

# MATHEMATICS AND COMPUTER SCIENCE

## Mission Statement

UW-Superior's Mathematics and Computer Science Department (<https://www.uwsuper.edu/academics/academic-departments/mathematics-and-computer-science/>) provides majors and minors in Computer Science (<https://www.uwsuper.edu/program/computer-science/>), Mathematics (<https://www.uwsuper.edu/program/mathematics/>), and Mathematics Education (<https://www.uwsuper.edu/program/mathematics-2/>). The programs provide a core of fundamental courses along with an array of electives that enable students to pursue special interests. Using this versatile, highly regarded program, students can choose a major, minor, certification or associates degree that prepares them for a career or graduate study in Computer Science, Mathematics, Information Technology and Systems, Engineering or Mathematics Education.

## Contact Information

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## Majors

- Computer Science Major (Comprehensive) (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/computer-science/computer-science-major-comprehensive/>)
- Computer Science Major (Non-Comprehensive) (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/computer-science/computer-science-major-non-comprehensive/>)
- Mathematics Major (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/mathematics/mathematics-major/>)
- Mathematics Teaching Major - Grades 4-12 (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/mathematics/mathematics-teaching-major-grades-4-12/>)

## Minors

- Information Technology and Systems (ITS) Minor - Suspended (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/computer-science/its-minor/>)
- Mathematics Minor (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/mathematics/mathematics-minor/>)
- Mathematics Teaching Minor - Grades 4-12 (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/mathematics/mathematics-teaching-minor-grades-4-12/>)

## Certificates

- Information Technology and Systems (ITS) Certificate (<http://catalog.uwsuper.edu/undergraduate/academic-departments/mathematics-computer-science/computer-science/its-certificate/>)

## Course Descriptions

### Computer Science

#### CSCI 101 Introduction to Computer Science 3.00

A first course in computer science providing a survey of current topics as well as core programming and related problems solving skills. Satisfies the mathematics requirement for University Studies.

#### Prerequisites:

Prerequisite for taking this course is the Mathematics Placement Test, or successful completion of MATH 090

#### University Studies Requirements:

- Math/Computer Science

#### Typically Offered:

- On-campus: Select Semesters;

#### CSCI 170 Programming and Technology for the Teaching of Mathematics 3.00

Graphing and analysis of functions using graphing calculators, structured programming, use of software packages such as SAGE, Alice, and Geogebra.

#### Prerequisites:

Acceptable score on the Mathematics Placement Test or completion of MATH 115 with grade of at least C-

#### Typically Offered:

- On-campus: Fall, Even Years;

#### CSCI 189 Computer Science Elective 1.00-12.00

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

#### CSCI 201 Introduction to Programming 3.00

A first programming course for students with a serious interest in computing. Topics include: data types and variables; memory and representation of data; control structures; primitive and reference data types; methods and modular programming; introduction to abstract data types and classes, and encapsulation; simple algorithms; recursion; and programming conventions and style all done in a formal programming language.

#### Prerequisites:

Completion of MATH 095 with a grade of C- or better or Mathematics Placement Test of MATH 112 or higher.

#### Typically Offered:

- On-Campus: Fall
- Online: Fall

**CSCI 202 Object-Oriented Programming 3.00**

Continuation of CSCI 201. Programming course emphasizing programming from an object-oriented perspective and software development principles. Topics include: data structure fundamentals; exception handling; abstraction and encapsulation; inheritance and polymorphism; pointer and reference variables; memory management, operator overloading, concurrent programming; various important algorithms; and file processing techniques.

**Prerequisites:**

Prerequisite for taking this course is having completed CSCI 201 with a grade of C- or better.

**Typically Offered:**

- On-campus: Spring
- Online: Spring

**CSCI 224 Assembly Language Programming 4.00**

Fundamentals of Assembly language programming with an emphasis to microcontroller programming. Topics include: binary representation of numbers and strings, fundamentals of ARM microcontroller architecture; types of memory; access; arithmetic and logical operations; conditional processing; functions and procedures; bit and string processing; recursion and stack manipulation; floating-point programming; interrupt handling; hardware configuration; fundamentals of C programming language; combining assembly with C. Lecture and Lab.

**Prerequisites:**

Prerequisite for taking this course is an acceptable score on the Mathematics Placement Test or completion of an appropriate course. MATH 113 recommended.

