Федеральное государственное автономное образовательное учреждение
высшего профессионального образования
"Национальный исследовательский университет
"Высшая школа экономики"

Факультет компьютерных наук
Департамент программной инженерии

Рабочая программа дисциплины
Разработка мобильных приложений для платформы Apple iOS
(на английском языке)
Apple iOS Applications Development

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

Разработчик программы
Александров Д.В., д.т.н., профессор, dalexandrov@hse.ru

Одобрена на заседании департамента программной инженерии «___»____________ 2015 г.
Руководитель департамента Авдошин С.М. ________________

Рекомендована Академическим советом образовательной программы
«___»____________ 2015 г., № протокола_________________

Утверждена «___»____________ 2015 г.
Академический руководитель образовательной программы
Александров Д.В. _________________

Москва, 2015

Настоящая программа не может быть использована другими подразделениями
университета и другими вузами без разрешения подразделения-разработчика программы.
Author of the Program:
Prof., Dr.Tech.Sci. Dmitry Alexandrov

General Information about Training Course:
The training course ‘Apple iOS Applications Development’ is offered to students of the specialization (track) «Mobile Applications Design and Development» of Master Program «System and Software Engineering» (area code 09.04.04), at the Faculty of Computer Science, the National Research University - Higher School of Economics/HSE. The course is classified as a compulsory subject (M.2 unit / Base module [Special subject disciplines M.2] of 2015 – 2016 academic year’s working syllabus); it is a two module course, which is started in module #3. The duration of the course amounts to 80 class periods (both lectures and practical trainings) divided into 32 lecture hours and 48 practical training hours. In addition, 110 academic hours are set aside for self-studying of students. Mark check stipulated by the working syllabus consists of results of performing of practical and homework tasks and one end-of-module test (MT, end of 3rd module) and final examination (FE) given in the 4th module.

Students Requirements:
It is presupposed that all individuals accepted as Master Program students completed corresponding full-time Bachelor degree training programs and were selected (based on either portfolio tenders, or other core performance indices) to continue their MS education in the Program, therefore.

The students should be familiar with the basics of the following training courses: a) Object-oriented analysis and programming, b) The software development methodology, c) Basics of Mobile Applications Development.

The students will learn how to analyze, design, and develop iOS apps, draft user interfaces and create the app prototypes.

Course Objectives:
The course covers the Swift programming language (Edition 2) and iOS application development basics. In particularly, main aspects include design and architecture, user interactions specifics, capabilities of Apple devices, etc. The main objective of the training course is also to examine and principles of iOS apps development, get familiar with platform, IDE, technologies, and frameworks for the development of iOS apps.
The course is aimed to help students to develop skills that will enable them to construct mobile apps of high quality, reliable, and that is reasonably easy to understand, modify and maintain.

Abstract
The training course ‘Apple iOS Applications Development’ is concerned the Swift programming language and IDE XCode for professional mobile apps development. It is based on the training materials (tutorials) from mobile apps developers for Apple iOS platform.
Modern mobile apps development requires the collaborative effort of a diverse team with varied skills. To be effective, team members need to understand the activities performed at each stage in the development cycle. In this course, students will analyze, design, and implement applications that meet user requirements through performing a collective team iOS app project.
The course is aimed at students taking courses at mobile apps development in commerce and
industry. It describes the technology and IDE, which are applied for iOS app development. The course is covering the main points of iOS apps development gives to the listeners to gather creation’s experience of real world apps on the basis of different prototypes.

**Training Objectives:**

During the two-module course “Apple iOS Applications Development”, the students will:

- Study the Swift 2 programming language and XCode IDE for the fast development of iOS apps,
- Acquire skills in mobile apps design, development and implementation for Apple iOS platform,
- Focus on techniques for iOS app development and modern trends in that field.

At the end of the course the students will acquire theoretical and practical knowledge and will be able to use:

**Technical skills**

1. Develop and write a proposal for project of iOS app development.
2. Define an architecture of an iOS app.
3. Design a mobile app with back-end.
4. Implement iOS apps using Swift programming language and IDE XCode.
5. Prepare the final report for the course.
6. Discuss the processes of mobile apps development.

