Choosing Your First Computing Course

The Computing Requirement in Engineering
Four credits of computing are required, which can be covered by any of the courses below.

(1) Introduction to Computing Using Python (CS 1110), 4 credits, letter grade.
(2) Introduction to Computing Using Matlab (CS 1112), 4 credits, letter grade.
(3) Introduction to Computing Using Matlab and Robotics (CS 1114), 4 credits, letter grade.
(4) Introduction to Computational Science and Engineering Using Matlab Graphical User Interfaces (CS 1115), 4 credits, letter grade.

Which of these courses you take is entirely your choice. All courses cover the same foundational computing concepts, even though some courses use Python and others Matlab as their programming language. The courses mostly differ in emphasis, and a short description of each course is given below. Note that you can always learn the other programming language as well by taking one of the transition courses

(a) Transition to Matlab (CS 1132), 1 credit, pass/fail.
(b) Transition to Python (CS 1133), 1 credit, pass/fail.

These transition courses take only 5 weeks to complete. CS 1133 will be offered starting in Spring ’13. CS 1132 is offered fall and spring. CS 1132 also provides all the material as an auto-tutorial on the web, so you can do the studying during the winter break or during the summer.

Deciding on a First Computing Course
Below, CS 111x refers to one of the 4-credit courses CS 1110, CS 1112, CS 1114, and CS 1115. For your information, brief course descriptions appear below. There is no need to decide until the semester begins and you can enroll or switch courses via http://studentcenter.cornell.edu/ during pre-enroll in July or during add/drop in August. However, enrollment in CS 1114, CS 1115, and CS 2112 is limited and assigned on a first-come first-serve basis. Note that CS 1112 and CS 1115 have mathematics pre/co-requisites while CS 1110 and CS 1114 do not.

1. Generally, engineering students take CS111x and an ENGRI course in different semesters during the first year, but if you have AP credit for CHEM 2090 and PHYS 1112, seriously consider taking both CS111x and an ENGRI course in your first semester.

2. If you are interested in computer science as a possible major or minor and do not have AP credit for programming, taking CS 111x the first semester is a good idea but is not necessary.

3. If you took an AP-level course in high school in Java and received 5 on the Computer Science A exam or perform sufficiently well on the placement exam Cornell offers to entering students during orientation, you will be offered credit for CS 1110. You may want to take one of the two transition courses CS 1132 or CS 1133 to learn Python or Matlab, but this is optional. Students considering majoring in CS, ORIE, ISST or ECE may want to (1) accept the AP credit and (2) take CS/ENGRD 2110 (or CS/ENGRD 2112) as the first programming course. (Note that one of CS/ENGRD 2110 or CS/ENGRD 2112 is required for CS, ORIE, and ISST majors, and it is strongly recommended for ECE majors.)

4. If you have exceptional prior experience, upper-level courses such as CS 3110 may be appropriate. Contact the CS undergrad office at 607-255-0982 or ugrad@cs.cornell.edu for more information and guidance.

Course Descriptions
Below is a short description of each course. Additional information can be found at

http://www.cs.cornell.edu/Courses/ListofCSCourses/index.htm

CS 1110 Introduction to Computing Using Python; offered fall, spring, and summer; 4 credits
Assumes basic high school mathematics (no calculus), but no programming experience. Programming and problem solving using Python. Emphasizes principles of software development, style, and testing. Topics include object-
oriented concepts, procedures and functions, iteration, recursion, arrays and vectors, strings, algorithms, exceptions, and GUIs (graphical user interfaces). Weekly labs provide guided practice on the computer, with staff present to help. Assignments use graphics and GUIs to help develop fluency and understanding.

**CS 1112 Introduction to Computing Using MATLAB; offered fall and spring; 4 credits**
Assumes student is comfortable with mathematics (at the level of one semester of calculus), but has no prior programming experience. Programming and problem solving using MATLAB. Emphasizes the systematic development of algorithms and programs. Topics include iteration, functions, arrays and vectors, strings, recursion, algorithms, object-oriented programming, and MATLAB graphics. Assignments are designed to build an appreciation for complexity, dimension, fuzzy data, inexact arithmetic, randomness, simulation, and the role of approximation. Weekly discussion or lab sections provide guided practice.

**CS 1114 Introduction to Computing Using Matlab and Robotics; offered spring; 4 credits**
Assumes basic high school mathematics (no calculus) and some prior programming experience. Honors-level introduction to computer science using camera-controlled robots using MATLAB. Emphasis is on modular and object-oriented design of programs and on fundamental algorithms. Extensive laboratory experiments with cameras and robots, including Sony Aibo. Example projects include controlling a robot by pointing a light stick and making a robot recognize simple colored objects.

**CS 1115 Introduction to Computational Science and Engineering Using Matlab Graphical User Interfaces; offered fall; 4 credits**
Assumes that students are also enrolled in MATH 1920 or MATH 1120 (or above), and that they also have some prior programming experience. Programming and problem solving using MATLAB. Emphasizes the systematic development of algorithms and programs. Topics include iteration, functions, arrays and vectors, strings, recursion, object-oriented programming, and MATLAB graphics. Assignments are designed to build an appreciation for complexity, dimension, fuzzy data, inexact arithmetic, randomness, simulation, and the role of approximation. The pace is more rapid than CS 1112. Every assignment involves the design of a graphical user interface and highlights important aspects of computational science and engineering. Weekly labs provide guided practice. Also see [http://www.cs.cornell.edu/courses/CS1115/2012fa/](http://www.cs.cornell.edu/courses/CS1115/2012fa/).

**CS 1132 Transition to Matlab; offered fall and spring; 1 credit; pass/fail only**
Introduction to programming in Matlab. Assumes programming knowledge in a language like Python, Java, C, C++, or Fortran.

**CS 1133 Transition to Python; offered spring; 1 credit; pass/fail only**
Introduction to programming in Python. Assumes programming knowledge in a language like MATLAB, Java, C, C++, or Fortran.

**CS/ENGRD 2110 Object-Oriented Design and Data Structures; offered fall, spring, and summer; 3 credits**
Prerequisite: One of: CS 1110, CS 1112, CS 1114, CS 1115, or an equivalent course in object-oriented programming. Intermediate programming and introduction to computer science. Topics include program structure and organization, object-oriented programming (classes, objects, types, sub-typing), graphical user interfaces, algorithm analysis (asymptotic complexity, big “O” notation), recursion, data structures (lists, trees, stacks, queues, heaps, search trees, hash tables, graphs), simple graph algorithms. Java is the principal programming language.

**CS/ENGRD 2112 Object-Oriented Design and Data Structures - Honors; offered fall; 4 credits**
Prerequisite: Very good performance in one of: CS 1110, CS 1112, CS 1114, CS 1115, or an equivalent course in object-oriented programming, or permission of the instructor. Honors version of CS 2110 / ENGRD 2110. Topics are similar to those in CS 2110 but are covered in greater depth, with more challenging assignments. Java is the principal programming language.