COMPUTER SCIENCE

Computer Science

Total minimum number of credits required for a major in Computer Science leading to the B.A. degree — 120.
Total minimum number of credits required for a major in Computer Science leading to the B.S. degree — 120.
Total minimum number of credits required for a minor in computer science — 17.

The Department of Mathematics and Computer Science offers a program study leading to the B.A. or B.S degree with a major in Computer Science. Interested students may also pursue Computer Science as a minor area of study.

Computer Science Major

The Computer Science curriculum consists of theoretical as well as application-oriented courses and is based on a strong foundation in mathematics. The B.A. degree is intended for those interested in management and social sciences, whereas the B.S. degree requires greater concentration in the engineering, natural, and physical sciences. The Computer Science prepares students for graduate study and research in the discipline or for employment in government or industry. Students are encouraged, through the pursuit of a minor or second major, to acquire competence in an area that lends itself to meaningful computer applications.

Because certain required and elective courses are offered in either alternative semesters or alternative years, or when demand warrants, degree candidates are strongly encouraged to meet with their advisors on a regular basis to discuss their academic schedule to ensure satisfactory progress toward the degree.

Computer Science Major - Required Courses and Recommended Course Sequence

First Semester	B.A.	B.S.
[[CS-125]] Computer Science I	4	4
[[FYF-101]] First-Year Foundations	3	3
[[ENG-101]] Composition or Distribution Requirement	4/3	4/3
[[MTH-111]] Calculus I	4	4
	14-15	**14-15**

Second Semester	B.A.	B.S.
[[CS-126]] Computer Science II	4	4
[[MTH-112]] Calculus II	4	4
[[CS-246]] C and Unix	3	3
[[ENG-101]] Composition or Distribution Requirement	4 / 3	4 / 3
	14-15	**14-15**

Third Semester	B.A.	B.S.
[[CS-225]] Computer Science III	3	3
[[MTH-231]] Discrete Mathematics	3	3
Laboratory Science Sequence	0	4
Distribution Requirements	9	6
	16	**17**

Fourth Semester	B.A.	B.S.
[[CS-226]] Computer Science IV	3	3
[[MTH-232]] Discrete Mathematics II	3	3
Laboratory Science Sequence	0	4
Distribution Requirement(s)	6	3
[[ENG-202]] Tech. & Prof. Writing	3	3
	15	**16**

Fifth Semester	B.A.	B.S.
[[CS-326]] Operating System Principles or [[CS-328]]Analysis of Algorithms	3	3
[[MTH-150]] Elementary Statistics or [[MTH-351]] Probability and Statistics I	3	3
Laboratory Science Elective	0	4
Distribution Requirements or Free Electives	9	6
	15	**16**

Sixth Semester	B.A.	B.S.
[[CS-334]] Software Engineering	3	3
CS Elective or [[CS-330]] Computer Arch.	3	3
CS Elective or [[CS-319]] Programming Languages or [[CS-323]] Theory of Computation or [[CS-327]] Compiler Design	3	3
Free Electives	6	6
	15	**15**

Seventh Semester	B.A.	B.S.
[[CS-391]] Senior Projects 1	1	1
CS Elective	3	3
[[CS-326]] Operating System Principles or [[CS-328]] Analysis of Algorithms	3	3
Free Electives	6-9	6-9
	13-16	**13-16**

Eighth Semester	B.A.	B.S.
[[CS-392]] Senior Projects II	2	2
CS Elective or CS330	3	3
CS Elective or [[CS-319]] Programming Languages or [[CS-323]] Theory of Computation or [[CS-327]] Compiler Design	3	3
Free Electives	6-9	6-9
	14-17	**14-17**

Science Electives for Computer Science Majors

B.A. candidates

see General Education Curriculum requirements

B.S. candidates

A laboratory science sequence, which must be one of the following:
[[BIO-121]]; [[BIO-122]]
[[CHM-113]] & [[CHM-115]]; [[CHM-114]] & [[CHM-116]]
[[EES-211]]; [[EES-230]]
[[PHY-201]] & [[PHY204]]; [[PHY-202]] & [[PHY-205]]
and
one additional four-credit course in Biology, Chemistry, Earth and Environmental Sciences, Physics, or any Engineering course not cross-listed in Computer Science. The course must be number above 200, except that [[BIO-121]], [[BIO-122]], [[CHM-113]] and [[CHM-115]], [[CHM-114]] and [[CHM-116]] are also acceptable in fulfilling this requirement.

