MOBILE DEVICE SOFTWARE ENGINEERING
CS 2724

I. Catalog Description

How to provide software-based solutions to complex problems using mobile devices (handheld computers). Software engineering life cycle processes including problem formulation, requirements engineering, architecting, design, programming, integration, and delivery / deployment. Object-oriented design and implementation in programming languages such as Objective C or Java. Design paradigms such as Model View Controller, Delegation, and Target-Action.

New Course: Computer Science (CS) 2724
Prerequisite: A grade of C or better in CS 1114. (3H, 3C).
ADP Title: Mobile Device Software Engg

II. Learning Objectives

Having successfully completed this course, students will be able to:

- provide software-based solutions to complex problems using mobile devices (handheld computers) such as iPhone/iPod Touch/iPad;
- engineer software for mobile devices, for example, for the iPhone/iPod Touch/iPad handheld computers using Objective C object-oriented programming language with Xcode and Interface Builder tools under the Cocoa Touch framework;
- effectively employ the object-oriented paradigm for software engineering; and
- work on a software engineering project with the title of Mobile Device Software Engineer.

III. Justification

A *mobile device* is a portable small electronic device that is also known as *handheld device, handheld computer, cellphone device, palmtop, tablet,* or *smartphone*. Mobile devices have become so capable that they are replacing netbooks, laptops, and desktops for many uses. Currently, more than 75 million people in more than 80 countries use iPhone and iPod Touch mobile devices, for which more than 12 billion downloads took place for tens of thousands of software applications.

Currently, the following platforms exist for Mobile Device Software Engineering: Apple Cocoa Touch (iPhone / iPod Touch / iPad), Microsoft Windows Mobile, Java Platform, Micro Edition (Java ME), Google Android, Palm webOS, and Symbian. Each platform comes with its own operating system, programming language(s), software development kit(s), developer resources, and application distribution channels.

This new course is proposed to educate our students so that they can provide software-based solutions to complex problems using mobile devices and meet the needs of the customers and employers in the future.

IV. Prerequisites and Corequisites

CS 1114 (**Introduction to Software Design**) introduces the fundamental concepts of programming from an object-oriented perspective, presents basic software engineering principles, and teaches programming skills in a programming language that supports the object-oriented paradigm.

V. Texts and Special Teaching Aids

Required Textbook:

- D. Mark and J. LaMarche (2009), *Beginning iPhone 3 Development: Exploring the iPhone SDK*, Apress, New York, NY, 555 pp.

Supplementary Materials:

- iPhone Developer Center, http://developer.apple.com/iphone/
- S. G. Kochan (2009), *Programming in Objective-C 2.0*, 2nd Edition, Addison-Wesley, Upper Saddle River, NJ, 600 pp.

VI. Syllabus

1. Mobile device software user interface development 15%
    a. Text field, label, button, switches, sliding bar, segmented control
    b. Taps, touches, and gestures
    c. Autorotation and autoresizing
    d. Date and multi-component data pickers
2. Mobile device software design patterns..... 5%
    a. Model View Controller (MVC)
    b. Delegation
    c. Target-Action
3. Structuring mobile device software for user's navigation 15%
    a. Tab bar controllers
    b. Navigation controllers
    c. Custom view and modal view controllers
4. Mobile device software structuring with table views 15%
5. Data persistence (data storage and retrieval) on the mobile device..... 15%
    a. Files
    b. Object archiving
    c. Relational database management system (e.g., SQLite3)
6. Mobile device graphics using, e.g., OpenGL 10%
7. Maps and location aware software development..... 5%
8. Web-based and network-centric software development..... 10%
9. Mobile device movement (accelerometer) aware software development 5%
10. Mobile device audio and video software development 5%

Total 100%

VII. Grading

1. Assignments on engineering of mobile device software applications:

    - Assignment 1 ..... 6%
    - Assignment 2 ..... 8%
    - Assignment 3 ..... 10%
    - Assignment 4 ..... 12%
    - Assignment 5 ..... 14%

2. Semester Project 25%

    A student individually engineers a mobile device software application to provide a solution to a complex problem. The student identifies a problem to solve and proposes it for approval. The deliverable includes (a) a project report describing the entire software engineering life cycle, and (b) well-documented mobile device software application.

