Department of Mathematics and Computer Science

Chair
Mr. Scott Kast

Mathematics and Computer Science Department Mission
The mission of the Department of Mathematics and Computer Science is to equip students with knowledge in, skills of, and values of mathematics, computer science, and statistics and the ability to apply and advance the knowledge, skills, and values of these disciplines.

Mathematics and Computer Science Department Goals:
The goals of the Department of Mathematics and Computer Science are as follows:

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<th>Goal</th>
<th>Outcome</th>
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<tr>
<td>To prepare students for careers in teaching, government, business, and industry.</td>
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<tr>
<td>To prepare students for graduate study in mathematics, computer science, and statistics.</td>
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<td>To enrich the General Education of students with appropriate mathematics and computer science courses.</td>
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<td>To support other disciplines with program specific service courses in the fields of mathematics, computer sciences and statistics.</td>
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<tr>
<td>To support other disciplines with mathematics, computer science, and statistics coursework.</td>
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<td>To support the university and larger community with faculty and student research.</td>
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<tr>
<td>To support the university and larger community with faculty and student service.</td>
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<tr>
<td>To provide outreach coursework, seminars, and professional presentations.</td>
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<tr>
<td>To provide remedial and developmental coursework to prepare students to enter and succeed in a program of study.</td>
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<td>To incorporate current technology to facilitate the goals of the department.</td>
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University Teacher Education Policies
Refer to Teacher Education and Policies (http://catalog.minotstateu.edu/undergraduate/teachereducationpoliciesandprocedures) section of the catalog for details regarding Teacher Education at Minot State University. These pages will explain admission, retention, and exit requirements of the program for math majors in Teacher Education.

Department Teacher Education Requirements
In addition to the University-wide teacher education policies listed above, majors in the Department of Mathematics and Computer Science must:

1. Maintain a minimum average of 2.50 after completing 16 semester hours in the mathematics major or minor or computer science education minor.
2. Complete the Math 391 methods course(s) and Math 371 and Math 381 practicum courses prior to student teaching.

The Department of Mathematics and Computer Science Review Committee monitors the progress of its teacher education students.

Placement in Mathematics
Appropriate initial enrollment in mathematics courses at Minot State University is determined by a combination of entrance and placement tests or the acceptance of credits of transfer, Advance Placement (AP), and College Level Examination Program (CLEP). Students enrolling without such previous credit are directed to entry level mathematics courses, courses numbered 102 through 165 depending on their scores on the ACT or SAT mathematics test and/or scores on locally-administered placements tests. Anyone without the required prerequisites enrolling in a mathematics course may be dropped from the class by the instructor.
ASC Courses

ASC 93. Intermediate Algebra. 4 Hours.
Topics of study include properties of the real number system, factoring, linear and quadratic equations, polynomial and rational expressions, inequalities, systems of equations, exponents, radicals, function notation, rational equations, and absolute value. Graduation credit is not given for this course.
Prerequisite: Students must have an ACT score of 18-20 or an SAT score of at least 400-510 or complete ASC 94 from DCB before enrolling.

CSCI Courses

CSCI 101. Introduction to Computer Science. 3 Hours.
General hardware and software issues such as: terminology, environments. Applications such as: word processing, spreadsheets, databases, Internet usage.

CSCI 110. Foundations of Computer Science. 3 Hours.
Introduction to computer science concepts and terminology including: generic data types, data representation, operating systems and system software, von Neumann architecture, OS and hardware usage, installation and maintenance, cyber security and privacy, and networking concepts.

CSCI 111. Introduction to Web Languages. 4 Hours.
Introduction to programming in a high-level language. Emphasis on problem solving and logical thinking. Design, implementation and testing of programs for small scale problems using elementary data types and control structures using web programming languages. Prerequisites: Student must complete CSCI 101 and ASC 093 with a C or higher in both courses before enrolling in this course.

CSCI 112. Visual Basic and VBA. 4 Hours.
Introduction to programming in the Visual BASIC and Visual Basic Application. Prerequisites: CSCI 111.