Computer Science Electives for Computer Science Majors

[[CS-319]] or [[CS-323]] or [[CS-327]] and three additional 300-level CS courses not listed as a required course excluding CS399.

Summary of the minimum credit distribution for the major in Computer Science:

B.A. and B.S.

[[CS-125]] – Computer Science I 4

[[CS-126]] – Computer Science II 4

[[CS-225]] – Computer Science III 3

[[CS-226]] – Computer Science IV 3

[[CS-246]] – C and Unix 3

[[CS-326]] – Operating System Principles 3

[[CS-328]] – Algorithms 3

[[CS-330]] – Computer Architecture 3

[[CS-334]] – Software Engineering 3

[[CS-391]] – Senior Projects I 1

[[CS-392]] – Senior Projects II 2

[[CS-319]] – Principles of Programming Languages or

[[CS-323]] – Theory of Computation or

[[CS-327]] – Compiler Design 3

CS Electives 9

[[MTH-111]] – Calculus I 4

[[MTH-112]] – Calculus II 4

[[MTH-231]] – Discrete Mathematics I 3

[[MTH-232]] - Discrete Mathematics II 3

[[MTH-150]] – Elementary Statistics or

[[MTH-351]] – Probability and Statistics I 3

[[ENG-101]] – Composition 4

[[ENG-202]] – Technical and Professional Writing 3

[[FYF-101]] – First-Year Foundations 3

Science Electives (B.A.) 6 (B.S.) 12

Distribution Requirements 18

Free Electives (B.A.)25 (B.S.) 19

Total minimum number of credits required for degree completion 120

Summary of the minimum credit distribution for the major in Computer Science – 120

CS. COMPUTER SCIENCE

CS-198, CS-298, CS-398. TOPICS IN COMPUTER SCIENCE
Credits: Variable

Study of one or more special topics in computer science. May be repeated for credit if different topics are emphasized. Offered when demand warrants.

Pre-Requisites

Varies with topic

CS-115. COMPUTERS AND APPLICATIONS
Credits: 3

An introduction to computers and computing, with emphasis on personal computing in both the Windows and OS X operating systems. Extensive hands-on experience will involve the application of current commercial software (including word processing, database, and spreadsheet). Not open to students who have received credit in any 200-level CS course. Students majoring in either Computer Science or Computer Information Systems will not receive credit for this course.

CS-125. COMPUTER SCIENCE I
Credits: 4

Introduction to information technology and programming (history of computing, text editors, word processing, spreadsheets, introduction to programming), basic data types, functions, decision structures, loops, one- and two-dimensional list structures, testing, debugging, and an introduction to computer graphics. Three hours of lecture and two hours of lab per week. Offered every fall and spring.
Click here for course fee.

Co-Requisites

[[MTH-100]] or higher

CS-126. COMPUTER SCIENCE II
Credits: 4

A study of advanced programming concepts, structures, and techniques (professional and ethical issues, testing and debugging, fundamentals of programming, basic data structures—strings, lists, multidimensional arrays, objects, hashes, inheritance, polymorphism, recursion, divide and conquer, machine representation of data, hardware components, machine instructions). Three hours of lecture and two hours of lab per week. Offered every fall and spring.
Click here for course fee.

Pre-Requisites

[[CS-125]] with grade of 2.0 or better OR equivalent programming experience.

CS-225. COMPUTER SCIENCE III
Credits: 3

A study of the use of a high-level language to implement basic data structures such as strings, lists, arrays, objects, and hashes, and their application to searching, sorting, and hashing. Representation of numbers and strings at the machine level. The course will also include an introduction to the concepts of algorithm design and problem solving with an emphasis on algorithm development, analysis, and refinement. Offered every fall.
Click here for course fee.