3. Midterm Exam 10%

4. Final Exam 15%

VIII. Old (Current) Syllabus

N/A

IX. Core Curriculum Guidelines

N/A

Mobile Device Software Engineering Platforms

Platform	*Mobile Devices*	*Operating System*	*Programming Language*	*Software Development Kit (SDK) / IDE*	*Developer Website*	*Application Distribution*
Cocoa Touch	• iPhone • iPod Touch • iPad	Scaled down version of Mach-based Unix OS	Objective C 2.0	iPhone SDK with • XCode • Interface Builder • Dashcode	• iPhone Dev Center	• iTunes
Windows Mobile	Smartphones by • HP • HTC • LG • Motorola • Nokia • Palm • Samsung • Sony Ericsson • etc.	Windows Mobile	C#, C++, VB.NET	• Microsoft Visual Studio	• HTC Developer Center • Motorola Developer Network • Samsung Windows Mobile • Sony Ericsson Developer World • Windows Phone Developers	• Marketplace • Samsung Apps
Java platform Micro Edition (Java ME)	Smartphones by • BlackBerry • LG • Motorola • Nokia • Samsung • Sony Ericsson • etc.	Mobile OS based on the Linux kernel	Java	• BlackBerry JDE Plug-in for Eclipse • Eclipse Mobile Tools for Java • LG SDK for Java ME • Motorola SDK for Java ME • Nokia IDEs: NetBeans and Eclipse • Samsung SDK for Java ME • Sony Ericsson SDK for Java ME • Sun SDK for Java ME	• BlackBerry Developer Zone • Eclipse Mobile Tools for Java • LG Mobile Developer Network • Motorola Developer Network • Nokia App Developers • Samsung Mobile Innovator • Sony Ericsson Developer World • phoneME	• BlackBerry App World • LG Distribution Channels • Samsung Apps
Android	Smartphones by • Dell • HTC • Motorola • Samsung • etc.	Android (Mobile OS running on the Linux kernel)	Java	• Android SDK • Motorola Dev Studio for Android • Sony Ericsson Android	• Android Developers • HTC Developer Center • Motorola Developer Network • Sony Ericsson Developer World	• Android Market
Palm webOS	Smartphones by • Palm	Palm webOS (Mobile OS running on the Linux kernel)	C, C++, Java	• Palm Mojo SDK (plug-ins for Eclipse) • PocketStudio • NS Basic for Palm	• Palm webOSdev	• Palm Software Store
Symbian	Smartphones by • Nokia • LG • etc.	Symbian OS	C++, Java	• Carbide.C++ Development Kit • Nokia Qt Development Platform • NS Basic for Symbian • Samsung Symbian Dev Platform • Sony Ericsson Symbian Foundation	• Nokia App Developers • Samsung Mobile Innovator • Sony Ericsson Developer World • Symbian Developer	• Samsung Apps • Symbian Apps

VirginiaTech Invent the Future

CS2984 iPhone Software Engineering

Home | Course | Policy on | Staff | Grading | Other

Department of Computer Science, Virginia Tech, Blacksburg, Virginia

Semester	*Course Number*	*Meeting Time*	*Meeting Place*
Spring 2010	**17569**	**TTh 9:30 – 10:45 a.m.**	**Torgersen 1080**

VirginiaTech Invent the Future

CS2984 iPhone Software Engineering

Course Description:

The primary objective of this course is to teach how to provide software-based solutions to complex problems using the iPhone/iPod Touch/iPad handheld computers. The course covers the entire software life cycle with the following processes: problem formulation, requirements engineering, architecting, design, programming, integration, and delivery/deployment. Object-oriented (OO) analysis, OO design, and OO programming are emphasized. The programming process involves the Objective-C 2.0 object-oriented programming language with Xcode and Interface Builder tools under the Cocoa Touch framework for the iPhone/iPod Touch/iPad handheld computers. The course focuses on the programming process of the software life cycle.

