[UC Irvine]: [Computer Science]

[CS 222]: [Communications in Internet-of-things (IoT)] [(Fall/2019)]

Instructor	*Sabur Hassan Baidya*
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Class Information	*M W*
Section #	
Office Hours	M: 2:00 – 3:00 pm, W: 1:00 – 2:00 pm
Website	Canvas

Introduction

Welcome to the course of Communications in Internet-of-things (IoT). This course starts with the background of communication and networks and gradually evolves with addressing the challenges imposed by plethora of smart connected devices and finally discussing about some of the recent innovative solutions. The goal of this course for the students is to learn about practical usage of communication and networking technologies in real-world while understanding the theory behind it and potentially provide new solutions. The course is designed with few hands-on projects for students to learn about the cutting-edge technologies which will help students for their next career in industry or in academic research.

Prerequisites

This course requires to have background in undergraduate level Computer Networks course CS 122, also some background in probability theory. Additionally, a programming knowledge is a requirement, since we will have couple of projects that need to create software application and system programming skills.

Required Materials:

- Notebook to solve quantitative problems
- iClicker for pop quizzes
- Raspberry Pi and IoT kit for projects
- Laptop/computer for programming for the project

Student Learning Outcomes

After successful completion of this course, students will be able to:

1. Understand and apply the theories behind different IoT applications:
   - Understand and Differentiate protocols in each communication system layer
   - Determine the interdependencies between different layers
   - Learn the challenges and scopes of communication protocols in real-world applications

2. By the end of this course, student will be able to build a software application on Raspberry Pi connected with sensors and build a simple communication and computation algorithm:
   - Learn to integrate the hardware component together
   - Write test cases for simple communication between components
   - Write a simple software application using all the components
   - Show the results in the last week

3. By the end of this course, student will be able to write a 6-8 pages long research paper:
   - Write a new section of the paper incrementally bi-weekly basis.
   - Get evaluation of the previous section of the paper written

Book
Most of the materials that will be covered in class are abundantly available in the web. There is no textbook required.
However, if you are interested, you can check the following books:

1. "Computer Networking: A Top-Down Approach 6th Edition**"** by Kurose and Ross
2. Internet-of-Things - From Hype to Reality, by A. Rayes, and S. Salam, Springer 2017
3. Fog Computing in the Internet of Things, by A. Rahmani et al., Springer 2017
4. IEEE Internet of Things: http://iot.ieee.org/

For advanced research-oriented topics can be found in recent published articles (e.g. IEEE and ACM conference and journal papers) which can be accessed through your UCI account.

How to Succeed

1. Come prepared for lecture, glance over slides, formulate any questions if you have.
2. Ask questions (either in class or via e-mail)! No question is silly to ask.
3. Practice quantitative problems and programming for the project.
4. Take the advantage of faculty and TA office hours to clarify doubts.

EEE/Canvas
Be sure to check Canvas often, as I will be using it to post news, incomplete lecture slides, and other interesting material relevant to your course. If you have any questions about internet-of-things or communications and networks in general, feel free to post on Canvas (under "Discussions"). The advantage is you can get answer from your fellow classmates and also the TA and instructors.

Assignments
There will be two assignments with set of quantitative questions based on concepts discussed in class. The assignments are meant to be done individually by the students. If clarification on some concepts for the assignments needed, you can come to my office hour or visit the TA in his/her office hour. Late submission accepted up to 24 hours with a deduction of points 1% per hour late from the deadline. The solutions for the assignments will be posted after the grades for the assignments are released.

Exams
There will be only one in-class midterm exam for the course. The exam will be in closed-book, closed-notes mode and seating will be randomized which will be displayed on the screen before and during the exam. To make your attendance verified, there will be a sign-up sheet which the students will sign showing their students ID after submitting the paper. No show in the exam receives a score zero. The only exemption is for valid medical conditions in which case students may be allowed to take the exam on a later date.