**Soft skills**

1. Work within a team under mobile app project.
2. Be able to effectively communicate their work (Presentation skills).
3. Be able to write a project report (report writing skills).
4. Be able to reflect on their own work as well as the work of others (evaluate their experience).

**1. Topic-wise curricula plan**
(accompanied with suggested themes of practical trainings)

<table>
<thead>
<tr>
<th>№</th>
<th>Topic Name</th>
<th>Course Hours, Total</th>
<th>Audience Hours</th>
<th>Self Study</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lectures</td>
<td>Practical Studies</td>
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<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

| Module 3. Apple’s Swift 2 Programming Language and iOS App Development |                     |                     |             |           |   |
|------------------------------------------------------------------------|---------------------|---------------------|-------------|-----------|
| 1 Getting Started With Xcode 7.2 and Swift 2                           | 27                  | 4                   | 5           | 18        |
| 2 2. iOS Features: Timers, Tables, Permanent Storage and Web Content   | 17                  | 3                   | 4           | 10        |
| 3 iOS Features II: Animation, Games, Maps & Geolocation, Audio         | 17                  | 3                   | 5           | 9         |
| 4 Core Data, Web Content, Json Data & Webviews                         | 17                  | 3                   | 5           | 9         |
II. Basic book(s) and/or reader(s) (Publications)

Books:

- Welcome to Swift. – Apple, 2014.

Internet-based Publications:

- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
- Parse Tutorials Website: https://www.parse.com/tutorials#all
- iPhone and iPad Icon Design Website: http://code.tutsplus.com/tutorials/killer-tips-for-iphone-and-ipad-icon-design--mobile-4006
- Principles of Effective Icon Design: http://design.tutsplus.com/articles/7-principles-of-effective-icon-design--psd-147
- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/

Other Recommended Sources of Information, including Ones under Free Electronic Access:

- Resources of Apple Developer Website: https://developer.apple.com/resources/
- IBM Bluemix Website: https://console.ng.bluemix.net/
- Microsoft Azure Website: https://azure.microsoft.com/ru-ru/
- Amazon Web Services Website: https://aws.amazon.com/ru/
- Google Cloud Platform Website: https://cloud.google.com/
IV. Education control forms / Assessments:
- [A] progress check: work activity (WA) and end-of-module test at the end of 3rd module,
- [B] concluding check: final exam (FE) at the end of 4th module (the last module of the course),
- [C] home assignment (HA) during 3rd, and 4th modules.
Work Activities (WA), Home Assignment (HA) and Exam (FE) are ten-point scale grades.

WA during seminar hours in 3rd, 4th modules is controlled by the use of keeping students attendance records and scoring (evaluation) involvement into discussions as well as quality of exercise performance during practical trainings. WA includes tasks that are given on the lessons. A student can implement (complete) the particular task, that he/she missed (or didn't finish on the lesson), during two weeks after the lesson at which he has got the one.
HA includes the tasks for individual and team projects and must be given by the instructor in the beginning of the 3rd module.

Final grade (FG) at the end of the last 4th module accumulates course results as follows:
\[ FG = 0.65 \times WA + 0.2 \times HA + 0.15 \times FE. \]

As always, calculated value of FG is rounded to integer grade. Conversion of the concluding rounded grade (FE) to five-point scale grade is done in accordance with the following table:

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1 - unsatisfactory</td>
<td>Unsatisfactory - 2</td>
</tr>
<tr>
<td>2 - very bad</td>
<td></td>
</tr>
<tr>
<td>3 - bad</td>
<td></td>
</tr>
<tr>
<td>4 - satisfactory</td>
<td>Satisfactory - 3</td>
</tr>
<tr>
<td>5 - quite satisfactory</td>
<td></td>
</tr>
<tr>
<td>6 - good</td>
<td>Good - 4</td>
</tr>
<tr>
<td>7 - very good</td>
<td></td>
</tr>
<tr>
<td>8 - nearly excellent</td>
<td>Excellent - 5</td>
</tr>
<tr>
<td>9 - excellent</td>
<td></td>
</tr>
<tr>
<td>10 - brilliantly</td>
<td></td>
</tr>
</tbody>
</table>

