ELECTRICAL ENGINEERING

COURSE 6

CONTACT

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DESCRIPTION

Course 6 at MIT houses electrical engineering, computer science, and combinations ofcomputer 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.

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 Biology
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

Student Information Processing Team

Electric Vehicle Team
Robotics Team
IEEE/ACM
AR/VR @ MIT
HKN
Women in EECS

SKILLS

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

POSSIBLE FUTURE POSITIONS

- **Control engineer:** Focus on the modeling of a diverse range of dynamic systems and design of controllers that cause these systems to behave in the desired manner.
- **Electronic engineer:** Employ knowledge of electronic theories and material properties to research, design, develop, and test electronic components and systems that are used in industrial, military, scientific, or commercial uses.
- **Electrical engineer:** Research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.

CAREER INDUSTRY EXAMPLES

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

SAMPLE EMPLOYERS

Amazon
Apple
Boeing
Bose
Citadel LLC
Formlabs
Fisker
General Electric
General Motors
Lockheed Martin
Nimble Robotics
Vecna Robotics