COMPUTER SCIENCE *Prerequisites*

VISITING STUDENTS: *Make sure you are familiar with the topics covered in the prerequisite(s) listed for a course, either from having taken a similar course at another college or university or from having previous background knowledge. The department trusts that students will place themselves accurately when enrolling in courses—no documentation of having met the listed prerequisite(s) is needed in order to enroll in Axess.*

Prerequisite Course	Prerequisite Course Description
CS 103: Mathematical Foundations of Computing	Mathematical foundations required for computer science, including propositional predicate logic, induction, sets, functions, and relations. Formal language theory, including regular expressions, grammars, finite automata, Turing machines, and NP-completeness. Mathematical rigor, proof techniques, and applications.
CS 106A/ENGR 70A: Programming Methodology	Introduction to the engineering of computer applications emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and testing. Uses the Java programming language. Emphasis is on good programming style and the built-in facilities of the Java language. No prior programming experience required.
CS 106B/ENGR 70B: Programming Abstractions	Abstraction and its relation to programming. Software engineering principles of data abstraction and modularity. Object-oriented programming, fundamental data structures (such as stacks, queues, sets) and data-directed design. Recursion and recursive data structures (linked lists, trees, graphs). Introduction to time and space complexity analysis. Uses the programming language C++ covering its basic facilities.
CS 107: Computer Organization and Systems	Introduction to the fundamental concepts of computer systems. Explores how computer systems execute programs and manipulate data, working from the C programming language down to the microprocessor. Topics covered include: the C programming language, data representation, machine-level code, computer arithmetic, elements of code compilation, memory organization and management, and performance evaluation and optimization.
CS 109: Computer Organization and Systems	Topics include: counting and combinatorics, random variables, conditional probability, independence, distributions, expectation, point estimation, and limit theorems. Applications of probability in computer science including machine learning and the use of probability in the analysis of algorithms.
EE 263: Introduction to Linear Dynamical Systems	Applied linear algebra and linear dynamical systems with application to circuits, signal processing, communications, and control systems. Topics: least-squares approximations of over-determined equations and least-norm solutions of underdetermined equations. Symmetric matrices, matrix norm, and singular value decomposition. Eigenvalues, left and right eigenvectors, with dynamical interpretation. Matrix exponential, stability, and asymptotic behavior. Multi-input/multi-output systems, impulse and step matrices; convolution and transfer matrix descriptions. Control, reachability, and state transfer; observability and least-squares state estimation.

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Prerequisite Course	Prerequisite Course Description
MATH 51: Linear Algebra and Differential Calculus of Several Variables	Geometry and algebra of vectors, systems of linear equations, matrices and linear transformations, diagonalization and eigenvectors, vector valued functions and functions of several variables, parametric curves, partial derivatives and gradients, the derivative as a matrix, chain rule in several variables, and constrained and unconstrained optimization.
STATS 116: Theory of Probablity	Probability spaces as models for phenomena with statistical regularity. Discrete spaces (binomial, hypergeometric, Poisson). Continuous spaces (normal, exponential) and densities. Random variables, expectation, independence, conditional probability. Introduction to the laws of large numbers and central limit theorem.