

# IT 0080 - IOT - INTERNET OF THINGS

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## Catalog Description

Advisory: Eligibility for ENGL 1A; Completion with grades of "C" or better or concurrent enrollment in IT 75 and IT 105 recommended

Hours: 72 (54 lecture, 18 laboratory)

Description: Introduction to the Internet of Things (IoT), where people, processes, things, and data are connected via emerging Internet technologies. A variety of networking and computer hardware devices will be integrated into end-to-end systems to solve practical problems. (CSU)

## Course Student Learning Outcomes

- CSLO #1: Research, analyze and evaluate information to solve business problems using Internet of Things.
- CSLO #2: Design and produce Internet of Things solutions incorporating current trends, security, and best practices.
- CSLO #3: Employ Internet of Things concepts and terminology in professional communication.
- CSLO #4: Demonstrate marketable Internet of Things career skills.

## Effective Term

Fall 2023

## Course Type

Credit - Degree-applicable

## Contact Hours

72

## Outside of Class Hours

90

## Total Student Learning Hours

162

## Course Objectives

Lecture Objectives:

1. Analyze the things and connections that make up the Internet of Things in relation to the physical world.
2. Discuss and design sensor/actuator systems, using a variety of computer and networking hardware.
3. Discuss scripts for the Internet of Things.
4. Plan, design, and troubleshoot models of Internet of Things systems that address a real-world problem.

Lab Objectives:

1. Experiment with the devices and connections that make up the Internet of Things in relation to the physical world.
2. Use a variety of computer and networking hardware to build sensor/actuator systems.
3. Manipulate scripts to provide functionality for the Internet of Things.
4. Build, configure, and troubleshoot models of Internet of Things systems that address a real-world problem.

5. Use IP networks and cloud applications to interconnect end nodes.

## General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

## Articulation Information

- CSU Transferable

## Methods of Evaluation

- Classroom Discussions
  - Example: 1. Students will discuss examples of vertical and horizontal markets. Student discussions will be evaluated using a standardized rubric.
- Essay Examinations
  - Example: 1. Students will respond to a prompt regarding privacy and security implications of a given IoT model. Essays will be evaluated using a standardized rubric.
- Objective Examinations
  - Example: 1. Weekly quizzes will include open-response questions on the design, configuration, and troubleshooting of end-to-end Internet of Things systems comprised of sensors, actuators, microcontrollers, single board computers, network switches, routers, WiFi devices, and mobile computing devices. Quizzes will be evaluated through multiple choice format. Example: What is an example of a closed-loop control system? A. A manual garage door opener B. a clock C. a traditional dishwasher D. a thermostat
- Projects
  - Example: 1. Students will design and implement an end-to-end IoT prototype, following the Student Hackathon format. Projects will be evaluated using a standardized rubric.
- Skill Demonstrations
  - Example: 1. Students submit graded Packet Tracer projects building end-to-end models of Internet of Things systems. Packet Tracer projects will be evaluated using standardized rubrics. 2. In-class graded labs demonstrating proficiency with Arduino microcontrollers and Raspberry Pi Single Board Computers integrated in Ethernet and WiFi-connected TCP/IP networks built of switches, routers, servers, and firewalls. Labs will be assessed using a standardized rubric. (Lab Objectives 2 & 5)

## Repeatable

No

## Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Instructor will demonstrate rapid prototyping techniques to design an Internet of Things system to meet user requirements. Students will use process to design an IoT system device (Lab Objective #2).

Lecture:

1. After students read the assigned chapter on "Networking devices as part of end-to-end IoT system" and complete the review questions, the instructor will lead students through a demonstration of the skills for that chapter and review the key concepts of the week, including guiding students in the creation of Packet Tracer models (Lecture Objective #4).

#### Distance Learning

1. Instructor will post a recorded lecture and slide lecture presentation show on existing and emerging IoT technologies and their impact on organizations and society to the course Learning Management System. Students will brainstorm potential new technologies based upon course reading and their own experiences in an online forum. (Lecture Objective #1).

- Author: Cisco Networking Academy Online Course
- Publisher: Cisco
- Publication Date: Continually Updated
- Text Edition:
- Classic Textbook?: No
- OER Link:
- OER:

**Other materials and-or supplies required of students that contribute to the cost of the course.**

## Typical Out of Class Assignments

### Reading Assignments

1. Read "Chapter on Sensors, Actuators and Microcontrollers" (Cisco Networking Academy Online Course, Connecting Things) and answer the questions at the end of the chapter.
2. Read "Voltage, Current, Resistance, and Ohm's Law" from Sparkfun.com (<https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law>) and respond to 2 of the questions on the discussion board about this content.

### Writing, Problem Solving or Performance

1. Design, configure, and troubleshoot increasingly sophisticated virtual models of Internet of Things systems in the Packet Tracer simulation-based learning environment. Models will be presented in small group discussion and posted to student portfolio.
2. Conduct online research into Internet of Things technologies and global and local social and environmental problems that might be addressed using Internet of Things systems and present findings in small group discussion.

### Other (Term projects, research papers, portfolios, etc.)

1. Manage a portfolio of Python scripts and programs in GitHub.

## Required Materials

- IoT Fundamentals - Networking Technologies, Protocols, and Use Cases for the Internet of Things
  - Author: David Hanes
  - Publisher: Cisco Press
  - Publication Date: 2017
  - Text Edition: 1st
  - Classic Textbook?: No
  - OER Link:
  - OER:
- Connecting Things
  - Author: Cisco Networking Academy Online Course
  - Publisher: Cisco
  - Publication Date: Continually Updated
  - Text Edition:
  - Classic Textbook?: No
  - OER Link:
  - OER:
- Hackathon Playbook