Pre-Requisites

[[CS-126]] with grade of 2.0 or better

CS-226. COMPUTER SCIENCE IV
Credits: 3

A continuation of [[CS-225]]. Topics include programming language paradigms, advanced use of word processors and spreadsheets, including macros, linked data structures, and an introduction to discrete mathematics, including counting, probability, and graphs. Offered every spring.
Click here for course fee.

Pre-Requisites

[[CS-225]] with grade of 2.0 or better

CS-246. C AND UNIX
Credits: 3

An introduction to using Unix operating systems, including shells, file manipulation, text editors, filters, and regular expressions. Fundamentals of C programming, including loops, arrays, functions, recursion, pointers, structures, unions, input/output, and system calls.
Click here for course fee.

Pre-Requisites

[[CS-125]] with grade of 2.0 or better

CS-265. MEDICAL INFORMATICS
Credits: 3

This course will cover basic principles of computer use and information management in health care (including general medicine, dentistry, optometry, and pharmacy). Topics will include basic computing concepts, the characteristics of medical data, and the use of computers in the administrative, diagnostic, and research oriented medical tasks. The course is primarily directed towards students who intend to pursue careers in health-related fields. Offered every spring.
Click here for course fee.

CS-283. WEB DEVELOPMENT I
Credits: 3

An introduction to the development of interactive web sites, including HTML, JavaScript, forms and CGI programs; server side includes cookies, web server configuration and maintenance. Offered in the fall semester of odd-numbered years when demand warrants.
Click here for course fee.

Pre-Requisites

[[CS-126]].

CS-285. MOBILE APPLICATIONS
Credits: 3

An introduction to programming mobile application development. Topics will include cross-platform development; user interface design; touchscreen, GPS, and motion sensing input; memory management; cloud services and network utilization; security and trust considerations; data privacy and ethics.

Click here for course fee.

Pre-Requisites

[[CS-126]] and [[CS-246]].

CS-317. SOFTWARE INTEGRATION
Credits: 3

An introduction to the integration of application programs, including email clients, word processors, spreadsheets, and database systems using Microsoft Office and Visual Basic.
Click here for course fee.

Pre-Requisites

[[CS-126]].

CS-319. PRINCIPLES OF PROGRAMMING LANGUAGES
Credits: 3

A study of the principles that govern the design and implementation of programming languages. Topics include language structure, data types, and control structures. Programming projects will familiarize students with features of programming languages through their implementation in interpreters.
Click here for course fee.

Pre-Requisites

[[CS-226]].

CS-321. SIMULATION AND DATA ANALYSIS
Credits: 3

Methods of handling large databases, including statistical analysis and computer simulations. The emphasis will be upon discrete simulation models with a discussion of relevant computer languages: ARENA, GPSS, and SIMSCRIPT.
Click here for course fee.

Pre-Requisites

[[CS-125]] and [[MTH-111]].

CS-323. THEORY OF COMPUTATION

This course formalizes many topics encountered in previous computing courses. Topics include languages, grammars, finite automata, regular expressions and grammars, context-free languages, push-down automata, Turing machines, and computability.
Click here for course fee.

Pre-Requisites

[[CS-126]] and [[MTH-231]].

CS-324. SYSTEMS ANALYSIS
Credits: 3
Fees:

A study of the design and implementation of large computer projects. Special emphasis is placed on applications to business systems. Students will use a CASE tool for automated systems analysis and design.
Click here for course fee.

Pre-Requisites

[[CS-225]].

CS-325. DATABASE MANAGEMENT
Credits: 3
Terms Offered: Winter

Practical experience involving the fundamental concepts of database systems including data modeling; query languages; database management system implementation; management of semi-structured and multimedia data; distributed and noSQL databases
Click here for course fee.

Pre-Requisites

[[CS-126]].

CS-326. OPERATING SYSTEM PRINCIPLES
Credits: 3

Analysis of the computer operating systems, including Batch, Timesharing, and Realtime systems. Topics include sequential and concurrent processes, processor and storage management, resource protection, processor multiplexing, and handling of interrupts from peripheral devices.
Click here for course fee.

