ELECTRICAL & COMPUTER ENGINEERING

EE P 523: Mobile Applications for Sensing and Control

Summer 2021

Instructor Information:

- Tamara Bonaci (tbonaci@uw.edu)
- **Office hours:**
  - Saturdays from 9-10am PT using Zoom
  - By appointment

TA Information:

- Trung Le (tle45@uw.edu)
- **Office hours:** TBD

Course Description:

In this course, we will learn how to develop modern applications for the Android mobile platform using ***Kotlin*** programming language. This class will equip you with practical skills necessary to develop modern mobile applications, able to take advantage of many sensing and control capabilities that modern smartphones offer. You will put into practice (individually and in teams) the concepts learned in this course to develop a final project of your 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 other languages.

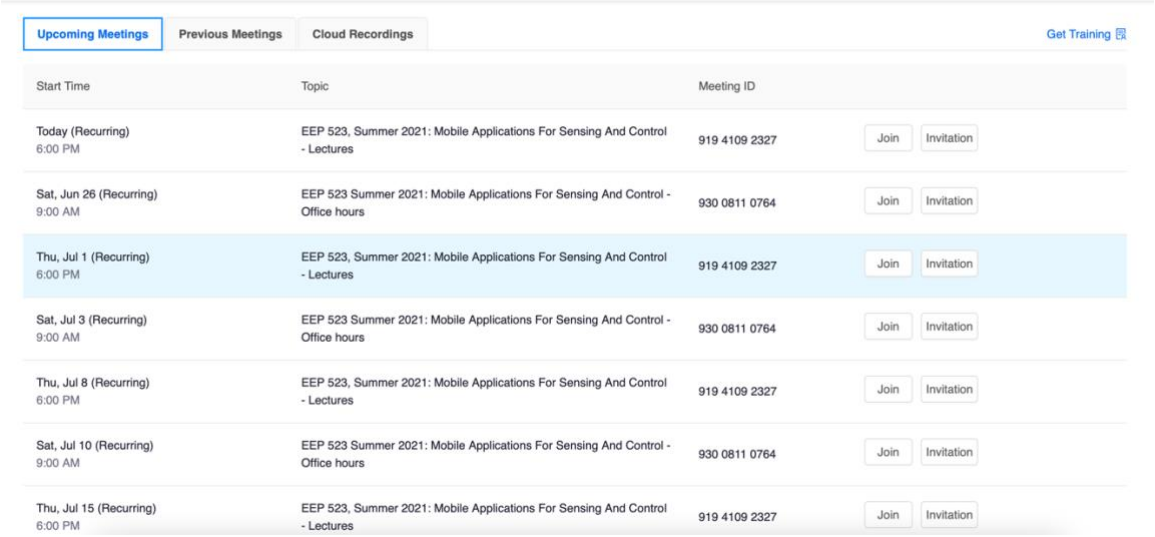
The course grade will be based upon weekly homework assignments, and on a final project. Final project presentations will be conducted in Zoom over the last week of the course, and a student or a team will be expected to give a short demonstration and presentation of the final project.

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 anmicrocontroller-based board, and to be able to control different sensors.

Logistics: Classes will be synchronous on Zoom - Thursdays 6pm to 9:30pm
Weekly Zoom links for classes are availabe on Canvas



Weekly homework assignments

Weekly homework will be submitted electronically, using individual GitHub accounts.
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 week of the course, each student or group will give a short presentation in Zoom (synchronous), 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

- Remote attendance: highly encouraged but not mandatory. All the course material will be posted in Canvas, including a video for every lecture.
- Weekly homework assignments: 50%
- Final Project: 50%

WEEK	Topic
1 **June 24th**	**Introduction** Course presentation: motivation and goals Introduction to Android Introduction to Kotlin My first Android App
2 **July 1st**	**Android Programming (I)** Dynamic and persistent GUIs Files and storage Multiple activities and Intents
3 **July 8th**	**Android Programming (II)** Activity Lifecycle Fragments 2D/3D graphics (intro) Text-to-Speech / Speech-to-text
4 **July 15th**	**Smartphone Sensors** Smartphone camera *Motion* sensors: accelerometer, gyroscope *Position* sensors: orientation, proximity *Environmental* sensors: barometer, photometer, thermometer Audio and Video. Media Player Maps and Location
5 **July 22nd**	**Tiny Machine Learning** Practical Introduction to Neural Networks 1D-Convolutional Neural Networks for time series Face detection model Gesture recognition model TensorFlow Lite
6 **July 29th**	**Arduino Programming** Introduction to Arduino Smartphone connectivity (BLE, Wi-Fi, NFC) Android-Arduino interaction
7 **August 5th**	**Databases and Web content** Local databases: MySQL with Room Remote data bases: Firebase Displaying lists Web based content Web services
8 **August 12th**	**Additional Android topics** Localization and Accessibility Touch events Dialogs Services and notifications / threads Animations (intro)
9 **August 19th**	**Final projects presentation**