

DEPARTMENT OF MATHEMATICS, PHYSICS, AND COMPUTER SCIENCE

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MATHEMATICS

The mission of the mathematics major is to provide the student with the opportunity to study the classical mathematics curriculum so that she may:

1. communicate mathematical ideas with ease and clarity
2. organize and analyze information
3. solve problems readily
4. construct logical arguments
5. understand the mathematics that forms the core of the undergraduate mathematics curriculum
6. enjoy mathematics and appreciate its power and beauty
7. naturally and routinely use technology in doing mathematics
8. understand how mathematics permeates our lives and how the various threads within mathematics are interwoven

A student completing the Bachelor of Arts in Mathematics must take a minimum of 35 semester hours of course work above MTH 115. The program of study includes the following requirements:

MTH 120, 210, 220: Calculus and Analytic Geometry	9 hours
MTH 251: Linear Algebra	3 hours
MTH 413: Algebraic Structures	3 hours
MTH 401: Multivariable Calculus	3 hours
MTH 499: Senior Seminar	1 hours
CSC 201: Introduction to Computing ...	4 hours
MTH Electives	12 hours
TOTAL HOURS	35 hours

Majors who plan to be certified as secondary teachers of mathematics must take MTH 311: Survey of Geometry as one of their electives.

A minor in Mathematics consists of any 24 hours of mathematics credit excluding MTH 100, MTH 105, and MTH 108. CSC 201 may also count toward the minor.

A student may not receive credit for any 100-level mathematics course if she has previously received credit (with a C- or higher) for a higher

level mathematics course. Exceptions to this rule may be allowed with the approval of the department chair.

*100. INTRODUCTION TO MODERN MATHEMATICS/THREE CREDITS

A study of some of the major areas of mathematics which have developed since 1800, together with some of the problems appropriate to each area. *Offered on demand.*

*105. COLLEGE ALGEBRA/THREE CREDITS

A study of algebraic functions, including equations and inequalities in one and two variables, graphing, the algebra of functions, inverse functions, the exponential function, and the logarithmic functions. *Offered most terms.*

*108. FINITE MATHEMATICS/THREE CREDITS

A study of selected topics from finite mathematics. The topics may include probability, statistics, systems of linear equations, linear programming and the mathematics of finance. *Offered most terms.*

*110. ELEMENTARY FUNCTIONS/THREE CREDITS

Prerequisite: High School Algebra. A study of elementary functions and their graphs and applications, including polynomials, rational and algebraic functions, exponential, logarithmic, and trigonometric functions. *Offered most terms.*

*115. SURVEY OF CALCULUS/THREE CREDITS

Prerequisite: MTH 110, or equivalent. A one-term introduction to the elements of the differential and integral calculus, intended for students majoring in other departments. *Offered on demand.*

*120. CALCULUS AND ANALYTIC GEOMETRY/THREE CREDITS

Prerequisite: MTH 110, or equivalent. A study of the differential and integral calculus of functions of one variable. *Offered fall and spring terms.*

203. ELEMENTARY THEORY OF NUMBERS/THREE CREDITS

Prerequisite: Consent of the instructor. A study of the integers and their divisibility properties with particular emphasis on the theory of congruencies, prime numbers, Diophantine equation, and quadratic residues. *Offered on demand.*

205. DISCRETE MATHEMATICS/THREE CREDITS

Prerequisite: CSC 201 or consent of the instructor. The course will introduce students to topics and techniques of discrete methods and combinatorial reasoning. Methods for approaching problems in counting, logic, and other Computer Science related topics will be accumulated. A wide variety of applications will be incorporated into the mathematics. *Offered alternate years.*

*210. CALCULUS AND ANALYTIC GEOMETRY II/THREE CREDITS

Prerequisite: MTH 120, or equivalent. A continuation of MTH 120. *Offered every year.*

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*220. CALCULUS AND ANALYTIC GEOMETRY III/ THREE CREDITS

Prerequisite: MTH 210, or equivalent. A continuation of MTH 210. Offered every year.

251. LINEAR ALGEBRA/THREE CREDITS

Prerequisite: MTH 210. A study of linear equations and matrices, vector spaces, determinants, linear mappings, inner products, and cross products of vectors. Offered alternate years.

299H. INTERDISCIPLINARY HONORS COURSE

This course is team taught by members in two departments and is open to Nisbet Honors Program members and to others who meet Honors Program guidelines. All students registering for these courses must register not only through the Honors Program but also with their adviser and the Registrar's Office.

