

MATHEMATICS AND COMPUTER SCIENCE

Chair: William H. Campbell

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*Undergraduate Mathematics Education Coordinator

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Mathematics has been central to human achievement for over three thousand years, important to both intellectual advancement and technological innovation. Many of the theoretical studies in mathematics have evolved and have been refined over a long period of time. Many of the practical aspects of mathematics have become more evident with the advent of calculators and computers. Computer technology is assuming a major role in society. Clearly, the computer revolution is the beginning of a new age of human existence. Many of the problems computer scientists and others will be expected to solve in decades to come have yet to be considered. As such, computing has evolved into a science covering the study of languages, programming, and theoretical concepts. The Department offers courses covering the intellectual and the practical sides of mathematics and computing.

A student of the Department of Mathematics and Computer Science has the opportunity of earning a Bachelor of Science degree (B.S.) in Mathematics and/or Computer Science or a Master's degree in Mathematics Education. The Mathematics major also may choose to gain licensure to teach mathematics at the secondary level. The Department offers minors in both mathematics and computer science and also cooperates with the School of Education in offering a teaching specialty area in mathematics for Middle Grades Education majors.

The Departmental faculty welcomes the opportunity to advise the major and non-major alike. Someone thinking of majoring in mathematics and computer science is especially urged to consult with the Department Chair prior to registering for General Education courses. All majors choose advisors and must consult with them each term in order to plan and carry out their program of study.

The Department web pages at www.uncp.edu/mathcs/ contain current information about the activities, the faculty, and the offerings of the department. Department majors are expected to consult the website regularly to remain informed.

Most non-majors fulfill the General Education requirements in mathematics by taking one of MAT 105, 107 or 108. Well-prepared students may select MAT 109 or 221 for this purpose.

BACHELOR OF SCIENCE IN MATHEMATICS

Requirements for a Bachelor of Science Degree in Mathematics: Major in Mathematics	Sem. Hrs.
Freshman Seminar	1
General Education Requirements	44
Prospective Mathematics Majors should start with MAT 109 and CSC 202 as their General Education courses in mathematics. MAT 107 & MAT 108 or MAT 221 may be used in place of MAT 109	
Major Requirements	39
MAT 221, 222, 230, 315, 325, 331, 431, CSC 202, and 12 additional sem. hrs. of advanced mathematics (PHY 336 may count for 3 hours)	
Electives	36
	Total: 120

BACHELOR OF SCIENCE IN MATHEMATICS EDUCATION (9-12)

Coordinator: Mary Klinikowski

Upon successful completion of the program of study in Mathematics Education and related requirements, graduates are eligible for an “A” license to teach in the State of North Carolina. For a more detailed description, including the program standards and goals and objectives, turn to Undergraduate Licensure Programs in the School of Education section of this catalog.

Course Requirements	Sem. Hrs.
Freshman Seminar and General Education	45
Specialty Area	42
MAT 221*, 222, 230, 315, 325, 331, 328, 411, 431, 402	
CSC 202	
6 additional hours in advanced mathematics	
Professional Studies	15
EDN 302, 312, 350, 419, SED 300	
Content Pedagogy	17
MAT 250, 400, 449	
CSC 405	
General Electives	8
	Total: 127

NOTE: Students who desire teacher licensure in Mathematics Education should declare the major as soon as possible in their college career. Consultation with the Program Coordinator or program advisor prior to registering for General Education courses is strongly recommended.

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Requirements for a Bachelor of Science Degree in Computer Science	Sem. Hrs.
Freshman Seminar	1
General Education Requirements*	44
Note: Prospective Computer Science Majors should start with MAT 109 as their first General Education mathematics course. MAT 107 and MAT 108 or MAT 221 may be used in place of MAT 109	
Major Requirements	44
CSC 175, 176, 185, 215, 225, 226, 265, 285, 292, 375; MAT 221, 222, 315, 328	
Four courses from one of the following areas (at least one must be a 400-level course):	12
Area I: CSC 335, 338, 365, 401, 415, 435, 445, 490; MAT 327	
Area II: CSC 380, 391, 392, 393, 401, 415, 445, 481, 482, 490	
Note: Students planning to attend graduate school in computer science should take CSC 401, 415, 435, and 445.	
Other electives	17-19
	Total: 120

*Computer Science majors must take PHY 150 or PHY 200 and one course from Biology, Chemistry, or HON 150 to satisfy the six hours of Natural Science requirements in General Education.

