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высшего образования  
"Национальный исследовательский университет  
"Высшая школа экономики"**

Факультет компьютерных наук  
Департамент программной инженерии

**Рабочая программа дисциплины**  
НИС «Программная инженерия: тренды мобильной разработки»  
(на английском языке)  
Software Engineering: Mobile Development Trends

для образовательной программы «Системная и программная инженерия»  
направления подготовки 09.04.04 «Программная инженерия»  
уровень - магистр

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Одобрена на заседании департамента программной инженерии «\_\_»\_\_\_\_\_ 2016 г.  
Руководитель департамента Авдошин С.М. \_\_\_\_\_

Утверждена Академическим советом образовательной программы  
«\_\_»\_\_\_\_\_ 2016 г., № протокола \_\_\_\_\_

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Москва, 2016

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## 1 Course Description

### a. Title of the Course

The scientific seminar title is Software Engineering: Mobile Development Trends.

### b. Pre-requisites

Studying of the "Software Engineering: Mobile Development Trends" discipline is based on the following courses:

- Programming,
- Introduction to Software Engineering,
- Functional and Logic Programming,
- Data Bases,
- Program Verification,
- Quality Provision and Testing,
- Operating systems,
- Software Constructing,
- Algorithms and Data Structures,
- Foreign language (English),
- Basics of Mobile Application Development
- Software Engineering: Mobile Development Trends scientific seminar (part 1).

### c. Course Type

The course is compulsory.

### d. Abstract

The course introduces new trends in techniques, technologies and software used to build mobile applications. Topics include user interface changing trends, different approaches to developing mobile applications, using different tools and templates to increase development speed and more. During the seminar practice work students are given with a home assignment which is a software project containing one of the topics implementation. Topics are not repeated from student to student. There is an exam in the end of the seminar studies which consists of theory and practice questions.

## 2 Learning Objectives

The discipline goal is to make students aware of the latest mobile application development trends and force students to use one of them so as to get certain skills of implementing existing technologies into a mobile application to reach a purpose of the application.

Topics to be learnt and tasks to be solved to achieve the goal are:

- getting to know the latest versions of mobile operating systems and how exactly they differ from the previous ones;
- learning new ways and possibilities mobile application environments can give, including brand-new environments;
- studying extra techniques and ways of mobile application programming;
- getting skills in mobile application developing, analyzing and testing by using one of the seminar topics and implementing it into a project.



### 3 Learning Outcomes

As a result of studying the course a student is supposed:

*to know and be able to use:*

- the latest versions of mobile operating systems and their functionality;
- new approaches and opportunities of mobile application development;
- new software to create a mobile application;
- new programming languages;
- tricks and features of mobile development;

*to be able to:*

- implement and use some of the new trends of mobile application development in his/her own project;
- install and use different types of new mobile application development environments;
- make a research on new technologies in the area and prepare the research report as a presentation;
- make changes of a mobile application programming and xml code and understand ideas and code of the third party applications.

As a result of studying the course student develops the competencies shown in table 4.1.

Table 1 - Student competence description

Competence	Key	Descriptors	Forms and techniques of the study which lead to developing the competence
Being able to analyze, verify, evaluate fullness of the information found and retrieved from different sources during professional activities and add and synthesize lacking information if needed.	SC*-M6 (6)	Student shows ability to analyze, verify and evaluate the information given considering developing a mobile application and find the lacking information pieces if needed using different resources.	Attending lectures, working on homework tasks, attending laboratory works, communicating with colleagues and searching and studying information needed using internet resources during the self-study sessions.
Being able to create principally new ideas and products, being creative, initiative.	SPC*-M8 (PC-8)	Student shows ability to create an idea and put it into a new mobile application which is then developed using skills taken during the self-studies.	Attending lectures, preparing and solving different homework tasks, searching and studying information needed using internet resources.
Being able to work in a multidisciplinary team including international environment.	SPC-M9 (PC-9)	Student shows ability to communicate in an international environment and to explain his ideas to other team members, to share work needed to be done between colleagues and to be responsible for his/her particular part of the work.	Attending lectures, preparing and solving different homework tasks, working as a group, working on the project in a team, searching and studying information needed using internet resources.
Ability to plan, manage and control meeting requirements.	PC*-13	Student is able to develop a requirement set for the mobile application being developed and fulfill them.	Attending lectures, preparing and solving different homework tasks, searching and studying of information needed using internet resources.