311. SURVEY OF GEOMETRY/THREE CREDITS

Prerequisite: Consent of the instructor or MTH 251. A study of the foundation of Euclidean and non-Euclidean geometry. Offered alternate years.

323. PROBABILITY AND STATISTICS/ THREE CREDITS

Prerequisite: MTH 210, or equivalent. A study of probability, distributions, sampling distribution theory, and estimation. Offered alternate years.

330. INTRODUCTION TO NUMERICAL ANALYSIS/ THREE CREDITS

See CSC 330. Offered on demand.

400. REAL ANALYSIS/THREE CREDITS

MTH 220. A study of selected topics from real analysis. Offered on demand.

401. MULTIVARIABLE CALCULUS/THREE CREDITS

Prerequisite: MTH 220 or equivalent. A study of real-valued functions of several variables, partial differentiation, multiple integration, and linear differential equations. Offered alternate years.

410. DIFFERENTIAL EQUATIONS/THREE CREDITS

Prerequisite: MTH 401 or consent of the instructor. A study of differential equations and their physical applications. Offered alternate years.

413. ALGEBRAIC STRUCTURES/THREE CREDITS

Prerequisite: MTH 210. A study of groups, rings, integral domains, and fields. Offered alternate years.

420. COMPLEX ANALYSIS/THREE CREDITS

MTH 220. A study of selected topics from complex analysis. Offered on demand.

480. SPECIAL TOPICS IN MATHEMATICS/ ONE TO THREE CREDITS

Prerequisite: Consent of the instructor. Each offering will cover a topic of mathematics that is not in the regular curriculum. Offered on demand.

490. DIRECTED INDEPENDENT STUDY IN SPECIAL TOPICS/ONE TO THREE CREDITS

Prerequisite: Consent of the instructor and department chair. Intensive independent study of a topic in mathematics which is not in the regular curriculum. This study will be directed by a cooperating faculty member. May be repeated for credit. Offered on demand.

499. SENIOR SEMINAR/ONE CREDIT

Required of all majors. This course allows the student to investigate a topic of particular interest in mathematics or COMPUTER SCIENCE. The student will have the opportunity to present a written and oral report on her topic. Offered every year.

COMPUTER SCIENCE

The department offers two majors in Computer Science—a Bachelor of Science in Computer Science and Math and a Bachelor of Arts in Computer Science. These Computer Science majors are designed to provide students with a scientific foundation in the study of computers and their uses. The mission of these majors is to prepare students for positions in business, industry, education, or graduate programs in Computer Science by providing theoretical and practical foundations in Computer Science.

The Bachelor of Science in Computer Science and Math degree provides a solid foundation in Computer Science and mathematics. This major is strongly recommended for students wishing to pursue a graduate degree in Computer Science or a career in education. However, the degree provides strong preparation for any career in Computer Science.

The Bachelor of Arts in Computer Science degree provides a solid set of core courses in Computer Science with two areas of concentration. A student may choose a concentration program from Computer Science or business. The Computer Science concentration broadens a student's knowledge of Computer Science through a selection of upper-level Computer Science topics. The business concentration combines the applicable concepts of Computer Science with those from business and management. Both concentrations provide a foundation for careers in the business-related computing workplace.

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Bachelor of Science in Computer Science and Math

The Bachelor of Science in Computer Science and Math degree consists of at least 24 hours of course work in Computer Science and at least 18 hours of course work in mathematics above MTH 115. The requirements are as follows:

CSC 201: Introduction to Computing	4 hours
CSC 202: Data Structures	4 hours
CSC 310: Computer Organization and Assembly Language Programming	3 hours
CSC 350: Principles of Programming Languages	3 hours
CSC 410: Operating Systems & Architecture.	3 hours
CSC 499: Senior Seminar	1 hour
CSC Electives (Choose 6 hours from the following)	
CSC 290: Software Workshops	
CSC 305: Database Design & File Structures	
CSC 309: Intro to Data Processing (COBOL)	
CSC 330: Intro to Numerical Analysis	
CSC 400: Special Topics in Computer Science	
CSC 420: Software Engineering	
CSC 430: Theory of Composition	
CSC 440: Algorithm Analysis	
Total Hours in Computer Science	24 hours

At least 18 hours of course work in mathematics above 115 is required for this major. The course of study will be planned in consultation with the chair of the department. The following is a suggested list of mathematics courses that the major should take.