ACADEMIC CONCENTRATION

Requirements for an Academic Concentration in Mathematics
 MAT 109 (MAT 107 & MAT 108 may substitute for MAT 109)*
 MAT 221, 222, 315, 325, 328, 411, CSC 202

Sem. Hrs.

Total: 27

*MAT 107 and 108, or MAT 109, count toward General Education

MIDDLE GRADES (6-9) LICENSURE IN MATHEMATICS

Students majoring in Middle Grades Education (6-9) are required to complete two teaching specialty areas. For a detailed description of the program of study in Middle Grades Education, including the program standards and goals and objectives, turn to Undergraduate Licensure Programs in the School of Education section of this catalog.

Students majoring in Middle Grades Education (6-9) with a Mathematics teaching specialty area should consult with the Coordinator of Undergraduate Mathematics Education in the Department of Mathematics and Computer Science and the Middle Grades Program Coordinator in the School of Education.

**Requirements for Licensure in Mathematics for the B.S. in Middle
 Grades Education (6-9)**

Sem. Hrs.

Mathematics

MAT 107 and 108

MAT 210 or 328, 211 or 411, 215 or 221, 230, 315, 402 or 415-

Pedagogy

MAT 250, 400, CSC 405

Total: 33

NOTE: If students place out of required mathematics courses, a total of 24 hours of mathematics must be taken to meet certification requirements.

MINORS

Requirements for a Minor in Mathematics

Sem. Hrs.

MAT 221, 222, 315, 331, and three additional hours selected from
 advanced mathematics courses (300 or above)

18

**Requirements for a Minor in Computer Science with Emphasis in
 Programming**

Sem. Hrs.

CSC 175, 176, 185, 215, 225; one course from CSC 130, 226, 265, 285,
 or 292

18

**Requirements for a Minor in Computer Science with Emphasis in World
 Wide Web**

Sem. Hrs.

CSC 130, 175, 176, 190, 226, 238

18

COURSES

MATHEMATICS (MAT)

MAT 104. Fundamentals of Mathematics

A study of topics in algebra that are essential for success in college algebra (MAT 107). Content includes solving of linear equations and inequalities as well as systems of linear equations and inequalities. Topics from geometry, polynomials, factoring, rational expressions, and radicals are also studied. (This course does not count toward earned hours or graduation requirements. Most students will be placed in this course by scores on the Mathematics Placement Test.) Fall, Spring. Credit, 3 semester hours.

MAT 105. Introduction to College Mathematics

Topics from mathematics which may include sets, logic, algebra, graphs, functions, systems of linear equations and inequalities, geometry, probability, and statistics. Problem solving is emphasized. **This course is intended to be a general education course and NOT a preparation for college algebra.** Some sections of the course will develop a theme for the applications of mathematical concepts. (Credit for MAT 105 will not be allowed if the student has previously received a grade of C or better in a math course with a higher catalog number, unless the course is being taken to replace a grade.) Fall, Spring, Summer. Credit, 3 semester hours.

MAT 107. College Algebra

A study of the real and complex number systems, algebraic expressions and equations, polynomial and rational functions and their graphs, inequalities and their graphs, exponential and logarithmic functions and their graphs, systems of equations, and conic sections. **This course is intended to be a preparation for calculus (MAT 215 and MAT 221).** Fall, Spring, Summer. Credit, 3 semester hours. A very good understanding of high school algebra is required.

MAT 108. Plane Trigonometry

A study of angle measures, trigonometric functions and their values, inverse trigonometric functions and their values, graphs of trigonometric and inverse trigonometric functions, solutions of right and oblique triangles, trigonometric identities and equations, polar coordinates, vectors, and rotation of axes. **This course is intended to be a preparation for calculus (MAT 221).** Fall, Spring, Summer. Credit, 3 sem. hours. PREREQ: MAT 107.

