COMPUTER SCIENCE

COURSE 6

CONTACT

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DESCRIPTION

Course 6 at MIT houses electrical engineering, computer science, and combinations of computer science with other areas. Computer scientists use computers to conceive, design, and test logical structures for solving problems with focuses on program efficiency and performance. Electrical engineers work to design new ways to use electrical power to develop or improve products, develop standards for manufacturing, construction, and installation, directing manufacturing, installation, and testing, and managing the production of electrical projects. Computer scientists often work as programmers or computer systems analysts, attempting to build and maintain complex technological systems. They may also work to develop control software, mobile applications, websites, and numerical analysis software.

INSIDE COURSE 6

6-1	Electrical Science and Engineering
6-2	Electrical Engineering and Computer Science
6-3	Computer Science and Engineering
6-7	Computer Science and Molecular Biolog
6-9	Computation and Cognition (Contact Course 9)
6-14	Computer Science, Economics, and Data Science
11-6	Urban Science and Planning with Computer Science (contact Course 11)

INTRODUCTORY COURSES

6.0001 **Introduction to Computer Science Programming in Pythom**
Introduction to computer science and programming for students with little or no programming experience. Students develop skills to program and use computational techniques to solve problems. Topics include the notion of computation, Python, simple algorithms and data structures, testing and debugging, and algorithmic complexity.

6.0002 **Introduction to Computational Thinking and Data Science**
Provides an introduction to using computation to understand real-world phenomena. Topics include plotting, stochastic programs, probability and statistics, random walks, Monte Carlo simulations, modeling data, optimization problems, and clustering.

6.01 **Introduction to EECS via Robotics**
An integrated introduction to electrical engineering and computer science, taught using substantial laboratory experiments with mobile robots. Key issues in the design of engineered artifacts operating in the natural world: measuring and

modeling system behaviors; assessing errors in sensors and effectors; specifying tasks; designing solutions based on analytical and computational models; planning, executing, and evaluating experimental tests of performance; refining models and designs. Issues addressed in the context of computer programs, control systems, probabilistic inference problems, circuits and transducers, which all play important roles in achieving robust operation of a large variety of engineered systems.

6.02 **Introduction to EECS via Communication Networks**
Studies key concepts, systems, and algorithms to reliably communicate data in settings ranging from the cellular phone network and the Internet to deep space. Weekly laboratory experiments explore these areas in depth. Topics presented in three modules - bits, signals, and packets - spanning the multiple layers of a communication system. Bits module includes information, entropy, data compression algorithms, and error correction with block and convolutional codes. Signals module includes modeling physical channels and noise, signal design, filtering and detection, modulation, and frequency-division multiplexing. Packets module includes switching and queuing principles, media access control, routing protocols, and data transport protocols.

6.03 **Introduction to EECS via Medical Technology**
Explores biomedical signals generated from electrocardiograms, glucose detectors or ultrasound images, and magnetic resonance images. Topics include physical characterization and modeling of systems in the time and frequency domains; analog and digital signals and noise; basic machine learning including decision trees, clustering, and classification; and introductory machine vision. Labs designed to strengthen background in signal processing and machine learning. Students design and run structured experiments, and develop and test procedures through further experimentation.

6.08 **Introduction to EECS via Interconnected Embedded Systems**
Introduction to embedded systems in the context of connected devices, wearables, and the "Internet of Things" (IoT). Topics include microcontrollers, energy utilization, algorithmic efficiency, interfacing with sensors, networking, cryptography, and local versus distributed computation. Students design, make, and program an Internet-connected wearable or handheld device. In the final project, student teams design and demo their own server-connected IoT system.

COURSE 6-FRIENDLY UROP AREAS

Computer Science and Artificial Intelligence Laboratory (CSAIL)
Research Laboratory of Electronics (RLE)
Laboratory for Information and Decision Systems (LIDS)
Microsystems Tech Lab (MTL)
Institute for Data, Systems, Society (IDS)
Lincoln Lab (LL)
Broad Institute (BR)

GET INVOLVED WITH EECS

CSAIL Student Social Committee
Electric Vehicle Team
Robotics Team
IEEE/ACM
Student Information Processing Team
AR/VR @ MIT
HKN
Women in EECS

SKILLS

COMPUTER SCIENCE

Proficiency in programming languages
Familiarity with relevant math concepts
Problem-solving and troubleshooting
Ability to work in interdisciplinary teams

ELECTRICAL ENGINEERING

Familiarity with basic engineering fundamentals
Interpret and write technical documents
Ability to work in interdisciplinary teams
Strong communication and problem solving

POSSIBLE FUTURE POSITIONS – COMPUTER SCIENCE

- **Network systems and data communications analyst/specialist:** Plan, design, build, maintain, and test networks and other data communications systems.
- **Computer programmer:** Write and test code that allows computer applications and software programs to function and turn program designs created by software developers into instructions a computer can follow.
- **Information security analyst:** Plan and carry out security measures to protect an organization's computer networks and systems. Responsibilities are continually expanding as the number of cyberattacks increases.
- **Software developer:** Develop computer programs and applications that allow people to do specific tasks on a computer or another device. Others develop the underlying systems that run the devices or that control networks.

CAREER INDUSTRY EXAMPLES

Automation	Laser and electro-optics	RF communications
App development	Magnetics	Robotics
Circuits and systems	Medical technologies	Telecommunications
Electrical insulation	Power electronics	Ultrasonics

SAMPLE EMPLOYERS

Amazon	Citadel LLC	Meta
Apple	Formlabs	McKinsey & Company
Boeing	Lockheed Martin	Nimble Robotics