MTH 120: Calculus & Analytic Geometry I	3 hours
MTH 210: Calculus & Analytic Geometry II	3 hours
MTH 220: Calculus & Analytic Geometry III	3 hours
MTH 205: Discrete Mathematics	3 hours
One of the following courses	3 hours
MTH 251: Linear Algebra	
MTH 413: Algebraic Structures	
One of the following courses	3 hours
MTH 323: Probability and Statistics	
MTH 400: Real Analysis	
MTH 401: Multivariable Calculus	
MTH 410: Differential Equations	
Total Hours in Math	18 hours
TOTAL HOURS FOR B.S. IN COMPUTER SCIENCE	42 hours

No more than 3 hours in CSC 290 may count toward the electives in Computer Science. CSC 101 (Computer Literacy), CSC 450 (Programming Internship), and CSC 460 (Data Processing Internship) may not count for major credit in the Bachelor of Science in Computer Science and Math degree.

Bachelor of Arts in Computer Science

The Bachelor of Arts in Computer Science degree consists of at least 24 hours of course work in Computer Science, at least 6 hours of course work in mathematics above MTH 115, and 12 hours of course work related to the student's selected concentration. The requirements are as follows:

CSC 201: Intro to Computing	4 hours
CSC 202: Data Structures	4 hours
CSC 310: Computer Organization & Assembly Language Programming	3 hours
CSC 410: Operating Systems & Architecture	3 hours
CSC 499: Senior Seminar	1 hour
Choose two courses from the following	6 hours
MTH 120: Calculus & Analytic Geometry I	
MTH 205: Discrete Mathematics	
ECN 303: Social Statistics	

BUSINESS CONCENTRATION:

CSC 305: Database Design & File Structures	3 hours
CSC 309: Intro to Data Processing (COBOL).	3 hours
CSC Electives	3 hours
ACC 211: Accounting Principles I	3 hours
ECN 201: Microeconomics Principles II	3 hours
Choose two courses from the following	6 hours
ACC 212: Accounting Principles II	
ACC 451: Cost Accounting	
ECN 202: Macroeconomic Principles	
ECN 321: Money and Financial Institutions	
FIN 370: Business Finance	
BAD 231: Management	

COMPUTER SCIENCE CONCENTRATION:

CSC 305: Database Design & File Structures	3 hours
CSC 350: Principles of Programming Languages	3 hours
Elective courses from the following	15 hours
CSC 290: Software Workshops	
CSC 309: Intro to Data Processing (COBOL)	
CSC 330: Intro to Numerical Analysis	
CSC 400: Special Topics in Computer Science	
CSC 420: Software Engineering	
CSC 430: Theory of Computation	
CSC 440: Algorithm Analysis	
MTH 210: Calculus & Analytic Geometry II	
ISC 303: Social Science Statistics	
TOTAL HOURS FOR B.A. IN COMPUTER SCIENCE	42 hours

No more than 4 hours in CSC 290 may count towards the electives in Computer Science in the Bachelor of Arts in Computer Science degree. CSC 101 (Computer Literacy), CSC 450 (Programming Internship), and CSC 460 (Data Processing Internship) may not count for major credit in the Bachelor of Arts in Computer Science degree.

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Minor in Computer Science:

The department offers a minor in Computer Science. The minor consists of 24 credit hours. No course may count for both the major and minor. The requirements for a minor in Computer Science are as follows:

CSC 201: Intro to Computing	4 hours
CSC 202: Data Structures	4 hours
CSC 310: Computer Organization & Assembly Language Programming	3 hours
CSC 410: Operating Systems & Architecture	3 hours
CSC Electives (Choose 10 hours from the following)	
CSC 290: Software Workshops	
CSC 305: Database Design and File Structures	
CSC 309: Intro to Data Processing (COBOL)	
CSC 330: Intro to Numerical Analysis	
CSC 350: Principles of Programming Languages	
CSC 400: Special Topics in Computer Science	
CSC 420: Software Engineering	
CSC 430: Theory of Computation	
CSC 440: Algorithm Analysis	
MTH 205: Discrete Mathematics	
ISC 303: Social Science Statistics	

No more than 3 hours in CSC 290 may count towards the electives in the Computer Science minor. CSC 101 (Computer Literacy), CSC 450 (Programming Internship), and CSC 460 (Data Processing Internship) may not count for minor credit.

