

Computer Science Course Descriptions (COMP)

- [Prerequisite Chart](#)
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CMPS 101 — INTRODUCTION TO C++ PROGRAMMING (3)

Properties of algorithms, languages, and notations for describing algorithms, applications of a procedure-oriented language to problem solving. A student may receive credit for only one of the following courses: CMPS 101, 200, 201, 202, 121.

CMPS 121 — INTRODUCTION TO PROGRAMMING TECHNIQUES (3)

Design and implementation of algorithms. Structured programming. Problem solving techniques. Introduction to a high-level language, including arrays, procedures, and recursion.

Prerequisite: [MATH 110](#) as prerequisite or [MATH 140](#) as concurrent.

CMPS 122 — INTERMEDIATE PROGRAMMING (3)

Object-oriented programming, recursion, fundamental data structures (including stacks, queues, linked lists, hash tables, trees, and graphs), the basics of algorithmic analysis, and an introduction to the principles of language translation.

Prerequisite: [CMPS 121](#).

CMPS 131 — PROGRAMMING AND COMPUTATION I: FUNDAMENTALS (3)

This course introduces the fundamental concepts and processes of solving computational problems through the design, implementation, testing and evaluation of efficient and robust computer programs. The concepts include basic computational constructs found in imperative, object-oriented and functional programming languages such as iteration, conditionals, functions, recursion, and datatypes.

Prerequisite: [MATH 110](#) as prerequisite or [MATH 140](#) as concurrent.

CMPS 132 — PROGRAMMING AND COMPUTATION II: Data Structures (3)

This course builds upon the foundations of programming and computation by introducing and studying the data structures and programming language features that support the design and construction of large-scale software systems. It introduces the foundations of object-oriented programming, the design and analysis of efficient algorithms using important data structures, and programming techniques that support reusable and modular program components, including data abstraction, polymorphism, and higher-order functions.

Prerequisite: [CMPS 121](#) or [CMPS 131](#).

CMPS 221 — OBJECT ORIENTED PROGRAMMING WITH WEB-BASED APPLICATIONS (3)

This course will continue with object-oriented programming and will introduce graphics, virtual machines, programming language concepts and web-based programming using Java.

Prerequisite: [CMPS 132](#) or equivalent.

CMPS 312 — COMPUTER ORGANIZATION AND ARCHITECTURE (3)

Data representation, digital logic, instruction set/control logic, machine/assembly languages, advanced architectures, memory hierarchy, I/O devices, overall system design.

Prerequisite: [CMPS 131](#) or equivalent.

CMPSC 313 — ASSEMBLY LANGUAGE PROGRAMMING (3)

Program design, addressing modes, subroutines, parameter passing, stacks, bit manipulation, text processing, DOS functions, macros, I/O, high level language interfaces.

Prerequisite: CMPSC 312

CMPSC 330: Advanced Programming in C++ (3)

In-depth study of various programming paradigm including procedural, object oriented, and generic programming in C++ programming language. The primary goals of this course are (1) to provide students with an in-depth knowledge of different programming paradigms, (2) to provide students with the ability to design and develop software using the paradigm that is appropriate to a given problem, and (3) to provide students with the programming concepts that are applicable to programming in other languages. The secondary goal of this course is to expose students to a diverse range of programming tasks using C++ programming language that is frequently used in the follow up courses as well as in industry.

Prerequisite: C or better in CMPSC 132

CMPSC 360 — DISCRETE MATHEMATICS FOR COMPUTER SCIENCE (3)

Discrete mathematics and foundations for modern computer science. Topics include sets, relations, logic, algorithms, graphs, finite state machines and regular expressions.

Prerequisite: CMPSC 132

CMPSC 412 — DATA STRUCTURES LAB (1.5)

Programming with common data structures; recursion; stacks, queues, dictionaries, priority queues; string searching and manipulation; sorting; trees; combinatorics.

Concurrent: CMPSC 462 or CMPSC 465

CMPSC 413 — ALGORITHMS LAB (1.5)

Programming with common algorithm design techniques; divide and conquer, greedy method, dynamic programming, and tree and graphy traversals.

