# List of Group I courses for Computer Science Major

**CS Majors are required to take four courses from this list, *including at least one* with an asterisk "*". Courses with a "*" are considered Group IA. All courses below (those with an "*" and those without) meet Group IB requirements.**

***CS410 Introduction to Computer Graphics** [4 cr.]
Prerequisite: MATH229 or MATH369, CS253.
Graphics hardware and software. Drawing simple objects. Coordinate transformations in 2D and 3D. Modeling and viewing complex 2D and 3D objects.

***CS414 Object-oriented Design** [4 cr.]
Prerequisite: CS314.
Object-oriented methods for large-scale software systems. Software design for reuse using patterns. WWW applications in languages such as Java.

**CS420 Introduction to the Analysis of Algorithms** [4 cr.]
Prerequisite: CS320.
Efficiency analysis, correctness proofs, design strategies, illustrations from domains such as graph theory, scheduling and optimization, geometry.

**CS425 Introduction to Bioinformatic Algorithms** [4 cr.]
Prerequisite: CS320 with a C or better.
Algorithms for analysis of large scale biological data.

**CS430 Database Systems** [4 cr.]
Prerequisite: CS314.
Database analysis, design, administration, implementation, hierarchical, network relational models; data sub-languages; query facilities.

***CS440 Introduction to Artificial Intelligence** [4 cr.]
Prerequisite: CS253, CS320.
Concepts, representations, and algorithms for applications of problem solving search, logical reasoning and machine learning.

**CS453 Introduction to Compiler Construction** [4 cr.]
Prerequisite: CS253, CS314.
Functional components of a compiler: modules, interfaces, lexical and syntax analysis, error recovery, resource allocation, code generation.

***CS 454 Principles of Programming Languages** [4 cr.]
Prerequisite: CS253, CS320
Language design concepts; functional programming; interpreter support for environments, procedures, recursion, types, objects; language paradigms.

***CS455 Introduction to Distributed Systems** [4 cr.]
Prerequisite: CS 370.
Fundamentals of distributed systems: currency, thread pools, scalable servers, graphs, data formats, transactions, secure systems, and overlays.

**CS457 Computer Networks and the Internet** [4 cr.]
Prerequisite: CS370, CS253, STAT301 or STAT315.
Principles of communications, local area networks, communications protocols, TCP/IP, and the Internet.

***CS464 Principles of Human-Computer Interaction** [4 cr.]
Prerequisite: CS253
History and trends in human-computer interaction; user-centered design techniques; prototyping; experimental methods for the evaluation of technology.

**CS470 Computer Architecture** [4 cr.]
Prerequisite: CS370.
Instruction sets. Control unit: hardwired and microprogramming. Memory systems.
Computer arithmetic. I/O and bus control. Performance evaluation. Pipelining.
RISC processors.

***CS475 Parallel Programming** [4 cr.]
Prerequisite: CS370.
Parallel programming techniques for shared-memory and message-passing systems; process synchronization, communication; example languages.