**Typically Offered:**

- On-Campus: Fall
- Online: Fall

**CSCI 281 Special Projects 1.00-4.00**

Individual project to learn a programming language not normally offered in the current array of programming courses. Requires weekly progress reports and demonstration of learned skills through a project under the supervision of one or more instructors. May be repeated, but no more than a total of 12 credits may be earned from CSCI 281. Pass-Fail only. Prerequisites: Preliminary project plan and an independent study contract.

**Typically Offered:**

- On-campus: Select Semesters;

**CSCI 289 Computer Science Elective 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**CSCI 303 Algorithms and Data Structures 4.00**

Continuation of CSCI 202. Concepts and implementation techniques for various algorithms and related data structures of particular interest to computer scientists; counting techniques and analysis of the complexity (efficiency) of algorithms. Topics include: stacks and queues, hashing, graphs and trees, data compression, game strategy, and related algorithms.

**Prerequisites:**

CSCI 202 with a grade of C- or better is prerequisite for taking this course.

**Typically Offered:**

- On-Campus: Fall
- Online: Fall

**CSCI 327 Embedded Systems Design 3.00**

A firmware and hardware development course for students with a serious interest in Micro-controller programming, Embedded Systems, or Engineering. Topics include: assembly and/or C programming of micro-controllers, interrupt processing, basic hardware and logic design, programming micro-controller peripherals like ADC, DAC, timers, PWM, comparators, programming and using serial interfaces, communication with user, basics of printed boards design.

**Prerequisites:**

Completion of CSCI 224 or CSCI 201 is recommended for taking this course.

**Typically Offered:**

- On-campus: Spring, Odd Years
- Online: Spring, Odd Years

**CSCI 331 Computer Graphics and Game Design 3.00**

Programming course emphasizing the implementation of fundamental data structures and algorithms, as well as the use of third-party modeling software and modern game engines, to represent and render 3D graphics. Topics include: color and output devices; 3D geometry and linear algebra; physics of motion and gravity; convexity and collision detection; lighting and shadow; texture maps; and keyframe animation.

**Prerequisites:**

The prerequisite for taking this course is having completed CSCI 201.

**Typically Offered:**

- On-campus: Spring, Even Years
- Online: Spring, Even Years

**CSCI 340 Software Development and Professional Practice 4.00**

Best practices in the field of software development. Students complete a medium-scale software project as members of a development team. Topics include: professional ethics and responsibilities; multi-tier systems; software life cycle; requirements analysis; system modeling; implementation and testing; re-engineering and maintainability. Both traditional (waterfall) and newer (agile) methodologies; design patterns; use of current technologies for programming, project management, and source archiving.

**Prerequisites:**

Prerequisite for taking this course is having completed CSCI 303

**Typically Offered:**

- On-campus: Spring;

**CSCI 351 Internet Programming 3.00**

Internet technologies for the World Wide Web such as XHTML, DHTML, CSS, CGI, JavaScript, and HTML5. Topics include: composing XHTML/XML web pages; page layout control with cascading style sheets, form processing and validation, working with images and JavaScript based animation, fundamentals of CGI programming under Unix/Linux environment, server-side programming with Perl and PHP; server configuration issues; and database access.

**Prerequisites:**

The prerequisite for taking this course is having completed CSCI 201.

**Typically Offered:**

- On-campus: Spring, Even Years;

**CSCI 356 Database Systems 3.00**

Information Management (IM) plays a critical role in almost all areas where computers are used. The course discusses the representation, organization, transformation, and presentation of information; algorithms for efficient and effective access and updating of stored information; data modeling and abstraction; relational algebra and Structured Query Language (SQL); and database design, implementation, querying, and administration. Pre-requisite: Having completed CSCI 201 is recommended when enrolling in this course.

**Typically Offered:**

- On-campus: Spring;

**CSCI 370 Computer Security 3.00**

A course in modern computer security and how to write secure programs. Topics include computer security, authentication, basic cryptography, identifying and stopping program threats, hacking, and secure software development.

**Prerequisites:**

CSCI 201 is the required pre-requisite.

**Typically Offered:**

- On-campus: Spring, Odd Years
- Online: Spring, Odd Years

**CSCI 381 Special Projects 1.00-4.00**

Various individual and small-group projects carried out under the supervision of one or more instructors. Requires weekly progress reports plus a final report and/or a final exam. May be repeated, but no more than a total of four credits may be earned from both MATH 381 and CSCI 381. Pass-Fail only. Preliminary project plan and an independent study contract required prior to enrollment.