Competence	Key	Descriptors	Forms and techniques of the study which lead to developing the competence
Ability to apply up-to-date software development technologies using automated systems of planning and management, ability to fulfill quality control of the software being developed.	PC-18	Student is able to control and follow the software development plan and can evaluate a quality of the developed software at any time so as to make changes if necessary.	Attending lectures, preparing and solving different homework tasks, searching and studying of information needed using internet resources.

\* SC - system competence, SPC - socially personal competence, PC - professional (instrumental) competence.

#### 4 Course Plan

Table 2 - Course topics

№	Topic	Total hours	Classroom activities	Self-study
			Seminars	
1.	The latest version of iOS: key features, difference from the previous version(s), UI changing and other trends.	18	3	15
2.	The latest version of Android: key features, difference from the previous version(s), UI changing and other trends.	18	3	15
3.	The latest version of Windows Phone: key features, difference from the previous version(s), UI changing and other trends.	18	3	15
4.	Voice recognition systems: Cortana. Technologies, implementations, software, changing, features etc.	22	4	18
5.	Voice recognition systems: Siri. Technologies, implementations, software, changing, features etc.	22	4	18
6.	Voice recognition systems: Google Now. Technologies, implementations, software, changing, features etc.	22	4	18
7.	IFA 2016: review and comparison: new hardware trends (smartphones, tablets, watch, TV), new software used.	20	4	16
8.	Tizen IDE. Basic features, abilities, difference from other environments, examples.	18	3	15
9.	Intel XDK. Cross-platform developing. Basic features, abilities, difference from other environments, examples.	18	3	15
10.	Intel System Studio 2016 (for Android). Basic features, abilities, difference from other	18	3	15



	environments, examples.			
11.	Marmalade SDK: mobile gaming application development. Basic features, abilities, difference from other environments, examples.	18	3	15
12.	Microsoft Visual Studio: the latest version, ability to create cross-platform applications, features, difference from other environments, examples.	18	3	15
13.	Android Studio: : the latest version, ability to create cross-platform applications, features, difference from other environments, examples.	18	3	15
14.	XCode and Swift: the latest versions and key features.	18	3	15
Total:		266	46	220

## 5 Reading List

### 5.1 Required

1. Android Application Development in 24 Hours, Sams Teach Yourself (4th Edition) [Text] / Carmen Delessio, Lauren Darcey, Shane Conder. - SAMS, 2015. - ISBN-13: 978-0672337390. ISBN-10: 0672337398.
2. Android Application Development All-in-One For Dummies, 2nd Edition [Text] / Barry Burd. - John Wiley & Sons Inc., 2015. ISBN-13: 978-1118973806. ISBN-10: 1118973801.
3. Google Android Developer Site [Electronic Resource] / Google Inc, 2016. - URL: <https://developer.android.com/samples/index.html>.
4. Neil Smyth. iOS 9 App Development Essentials: Learn to Develop iOS 9 Apps Using Xcode 7 and Swift 2 [Text] / CreateSpace Independent Publishing Platform, 2015.
5. Microsoft Visual Studio [Electronic Resource] / Microsoft, 2016. - URL: <https://www.visualstudio.com/en-us/dn469161>
6. Google Android Developer Site [Electronic Resource] / Google Inc, 2016. - URL: <https://developer.android.com/samples/index.html>
7. Tizen IDE [Electronic Resource] / Tizen Project, a Linux Foundation Project, 2012-2016. - URL: <https://developer.tizen.org/node/12>

### 5.2 Optional

8. Android Programming: The Big Nerd Ranch Guide (2nd Edition) [Text] / Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano. - Big Nerd Ranch, LLC, 2015. - ISBN-13: 978-0134171456. ISBN-10: 0134171454.
9. Head First Android Development (1st Edition) [Text] / Dawn Griffiths, David Griffiths. - O'Reilly Media, Inc., 2015. - ISBN-13: 978-1449362188. ISBN-10: 1449362184.



