Course Information and Standards

Special Topics Course: "Internet of Things" COMP 3500 Sect 201

University of Massachusetts Lowell
Department of Computer Science
Spring Semester 2019

Time and location: Wednesdays 2:00 – 4:50 – DAN 403 lab
Instructor: Jeffrey Brown
Office and telephone: Virtual office – 508-614-5187
Office hours: by appt.
Lab: DAN 403
Email: jefbrown@redhat.com or jeffrey.brown@townisp.com
Web site: tbd

1. Course Description:

This course will combine a hands-on project lab with study of emerging Internet of Things (IOT) -- large-scale networks of devices with embedded electronics, software, sensors and connectivity. Students will create their own IOT device with a Raspberry Pi and their choice of sensor. Students will develop a web server to manage their device. As a group, the class will also create a system environment that federates the devices and performs device data analytics. The course will also cover market issues including technology drivers, market segments, industry trends, security implications, and current residential commercial offerings.

2. Prerequisites:

COMP 3050 or permission of instructor

3. Required Text:

Online material and handouts.

4. Grading:

Final grades will be based as follows:

Type	Number	Weight
Programming Assignments	approx. 6	25 %
Final Project/Presentation	1	35/10 %
Class Participation	1 absences permitted, addl 5% per	25%
Class Presentation Assignment	1	5 %

The programming assignments are to be coded using the `C` or `C++`, java programming or python programming languages (as appropriate).

5. Lateness:

For each **class day** an assignment or project is late, **10 % of the total points** will be deducted from the points received. This will continue for **five class days**, after which the assignment or project may be submitted at any time **up to and including 11:59:59 PM of the last day of the semester (May 3)** and will receive a maximum of half the total credit.

6. Academic Dishonesty:

In this course, **all work is to be each student's own**. Students should therefore be familiar with the University's rules on academic dishonesty, which can be found in the *Bulletin of Undergraduate Studies* and in the *Schedule of Classes*. In particular, **plagiarism** will not be tolerated! Any student caught plagiarizing another's work will automatically receive a grade of **F** for the course. If you are unsure as to what constitutes plagiarism, it is your responsibility to check with the instructor. Other forms of dishonesty will result in similar actions. You may collaborate with your classmates on the design and results of the programs you will write in this course, but each student **must implement these programs alone for the individual project and programming assignments.** Submission of **shared student code for the individual project or programming assignments is not permissible**, and will result in a grade of 0 for each component. Help files are typically provided for each programming assignment, and students are encouraged to cut and paste useful code from these help files into their assignment submissions, but all other code **must be the specific work of each student for the individual project or programming assignments**. Shared code is acceptable and encouraged for the group final project.

7. Topical Outline:

The topics covered in this course include the following:

- What is the "Internet of Things"
- The technology driving the evolution
- IOT market segments
- Market segment challenges
- IoT device implementation
  - Management UI
  - IoT device
- IoT device topologies
  - Local
  - Cloud
  - Hybrid
- IoT device Federation
- IoT Federation data analytics
- IoT Device security
  - Policies
  - Evolving Standards
  - Threat Mapping (Owasp)
  - Security scan validation
- Common API progress
- Android SDK
- Raspberry Pi HW
- Raspberry Pi SW
- GPIO, I/O bus technologies
- Sensor technology

Potential Guest Speakers (TBD, but potentially 3 different have been investigated. These talks will be opened up to the CS community.)

These are the major topics, but be prepared to cover many others as during the lecture and lab classes.

Individual programming Assignments

It is up to the student to get these assignments complete. I require that a video of the individual and assignment functioning be emailed to me prior to the due date/time. I will be available for consulting and helping at a time convenient to both of us. These assignments are fairly straight forward and will guarantee you have the basic skills to complete the individual project.

Assignment 1. Setup raspberry pi

Assignment 2. Basic Esp8266 led project

Assignment 3. Communicate over mqtt between pi ans esp8266

Assignment 4. Use database to log sensor values from esp8266

Assignment 5. Restful api to get sensor values and control led

Assignment 6. create a ui to interface with your restful api

Final Project/Presentation:
Build an IOT device that uses what you learned in the six labs. Extend what you learned in the labs to make your own IOT device.
A display of your IOT device, fully functional. It should be fully functional as described by your design proposal.

Class Particpation

One of the major aspects of this class is the discussions that will be held on different topics during each held class. I'll be sharing links to online material that will be discussed during class times. It is important that you read the material and be prepared to discuss at class. Up to 1 class absences will be permitted without grade penalty. Any absences beyond this will incur a reduction in the class participation component of your grade by 5% per class.