MAT 109. Precalculus

This course is an accelerated version of MAT 107 and MAT 108 combined. See both course descriptions for a list of topics covered. This course is intended as a **rapid review** of the topics in preparation for calculus. Fall, Spring. Credit, 4 semester hours.

MAT 118. Finite Mathematics

Set theory, symbolic logic, permutations and combinations, probability, conditional probability, matrices and systems of equations. Some applications to stochastic processes, Markov chains, linear programming, statistics. As announced. Credit, 3 semester hours. PREREQ: MAT 107 or equivalent.

MAT 210. Introduction to Statistics

Elementary statistics, descriptive and inferential. Graphing data sets, finding measures of center, position, and dispersion. Probability, linear regression and correlation. Central Limit Theorem, sampling and hypothesis testing, including z-tests, student's tests, F-test, Chi-Square, and ANOVA. The use of calculators and computers is an integral part of the course. Fall, Spring, Summer. Credit, 3 semester hours. Recommended PREREQ: MAT 107 or equivalent.

MAT 211. Survey of Geometry

Topics covered involve: Plane and Solid Geometry, Coordinate Geometry, Transformational Geometry, Trigonometry, Logic, and Measurement Systems. These topics will emphasize fundamental

concepts: points, lines, planes, angles, polygons, circle, perimeter, area, surface area, volume, and construction of figures. Various types of technology will be incorporated throughout the course. As announced. Credit, 3 semester hours. PREREQ: MAT 107 and 108 or equivalent.

MAT 215. Calculus with Applications

Required for Biology majors. Not open to Mathematics majors. A study of functions of one variable; derivatives, integrals and their applications to Biological Sciences and Business. Special attention will be given to exponential functions with respect to growth and decay applications. Topics of multi-variable calculus will also be included. Fall, Spring, Summer. Credit, 4 semester hours. PREREQ: MAT 107 or MAT 109 or equivalent.

MAT 221. Calculus I

Study of functions of one variable, topics from analytic geometry, limits and continuity; differentiation of algebraic functions; curve sketching; various applications chosen from physics, economics, and optimization. Fall, Spring, Summer. Credit, 4 semester hours. PREREQ: MAT 107 and MAT 108, or MAT 109, or equivalent.

MAT 222. Calculus II

A study of integrals, the definite integral, the fundamental theorem of the calculus, applications of the definite integral. The derivative and integral of exponential, logarithmic, trigonometric and inverse trigonometric functions; and techniques of integration. Fall, Spring, Summer. Credit, 4 semester hours. PREREQ: MAT 221.

MAT 230. Introduction to Advanced Mathematics

Introduction to set theory, elementary concepts of the topology of the real line and the plane, elementary logic, and techniques of proof. Spring. Credit, 3 sem. hours. PREREQ: MAT 221 or 215.

MAT 250. Introduction to Teaching Mathematics in Middle Grades and Secondary Schools

Designed to provide an overview of mathematics in the secondary school and early experiences for prospective mathematics teachers. These experiences include a planned program of observational and participatory experience in the mathematics classroom. Spring. Credit, 2 semester hours. PREREQ: EDN 302, MAT 221 or 215.

MAT 315. Linear Algebra I

An introduction to the theory of vector spaces, linear transformations, systems of linear equations, matrices, inverses, rank, determinants, inner products. Applications of matrices to problems involving systems of equations. Fall, Spring. Credit, 3 semester hours. PREREQ: MAT 221 or 215.

MAT 317. Linear Algebra II

Eigenvalues and eigenvectors, similarity of matrices, reduction of matrices to diagonal form. Cayley-Hamilton theorem, minimum polynomial, Jordan canonical form. Hermitian, unitary, and normal matrices, orthonormal basis, Gram-Schmidt process. Simplification of quadratic forms and other applications. As announced. Credit, 3 semester hours. PREREQ: MAT 315.