CSCI 127. Beginning JAVA. 4 Hours.
An introduction to programming in the Beginning JAVA language. Prerequisite: Student must complete CSCI 120 or have consent of the instructor before enrolling in this class.

CSCI 160. Computer Science I. 4 Hours.
An introduction to computer science, with problem solving algorithm development, and structured programming in a high-level language. Emphasis is on design, code debug, and document programs, using techniques of good programming style. Prerequisites: CSCI 111 and ASC 93 with a C or higher in both courses.

CSCI 161. Computer Science II. 4 Hours.
Object-oriented concepts, terminology and notation. The C++ language is explored including topics such as dynamic memory, exception handling, function and class templates, operator overloading, inheritance, polymorphism, and generic programming with the standard template library. Additional topics may include GUI libraries. Prerequisites: CSCI 160 and MATH 103 with a C or higher in both courses.

CSCI 177. Intermediate JAVA. 4 Hours.
Intermediate level programming in the JAVA language. Prerequisite: CSCI 127.

CSCI 221. Web and Internet Programming. 4 Hours.
Service side programming for the WWW. Emphasis on servlet programming and distributed component programming using API's for object serialization, remote method invocation, database connectivity and XML generation. Prerequisite: CSCI 161 with a C or higher.

CSCI 242. Algorithms & Data Structures I. 4 Hours.
Advanced programming techniques including recursion divide-and-conquer, and backtracking will be considered. Dynamic and static data structures including lists, stacks, and queues. Modular programming, program specification and verification, and analysis of algorithms. Prerequisites: CSCI 161, MATH 107 or both MATH 103 and MATH 105 with a C or higher in all courses.

CSCI 243. Algorithms & Data StructuresII. 4 Hours.
Advanced programming techniques including sorting, binary trees, AVL trees, graphs and networks. A discussion of searching techniques for conceptual graphs and networks and additional searching strategies. Analysis of algorithms will also be presented. Prerequisite: CSCI 242 with a C or higher.

CSCI 260. UNIX Environment. 4 Hours.
An introduction to the UNIX environment. Basic tools and utilities. Shell programming. Prerequisite: CSCI 160.

CSCI 275. Computer and Digital Hardware I. 4 Hours.
Fundamentals of digital systems, data representations, mathematics digital systems, microprocessor design and instruction sets, introduction to laboratory equipment. Prerequisites: CSCI 161, MATH 107 or MATH 103 and MATH 105 with a C or higher in all courses.

CSCI 297. Internship. 1-8 Hour.
Supervised professional work experience in a cyber-technology environment at the 100 & 200 course level. May not be counted towards earned credits for major or minor. Student must have departmental approval before enrolling.

CSCI 299. Special Topics. 1-4 Hour.
Prerequisite: CSCI 101.

CSCI 321. Windows Programming. 4 Hours.
Development of applications for the Windows environment and use of a standard library and its classes. Prerequisite: CSCI 161 with a C or higher.
CSCI 323. Robotics. 4 Hours.
Introduction to robotics emphasis is on the computer design, programming of autonomous robot systems, basic dynamics and control of motion, sensors, and artificial intelligence techniques for robot applications in the real world. Individual and group projects analyze robot control problems, designing hardware, and software solutions. Students write basic control programs for different robot platforms and apply state-of-art artificial intelligence techniques to the control of robotic mechanisms. Prerequisite: CSCI 161 with a C or higher.

CSCI 330. Software Engineering and Testing. 4 Hours.
The principle, methods and models used to develop and manage software projects, including test implementation of a large-scale project. Prerequisite: Student must complete CSCI 161, 275 and 340 with a C or higher before enrolling in this course.

CSCI 331. Social Implications. 4 Hours.
An introduction to: The effects of computer technology (hardware and/or software) on society and individuals; ethical problems faced by computer professionals; human interaction and interfacing with computer technology. Prerequisite: CSCI 161, 275 and 340 or instructor consent.

