schedule for the autumn semester of the current academic year (http://roz.kpi.ua/)</i>
Language of teaching	<i>English</i>
Information about the course leader / teachers	<i>Lecturer: Ph.D., associate professor, O. A. Tkachenko, Laboratory work: Ph.D., associate professor, O. A. Tkachenko, e-mail: aatokg@gmail.com</i>
Placement of the course	<i>Google classroom. Access is granted to registered students.</i>

Program of educational discipline

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

Studying the discipline "Mobile Application Development" allows students to develop the competencies necessary for working with modern software, a systematic approach to solving engineering and technical problems using a PC, searching and processing information using modern technologies. Mastering the capabilities and tools of developing applications for mobile applications is a key task of the discipline.

The purpose *studying the discipline "Mobile Application Development" is the formation of students of a modern level of information and computer culture, knowledge of the structure and principles of building technologies for creating applications based on modern mobile platforms, used in computer systems, and being able to draw correct conclusions from the information received.*

Subject *the discipline "Mobile Application Development" is information technologies for ensuring the processes of development and improvement of mobile software applications.*

Studying the discipline "Mobile Application Development" strengthens the professional competences (PC) in students, necessary for solving practical tasks of professional activity:

PC01 *Ability to identify, classify and formulate software requirements.*

PC08 *Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.*

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.*

Studying the discipline "Mobile Application Development" contributes to the formation of program learning outcomes (PLO) for students according to the educational program:

PLO01 To analyze, purposefully search and select the necessary information and reference resources and knowledge to solve professional problems, taking into account modern advances in science and technology.

PLO08 To know and to be able to develop a human-machine interface.

PLO12 To apply effective approaches to software design in practice.

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.

PLO19 To know and be able to apply software verification and validation methods.

PLO30 To be able to apply programming technologies for multimedia and information retrieval systems software development.

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 "Mobile Application Development" is preceded by the study of the disciplines "Mathematical support of multimedia and information retrieval systems", "Algorithmic support of multimedia and information retrieval systems", "Programming", "Software Engineering Components" of the curriculum of bachelor's training in the specialty F2 Engineering Software.

Theoretical knowledge and practical skills obtained during the study of the discipline "Mobile Application Development" ensure the successful completion of course projects and diploma projects in the specialty F2 Software Engineering.

3. Content of the academic discipline

The discipline "Mobile Application Development" involves the study of the following topics:

Topic 1. Basic concepts of the Android OS. Basic Android application development tools

Topic 2. Creating a user interface

Topic 3. Databases and work with files

Topic 4. Providers and receivers of content. Graphics and animation

Modular control work

Credit

4. Educational materials and resources

Basic literature:

1. Android developer guides. <https://developer.android.com/guide>

2. CREATE YOUR FIRST APP FOR ANDROID: <http://mikrotik.kpi.ua/index.php/courses-list/android/39-create-your-first-app-for-android>.

3. Software Development Studio: Guide to Laboratory Work/O. Tkachenko - K.: HAY, 2021. - 32 p.

4 C. Ullenboom. Java: The Comprehensive Guide to Java Programming for Professionals. - Rheinwerk Computing, 2022. - 1128p.

5 Dennis A., Wixom B., Tegarden D. Systems Analysis and Design : An Object-Oriented Approach with UML. Hoboken, USA : Wiley, 2020. 544 p.

Additional literature:

6. Petzold C. Creating Mobile Apps with Xamarin.Forms. - WWW: <https://developer.xamarin.com/guides/xamarin-forms/creating-mobile-apps-xamarin-forms/>

7. Troelsen A. Pro C# 2010 and the .NET 4.0 Platform / A. Troelsen. WWW: <http://www.apress.com/book/view/9781430225492>

8. Kotlin. <https://kotlinlang.org/>

9. Android developer guides. <https://developer.android.com/guide>.

Use to master the practical skills of the discipline. The materials are freely available on the Internet.

Educational content

5. Methods of mastering an educational discipline (educational component)

No.	Type of training session: Lecture	Description of the training session
<i>Topic 1. Basic concepts of the Android OS. Basic Android application development tools</i>		
1	<i>Lecture 1. Overview of mobile operating systems and programming languages for mobile platforms.</i>	<i>Overview of modern mobile operating systems Overview of programming languages for mobile platforms. Java is a programming language for mobile platforms. Task for self-training: item 6 #1.</i>
2	<i>Computer workshop 1. Basic constructions of the Java language.</i>	<i>Task: Develop an application using the basic constructions of the Java language. Task for self-training: item 6 #2.</i>
3	<i>Lecture 2. Android platform architecture. Android application components.</i>	<i>Architecture of the Android platform. Android application components. Java Virtual Machine. Android SDK versions and compatibility Task for self-training: item 6 #3.</i>
4	<i>Lecture 3. Integrated mobile application development environments. Resources and localization of the mobile application.</i>	<i>Integrated development environments Android Studio. Project structure in Android Studio. Resources and localization. Running the application on an emulator and a mobile device. Task for self-training: item 6 #4.</i>
5	<i>Computer workshop 2. Resources</i>	<i>Task: Develop an application in the AndroidStudio environment using resources. Implement localization. Task for self-training: item 6 #5.</i>
6	<i>Lecture 4. The process of building Android applications. The Activity component and its lifecycle.</i>	<i>Application manifest file. The process of building Android applications. The Activity component of the Android platform. The application life cycle. Task for self-training: item. 6 # 6.</i>
<i>Topic 2. Creating a user interface</i>		
7	<i>Lecture 5. Basics of creating a user interface. Layouts. Controls.</i>	<i>The basics of creating a user interface. Building a layout of the user interface. Layout Managers. Controls. Task for self-training: item 6 #7.</i>
8	<i>Computer workshop 3. Layouts</i>	<i>Task: Create a user interface using layouts. Task for self-training: item 6 #8.</i>