Concurrent: CMPSC 463 or CMPSC 465

CMPSC 414 — CONTEST PROGRAMMING (1)

Programming Contest Questions; Common Data Structures; Strings; Sorting; Searching; Combinatorics; Number Theory; Graph Algorithms; Dynamic Programming.

Concurrent: CMPSC 221 or CMPSC 330

CMPSC 421 — NET-CENTRIC COMPUTING (3)

This course introduces JavaScript and AJAX for creating Rich Internet Applications, and XML for client-server communication and Web Services.

Prerequisite: CMPSC 221 or SWENG 311

CMPSC 430 — DATABASE DESIGN (3)

Relational database model, query languages, integrity, reliability, normal forms for design.

Concurrent: CMPSC 462

CMPSC 436 — COMMUNICATIONS AND NETWORKING (3)

Data transmission, basic signaling, data encoding, error control, communication protocols, security, network topologies, routing, switching, internetworking, emerging high speed networks.

Prerequisite: CMPSC 312

CMPSC 438 — COMPUTER NETWORK ARCHITECTURE AND PROGRAMMING (3)

Network architectures, communication protocols, internetworking, network security, client-server computing, web application development,

programming with APIs.

Prerequisite: CMPSC 312, CMPSC 221; CMPSC 330

CMPSC 441 — ARTIFICIAL INTELLIGENCE (3)

Problem solving, search techniques including local search and genetic algorithms, knowledge representation, planning, learning, and neural networks.

Prerequisite: CMPSC 462

CMPSC 444 — SECURE PROGRAMMING (3)

Secure software design principles/practice, common threats, applied cryptography, trust management, input validation, OS-/programming language- specific issues, software validation.

Prerequisite: CMPSC 221 or CMPSC 330

CMPSC 445 — APPLIED MACHINE LEARNING IN DATA SCIENCE (3)

Applied machine learning techniques are used in many different areas, such as the classification, visualization and analysis of data, clustering, and understanding of natural languages for human-computer interactions. This course will start with an overview of supervised and unsupervised learning, and introduce the associated libraries. It covers basic machine learning concepts, tasks, and workflow using an example classification problem based on K-nearest neighbors, Naïve Bayes, Support Vector Machine (SVM), K-means, and implementation using Python libraries. Natural language processing (NLP) techniques including n-gram models, grammar, parse trees, and part-of-speech tagging will be discussed.

Prerequisite: STAT 318, MATH 220, CMPSC 132

CMPSC 446 — DATA MINING (3)

Data Mining is the process of discovering patterns, correlations, and trends, in large data sets. This course is designed to provide an overview of the data mining process, with an emphasis on data management, pattern discovery, and cluster analysis.

Prerequisite: STAT 318, MATH 220, DS 220

CMPSC 455 — INTRODUCTION TO NUMERICAL ANALYSIS I (3)

Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from CMPSC (MATH) 451 and CMPSC (MATH) 455.

Prerequisite: MATH 220, MATH 230 or MATH 231, 3 credits of programming

CMPSC 457 — COMPUTER GRAPHICS ALGORITHMS (3)

Graphics systems/hardware, color models, transformations, projections, clipping, hidden line/surface removal, aliasing, parametric curves/surfaces, 3D modeling, animation.

Prerequisite: CMPSC 330, MATH 220

CMPSC 460 — PRINCIPLES OF PROGRAMMING LANGUAGES (3)

Design and implementation of high level programming languages and survey of language paradigms including imperative, functional, and object-oriented programming.

Prerequisites: CMPSC 312, CMPSC 462

Concurrent: CMPSC 469

CMPSC 462 — DATA STRUCTURES (3)

In-depth theoretical study of data structures such as balanced trees, hash tables, priority queues, B-trees, binomial heaps, and Fibonacci heaps.

Prerequisites: C or better in MATH 141 and C or better in CMPSC 132 and C or better in CMPSC 360 and CMPSC 330

CMPSC 463 — DESIGN AND ANALYSIS OF ALGORITHMS (3)

Recurrences, algorithms design techniques, searching, sorting, selection, graph algorithms, NP-completeness, approximation algorithms, local

optimization algorithms.