10. Android Application Development Cookbook - Second Edition [Text] / Rick Boyer, Kyle Mew. - Packt Publishing, 2016. - ISBN-13: 978-1-78588-619-5.
11. Eclipse IDE Site [Electronic Resource] / Developers of the site. 2016 - URL: <http://www.eclipse.org/>
12. Android Studio IDE Site [Electronic Resource] / Google Inc., 2016. - URL: <https://developer.android.com/develop/index.html>
13. Java SE Site [Electronic Resource] / Oracle Corporation, 2016. - URL: <http://www.oracle.com/technetwork/java/javase/overview/index.html>
14. Genymotion Emulator Site [Electronic Resource] / The site authors, 2016. - URL: <https://www.genymotion.com/>
15. Thinking in Java (4th ed.) [Text] // Bruce Eckel. - Prentice Hall, 2006.
16. Intel XDK [Electronic Resource] / The site authors, 2016. - URL: <https://software.intel.com/en-us/intel-xdk>
17. Intel System Studio 2016 [Electronic Resource] / The site authors, 2016. - URL: <https://software.intel.com/en-us/intel-system-studio>
18. Marmalade SDK [Electronic Resource] / Marmalade Technologies Ltd, 2016. - URL: <https://www.madewithmarmalade.com/platform/technicaldetails>
19. XCode 8 Beta [Electronic Resource] / Apple Inc., 2016. - URL: <https://developer.apple.com/xcode/>
20. Swift 3 [Electronic Resource] / Apple Inc., 2016. - URL: <https://swift.org/>
21. Resources of Apple Developer Website [Electronic Resource] / Apple Inc, 2016. - URL: <https://developer.apple.com/resources/>
22. IBM Bluemix Website [Electronic Resource] / IBM, 2016. - URL: <https://console.ng.bluemix.net/>
23. Microsoft Azure Website [Electronic Resource] / Microsoft, 2016. - URL: <https://azure.microsoft.com/en-us/>
24. Amazon Web Services Website [Electronic Resource] / Amazon Web Services, Inc. or its affiliates, 2016. - URL: [https://aws.amazon.com/?nc1=h\\_ls](https://aws.amazon.com/?nc1=h_ls)
25. Google Cloud Platform Website [Electronic Resource] / Google Inc, 2016. - URL: <https://cloud.google.com/>
26. PhoneGap [Electronic resource] / Adobe Systems Inc., 2016. - URL: <http://phonegap.com/>
27. Google Developer Console Website [Electronic Resource] / Google Inc., 2016. - URL: <https://console.developers.google.com>.
28. Official Google developers blog [Electronic Resource] / various authors and Google Inc., 2016. - URL: <http://googleblog.blogspot.com/search/label/Android>.
29. Official Android Blog [Electronic Resource] / various authors and Google Inc., 2016. - URL: <https://android.googleblog.com/>
30. Stackoverflow [Electronic resource] / Question-Answer blog platform with different users as authors. Site design and logo by Stack Exchange Inc., 2016. - URL: <http://stackoverflow.com/>
31. AppCode IDE [Electronic resource] / JetBrains, 2000 - 2016. - URL: <http://www.jetbrains.com/objc/>
32. Hackintosh [Electronic resource] / Hackintosh.com, 2016. - URL: <http://www.hackintosh.com/>
33. Apple Life forum [Electronic resource] / forum platform with different users as authors (language - russian), 2016. - URL: <https://applelife.ru/>



### 5.3 Dictionaries, wiki

1. Objective-C [Electronic resource] / Wikipedia – free encyclopedia. Different users as authors, last modified on September 14, 2016. – URL:  
<http://en.wikipedia.org/wiki/Objective-C>
2. Swift [Electronic resource] / Wikipedia – free encyclopedia. Different users as authors, last modified on September 17, 2016. – URL:  
[https://en.wikipedia.org/wiki/Swift\\_\(programming\\_language\)](https://en.wikipedia.org/wiki/Swift_(programming_language))

### 5.4 Software needed for students

Students need the following software installed to successfully study the course:

- Browsers: the latest versions of the Chrome, Opera, Firefox.
- Microsoft Office (including the PowerPoint).
- JDK 1.8 (Java SE 8.x).
- Android SDK.
- Android Studio 2.1.
- Eclipse Neon or Juno.
- Adobe PhoneGap.
- Xamarin.
- Microsoft Visual Studio 2015 Enterprise.
- Tizen IDE.

## 6 Grading System

Current control is evaluated as following:

$$O_{current} = 0.5 \cdot O_{HA} + 0.5 \cdot O_R,$$

where  $O_{HA}$  - homework assignment mark,  $O_R$  - report (research) mark. Both of these marks are evaluated using 10 grade scale.

So for example if a student has prepared and presented a research on one of the seminar topics and successfully implemented one of the topics features into a project (mobile application) the  $O_{current} = 10$  (using the 10 grade scale).

The final control is evaluated like

$$O_{final} = 2 \cdot O_{answer}$$

where

$$O_{answer} = \{0, 1\}$$

If a student answered 4 questions of 5 total he gets 8 mark (using the 10 grade scale).