CSCI 335. Theoretical Computer Science. 4 Hours.
Models of computation, regular expressions, finite automata, Kleene's Theorem, lexical analysis, context-free grammars, pushdown automata, introduction to parsing. Prerequisites: CSCI 242, CSCI 275, MATH 208, and MATH 209 with a C or higher in all courses.

CSCI 340. Computer Networks I. 4 Hours.
Introduction to network design and management. Topics include the local area networks, wireless networks and communication systems, OSI and TCP/IP Models, signals and modulation, protocol designs such as Ethernet, Wi-Fi, Bluetooth, cellular networks, ad hoc networks, flow control, error handling, routing, interfaces, and applications. Prerequisites: CSCI 161, CSCI 275, MATH 107 or MATH 103 and MATH 105, MATH 208, and MATH 209 with a C or higher in all courses.

CSCI 352. Comparative Languages. 4 Hours.
Comparison of procedural and non-procedural languages. Study of strengths and weaknesses of language for solving various problems. Introduction to implementation issues such as memory allocation. Prerequisite: CSCI 242.

CSCI 356. Database Management I. 4 Hours.
Introduction to database management systems, database theory and schema design, and programming, including data modeling, set theory, relational calculus, functional and multivalued data dependencies, and normalization. Various database models are discussed including, relational, NoSQL, network, hierarchical, and inverted files, and database management and security. Prerequisites: CSCI 161 and MATH 209 with a C or higher in all courses or BIT 312 or department approval.

CSCI 360. Systems Programming. 4 Hours.
Programming using interrupts and operating systems services. Device driver implementation. Brief comparison of different hardware systems. Prerequisites: CSCI 242, CSCI 275, MATH 208, and MATH 209 with a C or higher in all courses.

CSCI 370. Computer Organization. 4 Hours.
The structure and organization of computer hardware. Register implementation and usage. Memory management. Comparison of Architectures. Prerequisites: CSCI 161, CSCI 275, MATH 208, and MATH 209 with a C or higher in all courses.

CSCI 375. Computer and Digital Hardware II. 4 Hours.
Advanced applications of digital systems, builds on the content of CSCI 275, emphasis on system designs. Prerequisite: CSCI 275.

CSCI 391. Teaching Computer Science. 2 Hours.
Classroom management and equipment. Analysis of student difficulties, survey of current literature, observation, and practicum. Prerequisites: CSCI 160, 250 and admission to Teacher Education.

CSCI 440. Data Communications & Computer Security. 4 Hours.
Network administration and management of data protocols and models, basic configurations, software, hardware, and routing applications. Problems of computer security and possible solutions, internet security, secure operation system and kernels, with an emphasis on applications. Prerequisite: CSCI 340 with a C or higher.

CSCI 450. Operating Systems. 4 Hours.
Design and implementation of operating systems. Study of the control of and communication between interacting processes. Resource allocation and management in a multiprogramming environment. Prerequisites: CSCI 360 and CSCI 370 with a C or higher in both courses.

CSCI 452. Compiler & Interpreter Construction. 4 Hours.
Theory and practice of program translation. Lexical and syntactic analysis, error detection and response, optimization. Prerequisites: CSCI 275 and CSCI 335 with a C or better in both courses.

CSCI 456. Database Management II. 4 Hours.
Advanced database theory and applications. Students will be expected to have a solid foundations in normalization and database programming. Students will be expected to apply their knowledge of set theory, relational calculus and normalization to design and develop a large database project in a relational database system and create an application which uses the database in the programming language of their choice from a large data set. Prerequisite: CSCI 356 with a C or higher.
Introduction to computer and network security. Topics covered include the CIA triad model, symmetric and public-key encryption algorithms, hashing algorithms, and securing data storage, application and communications systems, firewalls, penetration testing, vulnerability assessments, reverse engineering, malware and ethics. Prerequisites: CSCI 340 and CSCI 370 with a C or higher in both courses.