Prerequisites: CMPSC 462,

Concurrent: STAT 301 or MATH 318 or STAT 318

CMPSC 469 — FORMAL LANGUAGES WITH APPLICATIONS (3)

Regular, context free, recursive, and recursively enumerable languages; associated machine models; applications.

Prerequisite: CMPSC 360

CMPSC 470 — COMPILER CONSTRUCTION (3)

Compiler design and implementation; scanning, parsing, semantic analysis, optimization (including static analysis), code generation, garbage collection, and error detection.

Prerequisite: CMPSC 312, CMPSC 330, CMPSC 462, CMPSC 469

CMPSC 472 — OPERATING SYSTEM CONCEPTS (3)

Theoretical and practical issues of operating systems design and implementation, process management, concurrent programming, memory management, scheduling, I/O, and security.

Prerequisites: CMPSC 312, CMPSC 462, CMPSC 469, C or better in CMPSC 330,

CMPSC 475 — MOBILE APPLICATIONS PROGRAMMING (3)

Development of software for devices including smart phones, tablets, handheld units, and other general purpose computing platforms.

Prerequisites: CMPSC 221, CMPSC 312, CMPSC 462

CMPSC 487W — SOFTWARE ENGINEERING AND DESIGN (3)

Software development process, life cycle; requirements analysis, specification, design, prototyping, testing, project management, and documentation.

Prerequisite: ENGL 202C, CMPSC 330

CMPSC 488 — COMPUTER SCIENCE PROJECT (3)

Project design and implementation with an emphasis on team work, documentation, and the employment and integration of computer science concepts.

Prerequisite: CMPSC 487W

CMPSC 495 — INTERNSHIP (1-18)

Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.

Prerequisite: Prior approval of proposed assignment by instructor

CMPSC 496 — INDEPENDENT STUDIES (1-18)

Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

CMPSC 497 — SPECIAL TOPICS (1-9)

Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

Typically offered special topic courses include:

- Natural Language Processing
- Computer Forensics
- Data Mining

Mathematical Science Course Descriptions (MATH)

Prerequisite chart for

- [General Option](#)
 - [Secondary Education Option](#)
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MATH 140 (GQ) — Calculus With Analytic Geometry I (4)

Functions, limits; analytic geometry; derivatives, differentials, applications; integrals, applications. Students may only take one course for credit from MATH 110, 140, 140A, 140B, and 140H.

Prerequisite: [MATH 022](#), [MATH 026](#); or [MATH 040](#) or [MATH 041](#) or satisfactory performance on the mathematics placement examination

MATH 141 (GQ) — Calculus with Analytic Geometry II (4)

Derivatives, integrals, applications; sequences and series; analytic geometry; polar coordinates. Students may take only one course for credit from MATH 141, 141B, and 141H.

Prerequisite: [MATH 140](#), [MATH 140A](#), [MATH 140B](#) or [MATH 140H](#)

MATH 220 (GQ) — Matrices (2-3)

Systems of linear equations; matrix algebra; eigenvalues and eigenvectors; linear systems of differential equations.

Prerequisite: [MATH 110](#), [MATH 140](#) or [MATH 140H](#)

MATH 230 — Calculus and Vector Analysis (4)

Three-dimensional analytic geometry; vectors in space; partial differentiation; double and triple integrals; integral vector calculus. Students who have passed either Math 231 or 232 may not schedule Math 230 or 230H for credit.

Prerequisite: [MATH 141](#) or [MATH 141H](#)

MATH 250 — Ordinary Differential Equations (3)

First- and second-order equations; special functions; Laplace transform solutions; higher order equations. Students who have passed MATH 251 may not schedule this course for credit.

Prerequisite: [MATH 141](#)

MATH 251 — Ordinary and Partial Differential Equations (4)

First- and second-order equations; special functions; Laplace transform solutions; higher order equations; Fourier series; partial differential equations.

Prerequisite: [MATH 141](#) or [MATH 141H](#)

STAT 301 — Statistical Analysis I (3)

Probability concepts; nature of statistical methods; elementary distribution and sampling theory; fundamental ideas relative to estimation and testing hypotheses.