**Typically Offered:**

- Occasional by Demand

**CSCI 389 Computer Science Elective 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**CSCI 390 Computer Science Internship 1.00-4.00**

Work in an approved position to gain experience in solving real problems using computer science. Interns may receive salaried appointments with cooperating companies. Pass-Fail only.

**Typically Offered:**

- On-campus: Select Semesters
- Online: Select Semesters

**CSCI 451 Operating Systems 4.00**

In-depth study of the concepts, issues, and algorithms related to the design and implementation of operating systems. Topics include: process management, process synchronization and inter-process communication; memory management; virtual memory; interrupt handling; processor scheduling; device management; I/O; file systems; and introduction to networking and network security. Students conduct programming projects and case studies to investigate modern operating systems such as Solaris, Linux, and Windows.

**Prerequisites:**

The prerequisite for taking this course is having completed CSCI 201.

**Typically Offered:**

- On-Campus: Fall;

**CSCI 461 Computer Architecture 4.00**

In depth study of fundamentals of computer hardware organization. Topics include: digital logic and circuits; hardware optimization principles; finite state machines; computer arithmetic, machine instructions and assembly language; pipeline design, parallelism and micro-programming; memory management and design; storage system design; I/O modules, operating system support; structure and function of computer processors, RISC vs. CISC architecture.

**Prerequisites:**

Prerequisite for taking this course is having completed CSCI 224.

**Typically Offered:**

- On-campus: Spring;

**CSCI 470 Net-Centric Computing 4.00**

Introduces the structure, implementation, and theoretical background of computer networking. Topics include: the ISO/OSI reference model and protocol stack, implementation details of various network protocols, routing algorithms, wireless challenges and protocols, mobility management, broadcasting and multicasting, multimedia networking, introduction to network security, Bluetooth application development for microcontrollers and mobile devices.

**Prerequisites:**

The prerequisite for taking this course is having completed CSCI 201.

**Typically Offered:**

- On-Campus: Fall;

**CSCI 481 Special Topics 1.00-4.00**

Investigation of one or more topics of current interest not covered in other courses. Not intended for independent study projects. May be repeated, but no more than a total of eight credits may be earned from both MATH 481 and CSCI 481.

**Typically Offered:**

- On-campus: Select Semesters
- Online: Select Semesters

**CSCI 489 Computer Science Elective 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**CSCI 498 Individual Capstone Project 1.00**

Students carry out a project under the supervision of a faculty member, write a report, and present the results to the entire department. Taken during senior year.

**Typically Offered:**

- On-campus: Select Semesters
- Online: Select Semesters

**CSCI 499 Group Capstone Project 3.00**

Group projects in software engineering are carried out by students under supervision of a faculty member to serve community organization.

Qualifies as an Academic Service-Learning course (see Academic Service-Learning for more details).

**Prerequisites:**

The prerequisite for taking this course is having completed CSCI 340.

**Typically Offered:**

- On-Campus: Fall;

**Information Technology and Systems****ITS 108 Computer Applications 3.00**

Use computer applications to increase personal and professional productivity. Students gain hands-on experience using a variety of productivity tools commonly found in software suites used in a professional setting, such as word processing, presentation graphics, spreadsheets, databases, and others. Classes are tailored to the college student with emphasis on providing real-world examples to make learning and using computer software interesting and applicable to a variety of career paths.

**Typically Offered:**

- Fall, Spring, and Summer Terms

**ITS 148 Computer Applications for Productivity 3.00**

Designed for students interested in learning how to use a computer to increase their personal and professional productivity. Enhance computer skills by using a variety of productivity applications found in common software suites, such as word processing, presentation graphics, desktop publishing, spreadsheets, personal organizers, and others. Classes are tailored to the college student with emphasis on providing a hands-on experience to make learning and using computer software interesting and easy.

**Typically Offered:**

- Occasional by Demand

**ITS 189 Information Technology and Systems Elective 1.00-9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**ITS 211 Visual Programming Fundamentals 3.00**

Introduces students to basic programming methods and techniques using the latest development tools. Designed for students who view themselves as nonprogrammers, but who have an interest in computer programming to create macros or to write simple applications. Students learn programming skills by writing and debugging simple routines that emphasize programming constructs such as variables, control structures, and data input and output. Object-oriented concepts are presented and practiced to enhance the experience.

