Mathematics & Statistics

(Bachelor of Science)

The Mathematics discipline has programs of study in two emphasis areas: mathematics and statistics.

Students choosing the emphasis in mathematics will focus their studies in a discipline which has been an important part of our intellectual heritage for centuries. Students select this area of emphasis if they are interested in mathematics for its own sake (pure mathematics) or as a tool for analyzing and solving real-world problems (applied mathematics). Graduates may use their skills in many careers, including fields such as secondary education and engineering. Other typical areas of employment traditional for mathematicians are those requiring physics. Today, mathematical techniques are required in social, industrial, and management realms as well.

The emphasis in statistics provides applied courses in experimental design, multivariate statistical analysis, and applied regression analysis. Students also gain an extensive background in statistical computing. Students who wish to enter actuarial professions may prepare for the first two actuarial examinations by completing the calculus sequence, linear algebra sequence, and statistical theory sequence. Students who concentrate studies in statistics may find employment in business, industry, and government, as well as pursue further professional training in graduate school.

Program Entrance Requirements

The University of Wisconsin System placement examination in mathematics is used to advise entering freshmen about the level at which they should enter university courses. In rare cases, a student who has been accelerated and has mastery of calculus may, with advice of faculty, enter Calculus and Analytic Geometry II (MATH 203). Upon earning a "C" or better in MATH 203, an additional four credits are granted for MATH 202.

Credits for calculus at UW-Green Bay may also be awarded for satisfactory performance on an AP exam. More details are available at http://www.uwgb.edu/oira/cfpl/ap/.

Retroactive credit for MATH 202 is not awarded to students who transfer to UW-Green Bay and have completed coursework deemed to be equivalent to MATH 203. If the student completes MATH 209 or MATH 305 at UW-Green Bay, they may submit an approved Retroactive Credit Form to the Registrar's Office to be awarded credit for MATH 202 only.

Mathematics majors often choose an additional minor. Examples are Environmental Science or Business Administration.

Students seeking information on teacher certification should contact the Education Office.

Area of Emphasis

Students must complete requirements in one of the following areas of emphasis:

- Mathematics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/mathematics-major/mathematics-emphasis)
- Statistics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/mathematics-major/statistics-emphasis)

- Actuarial Science Minor (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/mathematics-minor/actuarial-sci)
- Mathematics Minor: Students must complete requirements in one of the following areas of emphasis:
    - Mathematics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/mathematics-minor/mathematics-emphasis)
    - Statistics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/mathematics-minor/statistics-emphasis)

The following are only examples of four-year Mathematics degree programs and are subject to change without notice. Students should consult a Mathematics program advisor to ensure that they have the most accurate and up-to-date information available about a particular four-year degree option.

- Mathematics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/cg/math)
- Statistics Emphasis (http://catalog.uwgb.edu/archive/2018-2019/undergraduate/programs/mathematics/cg/statistics)

Devin Bickner; Associate Professor; Ph.D., Iowa State University

Woo Jeon; Associate Professor; Ph.D., University of Wisconsin - Madison, chair

Brian Murphy; Associate Professor; Ph.D., Marquette University

Megumi Onoda; Associate Professor; M.S., Southeastern Louisiana University

Yongjun Yang; Associate Professor; Ph.D., Colorado School of Mines

Laxmi Chataut; Assistant Professor; Ph.D., University of Alabama

Tetyana Malysheva; Assistant Professor; Ph.D., University of Oklahoma

Mark Norfleet; Assistant Professor; Ph.D., University of Texas-Austin

Megan J Olson-Hunt; Assistant Professor; Ph.D., University of Pittsburgh

Theresa E Adsit; Senior Lecturer; M.S., University of Wisconsin - Milwaukee

Mary E Guy; Senior Lecturer; M.S., University of Wisconsin - Oshkosh

James M Meyer; Senior Lecturer; Ph.D., University of North Carolina

Courses

MATH 94. Elementary Algebra. 3 Credits.
Intended as a preparation for Math 101. Topics include: properties of real numbers, exponents and polynomials, simplifying variable expressions, linear equations and inequalities, factoring, graphing, and basic quadratic equations. Offered on a pass/no credit, non-degree credit basis only.
Fall and Spring.

MATH 99. Intermediate Algebra. 2 Credits.
Intended as a preparation for Math 101. Topics include: functions, linear equations, quadratic equations, set operations, Venn diagrams, polynomials, rational functions, rational exponents, radicals. Offered on a pass/no credit, non-degree credit basis only.
P: Math 94 or WPT-MFND score greater than 415
Fall and Spring.