Prerequisite: 3 credits of calculus

MATH 315 — Foundations of Mathematics (3)

A consideration of selected topics in the foundations of mathematics, with emphasis on development of basic meaning and concepts.

Prerequisite: [MATH 141](#)

MATH 318 (STAT 318) — Elementary Probability (3)

Combinatorial analysis, axioms of probability, conditional probability and independence, discrete and continuous random variables, expectation, limit theorems, additional topics. Students who have passed either MATH(STAT) 414 or 418 may not schedule this course for credit.

Prerequisite: MATH 141

MATH 401 — Introduction to Analysis I (3)

Review of calculus, properties of real numbers, infinite series, uniform convergence, power series. Students who have passed Math 403 may not schedule this course.

Prerequisite: MATH 230 or MATH 231

MATH 412 — Fourier Series and Partial Differential Equations (3)

Orthogonal systems and Fourier series; derivation and classification of partial differential equations; eigenvalue function method and its applications; additional topics.

Prerequisite: MATH 230; MATH 250 or MATH 251

MATH 421 — Complex Analysis (3)

Infinite sequences and series; algebra and geometry of complex numbers; analytic functions; integration; power series; residue calculus; conformal mapping, applications.

Prerequisite: MATH 230, MATH 232 or MATH 405; MATH 401 or MATH 403

MATH 425 — Introduction to Operations Research (3)

Nature of operations research, problem formulation, model construction, deriving solution from models, allocation problems, general linear allocation problems, inventory problems.

Prerequisite: MATH 141 and MATH 220

MATH 427 — Foundations of Geometry (3)

Euclidean and various non-Euclidean geometries and their development from postulate systems. Students who have passed MATH 427 may not schedule MATH 471.

Prerequisite: MATH 230 or MATH 231

MATH 430 — Linear Algebra and Discrete Models I (3)

Vector spaces, linear transformations, matrices determinants, characteristic values and vectors, systems of linear equations, applications to discrete models.

Prerequisite: MATH 220

MATH 431 — Linear Algebra and Discrete Models II (3)

Vector spaces, linear transformations, matrices, determinants, characteristic values and vectors, systems of linear equations, applications to discrete models.

Prerequisite: MATH 430

MATH 435 — Basic Abstract Algebra (3)

Elementary theory of groups, rings, and fields. Students who have passed MATH 435 may not schedule MATH 470.

Prerequisite: MATH 311W or MATH 315

MATH 449 — Applied Ordinary Differential Equations (3)

Differential and difference equations and their application to biology, chemistry, and physics; techniques in dynamical systems theory.

Prerequisites: MATH 250 or MATH 251

MATH 450 — Mathematical Modeling (3)

Constructing mathematical models of physical phenomena; topics include pendulum motion, polymer fluids, chemical reactions, waves, flight, and chaos.

Prerequisite: either MATH 315 and MATH 430 or MATH 405 or MATH 412

MATH 455 — Introduction to Numerical Analysis I (3)

Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from MATH 451 and MATH 455.

Prerequisite: CMPSC 201, CMPSC 202 or CMPSC 121; MATH 220; MATH 230 or MATH 231

MATH 465 — Number Theory (3)

Elements, divisibility of numbers, congruences, residues, and forms.

Prerequisite: MATH 311W

MATH 468 — Mathematical Coding Theory (3)

Shannon's theorem, block codes, linear codes, Hamming codes, Hadamard codes, Golay codes, Reed-Muller codes, bounds on codes, cyclic codes.

Prerequisite: MATH 311W; advanced calculus

MATH 475W — History of Mathematics (3)

A global survey of the history of mathematics as viewed as a human response to cultural, political, economic, and societal pressures.

Prerequisite: MATH 315 or MATH 311W

MATH 496 — Independent Studies (1-18)

Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

MATH 497 — Special Topics (1-9)

Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

MATH/COMPUTER SCIENCES HOME PAGE

| [MATH HOME](#) | [ENTRANCE REQ](#) | [DEGREE REQ](#) | [COURSES](#) | [PREREQ CHART](#) | [FACULTY](#) | [STUDENTS](#) |

PROSPECTIVE MATH STUDENTS

CURRENT MATH STUDENTS

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