*101. COMPUTER LITERACY/THREE CREDITS

GEP, elective credit. Students will discover the practical use of computers to acquire, manage, and use information in the remainder of their education and throughout their career. This course introduces the basics of computer technology and provides hands-on experience with applications software for word processing, electronic spreadsheets, graphics, data communication, and networks. *Students who have successfully passed any 200-level Computer Science course must have the approval of the department chair to take CSC 101. Pass/Fail grading.*

*199H. FRESHMAN HONORS SEMINAR/THREE CREDITS

GEP, elective credit. A study of a selected subject within the discipline which will vary from term to term. The course is designed to encourage student participation in the intellectual processes through class discussion, research and writing, special projects, problem solving, and evaluation and defense of positions. *When the subject matter duplicates that of another course, credit toward graduation will be granted for only one of these courses. Offered periodically in rotation with seminars in other disciplines.*

*201. INTRODUCTION TO COMPUTING/FOUR CREDITS

Prerequisites: MTH 105 or equivalent. A study of computer systems, program development techniques, and basic programming concepts; emphasis on good programming style; introduction to a high-level programming language. *Lectures and laboratory.*

202. DATA STRUCTURES/FOUR CREDITS

Prerequisites: CSC 201. To continue the study of the fundamental concepts of programming applied to problem solving and to introduce students to the major data structures (arrays, records, stacks, queues, and lists) and their use in Computer Science and classical Computer Science

algorithms including searching, sorting, recursion, and pattern matching. *Lectures and laboratory.*

290. SOFTWARE WORKSHOP/ ONE CREDIT

Major or elective credit. Prerequisite: Consent of the instructor. A supervised workshop designed to develop competence and proficiency in using some commercial software product. This course may be taken more than once, provided that it is taken to learn different software and skills. No more than 6 credit hours in this course may be applied toward graduation requirements. *May be offered any term. Pass/Fail grading.*

299H. INTERDISCIPLINARY HONORS COURSE

This course is team taught by members in two departments and is open to Nisbet Honors Program members and to others who meet Honors Program guidelines. All students registering for these courses must register not only through the Honors Program but also with their adviser and the Registrar's Office.

304. VISUAL BASIC PROGRAMMING/THREE CREDITS

Prerequisite: CSC 202. An introduction to developing applications using Visual Basic. This course is designed to show how to analyze problems, design solutions, and implement applications that use Visual Basic.

305. DATABASE DESIGN/THREE CREDITS

Prerequisite: CSC 201 or equivalent. Fundamental principles of database models and database management systems design, implementation, and application.

309. INTRODUCTION TO DATA PROCESSING (COBOL)/ THREE CREDITS

Prerequisites: CSC 201 or equivalent. A study of the problems of data processing as they occur in business and industry and an introduction to COBOL. *Lectures and laboratory.*

310. COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING/THREE CREDITS

Prerequisites: CSC 202 or equivalent. Introduction to the organization and structure of the major hardware components of computers. Machines and assembly language will be considered along with numeric representations, binary arithmetic, addressing techniques, subroutines, input/output operations, and features of machines in common use. *Lectures and laboratory.*

330. INTRODUCTION TO NUMERICAL ANALYSIS/ THREE CREDITS

Major or elective credit. Prerequisites: CSC 201; MTH 251. This is a first course in numerical analysis with the emphasis more on intuition, experimentation, and error assessment than on rigor. Students will be expected to program and run a number of problems on a computer, and considerable time will be spent analyzing the results of the programs. In particular, the analysis of roundoff and discretization errors, as well as the efficiency of algorithms, should be stressed. Topics will include the solution of linear systems, the solution of a single, non-linear equation, interpolation and approximation (including least squares approximation), differentiation and integration, and elements of the numerical solution of eigenvalue problems.

350. PRINCIPLES OF PROGRAMMING LANGUAGES/ THREE CREDITS

Prerequisite: CSC 202 or permission of instructor. A comparative study of the syntax and semantics of programming languages; topics include data types, data control, sequence control, run-time storage, language translation, and semantics; actual programming languages are used to illustrate the concepts and virtual architectures of procedural, logic, functional, and object-oriented paradigms.

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400. SPECIAL TOPICS IN COMPUTER SCIENCE/ ONE TO THREE CREDITS

Prerequisite: Consent of instructor. Each offering will deal with a topic selected from various fields of Computer Science.

410. OPERATING SYSTEMS AND ARCHITECTURE/ THREE CREDITS

Prerequisite: CSC 310. Fundamental concepts of operating systems and their relationship to computer architecture including such topics as interrupt processing, memory management, and resource allocation.

420. SYSTEMS ANALYSIS AND DESIGN/THREE CREDITS

Prerequisite: CSC 201 or equivalent. An introduction to software systems development as an engineering discipline and to the principles of analysis and design of large software systems. Participation on team projects.

430. THEORY OF COMPUTATION/THREE CREDITS

Prerequisites: CSC 202 and MTH 205. Introduction to automata theory, formal languages, and complexity. Introduction to the mathematical foundations of Computer Science: finite state automata, formal languages and grammars, Turing machines, computability, unsolvability, and computational complexity.