**Typically Offered:**

- Spring Term Only

**ITS 230 Introduction to Information Technology 3.00**

Provides a stimulating experience for students with new perspectives on cutting-edge technology and systems. Illustrates how everyday computer technology is combined to form systems people and society depend upon. Covers core computer concepts, latest technological advances, and emerging trends in information system design and deployment. Arms participants with current knowledge about information technology used in a wide array of real-world applications.

**Typically Offered:**

- Occasional by Demand

**ITS 289 Information Technology and Systems Elective 1.00-9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**ITS 310 Information Technology Operations 3.00**

Go behind the scenes and discover the systems organizations use to provide computing and networking services. This course examines the technology and applications that drive modern IT operations such as server virtualization, virtual desktop infrastructure, cloud computing, and user state virtualization. Topics include desktop and application deployment, help desk services, and configuration management. Mobile applications are given special consideration. Students work with open source and proprietary software using state-of-art virtualization tools to model system configurations and learn problem solving skills through hands-on projects.

**Typically Offered:**

- Occasional by Demand

**ITS 335 Web Page Authoring 3.00**

Build functional and appealing Internet websites using readily available commercial software to design and construct web pages. Considers various website strategies and layouts that enable web users. Create web pages that integrate multimedia applications to present content in an attractive and user-friendly manner. Learn about measures of performance and how to test your website for functionality. Designed for students with a wide variety of backgrounds and interests, employing a hands-on approach.

**Typically Offered:**

- Fall Term Odd Years Only

**ITS 342 Information Systems 3.00**

Introduces topics and concepts of management information systems with emphasis on planning, organizing, and controlling user services and managing the system development process. Focuses on use of information system technologies in the business world from the standpoint of the end-user manager.

**Typically Offered:**

- Spring Term Only

**ITS 346 Database Management 3.00**

Learn the science of database management to include the organization, storage, and retrieval of data used in a wide range of applications. Basic theory is combined with practical examples to reinforce concepts presented in class. Students are encouraged to apply learned skills to projects in their particular areas of interest. Intended for the student with no or minimal exposure to database systems and uses state-of-the-art database management system software.

**Typically Offered:**

- Spring Term Only

**ITS 350 Networking and Communications 3.00**

Discover the ways data moves between computers, network-enabled devices, and other communication technology using wired and wireless media. A broad range of applications are considered ranging from networked enterprise to mobile technology to the ubiquitous broadcast signals used to transmit television and radio programs. Emphasis is placed on networking and communication technology and how it used to connect people with each other and with the information they need.

**Typically Offered:**

- Fall Term Only

**ITS 360 Ethics in Information Technology 3.00**

Examines the impact computers and Internet technology have had on people and society through the lens of Internet law, ethics, and intellectual property. Designed to be a forum where students discuss and debate critical issues related to these areas. Students participate in exercises that stimulate critical thinking and prepare them to address complicated issues that provoke a wide range of opinions.

**Typically Offered:**

- Spring Term Odd Years Only

**ITS 364 Digital Multimedia 3.00**

Examines the history and underlying theory behind computer integration of text, sound, video, animation, and graphics. Survey the fundamental concepts and historical development of multimedia. Review current and future applications of multimedia. Introduce the practical tools and techniques for developing digital media applications. Students gain practical experience in design and implementation of multimedia applications on a platform.

**Typically Offered:**

- Fall Term Even Years Only

**ITS 370 Information Security 3.00**

Provides the knowledge of information assurance and security necessary for modern programmers, analysts, and other IT professionals and also important for business managers, auditors and many other careers. Covers a diverse range of topics recommended by the Association for Computing Machinery, including operational issues, policies and procedures, attacks and defense mechanisms, risk analysis, recovery and business continuity, data security, cryptography, and digital forensics.

**Typically Offered:**

- Spring Term Even Years Only

**ITS 380 Global E-Commerce Systems 3.00**

A close look at technology that enables e-commerce to leverage information to their strategic advantage. Examines the business use to improve productivity, manage information, market and sell product, streamline supply chains, and compete on a global scale that has led to a revolution in the e-business enterprise. Students are guided to understand basic e-commerce and e-business systems on key areas of developing, managing, and maintaining a successful e-commerce site. Case studies and examples illustrate how theory is successfully translated into real-life business scenarios.

**Typically Offered:**

- Fall Term Only

**ITS 381 Special Projects 1.00-4.00**

Various individual and small-group projects carried out under the supervision of one or more instructors. Requires weekly progress reports plus a final report and/or a final exam. May be repeated, but no more than a total of four credits may be earned from both ITS 381 and CSCI 381. Pass-Fail only. Prerequisites: Preliminary project plan and an independent study contract. Offered as needed.