CSCI 460. Capstone Project. 4 Hours.
The student chooses a research or software development project in consultation with the instructor. The student prepares a project proposal discussing the scope of the project and develops it to those specifications. On completion of the project the student is expected to present the results of their work and submit a final report. It is recommended that the project is focused on student's chosen field of study. Prerequisites: CSCI 242, CSCI 340, CSCI 356, and CSCI 370 with a C or higher in all courses.

CSCI 497. Internship. 1-8 Hour.
Supervised professional experience in computing applications. A maximum of two credits may be counted toward a major or minor. May be repeated up to a total of eight credits. Grading is pass/fail. Prerequisite: Departmental Approval.

MATH Courses

MATH 103. College Algebra. 4 Hours.
This course explores fundamental college algebra topics, either as preparation for further study in mathematics or to meet the general education requirement. Topics of study include the following: relations, functions, and graphing; equations and inequalities; complex numbers; radical, polynomial, rational, exponential, and logarithmic functions; systems of equations; matrices; sequences and series; and the binomial theorem. Prerequisite: ASC 093 with C or better, or qualifying math placement test score, or ACT math subtest score of 21 or higher.

MATH 104. Finite Mathematics. 4 Hours.
This course is for students whose major does not require MATH 103 College Algebra, Math 107 Precalculus, or courses in calculus. This course emphasizes the understanding and application of mathematics as they are used in everyday life. Topics of study include systems of linear equations and inequalities, matrices, linear programming, logic, mathematics of finance, elementary probability, and descriptive statistics. This course does not serve as the prerequisite for any other math course. Prerequisite: ASC 093 with C or better or qualifying math placement test score, or ACT math subtest score of 21 or higher.

MATH 105. College Trigonometry. 2 Hours.
A study of angles, trigonometric function and their inverses, solving triangles, trigonometric identities and equations, polar coordinates, and applications. Prerequisite: Students must complete Math 103 with a C or better or have an ACT subscore of 25 or higher before enrolling.

MATH 107. Precalculus. 4 Hours.
This course includes the study of equations and inequalities, polynomial, rational, exponential and logarithmic functions, conic sections, standard forms, polar-coordinates and introduction to parametric equations, graphing, trigonometric and inverse trigonometric functions, trigonometric identities and equations, and applications. Prerequisite(s): MATH 103 with a C or better, or qualifying math placement test score, or ACT math subtest score of 25 or higher.

MATH 146. Applied Calculus. 3 Hours.
Introduction to differential and integral calculus with applications from areas such as social science and business. Topics include limits, derivatives, integrals, exponential and logarithmic functions, and applications. Prerequisite(s): MATH 103 with a C or better, or qualifying math placement test score, or ACT math subtest score of 25 or higher.

MATH 165. Calculus I. 4 Hours.
Topics include limits, continuity, differentiation, Mean Value Theorem, integration (indefinite and definite integrals), Fundamental Theorem of Calculus, and applications. Prerequisite(s): MATH 107 with a C or better, or MATH 103 and 105 with a C or better, or qualifying math placement test score, or ACT math subtest score of 29 or higher.

MATH 166. Calculus II. 4 Hours.
Topics include applications of integration, methods of integration, polar equations, sequences, series, power series, and application. Prerequisite(s): MATH 165 with a C or better.

MATH 201H. Environmental Mathematics. 3 Hours.
Exploration of environmental issues using mathematical models together with real world data. Topics may include: ecology, health sciences, economics, genetics, and other environmental issues. Possible field experience. Prerequisite(s): Math 102 with a C or higher, or qualifying math placement test score, or ACT math subtest score of 22 or higher.

MATH 205. Math Proof & Problem Solving. 3 Hours.
A course on mathematical proofs and axiomatic systems. Topics may include set theory, formal logic, combinatorics, graph theory. Prerequisite: MATH 165.