Learning Objectives:

Having successfully completed this course, students will be able to:

1. provide software-based solutions to complex problems using the iPhone/iPod Touch/iPad handheld computers;
2. engineer software for the iPhone/iPod Touch/iPad handheld computers using Objective C 2.0 object-oriented programming language with Xcode and Interface Builder tools under the Cocoa Touch framework;
3. effectively employ the object-oriented paradigm for software engineering; and
4. work on a software engineering project with the title of iPhone/iPod Touch/iPad Mobile Device Software Engineer.

Prerequisites:

- **CS Majors Only**
- CS1706: Introduction to Object-Oriented Development II
  or CS2114: Software Design and Data Structures

Materials:

Required Enrollment:

Apple iPhone Developer Program, Standard Program, $99
This enrollment enables the student to individually access *copyrighted* resources, sample code, and tutorial documents, which will be used in the course.

Required Textbook:

- D. Mark and J. LaMarche (2009), Beginning iPhone 3 Development: Exploring the iPhone SDK, Apress, New York, NY, 555 pp.

Optional Textbook:

- S. G. Kochan (2009), Programming in Objective-C 2.0, 2nd Edition, Addison-Wesley, Upper Saddle River, NJ, 600 pp.

Facilities:

- **Torgersen Hall 1080** will be used for teaching and learning.
- This classroom/lab provides 35 Mac computers for use during lectures/hands-on teaching.
- The students can access this facilty when no class is using it by swiping their VT ID cards.
- The iPhone/iPod Touch/iPad Software Development Kit (SDK) will be available on each Mac computer. The students will do all of their work on these computers.
- There is no requirement for the student to buy any equipment.

Tentative Chronological Outline:

- Tentative Chronological Outline (For Registered Students Only)

Attendance Policy:

Attendance will be taken for each class and will be used in determining your final course grade. Justifiable excuses should be e-mailed to the instructor before missing the class for approval. If you are late for class more than 10 minutes or if you leave before the class ends, you will be considered absent for that day.

No. of unexcused absences	*Penalty*
1-3	There will be no penalty; however, the information will be used in judging your final course grade if it falls on the border line.
4-6	Your final course grade will be reduced one grade level. For example, if you total a B+, you will get a B.
7-9	Your final course grade will be reduced two grade levels. For example, if you total a B+, you will get a B–.
10 or more	Your final course grade will be reduced three grade levels. For example, if you total a B+, you will get a C+.

Computer Use Policy:

All students are required to follow the instructions and guidelines specified under Acceptable Use Guidelines at Virginia Tech.

Classroom Laptop Use Policy:

Laptops are allowed in the classroom only for taking notes, viewing lecture slides, and other course-related activities. During class, students are strictly prohibited to use their laptops for checking e-mail, web surfing, chatting, instant messaging, playing games, or performing other activities unrelated to the course. The students must demonstrate sensitivity to others and must not display screen images, including wallpapers and screen savers, which are distracting or offensive to other students. Typing on the keyboard must not create noise that distracts the attention of others.

If you see a student in class who is in violation of this policy, it is your Honor Code duty to report it immediately to Dr. Balci. Violators of this policy will be reported to the Virginia Tech Honor System for prosecution. If you witness an Honor Code violation and fail to report it, you yourself are in violation of the Honor Code.

Disability:

If any student needs special accommodations because of a disability, please contact the instructor during the first week of classes.

Honor System:

All work is to be done under the provisions of the Virginia Tech Honor System.

Submission Policy:

Assignments and project reports are due in their entirety on the due date by 9:30 a.m. There will be a 10% penalty per day late. Lateness is determined with respect to your submission time. For example, an assignment due on Monday: if submitted on Tuesday before 9:30 a.m. is considered one day late;

on Wednesday before 9:30 a.m. is considered two days late; etc. The period between Friday 9:30 a.m. and Monday 9:30 a.m. is considered one day late. *No assignments or project reports will be accepted if late more than **three** days.* Your assignment or project report must be complete when submitted. *Partial submissions are not allowed.*

Exam Policy:

Students are allowed to check the questions incorrectly answered on an exam only within 10 days following the exam.