440. ALGORITHM ANALYSIS/THREE CREDITS

Prerequisites: CSC 202 and MTH 205. Qualitative and quantitative analysis of algorithms and their corresponding data structures from a precise mathematical point of view. Performance bounds, asymptotic and probabilistic analysis, worst case and average case behavior. Correctness and complexity.

450. PROGRAMMING INTERNSHIP/THREE OR SIX CREDITS

Prerequisite: CSC 202, or equivalent. A program of work and study in which the student is accepted as a programming trainee by a local industry.

460. DATA PROCESSING INTERNSHIP/THREE OR SIX CREDITS

Prerequisite: CSC 450, or equivalent. A program of work and study in which the student is accepted as an apprentice in data processing by a local industry. She is expected to be a productive member of the data processing staff and have some programming responsibilities.

490. DIRECTED INDEPENDENT STUDY IN SPECIAL TOPICS/ ONE TO THREE CREDITS.

Prerequisite: Consent of the instructor and the department chair. Intensive independent study of a topic in computer science which is not in the regular curriculum. This study will be directed by a cooperating faculty member. May be repeated for credit. Offered on demand.

499. SENIOR SEMINAR/ONE CREDIT

Required of all majors. This course allows the student to investigate a topic of particular interest in mathematics or Computer Science. The student will have the opportunity to present a written and oral report on her topic.

PHYSICS

A physics minor requires 22 hours of course work in physics, not including 100 level courses. The requirements are as follows:

Required Courses:

PHY 251–252: Essentials of Physics	8 hours
PHY 331–332: Modern Physics	6 hours
Two terms of PHY 310: Lab. in Modern Physics	2 hours
Additional Physics Electives	6 hours
TOTAL HOURS	22 hours

Students seeking initial certification in secondary physics must complete a minor in physics and must take MTH 120, CHM 201, CHM 202, EDU 387, and ISC 303.

*140. CONCEPTS OF PHYSICS/FOUR CREDITS

A survey of some of the major concepts in PHY. Designed for the nonscientist with limited background in mathematics. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

*143. ASTRONOMY/FOUR CREDITS

A course in descriptive astronomy in which emphasis is placed upon the basic principles involved. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

*241. ELEMENTS OF PHYSICS I/FOUR CREDITS

A course of mechanics, properties of matter, heat, and sound. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

242. ELEMENTS OF PHYSICS II/FOUR CREDITS

Prerequisite: PHY 241. Study of light, static and current electricity, magnetism, and modern physics. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

251. ESSENTIALS OF PHY I/FOUR CREDITS

Prerequisite or corequisite: MTH 120 (Calculus and Analytic Geometry). This course studies mechanics, heat, and waves using calculus to derive relationships and find solutions to problems. This course may be used to partially satisfy the GEP science requirement. It is required for all physics minors. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

252. ESSENTIALS OF PHY II/FOUR CREDITS

Prerequisite: MTH 120 (Calculus and Analytic Geometry). This course is a continuation of PHY 251 and studies light, electricity, and magnetism using calculus. It is required for all physics minors. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered yearly.*

280. SPECIAL PROBLEMS/ONE, TWO, OR THREE CREDITS

Study in the area of a student's special interest. *Offered on demand.*

299H. INTERDISCIPLINARY HONORS COURSE

This course is team taught by members in two departments and is open to Nisbet Honors Program members and to others who meet Honors Program guidelines. All students registering for these courses must register not only through the Honors Program but also with their adviser and the Registrar's Office.

310. LABORATORY IN MODERN PHY/ONE CREDIT PER TERM

An advanced laboratory taken in conjunction with PHY 331 and 332. *Offered on demand.*

331. MODERN PHY I/THREE CREDITS

Prerequisites: PHY 242 or 252, calculus. A study of relativity and quantum theory with applications in atomic physics. *Offered on demand.*

332. MODERN PHY II/THREE CREDITS

Prerequisites: PHY 331, calculus. A study of nuclear structure and interaction. *Lectures and laboratory. A non-refundable laboratory fee of \$20.00 is required. Offered on demand.*

411–412. SEMINAR/ONE CREDIT PER TERM

Prerequisite: PHY 242 or 252. A study of various topics in physics. *Offered on demand.*

431. ANALYTICAL MECHANICS/THREE CREDITS

Prerequisites: PHY 242 or 252, calculus. Study of statics and dynamics of particles and rigid bodies. Harmonic oscillations. *Offered on demand.*