**Typically Offered:**

- Occasional by Demand

**ITS 389 Information Technology Elective 9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**ITS 400 Information Technology and Systems Internship 2.00-7.00**

Students extend classroom learning in the ITS field. Students obtain the cooperation of an employer and prepare a learning contract. Students will submit weekly recaps of activities and a final report about their experience. The internship may be taken any academic term. Pass-Fail only.

**Typically Offered:**

- Fall, Spring, and Summer Terms

**ITS 481 Special Topics 1.00-4.00**

In-depth study of specialized current topics in information technology and systems. May be repeated when topics are different. Offered as needed.

**Typically Offered:**

- Occasional by Demand

**ITS 489 Information Technology Elective 9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**ITS 498 Individual Capstone Project 1.00**

Students will integrate an information technology and systems (ITS) application into the senior experience in their program of study. Requires weekly progress reports and demonstration of learned skills through a project under the supervision of one or more instructors. Pass-Fail only.

**Typically Offered:**

- Fall, Spring, and Summer Terms

**ITS 499 Group Capstone Project 1.00**

Group projects are carried out by students. Students will integrate an information technology and systems (ITS) application into the senior experience in their program of study. Requires weekly progress reports and demonstration of learned skills through a project under the supervision of one or more instructors. Pass-Fail only.

**Typically Offered:**

- Occasional by Demand

**Mathematics****MATH 102 Intermediate Algebra 2.00**

Review of intermediate algebra topics typically studied in high school. Topics include: rational expressions and equations; rational exponents; radical expressions and equations; complex numbers; functions; quadratic equations and functions; graphing techniques, conic sections; exponential and logarithmic functions and equations.

**Prerequisites:**

Adequate math placement score or completion of MATH 095 with a C- or better.

**MATH 112 Introduction to Contemporary Mathematics 3.00**

A liberal arts mathematics course presenting mathematics as a tool used by a wide range of professionals in modern society. Real-life examples are used to promote understanding of mathematics and its relationship to other areas of study. Examples will be chosen from graph theory (Traveling Salesman Problem and Euler Circuits), voting theory (fairness criteria and Arrow's impossibility theorem), elementary probability and statistics, logic, geometry, mathematics of growth, mathematics of finance, and mathematical modeling.

**Prerequisites:**

Adequate math placement score or completion of MATH 095 with a C- or better or concurrent enrollment in MATH 097 or successful completion of MATH 130 or MATH 113 with a C- or better

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 113 Algebra with Applications 3.00**

Algebraic concepts, problem-solving techniques, and applications for students in business, natural and social sciences. Topics include linear, quadratic, exponential, logarithmic functions and their graphs; equations and inequalities; systems of equations and matrices; complex numbers.

**Prerequisites:**

Adequate Math Placement Score or completion of MATH 095 with a C- or better or concurrent enrollment in MATH 096

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring



**MATH 115 Precalculus 5.00**

Covers the algebra and trigonometry required for Calculus and Analytic Geometry. Topics include review of intermediate algebra; composite and inverse functions; systems of equations; partial fractions; matrices; polynomial and rational functions, exponential and logarithmic functions, trigonometric functions, identities, and equations; the binomial theorem; and fundamentals of analytic geometry.

**Prerequisites:**

Adequate math placement score or completion of MATH 113 with a C- or better.

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 130 Elementary Statistics 4.00**

Introductory course for students of all disciplines. Includes descriptive statistics, probability, the binomial and normal distributions, confidence intervals, correlation and linear regression, Central Limit Theorem, and one-sample (population mean and population proportion) and two-sample (population means) hypothesis testing. Problems are taken from various fields of study dependent on statistical decision making.

**Prerequisites:**

Adequate math placement score or completion of MATH 095 with a C- or better, or concurrent enrollment in Math 097, or successful completion of MATH 112 or MATH 113 with a C- or better.

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 151 Calculus for Business, Life, and Social Sciences 3.00**

A short course in calculus including concepts and problem-solving techniques for students in business, economics, biology and the social sciences. Topics include algebraic, exponential and logarithmic functions; derivatives, and optimization problems; integrals; partial derivatives and Lagrange multipliers as time permits.

**Prerequisites:**

Adequate math placement score or completion of MATH 113 with a C- or better.