Pre-Requisites

[[CS-226]].

CS-327. COMPILER DESIGN
Credits: 3

A study of compiler design, including language definition, syntactic analysis, lexical analysis, storage allocation, error detection and recovery, code generation, and optimization problems.
Click here for course fee.

Pre-Requisites

[[CS-226]].

CS-328. ALGORITHMS
Credits: 3

Theoretical analysis of various algorithms. Topics are chosen from sorting, searching, selection, matrix multiplication of real numbers, and various combinatorial algorithms.
Click here for course fee.

Pre-Requisites

[[CS-226]] and [[MTH-232]].

CS-330. COMPUTER ARCHITECTURE
Credits: 3

A study of the design, organization, and structure of computers, ranging from the microprocessors to the latest 'supercomputers.' An emphasis will be placed on machine language, instruction formats, addressing modes, and machine representation of numbers.
Click here for course fee.

Pre-Requisites

[[CS-226]].

CS-334. SOFTWARE ENGINEERING
Credits: 3

A course in 'programming in the large.' Topics include software design, implementation, validation, maintenance, and documentation. There will be one or more team projects.
Click here for course fee.

Pre-Requisites
[[CS-226]].

CS-335. DATA SCIENCE AND INFORMATION RETRIEVAL
Credits: 3

Practical experience involving unstructured data collections. Topics cover big data, data mining, predictive modeling, decision analysis and indexing and retrieval including probabilistics, clustering, thesauri and passage based retrieval strategies.
Click here for course fee.

Pre-Requisites
[[CS-325]] or [[CS-340]]

CS-340. ARTIFICIAL INTELLIGENCE
Credits: 3

This course will provide an overview of artificial intelligence (AI) application areas and hands-on experience with some common AI computational tools. Topics include search, natural language processing, theorem proving, planning, machine learning, robotics, vision, knowledge-based systems (expert systems), and neural networks.
Click here for course fee.

Pre-Requisites
[[CS-126]].

CS-350. OBJECT-ORIENTED PROGRAMMING
Credits: 3

Object-oriented concepts and their application to human-computer interaction. Concepts to be covered include objects, classes, inheritance, polymorphism, design patterns, GUI interface guidelines, and design of interfaces. There will be programming projects in one or more object-oriented languages using one or more GUI interface guidelines.
Click here for course fee.

Pre-Requisites
[[CS-226]].

CS-355. COMPUTER NETWORKS
Credits: 3

This course introduces basic concepts, architecture, and widely used protocols of computer networks. Topics include the Open System Interconnection (OSI) model consisting of physical link layer, data layer, network layer, transport layer, session layer, presentation layer, and application layer, the medium access sublayer and LAN, various routing protocols, Transmission Control Protocol (TCP), and Internet Protocol (IP) for internetworking.
Click here for course fee.

Pre-Requisites
[[CS-225]] and [[CS-246]]

CS-363. OPERATIONS RESEARCH
Credits: 3

A survey of operations research topics such as decision analysis, inventory models, queuing models, dynamic programming, network models and linear programming. Cross-listed with [[MTH-363]].
Click here for course fee.

Pre-Requisites
[[CS-125]], and [[MTH-111]].

CS-364. NUMERICAL ANALYSIS
Credits: 3

An introduction to numerical algorithms as tools to providing solutions to common problems formulated in mathematics, science, and engineering. Focus is given to developing the basic understanding of the construction of numerical algorithms, their applicability, and their limitations. Cross-listed with [[MTH-364]]. Offered Spring odd years.

Pre-Requisites
[[MTH-211]]and [[CS-125]] (or equivalent programming experience).

CS-366. 3 DIMENSIONAL ENVIRONMENTS AND ANIMATION
Credits: 3

This course will explore the foundations of 3-dimensional animation processes as they apply to multiple mediums. Students will build computer-based models and environments, texture, light, animate, and render content for Integrative Media projects or as stand-alone pieces. Cross-listed with [[IM-350]].
Click here for course fee.