And the most final "result" mark of a student knowledge which goes to the master diploma is evaluated according to the following formula using the 10 grade scale:

$$O_{result} = 0,6 \cdot O_{current} + 0,4 \cdot O_{final}$$



## 7 Guidelines for Knowledge Assessment

Table 7.1 - Forms of student knowledge control

Type of control	Form of control	The whole year / modules				Parameters**
		1	2	3	4	
Current	Homework assignment		*			Homework assignment means implementing one of the topics features into a project (mobile application). Passing the assignment means to show it working on mobile phone/emulator and to be able to answer any questions regarding the code of the assignment script and theory. Each student gets different assignments which he/she chooses him-/herself. Usually it takes 10 minutes to evaluate solving of the assignment. For more information check section 7.2 of this document.
Current	Topic research presentation	*	*			Each student prepares and presents a research on one of the seminar topics. The presentation lasts from 20 minutes to an hour. Student should be able to answer any questions regarding the report.
Final	Examination		*			Oral examination consisting of 5 questions. Sample question are presented in the section 7.3.

\*\* Parameters specify a control format: written, oral, computer testing, timing, and what exactly a student should do to pass, etc.

### 7.1 Knowledge and skill estimating criteria

Current control consists of home assignment and a topic research presentation. Each assignment is evaluated as 1 if it has been successfully passed and as 0 if it was not (1 grade scale).

There is no intermediate control.

Final control means passing the examination and is evaluated using the 5 grade scale. Each correct answer means getting 1 grade.

The 5 grade scale used for final control consists of 5 grades: 0 (failed: nothing was done, no questions answered), 1 (1 question was answered), 2 (2 questions answered), 3 (3 questions), 4 (4 questions) and 5 (5 questions, excellent answers).

As long as the National Research University Higher School of Economics has the 10 grade scale system all the results above are then transformed into the 10 grade scale as written in section 6 of the document.

### 7.2 Current control sample tasks

Topics for a research presentation basically match the lecture topics as shown in the table 2. Student can pick a different to the research topic for implementation in his/her mobile application.



### 7.3 Sample questions for the final control

1. What mobile application development environments do you know? Describe them.
2. What speech recognition engines are you aware of?
3. Describe new features of the latest version of XCode.
4. What is the difference between Intel System Studio 2016 and Intel XDK?
5. What is Cortana?
6. What OS versions do new mobile devices presented at IFA 2016 use?
7. What company suggests using Tizen SDK?
8. How to use a voice recognition in a simple mobile application?
9. Which new programming languages used for mobile software development do you know?
10. What is the latest version of Windows Phone OS?

## 8 Methods of Instruction

Classes of the course are conducted as the following forms:

- seminars/master classes/code sessions of the computer presentation format;
- discussing various questions rising during the lectures, discussing them via email;
- practice (can be part of a presentation);
- self-studies with the help of the lecture presentations, software needed, internet, literature sources.

### 8.1 Recommendations for the lecturer

Seminars should be given in a presentation form which means a report followed by info- or just graphics shown with the help of presentation software and a computer connected to a projector and internet. Experience confirms that the presentation lectures are the most effective way to teach students during the course.

Each assignment passing is preparation to pass the exam. If student have questions considering the assignments the questions should be asked right away during the seminar. If they are not asked, the lecturer (reporting student) still should ask students if they have any questions regarding the topic.

When the lecturer tests students who are trying to pass any type of the controls mentioned above it is necessary for the lecturer to pay attention at the way each student tells about his work and answers the questions being asked about the code, reports of other students, etc. Questions should not be repeated from student to student. If a student can hardly answer some questions or the assignment result does not work or raises errors it is crucial to explain and help student about the code errors and how to avoid them, and give correct answer to the question asked with maximum amount of information and explanations (of course excluding the exam case), otherwise the student will keep coming with the same mistakes again and again.

### 8.2 Recommendations for the students

Students have to attend seminars because all the problems while working with the software, programming languages, ways and techniques of building and mobile applications, examination questions are described and given in the seminars.



Implementation of a seminar topic should be different for each student. Having the same assignments (if that happens nevertheless) doesn't mean the same interface including the application UI element position, styles and more because people are different and leads to lowering the mark.

Do not try to pass an assignment you have nothing to do about - it is obvious for the lecturer, and you know lecturers do not like copycats much.

Do not learn by heart all the answers to all the questions to prepare for the exam because 1) all you need to do to prepare for the exam is to attend seminars and listen carefully; 2) there is no guarantee you will be given the questions you have learnt by heart (there are always some extra questions); 3) there are additional exam questions which are very possible including the assignment questions. That is why good work during all the course and lectures especially is a high exam mark guarantee.

## **9 Special Equipment and Software Support**

Computer classes with MS Windows XP/7/8/10 and section 5.4 software - for the practice.

Classroom with good quality wi-fi or VGA/HDMI projector (not less than 1024x768 px) and section 5.4 software - for providing seminars.