MAT 325. Algebra I

Introduction to groups, integral domains, rings and fields, with further study of subgroups, cyclic groups, groups of permutations, isomorphisms and homomorphisms of groups, direct products, and factor groups. Fall. Credit, 3 semester hours. PREREQ: MAT 230; PREREQ or COREQ: MAT 315.

MAT 326. Algebra II

Further topics in group theory; rings, integral domains, fields, ideals, quotient rings, homomorphisms, direct sums, polynomial rings, extension fields. As announced. Credit, 3 semester hours. PREREQ: MAT 325.

MAT 327. Numerical Analysis

An introduction to the solution of mathematical problems by computational techniques, including both finite and iterative methods and error analysis. Spring. Credit, 3 semester hours. PREREQ: MAT 315, 331, and one high level programming language.

MAT 328. Probability and Statistics I

Probability, sample spaces, counting techniques, random variables, discrete and continuous distribution functions, characteristics functions. Binomial, Poisson, and normal distributions. Central limit theorems. Fall. Credit, 3 semester hours. PREREQ: MAT 222.

MAT 330. Probability and Statistics II

Introduction to common theoretical distributions, central limit theorems, two dimensional random variables, sampling distributions, confidence intervals, hypothesis testing, regression theory and applications. As announced. Credit, 3 semester hours. PREREQ: MAT 331, 328.

MAT 331. Calculus III

A continuation of Calculus I and II from an advanced viewpoint. L'Hospital's rule, improper integrals, Taylor's theorem, infinite series. Multi-variable calculus: limits, continuity, partial derivatives, extrema, iterated integrals, and applications. Fall, Spring. Credit, 4 sem. hrs. PREREQ: MAT 222.

MAT 332. Differential Equations

An introduction to ordinary differential equations including classification of solutions to differential equations, existence and uniqueness of solutions, power series methods, initial value problems, and applications. Spring. Credit, 3 semester hours. PREREQ: MAT 331.

MAT 400. Methods of Teaching Mathematics in Middle Grades and Secondary Schools (EDN 400)

Presents modern techniques, methods, materials, and assessment practices in the teaching of mathematics. Directed observation in middle or high school mathematics classes. Laboratory work provides experience in developing lesson plans that utilize materials and methods appropriate for classroom use. *NOTE: This course should precede teaching internship by no more than one academic year.* Fall. Credit, 3 semester hours. PREREQ: MAT 250.

MAT 402. A Historical Development of Mathematics

A study of the development of mathematics in its historical setting from its earliest beginnings to modern times. Note: This course may not be used as an Advanced Mathematics requirement for the major in Mathematics. Spring. Credit, 3 semester hours. PREREQ: MAT 221 or 215.

MAT 411. College Geometry

A rigorous development of metric and synthetic approaches to Euclidean and non-Euclidean geometries using an axiomatic format. Similarities and differences among definitions, axioms, theorems, and postulates of non-Euclidean geometries will be considered. The relationship of these geometries to Euclidean geometry will also be studied. Fall. Credit, 3 semester hours. PREREQ: MAT 230; PREREQ or COREQ: MAT 315.

MAT 415. Theory of Numbers

An introduction to the properties of integers, prime and composite numbers, Fermat's Theorem, arithmetic functions, quadratic residues, Diophantine equations, continued fractions and congruences. As announced. Credit, 3 semester hours. PREREQ: MAT 221 or 215.

MAT 422. Applied Mathematics

Introduction to mathematical modeling. Techniques and properties of discrete and continuous models. Case studies. Fall. Credit, 3 semester hours. PREREQ: MAT 315 and MAT 332.

MAT 431. Real Analysis I

An introduction to modern mathematical analysis with careful attention to topics of elementary and intermediate calculus of one or more variables. Topics include convergence of sequences and series, mean value theorems, the Cauchy criterion, integrability. Fall. Credit, 3 semester hours. PREREQ: MAT 230 and 331.

MAT 432. Real Analysis II

A continuation of Advanced Calculus I including such topics as the total derivative of multi-variable functions, transformations of R_n , representations of functions by series and integrals, and uniform convergence. As announced. Credit, 3 semester hours. PREREQ: MAT 431.