Pre-Requisites
[[CS-126]] or [[IM-201]].

CS-367. COMPUTER GRAPHICS
Credits: 3
Fees:

Introduction to equipment and techniques used to generate graphical representation by computer. Discussion of the mathematical techniques necessary to draw objects in two- and three-dimensional space. Emphasis on application programming and the use of a high-resolution color raster display.
Click here for course fee.

Pre-Requisites
[[CS-226]].

CS-368. 3 DIMENSIONAL GAME DEVELOPMENT
Credits: 3

An overview of simulation, engine-based, and real-time game systems with a focus on theory, creation, and animation of three-dimensional models used within a game context. Cross-listed with [[IM-368]].
Click here for course fee.

Pre-Requisites
[[CS-366]]/IM 350 or [[CS-367]].

CS-370. SPECIAL PROJECTS
Credits: variable

Requirements: Senior standing and approval of the department chairperson.

CS-383. WEB DEVELOPMENT II
Credits: 3

An introduction to the development of dynamic, database-driven sites, including active server pages, PHP, authentication, session tracking and security, and the development of shopping cart and portal systems.
Click here for course fee.

Pre-Requisites
[[CS-283]]. [[CS-325]].

CS-391. SENIOR PROJECTS I
Credits: 1

Design and implementation of a software project under the direction of a faculty member. Students will normally work in teams. Detailed requirements and design documents are required and will be presented at the end of the semester. Offered every fall.
Click here for course fee.

Pre-Requisites
[[CS-334]] or [[CS-324]].

CS-392. SENIOR PROJECTS II
Credits: 2

Design and implementation of a software project under the direction of a faculty member. Students will normally work in teams. Production of a finished product, including software and documentation, is required. There will be an open forum presentation of the project at the end of the semester. Offered every spring.
Click here for course fee.

Pre-Requisites
[[CS-391]].

CS-399. COOPERATIVE EDUCATION
Credits: 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experiences, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.

MTH. MATHEMATICS

MTH-198, MTH-289, MTH-398, MTH-498. TOPICS IN MATHEMATICS
Credits: Variable

A study of topics of special interest. It may be a continuation of intensive study of topics begun in the upper-level courses in analysis, topology, algebra, and probability. May be repeated for credit for a different topic.

Pre-Requisites
Varies with topic

MTH-94. COLLEGE ALGEBRA
Credits: 3

Designed for students who need to review basic algebra before taking [[MTH-100]] or [[MTH-150]]. Topics include polynomials, solution of equations and inequalities, exponents and radicals, graphing, and solution of systems of equations. Offered every fall.

MTH-100. PRECALCULUS
Credits: 3

A course in advanced algebra and trigonometry designed to prepare students for calculus. Topics include functions, inverse functions, logarithms, exponentials, and trigonometry.

Pre-Requisites
MTH 94 with grade of 2.0 or better or meet Department of Mathematics and Computer Science placement criteria.

MTH-101. SOLVING PROBLEMS USING MATHEMATICS
Credits: 3

An introduction to the methodology of mathematical modeling as a technique in working towards the solution to real world problems. In an effort for the non-specialist to gain an appreciation of the use of mathematics in our society, topics are selected from among the following: basic voting theory, fair division schemes, routing problems, population growth, and descriptive statistics and probability.

MTH-103. MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS
Credits: 3

A study of the theory of arithmetic, structure of the number systems, and other topics relevant to the teaching of mathematics in elementary schools. Offered every fall.

Pre-Requisites
Admission to the Teacher Education Program or consent of the instructor.

MTH-104. MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II
Credits: 3

A continuation of [[MTH-103]]. Topics include elementary probability, statistics, and geometry. Offered every spring.

Pre-Requisites
Admission to the Teacher Education Program or consent of the instructor.

MTH-111. CALCULUS I
Credits: 4

Calculus of functions of one variable. Topics include functions, limits and continuity, derivatives and integrals. Course will focus on applying conceptual aspects of calculus to modeling and solving problems from across the sciences and engineering.