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 189 Mathematics Elective 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 189MC Mathematics Elective Math/Computer Science 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 240 Calculus and Analytic Geometry I 4.00**

A first course in the fundamentals of calculus. Topics include: real numbers; functions; limits; continuity; derivatives, integrals; the use of computational tools in calculus; transcendental functions; and applications.

**Prerequisites:**

Adequate math placement score or completion of MATH 115 with a C- or better.

**University Studies Requirements:**

- Math/Computer Science

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 241 Calculus and Analytic Geometry II 4.00**

Continuation of MATH 240. Topics include: conic sections; techniques and applications of integration; parametric curves and polar coordinates; indeterminate forms; improper integrals; and infinite series.

**Prerequisites:**

Completion of MATH 240 with a grade of C- or better.

**Typically Offered:**

- On-campus: Spring;

**MATH 242 Calculus and Analytic Geometry III 4.00**

Continuation of MATH 241. Topics include: three-dimensional analytic geometry; vectors; partial derivatives; multiple integrals; line integrals; and surface integrals.

**Prerequisites:**

Completion of MATH 241 with a grade of C- or better.

**Typically Offered:**

- On-Campus: Fall;

**MATH 289 Mathematics Elective 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 289MC Math Elective Math/Computer Science 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 310 Introduction to Abstract Mathematics 3.00**

Fundamentals of formal mathematics emphasizing mathematical writing and types of formal proof. Includes significant coverage of topics in logic, set theory, basic number theory, relations and functions.

**Prerequisites:**

Completion of MATH 240 with a C- or better or instructor permission.

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MATH 315 Linear Algebra 3.00**

Introduction to the algebra and geometry of two- and three-dimensional real vector space and extension to  $n$ -dimensional space. Topics include: line and coordinate vectors; systems of linear equations and their solution by reduction methods; matrix algebra; determinants; fundamentals of abstract vector spaces; linear independence, dimension theorems; linear transformations; eigenvalues and eigenvectors; diagonal matrices; quadratic forms; inner products; and the Gram-Schmidt orthogonalization.

**Prerequisites:**

Successful completion of MATH 310.

**Typically Offered:**

- On-campus: Spring;

**MATH 320 Discrete Structures 4.00**

Continuation of MATH 310. Investigation of concepts of non-calculus mathematics of interest in computer and other areas. Topics include: recurrence relations, enumerative combinatorics, partially ordered sets, graph theory, and related algorithms.

**Prerequisites:**

Successful completion of MATH 310.

**Typically Offered:**

- On-Campus: Fall
- Online: Fall

**MATH 344 Differential Equations 4.00**

Introduction to the theory of ordinary differential equations including some coverage of series solutions, as time permits. Also covers various classical applications, such as spring mass systems.

**Prerequisites:**

Successful completion of MATH 241.

**Typically Offered:**

- On-campus: Select Semesters;

**MATH 362 Topics In Geometry 3.00**

A proof-based course in modern geometry with an emphasis in Euclidean Geometry. Topics include: lines, polygons, circles, congruence and similarity, area of shapes, compass and straight edge constructions, axioms of incidence, and Playfair's axiom.

**Prerequisites:**

Successful completion of MATH 310.

**Typically Offered:**

- On-campus: Fall, Odd Years;

**MATH 370 Probability 3.00**

A first course in Calculus-based probability theory. Topics include: axioms of probability; combinatorial analysis; conditional probability; independence; discrete and continuous random variables; probability distributions; expectation; variance; Poisson processes; and limit theorems.

**Prerequisites:**

Successful completion of MATH 241 and MATH 310.

**Typically Offered:**

- On-campus: Fall, Odd Years;

**MATH 371 Statistics 4.00**

Calculus-based statistics emphasizing applications intended for students in mathematics, economics and the sciences. Topics include: the use of statistical software; estimation and prediction; hypothesis testing; linear and multiple regression; F and t tests; analysis of variance; and non-parametric statistics.

**Prerequisites:**

Successful completion of MATH 241 and MATH 310 (MATH 242 recommended).

**Typically Offered:**

- On-campus: Fall, Even Years;

**MATH 381 Special Projects 1.00-4.00**

Various individual and small-group projects carried out under the supervision of one or more instructors. Requires weekly progress reports plus a final report and/or a final exam. May be repeated, but no more than a total of four credits may be earned from both MATH 381 and CSCI 381. Pass-Fail only. Preliminary project plan and an independent study contract required prior to enrollment.

