EE P 523: Mobile Applications for Sensing and Control

Spring 2020

Course Description:

In this class we will learn how to develop modern applications for the Android mobile platform using ***Kotlin*** language. This class will equip students with the practical skills necessary to develop modern mobile applications able to take advantage of the myriad sensing and control capabilities that modern smartphones offer. Students (individually and in teams) will put into practice the concepts learned in this course to develop a final project of their own choice, using an Android Smartphone and optionally an Arduino board.

No pre-requisites are needed, although a background in Object-Oriented programming (such as Java or Kotlin) is highly recommended. Whether you prefer Kotlin or Java, this class will teach you how to write Android apps for sensing and control applications. The knowledge and experience you gain in developing apps for the Android platform will translate to either language.

The course grade will be based upon weekly or bi-weekly homework assignments throughout the quarter, and a final project at the end of the quarter. Final project presentations will be conducted over the last two weeks of the course and student groups giving short demonstrations and presentations of their final project.

Learning Outcomes

By the end of this course, students will demonstrate the ability to:

- Apply Kotlin programming concepts to Android application development.
- Implement dynamic graphical user interfaces for Android mobile apps which combine different elements and actions.
- Extract data from different hardware sensors of an Android smartphone, and to process and interpret that data for different applications.
- Program and control a microcontroller-based board.
- Develop and Android App to wirelessly communicate with an microcontroller-based board, and to be able to control different sensors.

Instructor: Laura Arjona (EE 371, arjonal@uw.edu)
Office Hours: TBA
Teaching Assistant: TBA

Weekly homework assignments

Weekly homework will be submitted electronically no later than the start of the next lecture. Homework will take the form of an Android application specification that the students will need to individually implement.

Final Project

Students will develop an Android app of their own choice, integrating some sensing and control capabilities. The students will have the option to include Arduino in their project. Projects can be developed individually or in teams. Over the last two weeks of the course, each student or group

will give a short presentation summarizing their project and demonstrating it to the rest of the class and the instructor.

Hardware/software

To work on the homework and final projects, students will use and Android smartphone and one Arduino board. Android phones and Arduino boards will be provided for the students individually, and they must be returned at the end of the quarter.

To work on the homework and final projects, students will need to access a computer. Computers can run Windows, Linux, or iOS. The software used will be Arduino IDE, Android Studio, and Oracle Java Development Kit ("JDK"). They are free to access and download, and they both are available for three mentioned OS.

Course Grading

- Attendance: highly encouraged but not mandatory. All the course material will be posted in Canvas.
- Weekly assignments: 50%
- Final Project: 50%
- No late work will be accepted

WEEK	Topic
1	**Introduction** Intro to Object-oriented programming Intro to Kotlin language Intro to Android
2	**Android Programming (I)** Dynamic GUIs Files and storage Multiple activities and Intents
3	**Android Programming (II)** Activity Lifecycle Fragments 2D graphics Text-to-Speech / Speech-to-text
4	**Sensors (I)** Smartphone camera. Face recognition. Web APIs *Motion* sensors: accelerometer, gyroscope *Position* sensors: orientation, proximity *Environmental* sensors: barometer, photometer, thermometer Audio and Video. Media Player
5	**Sensors (II)** Maps and Location Web Based Content Arduino Programming (I)
6	**Control (I)** Bluetooth, BLE NFC, Wi-Fi Arduino programming: real time communication with Android

7	**Control (II)** Local databases: MySQL with Room Remote data bases: Firebase Web services Localization
8	**Special topics** Android SDK and JNI Hybrid Mobile App Frameworks. React Native Uploading app to Google Play Store
9,10	**Final projects presentation**