Pre-Requisites
[[MTH-100]] with a grade of 2.0 or better OR meet Department of Mathematics and Computer Science placement criteria.

MTH-112. CALCULUS II
Credits: 4

A continuation of [[MTH-111]]. Topics include inverse functions, techniques of integration, applications of the integral, and infinite sequences and series.

Pre-Requisites
[[MTH-111]] with grade of 2.0 or better

MTH-114. CALCULUS AND MODELING FOR THE BIOLOGICAL AND HEALTH SCIENCES
Credits: 4

A continuation of MTH 111 for students in the biological and environmental sciences. Topics include integrals, differential equations and continuous dynamical systems, stochastic models and Markov chains, and discrete and continuous probability models. Course will focus on applying ideas from calculus to modeling and solving problems drawn from the biological and environmental sciences. Major credits cannot be granted for both MTH 112 and MTH 114.

Pre-Requisites

[[MTH-111]] with grade of 2.0 or better

MTH-150. ELEMENTARY STATISTICS
Credits: 3

Elementary statistical inference, with an emphasis on ideas, techniques, and applications in the life, physical, and social sciences. Topics include descriptive statistics, confidence intervals, hypothesis testing, contingency tables, multiple regression, and analysis of variance. Not open to mathematics majors or students with credit in MTH 351.

Pre-Requisites

[[MTH-94]] with grade of 2.0 or better OR meet Department of Mathematics and Computer Science placement criteria.

MTH-211. INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS
Credits: 4

First-order and linear higher order differential equations; matrices, determinants, and systems of differential equations; numerical and power series methods of solution; the Laplace transform. Offered every fall.

Pre-Requisites

[[MTH-112]] with grade of 2.0 or better

MTH-212. MULTIVARIABLE CALCULUS
Credits: 4

Differential and integral calculus of real and vector valued functions. Topics include continuity, partial differentiation, implicit functions, Taylor's Theorem, gradient, curl, line, surface, and multiple integrals, inverse functions, theorems of Green and Stokes.
Click here for course fee.

Pre-Requisites

[[MTH-112]] with grade of 2.0 or better

MTH-214. LINEAR ALGEBRA
Credits: 3

An axiomatic approach to vector spaces, linear transformations, systems of linear equations, Eigen values, and Eigen vectors. Offered every spring.

Pre-Requisites

[[MTH-112]] with grade of 2.0 or better OR consent of the instructor.

MTH-231. DISCRETE MATHEMATICS I
Credits: 3

An introduction to logic, sets, relations, and counting for students in the mathematical and computing sciences. Topics include: Introduction to symbolic logic; types of proof including direct proof and proof by contradiction; introduction to mathematical induction; elementary set theory including sets, equivalence and partial order relations and functions; basic counting principles including permutations and combinations with and without multiplicity, the Binomial Theorem, an introduction to combinatorial proof and the Pigeonhole Principle; Introduction to recursive definition, solving first-order recurrences using iteration; solving linear homogeneous and non-homogeneous recurrences with constant coefficients.

Pre-Requisites

[[MTH-111]] with grade of 2.0 or better

MTH-232. DISCRETE MATHEMATICS II
Credits: 3

A continuation of [[MTH-231]] providing background in discrete mathematics. Emphasis will be placed on the development of mathematical algorithms and their usage in computer science. Topics include: Introduction to divisibility, the integers, and the Euclidean Algorithm; growth rates of functions, big OH notation and an introduction to algorithm analysis including analyzing iterative and recursive algorithms; basics of graph theory including paths, cycles, graph isomorphism, and graph colorings; introduction to greedy algorithms and their use; trees, spanning trees, binary trees and related algorithms; introduction to combinatorial circuits and Boolean algebra, introduction to finite state machines.

Pre-Requisites

[[MTH-231]] with grade of 2.0 or better

MTH-234. FINANCIAL MATHEMATICS
Credits: 3

This is an introductory course in Financial Mathematics. students will learn about the different types of interest (simple interest, discount interest, compound interest), annuities, debt retirement methods, investing in stocks and bonds. If time is permissible, more advanced topics will also be covered.