V. Course Contents

Topic 1. Getting Started With Xcode 7.2 and Swift 2
♦ Topic outline:
  • The Xcode Interface Overview
  • Adding Labels To the Apps
  • Working With Text Inputs and Buttons
  • The Swift 2 Playground Overview
  • Variables And Variable Types
  • Arrays And Dictionaries
  • If and Else Statements
• For and While Loops
• Using Constraints for Creating Robust Layouts

♦ Main references/books/reading:
• Welcome to Swift. – Apple, 2014.
• Alasdair Allan. Learning iPhone Programming: From Xcode to App Store, 2012.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Apple Documentation Website: https://developer.apple.com/library/ios/documentation/userexperience/conceptual/mobilehig/LaunchImages.html#//apple_ref/doc/uid/TP40006556-CH22-SW1!
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 2. iOS Features: Timers, Tables, Permanent Storage and Web Content
♦ Topic outline:
• Navigation & Menu Bars With Bar Button Items
• Table Views & Working With Classes
• Storing Data Permanently In the Apps
• Creating Multiple View Controllers & Using Segues
• Controlling The Keyboard With Taps & The Enter Key
• Working with Data From The Web
• String Manipulation & Processing Web Data
♦ Main references/books/reading:
• Welcome to Swift. – Apple, 2014.
• Alasdair Allan. Learning iPhone Programming: From Xcode to App Store, 2012.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Apple Documentation Website: https://developer.apple.com/library/ios/documentation/userexperience/conceptual/mobilehig/LaunchImages.html#//apple_ref/doc/uid/TP40006556-CH22-SW1!
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 3. iOS Features II: Animation, Games, Maps & Geolocation, Audio
♦ Topic outline:
• Manipulating UIImages and Creating Animations
• Integrating Maps Into the Apps and Adding Pins and Messages
• Geolocation: Using The User's Location In the Apps
• Executing Code Before & After Segues
• Working with Audio
• Responding To User Shaking and Swipes

Main references/books/reading:
• Welcome to Swift. – Apple, 2014.
• Alasdair Allan. Learning iPhone Programming: From Xcode to App Store, 2012.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com
  https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Apple Documentation Website:
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com
  https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 4. Core Data, Web Content, Json Data & Webviews
Topic outline:
• Working With Core Data and Searching For Objects
• Working with Images From The Web
• Working With Json Data & Dictionaries
• Viewing Website & Web Content In the Apps
Main references/books/reading:
• Welcome to Swift. – Apple, 2014.
• Alasdair Allan. Learning iPhone Programming: From Xcode to App Store, 2012.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com
  https://www.udemy.com/the-complete-ios-9-developer-course/#/
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  https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 5. Creating the Instagram App Clone
Topic outline:
• Introduction To Parse
• Retrieving And Updating Data With Parse
• Getting Images From The Photo Library And Camera
• Spinners And Alerts
• Login And Signup
• Adding The User Table
• Pull To Refresh
• Posting Images and Viewing Users' Feeds

♦ Main references/books/reading:
• Parse Tutorials Website: https://www.parse.com/tutorials#all
• Welcome to Swift. – Apple, 2014.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Apple Documentation Website: https://developer.apple.com/library/ios/documentation/userexperience/conceptual/mobilehig/LaunchImages.html#//apple_ref/doc/uid/TP40006556-CH22-SW1!
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 6. Creating the Tinder App Clone
♦ Topic outline:
• Introduction To Tinder
• Facebook Login
• Dragging Elements
• Push Notifications
• Login & Signup
• Adding, Swiping, Accepting, Rejecting and Contacting Users

♦ Main references/books/reading:
• Welcome to Swift. – Apple, 2014.
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
• Apple Documentation Website: https://developer.apple.com/library/ios/documentation/userexperience/conceptual/mobilehig/LaunchImages.html#//apple_ref/doc/uid/TP40006556-CH22-SW1!
• The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
Resources of Apple Developer Website: https://developer.apple.com/resources/