**Typically Offered:**

- On-campus: Select Semesters
- Online: Select Semesters



**MATH 385 Introduction to Operations Research 3.00**

Topics include mathematical programming, (programming problems, transportation problems, dynamic programming, game theory), queuing theory, inventory theory, reliability theory, and simulation techniques. Look at capitalization

**Prerequisites:**

Successful completion of MATH 315 and MATH 370.

**Typically Offered:**

- On-campus: Select Semesters;

**MATH 389 Mathematics Elective 1.00-9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 390 Mathematical Sciences Internship 1.00-4.00**

Work in an approved position to gain experience in solving real problems using computer science, mathematics, and statistics. Interns may receive salaried appointments with cooperating companies. Pass-Fail only.

**Typically Offered:**

- On-campus: Select Semesters
- Online: Select Semesters

**MATH 391 Putnam Mathematical Competition 3.00**

Preparation for the national Putnam Mathematics Contest. Includes review of previous examination problems and lectures on selected topics. May be repeated for a total of up to six credits. Pass-Fail only.

**Typically Offered:**

- On-Campus: Fall;

**MATH 421 Theory of Computation 4.00**

Thorough introduction to automata, formal languages and computability. Topics include: models of computation; regular and context-free languages; finite and pushdown automata; Turing machines; unsolvable decision problems; and fundamentals of computational complexity.

**Prerequisites:**

Successful completion of MATH 320.

**Typically Offered:**

- On-campus: Spring, Odd Years
- Online: Select Semesters

**MATH 425 Algorithm Design and Analysis 4.00**

Study of the design and analysis of algorithms that are based on elementary data structures such as queues, stacks and trees. Some graph and network algorithms (shortest paths, connectivity, coloring, flows, matchings), geometric algorithms (convex hulls, range search, nearest neighbors), NP-complexity, approximation algorithms (vertex cover, traveling salesman, scheduling), and introduction to randomized algorithms. Introduction to algorithm design techniques, including greedy algorithms, divide-and-conquer, and dynamic programming. Lower and upper bounds of program complexity are analyzed. Introduction to algorithms used in the area of information security.

**Prerequisites:**

Successful completion of MATH 320.

**Typically Offered:**

- On-campus: Spring, Even Years
- Online: Spring, Even Years

**MATH 437 Cryptography 4.00**

Study of the theory of cryptography together with applied programming projects. Topics include: discrete probability spaces; Shannon's theory of information and perfect secrecy; classical cryptosystems and cryptanalysis; authentication and key exchange; public key cryptosystems; elementary number theory, primality checking, the RSA cryptosystem; and Advanced Encryption Standard (AES).

**Prerequisites:**

Successful completion of MATH 310 and CSCI 201.

**Typically Offered:**

- On-campus: Select Semesters;

**MATH 440 Real Analysis 4.00**

Fundamental concepts of limit, continuity, differentiability, and integrability of functions of one variable and sequences and series.

**Prerequisites:**

Successful completion of MATH 242 and MATH 310.

**Typically Offered:**

- On-campus: Spring;

**MATH 450 Topology 4.00**

Topology of Euclidean space, metric spaces, topological spaces, bases and neighborhoods, Hausdorff property, continuity, homeomorphisms and embeddings, connectivity, and compactness.

**Prerequisites:**

Successful completion of MATH 240 and MATH 310.

**Typically Offered:**

- On-campus: Fall, Even Years;

**MATH 455 Abstract Algebra 4.00**

Introduction to algebraic systems including groups, rings, integral domains and fields, homomorphisms and isomorphisms.

**Prerequisites:**

Successful completion of MATH 310.

**Typically Offered:**

- On-campus: Fall, Odd Years;

**MATH 471 Introduction to Complex Variables 4.00**

Introduction to the study of analytic functions including differentiation, integration and series.

**Prerequisites:**

Successful completion of MATH 242 and MATH 310.

**Typically Offered:**

- On-campus: Spring, Even Years;

**MATH 475 Numerical Analysis 4.00**

Study of theory and applications of computational techniques for mathematical solutions emphasizing rapid approximation and error analysis. Topics include: solution to equations in one variable; polynomial approximations to functions; error analysis; numerical solutions to ordinary differential equations; boundary value problems.

**Prerequisites:**

Successful completion of MATH 242 and MATH 310.

**Typically Offered:**

- On-campus: Select Semesters;

**MATH 481 Special Topics 1.00-4.00**

In-depth study of selected topics in mathematical sciences. May be repeated when topics are different.