Pre-Requisites

[[MTH-100]] with grade of 2.0 or better or consent of the instructor.

MTH-302. INTRODUCTION TO HIGHER MATHEMATICS
Credits: 3

A continuation of [[MTH-231]] which provides foundational background for upper-level courses in pure mathematics. Topics include advanced studies of relations including a review of equivalence relations, an introduction to partial order and total order relations; properties of the integers including divisibility, the notion of congruence, the Euclidean Algorithm, and the Fundamental Theorem of Arithmetic; properties of the real number system including axioms for the real numbers, subsets of the real number system (including the integers, rational numbers, and irrational numbers), the completeness of the real number system; properties of sets and functions including cardinality, countable vs uncountable sets, the cardinal hierarchy of infinite sets and the Continuum Hypothesis.

Pre-Requisites

[[MTH-231]] with a grade of 2.0 or higher

MTH-303. THE TEACHING OF MATHEMATICS IN MIDDLE LEVEL AND SECONDARY SCHOOLS
Credits: 4

This course deals with educational perspectives that pertain to the teaching of mathematics at the middle and secondary levels (grades 4 through 12). Topics of discussion include recommendations by the National Council for Teachers of Mathematics (NCTM) regarding instructional methods, assessment, techniques, and curricular issues. The course includes a 40-hour practicum. Offered in the fall semester of odd-numbered years.

Pre-Requisites

MTH 111, Junior or Senior in Mathematics or Middle-Level Education, and admission to the Teacher Education Program.

MTH-311. REAL ANALYSIS
Credits: 4

A rigorous study of the topology of the real line, limits, continuity, differentiation, integration, and series of functions. Offered in the fall semester of even-numbered years.

Pre-Requisites

[[MTH-302]] or consent of the instructor.

MTH-314. COMPLEX ANALYSIS
Credits: 3

Complex functions, limit, continuity, analytic functions, power series, contour integration, Laurent expansion, singularities, and residues. Offered when demands warrants.

Pre-Requisites

[[MTH-212]] or consent of the instructor.

MTH-331. ABSTRACT ALGEBRA I
Credits: 4

A rigorous study of elementary number theory, groups, rings, and fields. Offered in the fall semester of odd-numbered years.

Pre-Requisites

[[MTH-302]] or consent of the instructor.

MTH-343. GEOMETRY
Credits: 3

A study of selected topics from Euclidean and non-Euclidean geometry. Offered in the fall semester of even-number years.

Pre-Requisites

[[MTH-302]] or consent of the instructor.

MTH-351. PROBABILITY AND MATHEMATICAL STATISTICS I
Credits: 3

Random variables, probability distributions, expectation and limit theorems, introduction to confidence intervals and hypotheses testing. Offered every fall.

Pre-Requisites

[[MTH-112]] or consent of the instructor.

MTH-352. PROBABILITY AND MATHEMATICAL STATISTICS II
Credits: 3

Hypothesis testing, non-parametric methods, multivariate distributions, introduction to linear models. Offered in the spring semester of odd-numbered years when demand warrants.

Pre-Requisites

[[MTH-351]] or consent of the instructor.

MTH-353. ACTUARIAL MATHEMATICS
Credits: 3
Terms Offered: On Demand

Actuarial science is the discipline that applies mathematical and statistical methods to assess risk in the insurance and finance industries. Actuarial science includes a number of interrelating subjects, including probability and statistics, finance, and economics. This course will provide basic aspects of the theory of insurance, concentrating on the part of this theory related to life insurance.

Pre-Requisites

[[MTH-351]] or consent of the instructor.

MTH-354. STATISTICAL METHODOLOGY
Credits: 3

This course emphasizes applications, using statistical computer packages, such as BMDP, SPSS, and JMP, and real data sets from a variety of fields. Topics include estimation and testing, stepwise regression, analysis of variance and covariance, design of experiments, contingency tables, and multivariate techniques, include logistic regression. Offered in the spring semester of even-numbered years when demand warrants.

Pre-Requisites

[[MTH-150]] or [[MTH-351]] or consent of the instructor.