MATH 208. Discrete Mathematics I. 3 Hours.
Introduction to discrete mathematics with an emphasis in computer science and applications including: sets and set theory, Boolean algebra and digital logic theory, formal logic and equivalence, mathematical proofs (direct, contradiction, contrapositive, and induction), sequences and recursion, relations and functions, and relational algebra. Prerequisite: MATH 103 or MATH 107 or MATH 146 or MATH 165 with a C or better.
MATH 209. Discrete Mathematics II. 3 Hours.
Intermediate discrete mathematics with an emphasis in computer science and applications including: combinatorics and probability, graph theory including circuits, isomorphisms, trees, shortest path algorithms, algorithm analysis, regular expressions and formal languages, and finite-state automata. Prerequisite: MATH 208 with a C or better.

MATH 210. Elementary Statistics. 4 Hours.
An examination of introductory statistics concepts, including sampling, descriptive statistics, probability, correlation, regression, binomial and normal distributions, confidence intervals and hypothesis testing of one and two populations, ANOVA, and Chi-square tests. Technology will be used to enhance learning and mirror statistical applications and practices in the larger world. Prerequisite(s): ASC with a C or better, or qualifying math placement test score, or ACT math subtest score of 21 or higher.

MATH 265. Calculus III. 4 Hours.
Functions of more than one variable, multiple integrals, line integrals, Green's and Stoke's theorem. Prerequisite: MATH 166.

MATH 266. Introduction to Differential Equations. 3 Hours.
First order equations, linear equations, systems of equations, series methods, Prerequisite: MATH 265 and MATH 314.

MATH 277. Mathematics for Elementary Teachers I. 3 Hours.
A course for elementary education majors. Topics include problem solving, number systems (natural numbers through the reals), number theory, and proportional reasoning. Technology and manipulatives are used throughout the course. Prerequisite: MATH 103 or MATH 104. Co-requisite: ED 221.

MATH 294. Intro to Research Math. 1-2 Hour.
Students explore topics, expand their mathematical knowledge, and begin to conduct introductory research under the direction of a faculty mentor. The number of credits is proportional to the time committed to the research (1 SH = 3 hours of student work per week on average). Repeatable for up to 4 credits total. Prerequisite(s): MATH 165 with a B or better; instructor permission required.

MATH 299. Special Topic. 1-4 Hour.

MATH 305. Linear Algebra. 4 Hours.
Real vector spaces, subspaces, linear transformations, matrices, eigenvalues and eigenvectors, vector geometry. Prerequisite: MATH 107 or advanced placement.

MATH 314. Introduction to Mathematical Programming. 2 Hours.
An introduction to symbolic, numerical, and graphical computing using mathematical software packages. MATLAB will be used during fall semesters and Mathematica will be used during spring semesters. Prerequisite: Students must complete MATH 165 and MATH 305 before enrolling in this course.

MATH 315. Intro to Mathematical Modeling. 3 Hours.
An introduction to mathematical modeling is the translation of a real world problem into a well formed mathematical model. Students will develop the basic skills and techniques of formulation, simulation, analysis, and testing of mathematical models for describing and predicting a variety of phenomena. Understanding the fundamental principles in model formulation in physics, chemistry, biology, business, economics, medicine, and social and environmental sciences will be emphasized. Prerequisites: Student must complete MATH 165 and Math 314 before enrolling in this class.

MATH 320. Number Theory. 3 Hours.
Unique factorization, residue theory, Diophantine equations, quadratic equations and reciprocity. Prerequisite: MATH 205.

MATH 325. Algebra for Secondary Teachers. 3 Hours.
Algebra topics in the secondary mathematics curriculum are explored using a variety of manipulative, technologies, and teaching resources. Focus areas include patterning, connections between algebraic topics, and multiple ways of knowing and learning algebraic topics. Prerequisite: Students must complete MATH 165 before enrolling in this course.

MATH 330. College Geometry. 4 Hours.
Geometry for secondary teachers. Euclidean geometry using both inductive and deductive approaches. Teaching tools include appropriate technology. Standard topics plus finite and transformational geometry. Prerequisite: MATH 205.

