MIT EECS ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

EECS (Course 6) Subjects Recommended for Freshmen (2016)

Recommendations

The best choices to experience both EE and CS:

Take 6.01 or 6.S08 in the Spring term. Please verify the prerequisites in the catalog listings below.

If you'd like to dive into Electrical Engineering:

6.S197 is a hands-on introduction to EE designed to be taken in conjunction with 8.02 and 8.022. If you have completed the Physics II GIR, you can take 6.002 or 6.004.

If you'd like to dive into Computer Science:

If you have no programming experience, take 6.0001 and, if interested, follow up with 6.0002. After completing 6.0001 or passing the 6.0001 advanced standing exam, take 6.009.

If you're interested in math:

EE-oriented: take 6.041 (probability). CS-oriented: take 6.042J (discrete math).

If you want to take non-EECS courses but are worried about falling behind as an EECS major:

It works to wait until sophomore year to take your first EECS course although we recommend gaining experience in programming early in your career: it's a useful skill for all scientists and engineers!

EECS subjects to consider during the term
(☆ = can satisfy EECS requirement, ✧ = satisfies CS Minor requirement)

☆✧ 6.0001 Introduction to Computer Science Programming in Python (,) ½

Prereq: None, Units: 2-3-1 (first half of term)

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. Combination of 6.0001 and 6.0002 counts as a REST subject.

✧ 6.0002 Introduction to Computational Thinking and Data Science (,) ½

Prereq: 6.0001 or passing advanced standing exam, Unit: 2-3-1 (second half of term)

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. Combination of 6.0001 and 6.0002 counts as a REST subject.

☆ 6.01 Introduction to EECS I ( , ) 

Prereqs: 6.0001, passing 6.0001 advanced standing exam, or 6.S080 Co-req, Units: 2-4-6

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. Counts as an Institute Lab.

☆ 6.S08 Interconnected Embedded Systems () 

Prereqs: none, Units: 1-5-6

Satisfies current 6.01 requirement for EECS majors. Introduction to embedded systems in the context of connected devices, wearables and the "Internet of Things". Topics include microcontrollers, energy utilization, algorithmic efficiency, interfacing with sensors, networking, cryptography, local versus distributed computation, data analytics, and 3D printing. Students will design, make, and program an internet-connected wearable device. Final project where student teams will design and demo their own cloud-connected wearable system. Enrollment may be limited; preference to first- and second-year students. Counts as an Institute Lab.

☆ 6.002 Circuits and Electronics ( , ) R

Prereq: Physics II (GIR), Coreq: 18.03, Units: 4-0-8

Fundamentals of the lumped circuit abstraction. Resistive elements and networks, independent and dependent sources, switches and MOS devices, digital abstraction, amplifiers, and energy storage elements. Dynamics of first- and second-order networks; design in the time and frequency domains; analog and digital circuits and applications. Design exercises. Occasional laboratory. Counts as a REST subject.

☆✧ 6.004 Computation Structures ( , ) R

Prereq: experience with programming, basic electricity, Units: 4-0-8

Introduces architecture of digital systems, emphasizing structural principles common to a wide range of technologies. Multilevel implementation strategies; definition of new primitives (e.g., gates, instructions, procedures, and processes) and their mechanization using lower-level elements. Analysis of potential concurrency; precedence constraints and performance measures; pipelined and multidimensional systems. Instruction set design issues; architectural support for contemporary software structures. Counts as a REST subject.

★ 6.008 Introduction to Inference () 

Prereq: Calculus II or permission of instructor, Units: 4-4-4

Introduces probabilistic modeling for problems of inference and machine learning from data, emphasizing analytical and computational aspects. Distributions, marginalization, conditioning, and structure; graphical representations. Belief propagation, decision-making, classification, estimation, and prediction. Sampling methods and analysis. Introduces asymptotic analysis and information measures. Substantial computational laboratory component explores the concepts introduced in class in the context of realistic contemporary applications. Students design inference algorithms, investigate their behavior on real data, and discuss experimental results.

★✧ 6.009 (formerly 6.S04) Fundamentals of Programming ( , ) 

Prereq: 6.0001 or 6.01+6.S080, Units: 4-4-4

Introduces fundamental concepts of programming. Designed to develop skills in applying basic methods from programming languages to abstract problems. Topics include programming and Python basics, computational concepts, software engineering, algorithmic techniques, data types, and recursion and tail recursion. Lab component will consist of software design, construction and implementation of design. Counts as Institute Lab.

★ 6.041 Probabilistic Systems Analysis ( , )

Prereq: Calculus II (GIR), Units: 4-0-8

An introduction to probability theory, and the modeling and analysis of probabilistic systems. Probabilistic models, conditional probability. Discrete and continuous random variables. Expectation and conditional expectation. Limit Theorems. Bernoulli and Poisson processes. Markov chains. Bayesian estimation and hypothesis testing. Elements of statistical inference. Counts as a REST subject.

★✧ 6.042J Mathematics for Computer Science ( , )

Prereq: Calculus I (GIR), Units: 4-0-8

Elementary discrete mathematics for computer science and engineering. Emphasis on mathematical definitions and proofs as well as on applicable methods. Topics: formal logic notation, proof methods; induction, well-ordering; sets, relations; elementary graph theory; integer congruences; asymptotic notation and growth of functions; permutations and combinations, counting principles; discrete probability. Further selected topics such as: recursive definition and structural induction; state machines and invariants; recurrences; generating functions. Counts as a REST subject.

★6.S080 Brief Introduction to Python ( ,  , )
Prereq: none, Units: 0-1-2

A 3-week introduction to programming in Python for students with little or no prior experience, designed to be taken prior to or concurrently with 6.01. Students will learn the basics of programming in Python through online materials and laboratory exercises.

6.S197 Practical Magic ()
Prereqs: 8.01, Coreq: Physics II (GIR), Units: 2-5-2

Provides students with the opportunity to experience the magical aspects of applying physics and machining to electrical product design. Students learn to use modern fabrication processes (laser cutting, thermoforming, and computer controlled machining) to construct systems using basic physics principles including resonance, conservation laws, and electromagnetic forces. Projects vary bi-weekly, but include analysis and construction of systems like audio speakers, laser range finders, timed rocket igniters, and optical instruments.

EECS subjects to consider during IAP

No more than 12 units of IAP credit can be taken. No IAP subjects satisfy any requirements for an EECS degree, although many of them provide very useful preparation for our required subjects. All Course 6 IAP subjects are P/D/F. Most IAP subjects are organized and taught by students.

6.057 Introduction to MATLAB, Units: 1-0-2
6.117 Introduction to Electrical Engineering Lab Skills, Units: 1-3-2
6.146 Mobile Autonomous Systems Laboratory: MASLAB, Units: 2-2-2
6.147 The BattleCode Programming Competition, Units: 2-0-4
6.148 Web Programming Competition, Units: 1-0-5
6.149 Introduction to Programming Using Python, Units: 3-0-3
6.151 iOS Game Design and Development Competition, Units: 2-2-2
6.176 Pokerbots Competition, Units: 1-0-5
6.177 Building Programming Experience in Python, Units: 1-0-5
6.178 Introduction to Software Engineering in Java, Units: 1-1-4
6.179 Introduction to C and C++, Units: 3-3-0

Questions?

If you or your advisor have any questions about EECS subjects, please visit the EECS Academics and Advising forum at http://bit.ly/6acad. Feel free to post your questions there!