MTH-356. ACTUARIAL P EXAM PREPARATION
Credits: 1
Terms Offered: On Demand

This is a seminar course with the aim of helping students prepare for the actuarial exams as needed.

Pre-Requisites

[[MTH-351]]

MTH-361. PARTIAL DIFFERENTIAL EQUATIONS
Credits: 3

Partial differential equations and boundary value problems, inner product spaces, orthogonal functions, eigenvalue problems, Sturm-Liouville equations, Fourier series, Fourier transforms, Green's functions, and classical equations of engineering and physics. Offered fall of even years. Click here for course fee.

Pre-Requisites

[[MTH-211]] & [[MTH-212]] or consent of the instructor

MTH-362. ADVANCED CALCULUS
Credits: 3

Topics from advanced calculus including matrix representation of differentials and the multivariable chain rule, vector calculus, curvilinear coordinates, tensors, change of variables in higher dimensions, improper multiple integrals, applications of line and surface integrals, differential forms and the general Stokes theorem, potential theory, and Taylor's formula for functions of several variables. Offered Fall of odd years.
Click here for course fee.

Pre-Requisites

[[MTH-212]]

MTH-363. OPERATIONS RESEARCH
Credits: 3

A survey of operations research topics such as decision analysis, inventory models, queuing models, dynamic programming, network models and linear programming. Cross-listed with [[CS-363]]. Offered in the spring semester of odd-numbered years when demand warrants.
Click here for course fee.

Pre-Requisites

[[MTH-112]] and [[CS-125]].

MTH-364. NUMERICAL ANALYSIS
Credits: 3

Numerical techniques for solving equations, interpolation and function approximation, numerical integration, and differentiation, and solution of differential equations. Error analysis and applications. Cross-listed with [[CS-364]]. Offered spring of odd-numbered years.

Pre-Requisites

[[MTH-211]]and [[CS-125]] (or equivalent programming experience).

MTH-365. NUMERICAL LINEAR ALGEBRA
Credits: 3

Direct and iterative methods for the solution of systems of linear equations, matrix decompositions, computation of eigenvalues and eigenvectors, and relaxation techniques. The theoretical basis for error analysis, including vector and matrix norms. Applications such as least squares and finite difference methods. Offered spring semester of even-numbered years.
Click here for course fee.

Pre-Requisites

[[MTH-214]] and [[CS-125]] (or equivalent programming experience)

MTH-391. SENIOR SEMINAR
Credits: 1

Presentations and discussions of selected topics in mathematics, conducted by students and faculty.

Pre-Requisites

[[MTH-311]] or [[MTH-331]] and senior standing in mathematics.

MTH-392. SENIOR SEMINAR
Credits: 2

Presentations and discussions of selected topics in mathematics, conducted by students and faculty.

Pre-Requisites

[[MTH-311]] or [[MTH-331]] and senior standing in mathematics.

MTH-397. SEMINAR
Credits: 1-3

Presentations and discussions of selected topics.

Pre-Requisites

Approval of the department chairperson.

MTH-399. COOPERATIVE EDUCATION
Credits: 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experiences, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.

MTH-413. FUNCTIONS OF SEVERAL VARIABLES
Credits: 3

A modern treatment of the calculus of functions of several real variables. Topics include Euclidean spaces, differentiation, integration of manifolds leading to the classical theorems of Green and Stokes. Offered when demand warrants.

Pre-Requisites

[[MTH-214]] and [[MTH-311]].

MTH-432. ABSTRACT ALGEBRA II
Credits: 3

A continuation of [[MTH-331]]. Polynomial rings, ideals, field extensions, and Galois Theory. Offered when demand warrants.

Pre-Requisites

[[MTH-331]].

MTH-442. TOPOLOGY
Credits: 3

Metric spaces, topological spaces, countability and separation axioms, compactness, connectedness, product spaces. Offered when demand warrants.

Pre-Requisites

[[MTH-311]] or consent of the instructor.

MTH-470. READING COURSE
Credits: 1-3

Requirements: Senior standing in mathematics and approval of the department chairperson.