MATH 100. Math Appreciation. 3 Credits.
An exploration of the exciting, rich, practical, historical, and creative nature of mathematics, while emphasizing reasoning skills and problem-solving abilities. Core material includes probability/statistics, rational and irrational numbers, infinity, and additional topics chosen from other areas of modern mathematics.
Fall and Spring.

MATH 101. Advanced Algebra. 2 Credits.
Absolute values, linear inequalities, system of linear equations in three variables, matrices, complex numbers, quadratic functions, exponential functions, logarithmic functions, sequences.
P: Math 99 or WPT:MFND test score >465
Fall and Spring.

MATH 104. Precalculus. 4 Credits.
Functions and their graphs, the algebra of functions, polynomial functions, rational functions, exponential and logarithmic functions, trigonometric functions, analytic trigonometry, conic sections
P: Math 101 with at least a C grade or WPT-MFND score >465 and WPT-AALG score >525
Fall and Spring.

MATH 202. Calculus and Analytic Geometry I. 4 Credits.
Differential and integral calculus of the elementary functions with associated analytic geometry; transcendental functions; techniques of integration; application.
P: Math 104 with at least a C grade or WPT-MFND score >465 and WPT-AALG score >525 and WPT-TAG score >525
Fall and Spring.

MATH 203. Calculus and Analytic Geometry II. 4 Credits.
Differential and integral calculus of the elementary functions with associated analytic geometry; transcendental functions; techniques of integration; application; sequences and series.
P: Math 202 with at least a C grade.
Fall and Spring.

MATH 209. Multivariate Calculus. 4 Credits.
Real-valued functions of several variables; tangent and normal lines; chain rule for partial derivatives; extrema; least squares method; higher-ordered derivatives; integration; polar and cylindrical coordinates; spherical coordinates; vector fields; line integrals; physical applications.
P: Math 203 with at least a C grade.
Fall and Spring.

MATH 260. Introductory Statistics. 4 Credits.
Using statistical software, this course covers probability, descriptive statistics, sampling distributions and the Central Limit Theorem, hypothesis testing and confidence intervals, distributions of random variables and/or test statistics (normal, Z, t, F, binomial, and chi-square), t-tests (one- and two-sample, paired), analysis of categorical data (one proportion: binomial test, normal approximation; two or more proportions: chi-square tests, odds ratios), correlation, and simple linear regression. Credit will not be granted for both MATH 260 and BUS ADM 216.
P: MATH 101 with at least a C, or WPT-MFND score > 465 and WPT-AALG score > 525
Fall and Spring.

MATH 299. Travel Course. 1-4 Credits.
Travel courses are conducted to various parts of the world and are led by one or more faculty members. May be repeated to different locations.
P: cons of instr & prior trip arr & financial deposit.

MATH 305. Ordinary Differential Equations. 4 Credits.
First-order differential equations, equilibrium solutions and stability, linear equations of higher order, Fourier series and periodic solutions, Laplace transform methods, first-order linear systems of differential equations with constant coefficients, eigenvalues and boundary value problems.
P: Math 203 with at least a C grade.
Fall Only.

MATH 314. Proofs in Number Theory and Topology. 3 Credits.
The skills necessary to read and write theoretical mathematics with basic material of Number Theory and Topology that will be needed for further study in theoretical mathematics.
P: Math 202 with at least a C grade; REC: Math 320.
Spring.

MATH 320. Linear Algebra and Matrix Theory. 4 Credits.
Matrices and vector space concepts, linear dependence and independence, systems of linear equations, linear transformations, determinants, eigenvalues and eigenvectors; functions of vectors, spectral decompositions
P: Math 202 with at least a C grade.
Fall Only.

MATH 323. Analysis. 4 Credits.
The real number system, sequences of real numbers and their generalizations to real-valued functions, series of real numbers, continuity of a function, the theory of differentiation, the theory and development of the Riemann integral, Picard's theorem.
P: Math 209 with at least a C grade and 314 with at least a C grade.
Fall Only.

MATH 328. Introduction to Algebraic Structures. 3 Credits.
Groups, rings, and fields as organizing ideas. Basic structure theorems. Applications.
P: Math 314 with at least a C grade and 320 with at least a C grade.
Spring.

MATH 329. Applied Regression Analysis. 4 Credits.
Techniques for fitting linear regression models are developed and applied to data. Topics include simple linear regression, multiple regression, curvilinear regression and linearizable models.
P: MATH 260 or BUS ADM 216 with at least a C, MATH 202 with at least a C, and MATH 320 with at least a C. REC: Knowledge of Excel and R
Fall Only.