**Typically Offered:**

- On-campus: Select Semesters;

**MATH 489 Mathematics Elective 1.00-9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 489MC Math Elective Math/Computer Science 1.00-12.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-S course.

**MATH 498 Mathematics Capstone 1.00**

Senior year students carry out individual investigations into chosen topics of mathematics. A written paper of their findings will be presented to the Mathematics and Computer Science department. Instructor consent is required.

**Typically Offered:**

- On-campus: Select Semesters;

**Mathematics Education****MTHED 189 Mathematics Education Elective 9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**MTHED 250 Essentials of Mathematics for Elementary Teachers 3.00**

This course for pre-service elementary school teachers includes mathematical content and concept required to teach elementary school. It includes mathematics topics essential for teaching mathematics at elementary school. This course includes both content and methods for teaching mathematics grades K-9. Prerequisite recommended is a University Studies math course. A minimum grade of C in this course is required for all education majors.

**Prerequisites:**

Completion of University Studies Mathematics Course(s)

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall, Spring, & Summer

**MTHED 289 Mathematics Education Elective 9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**MTHED 305 Tutoring Practicum 1.00-3.00**

Tutoring practicum designed for secondary mathematics teaching majors and minors to develop competencies in mathematics content tutoring skills and interpersonal relations needed in peer tutoring with college students. Permission of Educational Success Center Supervisor required. Limited enrollment.

**Prerequisites:**

Completion of MATH 240 with a grade of C- or better.

**Typically Offered:**

- Fall and Spring Terms

**MTHED 322 Teaching Elementary/Middle School Mathematics 3.00**

A learner-center approach methods course focusing on the theories, models, and strategies for effectively understanding and teaching mathematics concepts and skills in the five content areas to elementary/middle school children grades K-9. National and state standards guide the conceptual framework for this course. Topics include Numbers and Operations; Measurement; Geometry; Data Analysis and Probability; and Algebra. Peer-to-Peer teaching required. A minimum grade of C in this course is required for all education majors.

**Prerequisites:**

Completion of MATH 230 or MTHED 250 (C or Better), and T ED Admission

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Spring

**MTHED 323 Teaching Elementary/Middle School Mathematics**  
**II 3.00**

A learner-center approach methods course focusing on the theories, models, and strategies for effectively understanding and teaching mathematics concepts and skills in the five content areas to elementary/middle school children Grades K-9. Topics include Technology Integration; History of Mathematics; Fractions and Decimals; Integers; Geometry and Algebraic Thinking. National and state standards guide the conceptual framework for this course. This course includes a required pre-student teaching clinical in grades 3-5. A minimum grade of C in this course is required for all education majors.

**Prerequisites:**

Completion of MTHED 322 (C or Better), Completion of T ED 300 (C or Better), and Admission to the Teacher Education Program. Teacher Education Non-Academic Test (TB and Criminal Background Check).

**Typically Offered:**

- On-campus: Fall & Spring
- Online: Fall & Summer

**MTHED 339 Secondary Methods in Mathematics Education 3.00**

General principles and problems of teaching mathematics in the secondary schools. Emphasis on organizing teaching activities; teaching materials and resources; and current methodology. This course is offered on-campus only. This course includes a pre-student teaching clinical in grades 9-12. A minimum grade of C in this course is required for all education majors. Typically Offered: Spring Terms Only - On Campus/Hybrid

**Prerequisites:**

Admission to the Teacher Education Program and Completion of T ED 300 (C or Better). Teacher Education Non-Academic Test (TB and Criminal Background Check)

**Typically Offered:**

- Selected Spring Terms Only

**MTHED 389 Mathematics Education Elective 9.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

**MTHED 489 Mathematics Education Elective 0.00**

Transfer credits ONLY from another accredited institution not equivalent to a UW-Superior course.

## Faculty and Staff

Dr. Serguei Bezroukov - Professor

Mr. Jerad Devries - Lecturer

Ms. Heather Kahler - Assistant Teaching Professor

Mr. Hossain Khorroosi - Lecturer

Ms. Karen Moen - Lecturer

Dr. Timothy Pervenecki - Senior Lecturer

Ms. Kristin Riesgraff - Assistant Teaching Professor

Dr. Steven Rosenberg - Professor

Dr. Chad Scott - Professor

Dr. Joshua Stangle - Associate Professor

Dr. Shin-Ping Tucker - ITS

Dr. Fnu Surina - Assistant Professor

Dr. Jonathan Totushek - Associate Professor, Department Chair