



Mobile Apps for Medicine

ITP 499 (2 Units)

Spring 2012

- Objective** This class will focus on developing mobile apps that interface and gather data from medical devices. Working with the USC Center for Body Computing under the Keck School of Medicine, we have access to various medical devices that are used either on or in the human body. Some example of devices are AgaMatrix's glucometer (determines glucose in the blood and is used by diabetics), Zephyr Technologies' "bug" (gathers heart rate, respiratory rate, temperature, and acceleration), AliveCor iPhone case (gathers real-time ECG and heart rates), and Boston Scientific's LATITUDE database (contains data from pacemakers).
- Concepts** Mobile development, user interface design, connected health care.
- Prerequisites** Prior programming experience required
- Instructor** Trina Gregory
- Contacting the Instructor** Email: trina.gregory@usc.edu
Office: OHE 412
- Office Hours** Listed on Blackboard under Contacts and at <http://bcf.usc.edu/~trinagre/index.html#officehours>
- Lab Assistants** Listed on Blackboard under Contacts
- Lecture** 1.5 hours/week
- Lab** 1.5 hours/week
- Course Structure** Lecture and lab on Monday and Wednesday from 12:30 to 1:50pm.
- Recommended Textbooks** TBD
- Optional Books** TBD
- Web Site** All information including lecture notes, assignments and references will be listed on Blackboard (<http://blackboard.usc.edu>).

Labs There will be approximately five lab assignments which will be given in lecture and posted on Blackboard.

Final Project There will be a final project given which will be due during the finals time of this class. For this project, students will be in groups of approximately 4 students. Each group will build an application of that groups' choosing which will interface with one of the various medical devices we have access to.

Grading The following point-structure will be used in determining the grade for the course. Final grade will be based upon the total points received, the highest total in the class, and the average of the class.

Class Participation & Attendance	5%
Midterm	15%
Lab Assignments	40%
Final Project	40%
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TOTAL POSSIBLE	100%

Grading scale:

A	100-93
A-	92-90
B+	89-87
B	86-83
B-	82-80
C+	79-77
C	76-73
C-	72-70
D+	69-67
D	66-65
F	64 or below

Policies Midterm Exam: The exam will cover material from the reading assignments, lectures, and lab projects. The exam is both closed book and closed notes. The exam will cover the material presented up to the date of the exam.

Make-up policy for exams: In order to make up for a missed exam, the student must provide a satisfactory reason along with proper documentation. Usually make-ups are allowed only under extraordinary circumstances.

Assignments: It is your responsibility to turn in your assignments on, or before, the deadlines as set by the instructor.

Late assignments: Late submission of assignments will lead to loss of points. No assignments will be accepted after two weeks beyond the original due date.

Before logging off a computer, students must ensure that they have emailed or saved projects created during the class or lab session. Any work saved to the computer will be erased after restarting the computer. ITP is not responsible for any work lost.

ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes. Please contact your instructor for specific times and

days for the current semester.

Academic Integrity

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the professor determines that a violation has occurred, appropriate action, as determined by the instructor, will be taken.

Although working together is encouraged, all work claimed as yours must in fact be your own effort. Students who plagiarize the work of other students will receive zero points and possibly be referred to Student Judicial Affairs and Community Standards (SJACS).

All students should read, understand, and abide by the University Student Conduct Code listed in SCampus, and available at:
<http://web-app.usc.edu/scampus/university-student-conduct-code/>

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to your TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Body Computing on Mobile Devices

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Course Outline

Week 1 – Introduction

- Course overview
- What is body computing?
 - o Sensors and biometrics
 - o Improving access to and sharing of information
 - o Enhancing the patient-doctor relationship
 - o Tools for personal health management
 - o Leveraging unique features of mobile devices

Week 2 – Mobile App Development Review: iOS

- Development tools
- SDK
- Data types and conventions
- IBOutlet & IBAction
- Common user interface elements

Week 3 – Mobile App Development Review: Android

- Development tools
- Brief review of Java
- SDK
- Data types and conventions
- Common user interface elements

Week 4 – Introduction to Medical Sensors

- Typical measured biomedical quantities
- Body temperature and thermometers
- Blood sugar and glucometers
- Respiratory sensors
- Introduction to the ECG

Week 5 – Body Sensor Interfaces

- Bluetooth
- Direct connections
- Hands-on exploration of interface(s) to selected sensor(s)

Week 6 – Tools for Physicians and Patients

- Patient information tracking
- Tools for linking symptoms to diagnoses
- Lab testing results and tracking
- Personal health management tools
- Communication between patient and doctor

Week 7 – Human Interface Design

- Creating a great user interface
- UI development process, from concept to prototype
- User interface guidelines
- Dos and don'ts of user interface design

Reading: "iPhone Human Interface Guidelines" document in the iPhone OS Reference Library on Apple's Developer Connection website (<http://developer.apple.com/iphone>)

Week 8 – Human Interface Development

- The basics: buttons, text fields and check boxes
- Views
- Displaying Tabular Data

Week 9 – Midterm

Week 10 – Making it Mobile

- An interactive discussion on leveraging the unique features of modern mobile devices
 - o Audio
 - o Accelerometer
 - o Core location
 - o Interfacing with other apps on the device (contacts, calendar, maps, etc.)

Week 11 – Data Persistence

- Exploring your filesystem
- Reading Data from file
- Creating and deleting files and directories
- Writing data to files

Week 12 – Sharing Information with Remote Databases

- RESTful APIs
- Upload
- Download

Week 13 – Web Interfaces

- HTTP requests
- Implementing a web server

Week 14 – Current Body Computing Industry Trends

- A discussion of up-to-date industry activity
- Possible guest lecture

Week 15 – Deployment

- Using analytics
- App Store submission
- Monitoring the success of your app – patient/doctor feedback
- Iterative design – planning for version 2.0

Reading: "App Store Submission Tips" on Apple's Developer Connection website (<http://developer.apple.com/iphone>)

Week 16 – Final Project due during Final Exams