Project
We will have a final project submission at the end of the course. The project will be a group project consisting of 3-4 students per group. The project will be judged based on the implementation results as well as a written report in a full 6-8 pages long research paper format. The projects will be done incrementally after basic hands-on lesson done in class. The paper will contain five sections as Introduction, Literature Survey, Problem Formulation, Solutions and, Results and conclusion at the end. Each of these five sections will be written bi-weekly and submitted for evaluation. The final demonstration will be given by the students in the last class of this course.

How to Properly Contact Me

If you have any question about the course materials, components for the projects, problem sets for the assignment, you can ask the TA or me in email. Any disputes regarding grades should be directed to me. While asking question in email you can mention the following template in the subject line:
[Course Code]: [First name] [Last Name] – [Subject].
For further guidelines on writing professional email, you can check the resource:
https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087#.1xcuo9rvg

Academic Dishonesty

Any academic dishonesty by the students will not be tolerated and all students are expected to adhere to the UCI Academic Dishonesty Policies:
http://senate.uci.edu/files/2015/12/Appendix-VIII-UCI-Academic-Senate-Policy-on-Academic-Honesty.pdf.

Regrades

Regrades can be done on valid dispute on grading with the instructor's discretion.

Student Behavior in Class

It is expected that all the electronics devices are in silenced mode. Side talking in the class while the lecture is presented by the instructor is prohibited. If a student is found disturbing other students or the class as a whole will be asked to leave the classroom. Asking questions are encouraged during the lecture by raising hands for permission.

Attendance and Tardiness

Attendance in this course is not mandatory but highly encouraged as there are credits for class participation and pop-quiz. Moreover, the hands-on lesson for the project will be shown in the class. Arriving late in the class is fine as long as you take the seat quietly and do not disturb others.

Disability Services

Any student needing a specific type of accommodation due to a disability should contact the UCI Disability Services Center at (949) 824 – 7494. However, the student should do that in the first week of lecture and let the instructor know about the accommodation scenarios. Student can consult privately to the TA or the instructor if needed any help regarding disabilities.

Grading

Quantitative Assignments (2)	**2 * 10% = 20%**
Class Participation + Quiz	**10%**
Midterm Written Exam	**30%**
Final Project + Paper	**40%**
Total	**100%**

Scale

A	**>90% and <=100%**
B	**>80% and <=90%**
C	**>70% and <=80%**
D	**>60% and <=70%**
F	**<=60%**

Schedule/Readings

Week	Lecture	Topic	Activities/Remarks
1	Mon	Introduction to Communication and Networks and Introduction to IoT	Homework for writing Introduction of the paper
	Wed	Details of Networks protocol layers	
2	Mon	Queueing Theory in communication	Solving Problems, Quantitative Assignment 1
	Wed	Wireless Communication introduction with MAC Layer details	
3	Mon	Queueing theory with M/M/N/K	Writing Literature Survey for the paper
	Wed	Wireless Communication Physical Layer aspects and challenges	
4	Mon	IoT Applications and multi-scale computations	
	Wed	IoT Development Kit hands-on	Software hardware integration, implementation
5	Mon	Wireless Sensor Networks	Writing Problem formulation of the paper
	Wed	Wireless Coexistence (Cellular, WiFi, Device-to-device)	
6	Mon	**Midterm**	In-class exam
	Wed	Mobility and Ubiquity in IoT	Quantitative Assignment 2
7	Mon	More on Wireless Challenges	Writing Solutions for the formulated problems
	Wed	IoT Protocol Stack: Industrial Open Standard Solutions	
8	Mon	Multimedia Networks	
	Wed	Autonomous Systems in IoT	
9	Mon	Edge/Fog Computing	Writing Results and conclusion of the paper
	Wed	Software Defined Networking	
10	Mon	Other IoT applications (Urban IoT, Healthcare IoT, IoT security)	
	Wed	Project Demonstration	Students show Demo