MATH 355. Applied Mathematical Optimization. 3 Credits.
Introduction to mathematical optimization: mathematical modeling of optimization problems, analytical and numerical optimization techniques, applications. Linear programming: simplex method, duality, integer programming; nonlinear programming: Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity; approximation techniques: line search methods, gradient methods, conjugate gradient methods; variational problems; dynamic programming; optimal control.
P: MATH 320 with at least a C grade or concurrent enrollment
Spring.

MATH 360. Theory of Probability. 3 Credits.
Probability concepts and counting techniques; expected value; discrete, continuous, and multivariate probability distributions; moments and moment-generating functions; transformations and functions of random variables; and the Central Limit Theorem.
P: Math 209 with at least a C grade.
Fall Even.

MATH 361. Mathematical Statistics. 3 Credits.
Properties of point estimators (bias, consistency, sufficiency), methods of estimation (method of moments, maximum likelihood estimation), hypothesis testing and interval estimation, power, likelihood ratio tests, least squares regression, correlation, and nonparametric statistics.
P: Math 360 with at least a C grade
Spring Odd.

MATH 385. Foundations of Geometry. 3 Credits.
Intuitive and deductive introductions to Euclidean, non-Euclidean, transformation, fractal, and projective geometries and their applications
P: Math 314 with at least a C grade.
Spring.

MATH 410. Complex Analysis. 3 Credits.
Algebra and geometry of complex numbers; analytic functions, elementary transformations, integration, Taylor and Laurent series, contour integration, residues, conformal mapping.
P: Math 209 with at least a C grade.
Spring Even.

MATH 425. Dynamical Systems. 3 Credits.
Fundamental concepts and techniques of discrete and continuous dynamical systems; asymptotic behavior, structural stability, elementary bifurcations, strange attractors, fractals, chaos. Applications to physical and biological systems.
P: Math 209 with at least a C grade and 320 with at least a C grade; and 305 with at least a C grade or conc enr.
Spring Odd.

MATH 430. Design of Experiments. 4 Credits.
Statistical theory and practice underlying the design of scientific experiments, and methods of analysis. Replication, randomization, error, linear models, least squares, crossed and nested models, blocking, factorial experiments, Latin squares, confounding, incomplete blocks, split-plots.
P: Math 202 with at least a C grade; and Math 260 with at least a C grade or Bus Adm 216 with at least a C grade.
Spring Even.

MATH 431. Multivariate Statistical Analysis. 4 Credits.
Principles and practice in the analysis of multivariate data. Correlation, partial correlation, principle components, factor analysis discriminate functions, canonical correlation, cluster analysis, multidimensional scaling. Emphasis on computer analysis of actual data.
P: Math 202 with at least a C grade and 320 with at least a C grade; and Math 260 with at least a C grade or Bus Adm 216 with at least a C grade.
Spring Odd.

MATH 478. Honors in the Major. 3 Credits.
Honors in the Major is designed to recognize student excellence within interdisciplinary and disciplinary academic programs.
P: min 3.50 all cses req for major and min gpa 3.75 all UL cses req for major.
Fall and Spring.

MATH 492. Special Topics in Mathematics. 1-4 Credits.
This course brings together students and professors who have a mutual interest in some topic not otherwise available among the usual mathematics and statistics offerings.

MATH 497. Internship. 1-12 Credits.
Supervised practical experience in an organization or activity appropriate to a student's career and educational interests. Internships are supervised by faculty members and require periodic student/faculty meetings.
P: jr st.
Fall and Spring.

MATH 498. Independent Study. 1-4 Credits.
Independent study is offered on an individual basis at the student's request and consists of a program of learning activities planned in consultation with a faculty member. A student wishing to study or conduct research in an area not represented in available scheduled courses should develop a preliminary proposal and seek the sponsorship of a faculty member. The student's advisor can direct him or her to instructors with appropriate interests. A written report or equivalent is required for evaluation, and a short title describing the program must be sent early inthe semester to the registrar for entry on the student's transcript.
P: fr or so st with cum gpa > or = 2.50; or jr or sr st with cum gpa > or = 2.00.
Fall and Spring.

MATH 499. Travel Course. 1-6 Credits.
Travel courses are conducted to various parts of the world and are led by one or more faculty members. May be repeated to different locations.
P: cons of instr & prior trip arr & financial deposit.