MAT 444. Complex Analysis

Complex numbers, analytic functions, conformal mappings, contour integration, Cauchy's theorem and integral formula. Taylor and Laurent expansions, analytic continuation, and Liouville's theorem. As announced. Credit, 3 semester hours. PREREQ: MAT 331.

MAT 449. Internship in Mathematics in the Secondary School

Provides a semester-long full-time teaching experience in an off campus public school setting. Pass/Fail grading. Spring. Credit, 9 semester hours. PREREQ: MAT 400

MAT 499. Independent Study

Offered for mathematics majors on approval of the Department Chair. Credit, 1-3 semester hours.

MATS 4xx. Special Topics (Variable Title)

A study of special topics in mathematics or mathematics education. May be repeated to a maximum of 6 hours. As announced. Credit, 1-3 semester hours. PREREQ: Permission of instructor.

COMPUTER SCIENCE (CSC)**CSC 100. Introduction to Computers**

The content of this course includes a discussion of computer hardware, computer software, the history of computing, and typical applications of computers. A significant amount of time is devoted to such applications as word processing, spreadsheets, databases, and graphics. Additional topics for discussion include a brief introduction to computer languages, effects of computers on society and the individual, data communications, and artificial intelligence. Fall, Spring, Summer. Credit, 3 semester hours.

CSC 130. WWW Information

Introduces students to the World Wide Web, focusing on the techniques of web page creation. No programming background is required, although students will learn some programming through scripting languages. Spring. Credit, 3 semester hours.

CSC 155. Foundations of Computing

Overview of the local computing environment. History of digital computers. Introduction to computer organization, data representation, and programming. Fall, Spring, Summer. Credit, 3 sem.hrs.

CSC 175. Introduction to Algorithms

Introduces a two-part survey of computing applications and algorithmic principles. This course introduces the range of algorithmic concepts and constructs in a particular programming language. The follow-on course, CSC 185, extends the conceptual foundation and expands the programming language context. Topics include data representation, simple I/O, arrays, subprograms, searching, sorting, and merging. Techniques of problem solving, stepwise refinement, and documentation are also covered. Spring, every other Fall, Summer. Credit, 3 semester hours. COREQ: CSC 176.

CSC 176. Introduction to Programming

This is an intense course in programming implementing concepts of structured programming and

algorithmic analysis with emphasis on application. Spring, every other Fall, Summer. Credit, 3 semester hours. COREQ: CSC 175.

CSC 185. Object-Oriented Programming

Builds on the foundation provided by CSC175 to provide students with immersion in programming experience and associated techniques, with a focus on the object oriented paradigm. Topics include control flow, debugging and testing, string processing, searching and sorting, recursion, and stacks and linked lists. Emphasis on effective software engineering practices, including incremental development, systematic testing, and hypothesis driven debugging of software artifacts. Fall, every other Spring. Credit, 3 semester hours. PREREQ: MAT 109 or MAT 107 & MAT 108 and C or better in CSC 175 and CSC 176.

CSC 190. JAVA Programming

A first course in programming Java using concepts of structured programming and algorithmic analysis with emphasis on application. As announced. Credit, 3 semester hours. PREREQ: CSC 175 and 176.

CSC 202. Microcomputer Programming

A first course in microcomputer programming emphasizing both numeric and string processing, and structured programming. (Visual BASIC and Delphi) using IBM compatible computers. Fall, Spring. Credit, 3 semester hours. PREREQ: CSC 100, or CSC 155, or permission of instructor.

CSC 205. Introduction to Programming—C

A first course in programming the C-Language using concepts of structured programming and algorithmic analysis with emphasis on application. As announced. Credit, 3 semester hours. PREREQ: CSC 155.

CSC 215. Discrete Structures

Offers an intensive introduction to discrete mathematics as it is used in computer science. Topics include functions, relations, sets, propositional and predicate logic, simple circuit logic, proof techniques, elementary combinatorics, and discrete probability. Fall, every other Spring. Credit, 3 semester hours. PREREQ: MAT 107 or MAT 109 or MAT 221 and CSC 175, 176.