MATH 345. Linear Models. 4 Hours.
An introduction to statistical methods including topics from sampling, hypothesis testing, nonparametric statistics, resampling, simple and multiple regressions, and the general linear model. Computer statistical packages will be integrated into the course. Prerequisite: MATH 210 or equivalent.

MATH 346. Experimental Design. 4 Hours.
Statistical methods including topics from analysis of variance; fixed and random factors; block, nested, and crossed designs; factorial, fractional factorial and confounded designs; split plot designs; and multivariate analysis. Computer statistical packages will be integrated into the course. Prerequisite: MATH 210.

MATH 371. Early Practicum. 1 Hour.
This course will require a minimum of 45 clock hours in a practicum experience. The experience can be any one of or combination of the following: secondary classroom, teaching assistant on campus, tutor on or off campus, tutor in the MSU Math Clinic, tutor at Job Corps, or some other experience approved by the Mathematics Department. Prerequisite(s): MATH 165.

MATH 377. Mathematics for Elementary Teachers II. 2 Hours.
A course for elementary education majors. Topics include probability, statistics, and geometry. Calculators, computer software, and manipulatives are throughout the course. Prerequisite: MATH 103 or MATH 104 or equivalent.
MATH 380. History of Mathematics. 3 Hours.
Development of mathematics from its early beginning through the present axiomatic approach. Problems from each era are included. Prerequisite: MATH 107 or advanced placement.

MATH 381. Secondary Math Practicum. 1 Hour.
This course will require a minimum of 60 clock hours in a practicum experience. The experience will take place in a grades 7-12 setting. Prerequisite(s): Admission to Teacher Education. Prereq/Coreq: MATH 391.

MATH 391. Teaching Mathematics. 3 Hours.
Intended for secondary mathematics teachers. Planning mathematics lessons, developing mathematics teachingskills. Prerequisite(s): Admission to Teacher Education.

MATH 394. Independent Study General Math. 1-4 Hour.

MATH 400. Abstract Algebra. 4 Hours.
Introduction to abstract algebraic systems. Groups, rings, homomorphisms and isomorphisms. Prerequisites: MATH 205.

MATH 445. Probability And Statistics I. 4 Hours.
Introduction to probability, discrete and continuous random variables, distribution functions, special probability distributions. Prerequisite: MATH 146 or 166.

MATH 446. Probability and Statistics II. 4 Hours.
Multivariate probability distributions. Functions of random variables, moment generating functions, sampling distributions, estimation methods, properties of point estimations, linear models, somes special experimental designs. Prerequisite: MATH 445.

MATH 450. Real Analysis. 4 Hours.
Limits of functions and sequences, continuitym topology of the reals, differentiaionm Riemann Integrationm convergence and uniform convergence. Prerequisite: MATH 205.

MATH 460. Complex Analysis. 3 Hours.
Analytic functions, conformal maps, Cauchy integral formula, residue theorem. Prerequisites: MATH 265, 450.

MATH 466. Intro to Partial Differential Equations. 3 Hours.
Solution of the standard partial differential equations (Laplace's equation, transport equation, heat equation, wave equation) by separation of variables and transform methods, including eigenfunction expansions, Fourier and Laplace transform. Boundary value problems, orthogonality and Fourier series. Prerequisite: Math 266.

MATH 470. Numerical Analysis. 4 Hours.
Error analysis, numerical differentiation and integration, linear systems and numerical solutions to differential equations. The computer language of instruction will be FORTRAN. Prerequisites: Student must complete MATH 265, 305, and 314 before enrolling in this class.

MATH 494. Directed Research in Math. 1-4 Hour.
Students conduct research under the direction of a faculty mentor. The general topic and specific goals and activites are agreed upon by the student and the mentor. While publication or presentation is not a requirement, all projects have a goal of producing publishable/presentable results. The number of credits is proportional to the time committed to the research (1 SH = 3 hours of student work per week on average). Repeatable for up to 8 credits total. Prerequisite(s): Math 294 (2 SH); instructor consent.

MATH 499. Special Topics. 1-4 Hour.