

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.

- A minimum GPA of 2.0 is required for the minor/concentration. The GPA is based on all coursework required within the minor (excluding prerequisites).
- A minimum of 9 credits must be completed at UM-Dearborn for a 12 credit minor/concentration.
- A minimum of 12 credits must be completed at UM-Dearborn for a 15 or more credit minor/concentration.
- Courses within a minor/concentration cannot be taken as Pass/Fail (P/F)
- Only 3 credit hours of independent study or internship may be used to fulfill the requirements for a 12 credit hour minor/concentration. Only 6 credit hours of such credit may be used in a 15 or more credit hour minor/concentration.
- Minors requiring 12 credits may share one course with a major. Minors requiring 15 credits or more may share two courses with a major. This does not apply to concentrations for the Integrative Studies major.

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 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

This course is an introduction to nonlinear dynamics and chaos with applications taken from engineering and the sciences. Topics include: one dimensional flows and bifurcations, two dimensional linear systems, phase plane analysis, limit cycles, and bifurcations. The class will finish with an introduction to chaotic systems and, if time permits, a study of fractals and strange attractors. Students cannot receive credit for both MATH 404 and MATH 504. (AY).

Prerequisite(s): MATH 228

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, and graphical user interfaces. (F).

Prerequisite(s): (MATH 217 or MATH 227 or MATH 228) and ((CIS 350 or CIS 3501 or IMSE 350) or (ECE 370 and MATH 276) or (ECE 370 and ECE 276))

Restriction(s):

Cannot enroll if Class is

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 Introduction to Numerical Analysis 3 Credit Hours

This course is an introduction to numerical analysis and scientific computing. Topics include: floating point representation, round off error, root finding techniques, interpolation, numerical integration, Gaussian elimination and techniques for solving linear systems, minimizing functions, and methods for solving ordinary differential equations numerically. Students cannot receive credit for both MATH 472 and MATH 572. (F).

Prerequisite(s): MATH 227 or MATH 228

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