CSC 225. Fundamentals of Computer Systems

Introduces the student to computer hardware and software interfaces. Topics include computer structure, machine language, assembly language, addressing modes, file structures, I/O, memory management, and assemblers, linkers, and loaders. Spring, every other Fall. Credit, 3 semester hours. PREREQ: CSC 215 and CSC 185. [CSC 185 is a corequisite with a B or better in CSC 175.]

CSC 226. Operating Systems and Networking

Introduces the fundamentals of operating systems together with the basics of networking and communications. Fall, every other Spring. Credit, 3 semester hours. PREREQ: C or better in CSC 175 and 176.

CSC 265. Digital Logic

Covers basic concepts of computer engineering and science from digital logic circuits to the design of a complete microcomputer system, presenting an understanding of principles and basic tools required to design typical digital systems such as microcomputers. Fall, every other Spring. Credit, 3 semester hours. PREREQ: C or better in CSC 215.

CSC 280. Information and Knowledge Management

Uses the idea of information as a unifying theme to investigate a range of issues in computer science, including database systems, artificial intelligence, human-computer interaction, multimedia systems, and data communication. As announced. Credit, 3 semester hours. PREREQ: CSC 185 and CSC 215.

CSC 285. Data Structures

Design of algorithms. Graphs, paths, and trees. Analysis of algorithms for internal and external sorting, searching, and merging. Hashing. Algorithms for dynamic storage allocation. Spring, every other Fall. Credit, 3 semester hours. PREREQ: CSC 215 and C or better in CSC 185.

CSC 292. Software Development and Professional Practices

The course material combines a range of topics integral to the design, implementation, and testing of a medium scale software system with the practical experience of implementing such a project as a member of a programmer team. In addition to material on software engineering, this course also includes material on professionalism and ethical responsibilities in software development and human-computer interaction. Spring, every other Fall. Credit, 3 semester hours. PREREQ: CSC 185.

CSC 335. Network Management

Presents the five conceptual areas of network management as defined by the International Organization for Standardization (ISO): performance management, configuration management, accounting management, fault management, and security management. This course covers networking technologies such as Ethernet, bridges, and switches. It addresses network management architectures and protocols to lay the foundation for SNMP management, broadband management, and TDM. Some network management applications, tools to monitor network parameters, and network management systems to manage networks are included. Spring. Credit, 3 semester hours. PREREQ: CSC 185, 226.

CSC 338. Programming for the World Wide Web

In this course, students will gain experience with the programming techniques, technologies, and issues associated with the Internet. Topics include network programming with sockets, TCP/IP, the HTTP protocol, web-servers, browsers, security, authentication, distributed objects, and client-server computing. This is a project-oriented course in which students will be expected to develop software using a variety of programming languages. Spring. Credit, 3 semester hours. PREREQ: CSC 185 or 190 and CSC 226.

CSC 365. Introduction to Computer Architecture

Introduces students to the organization and architecture of computer systems, beginning with the standard von Neumann model and then moving forward to more recent architectural concepts. Fall. Credit, 3 semester hours. PREREQ: CSC 265 and CSC 225.

CSC 375. Programming Languages

This is an introduction to the design and implementation of programming languages, including a survey of several major languages and their features. Material covered will emphasize implementation details. Fall, every other Spring. Credit, 3 semester hours. PREREQ: CSC 225.

CSC 380. Database Management Systems

The course covers the goals of DBMS including data independence, relationships, logical and physical organizations, schema, and subschema. Hierarchical, network, and relational models are covered with an emphasis on the relational model. Small SQL queries are created and examined. Fall. Credit, 3 semester hours. PREREQ: CSC 285.

CSC 391. Software Engineering

Software Engineering is the study of the software process, in particular the analysis, design, implementation, testing, maintenance, and documentation of a software system. This course introduces the fundamental software engineering concepts and terminology, presents formal models of structured design and programming, and aims to give students both a theoretical and a practical foundation. The primary focus of the class will be on learning modern software methods and tools that can be applied on a project in CSC 490. Topics covered include information hiding, iterative enhancements, structured programming teams, program libraries, walkthroughs, and documentation. Fall. Credit, 3 semester hours. PREREQ: CSC 292.

