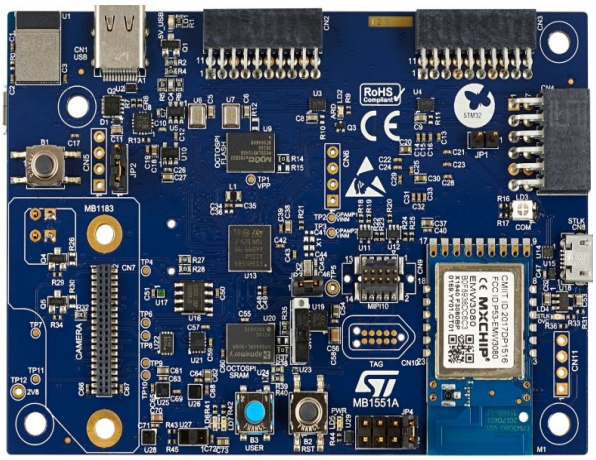
Engineering Design Summer Institute

E1IT: Internet of Things

Schedule and Program Details



STMicroelectronics Sensor Tile Internet of Things System

Curriculum Overview:

The new IoT (Internet of Things) thrust is one of the most important trends in technology today. IoT systems provide sensors and actuators in our global environment, on the scale of nations and cities, to individual buildings, homes, vehicles, and the rapidly expanding world of wearable devices. Machine learning is one of the most important new innovations for engineering system design and development. It enables development of the first computational systems that autonomously learn and recognize specific events, conditions, and the characteristics of complex systems. The class will provide a rapid introduction to machine learning suitable for IoT systems that is inherently accessible and meaningful to precollege students. This is hosted *directly* on our IoT platform. Completion of hands-on engineering design projects, preparation of short report describing projects, and presentation of results are expected.

Introduction to sensors: An overview of microsensors commonly used in IoT devices. Students directly use these sensors in our IoT platform, writing machine learning algorithms to exploit them.

Fundamentals of machine learning: Students will learn the basic concepts of machine learning and artificial neural networks.

Creative Applications: Learn how machine learning is used in motion pattern recognition fundamental to navigation and autonomous driving.

Expert Guidance: Interact with industry experts and researchers who are pioneers in the fields of microsensors, IoT, and machine learning.

Hands-on Projects: Work on real-life projects, experimenting with machine learning algorithms.

Hands-on Experience: Gain practical experience through coding sessions, interactive workshops, and guided projects.

Application Requirements:

During the online registration process, applicants are required to:

- Provide an unofficial transcript from grade 9 to present reflecting a cumulative GPA of 3.2 or higher.
- Provide a value statement including a few short sentences (up to 200 words) to describe their experience in:

    1. Basics of physics covering mechanics and electricity/magnetism,
    2. Basics of calculus covering functions, integrals, derivatives, and trigonometry,
    3. Software development and computer programming,
    4. Working with electronic devices.

    Describe any courses that have been completed in the areas mentioned.

- Take a quiz comprising a few simple questions on the areas described above.

Schedule:

The class meets every day, M-F from 9AM to 4PM, and consists of lectures, and lab activities. The lectures provided by the instructor cover various important topics pertaining IoT systems, such as introduction to microsensors, machine learning, and digital signal processing. The labs are supervised by the TA and mentors, where students get to perform hands-on activities on our IoT platform, and learn about the practical aspects of aforementioned topics in a real IoT system. The students are required to finish through 8 tutorials, followed by a final project accompanied with a report and a brief video presentation.

Week	Lecture/Lab
1	• Lecture: Introduction to Internet of Things • Lecture: Introduction to Microsensors for IoT • Lecture: Tutorials 1, 2, and 3 • Lab: Tutorials 1, 2, and 3
2	• Lecture: Introduction to Machine Learning and Neural Networks for IoT • Lecture: Tutorials 4, 5, and 6 • Lab: Tutorials 4, 5, and 6
3	• Lecture: Introduction to Digital Signal Processing for IoT • Lecture: Introduction to microprocessors for IoT • Lecture: Tutorials 7, 8, and the final project • Lab: Tutorials 7, 8, and the final project • Video file demonstrating Final Submission • Final Project Submissions

Added value components:

The course features extensive lab hours to go over hands on experiments with IoT systems, as well as an introduction to C programming workshop. In addition to the lectures, there will be feature presentations by industry-expert guest speakers. The students will be given a state-of-the-art IoT platform which they will own for future experiments.

Culminating event:

The students are required to submit a final project accompanied with a report and a brief video presentation. The project is open-ended, where the students can innovate and implement their own version of the IoT system, for any relevant application. Each student will give a short live presentation of her/his work on the last day of the session. Refreshments will be served.

Required material:

A notebook computer (Apple Mac or Windows) is required for each class session. The IoT kit and the required accessories to connect to the notebook computers will be provided to the students at the beginning of the class, for them to keep.

Grading:

This is a 2-unit course with letter grading, equivalent to UCLA's Engineering 1IT course. The breakdown of the final grade is as follows:

- 40% Completion of Tutorials
- 30% Final Project
- 15% Assignments
- 15% Attendance

Grades for the project will reflect not only the success of the project as a whole but also faculty/TA assessment of the contributions of the individual members

No midterm or final are required.

Points of contact

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