

COMPUTER AND COMPUTATIONAL MATHEMATICS

The courses in Computer and Computational Mathematics (CCM) develop skills in applying mathematical algorithms and scientific computing in real world situations.

Minor or Integrative Studies Concentration Requirements

A minor or concentration consists of 12 hours of upper-level credit in courses specifically selected as CCM.

CCM 150 Computer Science I 4 Credit Hours

An introduction to structured computer programming covering problem formulation, algorithm development, the C++ programming language, program testing and debugging, capabilities and elements of computer organization, and object-oriented software methodologies.

Prerequisite(s): MATH 115*

Corequisite(s): CCM 150L

CCM 172 Computing Environ for Math 3 Credit Hours

This course covers introductory programming techniques for Mathematics majors. Students will learn to program in sage and python. Topics include data types, variables and assignments, decisions, loops, functions, recursion, arrays and objects. Programming assignments focus on problems that are mathematical in nature, giving students an opportunity to use simulations to understand and verify familiar mathematical results. This course, or CIS/CCM 150, satisfies the programming requirement for the Mathematics concentration.

Prerequisite(s): MATH 115

Restriction(s):

Can enroll if Class is Freshman or Sophomore or Junior or Senior

Can enroll if College is Arts, Sciences, and Letters

CCM 305 The Theory of Computation 3 Credit Hours

An introduction to the foundations of computer science including the theory of computability, Turing machines, automata, and formal languages.

Prerequisite(s): CIS 175 and (CIS 200 or IMSE 200)

CCM 390 Topics in Computational Math 1 to 3 Credit Hours

A course designed to offer selected topics in different areas of applied mathematics. The specific topics will be announced together with the prerequisites for each separate offering. Course may be repeated when the topics covered differ.

CCM 399 Independent Studies 1 to 3 Credit Hours

Readings or analytical assignments in Computers and Computational Mathematics in accordance with the needs and interests of those enrolled and agreed upon by the student and advising instructor.

CCM 404 Dynamical Systems 3 Credit Hours

The aim of this course is to survey the standard types of differential equations. This includes systems of differential equations, and partial differential equations, including for each type, a discussion of the basic theory, examples of applications, and classical techniques of solutions with remarks about their numerical aspects. Also included are autonomous and periodic solutions, phase space, stability, perturbation techniques and Method of Liapunov. Students cannot receive credit for both MATH 404 and MATH 504. (AY).

Prerequisite(s): (MATH 216 or MATH 228) and (MATH 217 or MATH 227)

CCM 451 Computer Graphics 3 Credit Hours

Basic geometrical concepts: graphics output primitives, two-dimensional transformations, windowing and clipping, three-dimensional viewing, visible surface detection methods, graphical user interfaces.

Prerequisite(s): (CCM 350 or CIS 350 or IMSE 350) or (ECE 370 and MATH 276) and (MATH 215 or MATH 205) and (MATH 217 or MATH 227)

Restriction(s):

Can enroll if Class is Graduate

CCM 458 Introduction to Wavelets 3 Credit Hours

This course will introduce the students to theory and application of wavelets using linear algebra. Topics will include the discrete Fourier transform, the fast Fourier transform, linear transformations, orthogonal decomposition, discrete wavelet analysis, the filter bank, Haar Wavelet family, Daubechies's Wavelet family, and applications. Students cannot receive credit for both MATH 458 and MATH 558. (OC)

Prerequisite(s): MATH 217 or MATH 227

Restriction(s):

Can enroll if Class is Sophomore or Junior or Senior

CCM 472 Intro to Numerical Analysis 3 Credit Hours

Solution of linear systems by Gaussian elimination, solution of nonlinear equations by iterative methods, numerical solutions of ordinary differential equations, data fitting with spline functions, numerical integration, optimization. (F).

Prerequisite(s): MATH 217 or MATH 227

CCM 473 Matrix Computation 3 Credit Hours

A study of the most effective methods for finding the numerical solution of problems which can be expressed in terms of matrices, including simultaneous linear equations, orthogonal projections and least squares, eigenvalues and eigenvectors, positive definite matrices, and difference and differential equations. (AY).

Prerequisite(s): MATH 217 or MATH 227

* An asterisk denotes that a course may be taken concurrently.

Frequency of Offering

The following abbreviations are used to denote the frequency of offering: (F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally