CS 437 Internet of Things

Course Description

The Internet of Things (IoT) stands to be the next revolution in computing. Billions of data-spouting devices connected to the Internet are already fundamentally changing the way we live and work. This course teaches a deep understanding of IoT technologies from the ground up. Students will learn IoT device programming (Arduino and Raspberry Pi), sensing and actuating technologies, IoT protocol stacks (Zigbee, 5G, NFC, MQTT, etc), networking backhaul design and security enforcement, data science for IoT, and cloud-based IoT platforms such as AWS IoT. Students will be guided through laboratory assignments designed to give them practical real-world experience, where they will deploy a distributed wifi monitoring service, a cloud-based IoT service platform serving tens of thousands of heartbeat sensors, and more. Students will emerge from the class with a cutting-edge education on this rapidly emerging technology segment, and with the confidence to carry out tasks they will commonly encounter in industrial settings.

Textbook and Readings

There are no required readings or a textbook for this course.

Course Outline

This 4-credit hour course is 16 weeks long. You should expect to invest about 12 hours every week in this course.

Week/Module	Duration	Topics
Week 1/Module 1 Part 1	Aug. 24 - Aug. 30	Orientation, Background: Computer Internetworking
Week 2/Module 1 Part 2	Aug. 31 - Sept. 6	Devices: IoT Circuits
Week 3/Lab 1	Sept. 7 - Sept. 13	IoT in Practice: Automotive IoT
Week 4/Module 1 Part 3	Sept. 14 - Sept. 20	Devices: IoT Device Architecture
Week 5/ Module 1 Part 4	Sept. 21 - Sept. 27	Devices: Arduino Programming
Week 6/Module 2 Part 1	Sept. 28 - Oct. 4	Protocols: Radio Frequency Modulation
Week 7/Module 2 Part 2	Oct. 5 - Oct. 11	Protocols: Media Access Control
Week 8/Lab 2	Oct. 12 - Oct. 18	IoT in Practice: Wireless IoT Infrastructure
Week 9/Module 2 Part 3	Oct. 19 - Oct. 25	Protocols: Mesh Routing
Week 10/Module 2 Part 4	Oct. 26 - Nov. 1	Protocols: Service Discovery

Week 11/Module 3 Part 1	Nov. 2 - Nov. 8	Infrastructure: Enterprise Infrastructure
Week 12/Module 3 Part 2	Nov. 9 - Nov. 15	Infrastructure: Core Networking
Week 13/Lab 3	Nov. 16 - Nov. 22	IoT in Practice: Wired Iot Infrastructure
Week 14/Module 3 Part 3	Nov. 23 - Nov. 29	Infrastructure: Networking Devices
Week 15/Lab 4	Nov. 30 - Dec. 6	IoT in Practice: Cloud IoT Infrastructure
Week 16/Module 3 Part 4	Dec. 7 - Dec. 13	Infrastructure: Physical Infrastructure and Wiring

Assignment Deadlines

For all assignment deadlines, please refer to the **Course Assignment Deadlines, Late Policy, and Academic Calendar** page.

Elements of This Course

The course is comprised of the following elements:

- **Lecture Videos.** In each week, the concepts you need to know will be presented through a collection of short video lectures. You may stream these videos for playback within the browser by clicking on their titles or download the videos. You may also download the slides that go along with the videos. **The videos usually total 1.5 to 3 hours each week.** You generally should spend at least the same amount of time digesting content in the video. The actual amount of time needed to digest the content will vary based on your background.
- **Orientation Quiz.** The purpose of the orientation quiz is to ensure that you have gone through the orientation module and acquired the necessary information about the course before you start it. The orientation quiz is a required activity, but it's not part of the course grading. You have unlimited attempts on the orientation quiz. You need to answer all questions correctly in order to pass the orientation quiz.

- **Graded Quizzes**. Each week conclude with a graded quizzes. You will be allowed unlimited attempts for each graded quiz with your highest attempt score used toward your final grade. There is no time limit on how long you take to complete each attempt at the quiz, though you can only attempt a given quiz 3 times in 8 hours. Graded quizzes will be used when calculating your final score in the class.

- **Labs:** There are 4 major lab projects to complete.
- **Final Project:** Students will complete a final project of their own design and choosing. There are two stages of the project: First, a proposal will be submitted. Later in the course, the final report will be submitted separately.

Grading Distribution and Scale

Grading Distribution

Assignment	Occurrence	Percent of the Final Grade
Graded Quizzes	12	10% (For all quizzes combined)
Lab 1: IoT Devices	1	15%
Lab 2: Edge Networking	1	15%
Final Project Proposal	1	10%
Lab 3: Infrastructure Networking for IoT	1	15%
Lab 4: Cloud Infrastructure	1	15%
Final Project Report	1	20%

Grading Scale

Letter Grade	Percent Needed	Letter Grade	Percent Needed	Letter Grade	Percent Needed
A+	97 - 100%	B+	87 - 89%	C	73-76%
A	93 - 96%	B	83 - 86%	D	63-66%
A-	90 - 92%	B-	80 - 82%	F	Below 60%

Student Code and Policies

A student at the University of Illinois at the Urbana-Champaign campus is a member of a University community of which all members have at least the rights and responsibilities common to all citizens, free from institutional censorship; affiliation with the University as a student does not diminish the rights or responsibilities held by a student or any other community member as a citizen of larger communities of the state, the nation, and the world. See the [University of Illinois Student Code](#) for more information.

Academic Integrity

All students are expected to abide by [the campus regulations on academic integrity found in the Student Code of Conduct](#). These standards will be enforced and infractions of these rules will not be tolerated in this course. Sharing, copying, or providing any part of a homework solution or code is an infraction of the University's rules on academic integrity. We will be actively looking for violations of this policy in homework and project submissions. Any violation will be punished as severely as possible with sanctions and penalties typically ranging from a failing grade on this assignment up to a failing grade in the course, including a letter of the offending infraction kept in the student's permanent university record.

Again, a good rule of thumb: *Keep every typed word and piece of code your own*. If you think you are operating in a gray area, you probably are. If you would like clarification on specifics, please contact the course staff.

Disability Accommodations

Students with learning, physical, or other disabilities requiring assistance should contact the instructor as soon as possible. If you're unsure if this applies to you or think it may, please contact the instructor and [Disability Resources and Educational Services (DRES)](#) as soon as possible. You can contact DRES at 1207 S. Oak Street, Champaign, via phone at (217) 333-1970, or via email at disability@illinois.edu.