EECS (Course 6) Subjects Recommended for Freshmen (2018-2019)

Recommendations

The best choices to experience both EE and CS:
In the Spring term take 6.08 or 6.01. Please verify the prerequisites in the catalog listings below.
6.004 introduces digital circuits and computer architecture.

If you’d like to dive into Electrical Engineering:
If you have completed the Physics II GIR, you can take 6.002.

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:

If you want to take non-E ECS 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 Fall and Spring terms
(★ = can satis fy EECS requirement, ✧ = satisfies CS Minor requirement)

★✧ 6.0001 Introduction to Computer Science Programming in Python  (Fall, Spring) ½REST
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  (Fall, Spring) ½REST
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**  (Fall, Spring) Institute Lab  
Prereqs: 6.0001, passing 6.0001 advanced standing exam, or 6.5080 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.

**6.08 Interconnected Embedded Systems**  (Spring) Institute Lab  
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**  (Fall, Spring) REST  
Prereq: Physics II (GIR), Coreq: 18.03, Units: 4-0-8


**6.004 Computation Structures**  (Fall, Spring) REST  
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** (Fall) Institute Lab
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 6.504) Fundamentals of Programming** (Fall, Spring) Institute Lab
Prereq: 6.0001 or 6.01+6.080, 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.

**6.041A, 6.041B Probabilistic Systems Analysis** (Fall, Spring) REST
Prereq: Calculus II (GIR), Units: 4-0-8


**6.042J Mathematics for Computer Science** (Fall, Spring) REST
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.
**6.080 Brief Introduction to Python** (Fall, IAP, Spring)
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.

**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. For the full list of Course 6 IAP classes for 2018, see https://www.eecs.mit.edu/node/6938.

- **6.080 Brief Introduction to Python**, Units: 0-1-2
- **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
- **6.178 Introduction to Software Engineering in Java**, Units: 1-1-4
- **6.179 Introduction to C and C++**, Units: 3-3-0
- **6.087 Frame by Frame: Learn to Animate with Stop-Motion**, Units: 3
- **6.090 How to Nail a Technical Interview: Methods for Quantitative Problem Solving**, 3 units
- **6.095 Programming for the Puzzled: Learn to Program While Solving Puzzles**, 3 units
- **6.098 Introduction to R for Data Science**, 6 units
- **6.187 Code for Good**, 6 units
- **6.190 Rapid Application Development Competition**, 3 units
- **6.198 Introduction to LabVIEW: Program the World!**, 6 units

**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!