9	Lecture 6. Application GUI event handling. Lists and adapters.	Using controls and widgets Connecting listeners. Event handling. Creating lists and using adapters. Task for self-training: item 6 #9.
10	Lecture 7. Styles. Topics Menu.	Creating of Styles, Themes, Menu. Event handling when working with the menu. Creation of dialog boxes. Task for self-training: item 6 #10.
11	Computer workshop 4. Graphical user interface	Task: Handle events in the graphical user interface. Task for self-training: item 6 #11.
12	Lecture 8. Services. Work in the background mode.	Work in the background. Creation, launch and management of the service. Connecting services with activities. Task for self-training: item 6 #12.
13	Lecture 9. Use of Intents.	Intents, their purpose and varieties. Developing of an application with multiple activities, switching between them, and exchanging data. Task for self-training: item 6 #13.
<i>Topic 3. Databases and work with files</i>		
14	Lecture 10. Databases and data sources. DBMS SQLite	Databases and data sources. Working with SQLite databases. Cursors and the ContentValues class. Using SQLiteOpenHelper. Execution of requests to the database. Task for self-training: item 6 #14.
15	Lecture 11. Built-in content providers.	The content provider as an intermediary between the data-providing application components and the database. Standard data sources in Android (MediaStore, ContactsContract, Calendar). Task for self-training: item 6 #15.
16	Computer workshop 5. Adapters and Intents. (Part 1)	Task: Develop an application using Adapters Task for self-training: item 6 #16.
17	Lecture 12. Data storage. Work with files.	Data and file storage in mobile applications. Organization of access to files. Internal and external data storage. Task for self-training: item 6 #17.
18	Lecture 13. Creating multi-threaded applications. Concept of process.	Work with threads of execution. Create, launch, and manage execution threads in a mobile application. Concept of process. Process life cycle. Types of processes. Task for self-training: item 6 #18.
19	Computer workshop 6. Adapters and Intents. (Part 2)	Task: Develop an application using Intents. Task for self-training: item 6 #19.

<i>Topic 4. Providers and receivers of content. Graphics and animation</i>		
<i>20</i>	<i>Lecture 14. Broadcast receivers.</i>	<i>Broadcast Receivers: Creating and Using Intentions. Types of broadcasts. Task for self-training: item 6 #19.</i>
<i>21</i>	<i>Lecture 15. Creating a ContentProvider and ContentResolver</i>	<i>Mandatory and optional methods of the own content provider. Registration of the content provider in the manifest. ContentResolver as an intermediary between the content provider object and client requests Task for self-training: item 6 #20.</i>
<i>22</i>	<i>Computer workshop 7. Work with Menu and DB (Part 1)</i>	<i>Task: Create a menu. Use built-in content providers in the application. Task for self-training: item 6 #22.</i>
<i>23</i>	<i>Lecture 16. Graphics in Android</i>	<i>API for creating 2D graphics: declarative, high-level and low-level. Vector and raster graphics. Task for self-training: item 6 #23.</i>
<i>24</i>	<i>Lecture 17. Animation in Android</i>	<i>The concept of material design. Types of animation in Android: step-by-step, transformations, fragments. Animator class. Animation API. Task for self-training: item 6 #24.</i>
<i>25</i>	<i>Lecture 18. Support and further development of mobile applications.</i>	<i>Support and further development of mobile applications. Software testing and documentation. Implementation of developed mobile applications. Functionality update and software promotion. Task for self-training: item 6 #25.</i>
<i>26</i>	<i>Computer workshop 8. Work with Menu and DB (Part 2)</i>	<i>Task: Work with SQLite. Adding and deleting rows in SQLite database, grouping, sorting, selection of data by condition Task for self-training: item 6 #26.</i>
<i>27</i>	<i>Test</i>	<i>Task for self-training: item 6 #27.</i>
<i>Modular control work</i>		

6. Independent work of a student/graduate student

The discipline "Mobile Applications Development" is based on independent preparations for classroom classes on theoretical and practical topics.