VirginiaTech Invent the Future

CS2984 iPhone Software Engineering

Instructor:

Professor Osman Balci

Office:	3160B Torgersen (See Map)
E-mail:	balci@vt.edu
Phone:	(540) 231-4841
Homepage:	http://manta.cs.vt.edu/balci

Graduate Teaching Assistant (GTA):

Office Hours:

Professor Osman Balci	11:00 a.m. – 12:00 p.m. on Tuesday & Thursday (or send e-mail to get an appointment).

Assignments:

Assignment 1	6%	Given on February 2. Due on **February 11**.
Assignment 2	8%	Given on February 11. Due on **February 25**.
Assignment 3	10%	Given on February 25. Due on **March 18**.
Assignment 4	12%	Given on March 18. Due on **April 6**.
Assignment 5	14%	Given on April 6. Due on **April 20**.

Project:

Semester Project 25%

Each student individually engineers an iPhone/iPod Touch/iPad application to provide a solution to a complex problem.The student identifies a problem to solve and proposes it for approval. The deliverable includes (a) a project report describing the entire software engineering life cycle, and (b) well-documented software application.

- Submit proposal no later than **March 16**.
- Project app and report are due on **May 5**.

Examinations:

Midterm Exam	10%	**Thursday, March 4 at 9:30 – 10:45 a.m. in Torgersen 1080.** Consists of developing an iPhone/iPod Touch/iPad app during the exam period based on a given design specification.
Final Exam	15%	**Saturday, May 8 at 3:25 – 5:25 p.m. in Torgersen 1080.** Consists of developing an iPhone/iPod Touch/iPad app during the exam period based on a given design specification.

Grades:

		B+	87-89	C+	77-79	D+	67-69	F 59 and below
A	94-100	B	84-86	C	74-76	D	64-66	
A-	90-93	B-	80-83	C-	70-73	D-	60-63	

Registered students can view their grades at http://learn.vt.edu in compliance with the Family Educational Rights and Privacy Act (FERPA).

Tentative Chronological Outline

Week 1:

Jan. 19

- Orientation to course. Explanation of intent of course and procedures.
- Introduction to Mobile Device Software Engineering
- iPhone & iPod Touch Technical Specifications
- *Reading Assignment:* **Chapter 1**: *Welcome to the Jungle*.

Jan. 21

- Hands-on development of a tutorial application: **HelloWorld** (displays "Welcome to CS2984!")
- *Read and Build:* **Chapter 2**: *Appeasing the Tiki Gods*.

Week 2:

Jan. 26

- Hands-on development of a tutorial application: **WhereAmI** (shows the user's current location on a Google map).
- iPhone Programming Layers of Abstraction and Frameworks.
- *Reading Assignment:* iPhone OS Technology Overview
- *Read and Build:* **Chapter 3**: *Handling Basic Interaction*.

Jan. 28

- Hands-on development of a tutorial application: **Happiness** (enables the user to select and display happiness level using a slider).
- iPhone Application Design Patterns
- *Read and Build:* **Chapter 4**: *More User Interface Fun*.

Week 3:

Feb. 2

- Assignment 1 given
- Hands-on development of a tutorial application: **Happiness** (continued)

Feb. 4

- Hands-on development of a tutorial application: **Web** (displays a web browser and a text field for entering URL).
- *Read and Build:* **Chapter 5**: *Autorotation and Autosizing*.

Week 4:

Feb. 9

- Hands-on development of a tutorial application: **MultiView** (provides tab bar-based navigation structure among 7 different views).
- View Controller Programming Guide for iPhone OS

- *Read and Build:* **Chapter 6**: *Multiview Applications.*

Feb. 11

- **Assignment 1 due**. Assignment 2 given
- Table View Tutorial
- *Read and Build:* **Chapter 7**: *Tab Bars and Pickers.*

Week 5:

Feb. 16

- Hands-on development of a tutorial application: **VTDepts** (displays a scrollable indexed table list of Virginia Tech's academic departments).