Topic 7. Creating the Games with Sprite Kit
♦ Topic outline:
- Adding And Animating Sprites
- Animating The Background
- Controlling and Spawning Sprites
- Collisions
- Scoring And Game Controls
♦ Main references/books/reading:
- Welcome to Swift. – Apple, 2014.
- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
- Apple Documentation Website:
- iPhone and iPad Icon Design Website:
  http://code.tutsplus.com/tutorials/killer-tips-for-iphone-and-ipad-icon-design--mobile-4006
- Principles of Effective Icon Design:
  http://design.tutsplus.com/articles/7-principles-of-effective-icon-design--psd-147
- Apple Documentation About App Icons:
- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/

Topic 8. Creating the Uber App Clone
♦ Topic outline:
- Login And Signup
- The Rider View Controller
- The Driver View Controllers
- Showing The Driver's Location To The Rider
♦ Main references/books/reading:
- Welcome to Swift. – Apple, 2014.
- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
**Topic 9. Extra useful features**

♦ Topic outline:
  - Custom Keyboards
  - Integrating iAd and In App Purchases Into the Apps
  - Implementing Version Control
  - 3D Touch: Peek & Pop and Quick Actions
  - Implementing Touch ID

♦ Main references/books/reading:
  - Welcome to Swift. – Apple, 2014.
  - The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
  - The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
  - Resources of Apple Developer Website: https://developer.apple.com/resources/

**Topic 10. Creating the Snapchat Clone**

♦ Topic outline:
  - Login User Table
  - Sending Images
  - Receiving Messages

♦ Main references/books/reading:
  - Welcome to Swift. – Apple, 2014.
  - The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com https://www.udemy.com/the-complete-ios-9-developer-course/#/
  - Apple Documentation Website:

- The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com
  https://www.udemy.com/the-complete-ios-9-developer-course/#/
- Resources of Apple Developer Website: https://developer.apple.com/resources/

**Topic 11. Submitting an App To The App Store**

- Topic outline:
  - App Icons And Launch Images
  - Screenshots
  - Submitting the Apps
- Main references/books/reading:
  - The Complete iOS 9 Developer Course – Build 18 Apps by Rob Percival on udemy.com
    https://www.udemy.com/the-complete-ios-9-developer-course/#/
  - Apple Documentation Website:
  - iPhone and iPad Icon Design Website:
    http://code.tutsplus.com/tutorials/killer-tips-for-iphone-and-ipad-icon-design--mobile-4006
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  - Apple Documentation About App Icons:
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    https://www.udemy.com/the-complete-ios-9-developer-course/#/
  - Resources of Apple Developer Website: https://developer.apple.com/resources/

**VI. Assignment topics for various education control forms:**

Home assignment is made as a capstone and team projects. Capstone and team projects will have the main result as a real world iOS apps with a back-end on one of the popular cloud platforms.

There are some topics for presentations on the seminars:

- Agile way of mobile apps development;
- Innovative models and tools for mobile app development;
- Technologies and frameworks for iOS development;
- iOS app development using Xamarin;
- iOS app development using PhoneGap;
- Architecture of iOS apps;
- Integrating iAds into iOS Apps;
- Integrating In App Purchases into iOS Apps;
- Using iBeacons in iOS apps;
- Development of geo social iOS apps;
- Submitting an App To The App Store;
Trends in iOS app development.

VII. Topics for course results quality assessment

Exemplary questions:

- Give a definition of terms «mobile app», «back-end», «cloud platform», etc. (the matter is related to main concepts introduced in the training course);
- What are the ideas of Agile way of development of mobile apps?
- Describe the IDE for iOS app development.
- What are the key challenges facing mobile app development? Provide examples.
- Describe mobile app design process and provide the examples.
- What are the principles of modern UI design for iOS apps?
- What are the trends in iOS app development?
- What are the main iOS app development process activities?
- What is the need of mobile app prototyping? What are the benefits and problems of prototyping?
- Describe the features of using the microservices approach for creating mobile apps.

The author of the program: Dmitry Alexandrov