No. z/p	The name of the topic submitted for independent processing	Number of hours	literature
1	Preparation for the lecture 1	2	4; 5;
2	Preparation for the computer workshop 1	3	4; 5;
3	Preparation for lecture 2	2	1; 2; 3;
4	Preparation for the lecture 3	2	1; 2; 3;
5	Preparation for the computer workshop 2	3	1; 2; 3;
6	Preparation for the lecture 4	2	1; 2; 3;
7	Preparation for the lecture 5	2	1; 2; 3;
8	Preparation for the computer workshop 3	3	1; 2; 3;
9	Preparation for the lecture 6	2	1; 2; 3;
10	Preparation for the lecture 7	2	1; 2; 3;
11	Preparation for the computer workshop 4	3	1; 2; 3;
12	Preparation for the lecture 8	2	1; 2; 3;
13	Preparation for the lecture 9	2	1; 2; 3;
14	Preparation for lecture 10	2	1; 2; 3;
15	Preparation for lecture 11	2	1; 2; 3;
16	Preparation for the computer workshop 5	4	1; 2; 3;
17	Preparation for lecture 12	2	1; 2; 3;
18	Preparation for lecture 13	2	1; 2; 3;
19	Preparation for the computer workshop 6	4	1; 2; 3;
20	Preparation for lecture 14	2	1; 2; 3;
21	Preparation for lecture 15	2	1; 2; 3;
22	Preparation for the computer workshop 7	4	1; 2; 3;
23	Preparation for lecture 16	2	1; 2; 3;
24	Preparation for lecture 17	2	1; 2; 3;
25	Preparation for lecture 18	2	1; 2; 3;
26	Preparation for the computer workshop 8	4	1; 2; 3;
27	Preparation for the test	2	1-4

Policy and control

7. Policy of academic discipline (educational component)

Attending lectures is 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, turning off phones.

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 and according to the option.

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

During the semester, students perform 8 computer workshops.

The maximum number of points for laboratory works 1-4 is 10 points each, for two works 5 and 6 - a total of 10 points, for two works 7-8 - a total of 10 points.

Criteria for evaluating the quality and timeliness of work:

- quality of work performance: 0-8 points;*
- timely presentation of work for defense: 0-2 points.*

Performance evaluation criteria:

7-8 points - the work is done with quality, in full;

5-6 points - the work is done qualitatively, in full, but has flaws;

3-4 points - the work is completed in full, but contains minor errors;

1-2 points - the work is completed in full, but contains significant errors;

0 points - the work is not done well, not in full.

Criteria for evaluating the timeliness of work submission for defense:

2 points - the work is submitted for the defense no later than 1 day after the specified deadline;

0 points - the work is submitted for defense more than 1 day later than the specified deadline.

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

10 points x 4 comp. practice + 5 points x 4 comp. practice = 60 points.

The assignment for the modular test consists of 40 test questions. Answer to each question is worth 1 point.

Evaluation criteria for test questions:

1 point - the answer is correct;

0 points - there is no answer or the answer is incorrect.

The maximum number of points for a modular control work:

1 point x 40 questions = 40 points.

The rating scale for the discipline is equal to:

$R = 60 \text{ points} + 40 \text{ points} = 100 \text{ points}.$

Calendar control: is conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements.

At the first certification (7th week), the student receives "credited" if his current rating is at least 15 points (50% of the maximum number of points a student can receive before the first certification).

At the second certification (13th week), the student receives "passed" if his current rating is at least 30 points (50% of the maximum number of points a student can receive before the second certification).

Semester control: assessment

Conditions for admission to semester control:

With a semester rating of at least 60 points and the completion of all computer lab work, the student receives credit "automatically" according to the table (Table of correspondence of rating points to grades on the university scale). Otherwise, he has to perform the final control work.

If the student does not agree with the "automatic" grade, he can try to improve his grade by writing a credit test, while his points received for the semester are kept.

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

<i>Scores</i>	<i>Rating</i>
00-95	Perfectly
94-85	Very good
84-75	Fine
74-65	Satisfactorily
64-60	Enough
Less than 60	Unsatisfactorily
Admission conditions not met	Not allowed

9. Additional information on the discipline (educational component)

The list of questions submitted for semester control is given in Appendix 1.

Working program of the academic discipline (syllabus):

Compiled by Ph.D., Associate Professor O.A. Tkachenko.

Adopted by Computer Systems Software Department (protocol № 8 from 22.01.2025)

Approved by the Faculty Board of Methodology (protocol № 8 from 03.02.2025)

Appendix 1. List of questions submitted for semester control

- 1. Android OS architecture. Java virtual machine.*
- 2. Development environments and programming languages for Android applications. Application manifest.*
- 3. Types of resources, resource identifiers and their use.*
- 4. Implementation of mobile application localization.*
- 5. Styles and themes of the mobile application.*
- 6. General characteristics of layouts. Their implementation is in the XML language.*
- 7. Lists and adapters.*
- 8. Types of menus in mobile applications.*
- 9. Handling of events in the graphic interface of the application.*
- 10. Activities. Activity life cycle.*
- 11. Intents. Explicit and implicit intents.*
- 12. Broadcast receivers and methods of their registration.*
- 13. Creation, launch and management of the service.*
- 14. Data storage. Work with files.*
- 15. Working with SQLite databases.*
- 16. Concept of content provider. Built-in and custom content providers.*
- 17. Concept of process. Process life cycle. Types of processes.*
- 18. Types of graphics in mobile applications.*
- 19. Types of animation in mobile applications.*