Feb. 18

- Hands-on development of a tutorial application: **VTDepts** (continued)
- *Read and Build:* **Chapter 8**: *Introduction to Table Views*

Week 6:

Feb. 23

- Tutorial: How to Structure Your App for Navigation
- Hands-on development of a tutorial application: **Countries** (displays countries in a table view with custom built rows (cells) where clicking a country row navigates to its map)

Feb. 25

- **Assignment 2 due**. Assignment 3 given.
- Semester Project description posted.
- Hands-on development of a tutorial application: **Countries** (continued)
- *Read and Build:* **Chapter 9**: *Navigation Controllers and Table Views*

Week 7:

Mar. 2

- Hands-on development of a tutorial application: **Countries** (continued)
- *Read and Build:* **Chapter 10**: *Application Settings and User Defaults*

Mar. 4

- **Midterm Examination** Consists of developing an iPhone/iPod Touch/iPad app during the exam period based on a given design specification.

Week 8:

Spring Break

Week 9:

Mar. 16

- **Submit proposal** for the semester project
- Hands-on development of a tutorial application: **CitiesILike** (enables the user to create a modifiable list of favorite cities in US and other countries (using a plist file))

- *Read and Build:* **Chapter 11**: *Basic Data Persistence*

Mar. 18

- **Assignment 3 due**. **Assignment 4 given**.
- Hands-on development of a tutorial application: **CitiesILike** (continued)

Week 10:

Mar. 23

- Hands-on development of a tutorial application: **SongsILike** (enables the user to create a modifiable list of favorite songs (using Core Data / SQLite3 database))

Mar. 25

- Hands-on development of a tutorial application: **SongsILike** (continued)

Week 11:

Mar. 30

Apr. 1

Week 12:

Apr. 6

- **Assignment 4 due**. **Assignment 5 given**.
- TBD

Apr. 8

Week 13:

Apr. 13

Apr. 15

Week 14:

Apr. 20

- **Assignment 5 due**.
- TBD

Apr. 22

Week 15:

Apr. 27

Apr. 29

Week 16:

May. 4

May. 5 **Semester Project Application and Report are due by midnight.**

May. 6 Reading Day

May. 8 **FINAL EXAMINATION: 3:25 - 5:25 p.m. in Torgersen 1080**

Course Material

Slides

- Introduction to Mobile Device Software Engineering
- iPhone Programming Layers of Abstraction and Frameworks
- iPhone Application Design Paterns

Handouts

- Mobile Device Software Engineering Platforms
- iPhone and iPod Touch Technical Specifications
- Software Engineering Life Cycle
- UIKit Class Hierarchy

Hands-on Tutorials

1. HelloWorld: displays “Welcome to CS2984!”
2. WhereAmI: shows the user's current location on a Google map.
3. Happiness: enables the user to select and display happiness level using a slider.
4. Web: displays a web browser and a text field for entering URL
5. MultiView: provides a tab bar-based navigation structure among 7 different views
6. Table View Tutorial
7. VTDepts: displays an indexed table view of Virginia Tech's academic departments
8. Tutorial: How to Structure Your App for Navigation
9. Countries: displays countries in a table view with custom built rows (cells)
10. CitiesILike: enables the user to create a modifiable list of favorite cities in US and other countries (using a plist file)
11. SongsILike: enables the user to create a modifiable list of favorite songs (using Core Data / SQLite3 database)

Apple iPhone Developer Library

- Interface Builder User Guide
- iPhone Application Programming Guide
- iPhone OS Technology Overview
- Objective C 2.0 Programming Language
- String Programming Guide for Cocoa
- Table View Programming Guide for iPhone OS
- UIApplicationDelegate Protocol Reference
- UITableViewDataSource Protocol Reference
- UITableViewDelegate Protocol Reference
- UITextFieldDelegate Protocol
- UIWebViewDelegate Protocol
- View Controller Programming Guide for iPhone OS
- Xcode Workspace Guide

Assignments

- Assignment 1
- Assignment 2
- Assignment 3

Project

- Semester Project

Exams

- Midterm Examination (10%)
- Final Examination (15%)

Downloads

- App Icons 57x57 (Zip file 7.2MB)
- Tab Bar / Toolbar Icons 26x26 (Zip file 283KB)
- HappinessImages.zip
- VTDeptsAppFiles.zip
- CountriesAppFiles.zip
- TextbookSourceCodes2009-10-12.zip