CSC 392. Software Process Improvement

This course is an introduction to the CMMI framework, emphasizing understanding, evaluation, and integrated process improvement. Topics include software process assessment, the Capability Maturity Model for Software, other approaches to software process assessment. This course presents a survey on the use of SPI and software process assessment (SPA) as practiced by large and small companies. Every other Spring. Credit, 3 semester hours. PREREQ: CSC 391.

CSC 393. Component-Based Computing

Analyzes the fundamental problems that must be solved by middleware in order to provide complete and transparent interoperability between distributed components. The course illustrates the state of the art with respect to how the fundamental problems are solved in practice and provides a hands-on experience developing distributed applications using the most important standards. Every other Spring. Credit, 3 semester hours. PREREQ: CSC 391.

CSC 401. Theory of Computation

Introduces the student to formal language theory, finite automata, regular expressions, and regular grammars; pushdown automata; context free grammars; and context sensitive grammars. Fall. Credit, 3 semester hours. PREREQ: CSC 225, CSC 285.

CSC 405. Current Topics in Computers in Education

The application of computer software in the classroom, including integration of software with lesson plans. Additional topics include matching software to the most appropriate hardware. This course is designed as a pre-service course for teachers and may not be used as an advanced MAT or CSC requirement. It is not to be counted toward the Mathematics Concentration at the Graduate level. As announced. Credit, 3 semester hours. PREREQ: Permission of instructor.

CSC 415. Translators and Compilers

This course covers interpreters, assemblers, and compilers. The student will study grammar, languages, syntax, semantics, and BNF. Course material covers parsing, symbol tables, one- and two-pass compilers, and code generation. The course has a programming project. Spring. Credit, 4 semester hours. PREREQ: CSC 401.

CSC 435. Operating Systems

This course covers the basic functions of an operating system. Topics covered include process management and scheduling, memory management and paging algorithms, I/O management, file management, deadlock, and operating system security. Fall. Credit, 3 sem. hours. PREREQ: MAT 222.

CSC 445. Design and Analysis of Algorithms

This course covers time and space complexity of algorithms. Survey of various design techniques such as “divide and conquer” and the “greedy” method is covered. Program verification and validation as well as NPComplete and NPHard problems are discussed. Fall. Credit, 3 semester hours. PREREQ: CSC 285, and MAT 222.

CSC 481. Data Mining

This course covers the principles underlying data mining algorithms and their applications. Algorithms that include trees and rules for classification and regression, association rules, belief networks, classical statistical models, nonlinear models such as neural networks, and local “memory-based” models are presented and examined. Examples showing how all of the preceding analysis fits together are presented. Topics include the role of metadata, how to handle missing data, and data preprocessing. Every other Spring. Credit, 3 semester hours. PREREQ: CSC 380.

CSC 482. Data Warehousing

The basic elements of data warehousing are described. Topics of project management, defining business requirements, the architecture and infrastructure, the role of metadata, implementation, growth, and maintenance are covered. Every other Spring. Credit, 3 semester hours. PREREQ: CSC 380.

CSC 490. Advanced Software Project

An assigned, group or individual, in-depth programming project includes problem definition, requirements analysis, design, implementation, documentation, and testing. Spring. Credit, 4 semester hours. PREREQ: CSC 225 and CSC 285.

CSC 499. Independent Study

Open to seniors in Computer Science with a quality point average of 3.0 in the major and with approval of the Department Chair. Written and oral reports are required. As announced. Credit, 13 semester hours.

CSCS 4xx Special Topics (Variable Title)

A study of special topics in computer science. The selected topics will be an in-depth study of a content area, or they will be selected over the breadth of a content area. As announced. Credit, 3 semester hours. PREREQ: Permission of instructor.

GRADUATE COURSES

See the School of Graduate Studies section of the Catalog.