Mathematics is the science and art of pattern and idea; statistics is the science of collecting, analyzing, and making inferences from data. There is no area that does not require some form of mathematical or statistical thought. It is an integral part of the liberal arts education and is the foundation for many areas of study. In filling many roles at UW-La Crosse, the Department of Mathematics and Statistics serves a diverse group of students; we nurture all liberal arts students, give students a solid foundation from which to study both the natural and social sciences, provide the tools needed by students in professional programs, and cultivate mathematics and statistics majors. As disciplines, mathematics and statistics can be studied by themselves or in conjunction with other fields such as the biological and life sciences, physical sciences, engineering, and social sciences.

Students who graduate with degrees in mathematics or statistics pursue a wide variety of careers. Our math education majors are sought after to fill a huge need for quality math teachers in our country. Many of our statistics and applied math majors go on to jobs in industry as analysts, statisticians, and actuaries while others go on to professional programs such as law, medicine and health professions, or business. With degrees from our program, students have gone to graduate programs in mathematics, applied mathematics, statistics, engineering, and computer science.

The faculty of the Department of Mathematics and Statistics is committed to being excellent teacher-scholars. Members of the department are involved in research in areas of algebra, analysis, topology and geometry, statistics, applied mathematics, numerical analysis, education, and combinatorics and graph theory. This research is widely published in prestigious research journals, and many faculty have received numerous grants. Technology is integrated into both the teaching and research in the department. Many students participate in undergraduate research projects that result in publications and presentations at national conferences.

Mathematics and statistics are interesting and lively subjects. Mathematics has both an aesthetic and a practical appeal; the enjoyment of problem solving, abstract thinking, and structural beauty draws many to mathematics. Statistics helps us understand and describe phenomena in our world and to help us draw reliable conclusions about those phenomena. The challenge and satisfaction of using mathematics and statistics to solve real world problems provides an equally strong appeal. #UWLmath

Mathematics and Statistics credit by examination policy

The Department of Mathematics and Statistics awards credit by examination in MTH 150 College Algebra (4 cr.); MTH 151 Precalculus (4 cr.); MTH 207 Calculus I (5 cr.); and MTH 208 Calculus II (4 cr.). The exams may be taken by new first years and are scheduled for the second week of semester I. Students may not earn credit by examination in both MTH 150 and MTH 151. Credit for STAT 145 Elementary Statistics (4 cr.) will be granted to entering first years with a College Board Advanced Placement Statistics Examination score of 3 or better. Credit for MTH 207 will be granted to entering first years with a College Board Advanced Placement AB exam score of 4 or better. Entering first years with a score of 3 on the BC Calculus examination are awarded credit for MTH 207; students with a score of 4 or 5 on the BC Calculus examination are awarded credit for both MTH 207 and MTH 208.

Mathematics and Statistics retroactive credit policy

Students taking MTH 207 Calculus I, MTH 208 Calculus II, MTH 309 Linear Algebra with Differential Equations, or MTH 310 Calculus III: Multivariable Calculus, and earning a grade of "B" or better, will be given retroactive credit for MTH 151 Precalculus (4 cr.) provided that the student’s transcript shows no record of prior or concurrent enrollment in MTH 151, MTH 207, MTH 208, MTH 309, or MTH 310.

General education writing emphasis

This department incorporates a significant amount of writing through the required courses instead of identifying particular courses as writing emphasis courses. Students who complete a major in this department will fulfill the general education writing emphasis requirement (http://catalog.uwlax.edu/undergraduate/generaleducation/#generaleducationrequirementstext).

2017-18 Faculty/Staff

The following is the department’s faculty and staff as of the publication date of this catalog. This list will not be updated again until the next catalog is published in June.

Professor
Robert Allen
Jeffrey Baggett
Barbara Bennie
Susan Kelly
Jennifer Kosiak
Rebecca LeDocq
James Peirce
David Reineke

Associate Professor
Douglas Baumann
Melissa Bingham
Tushar Das
Eric Eager
Abdulaziz Elfessi
Heather Hulett
Karl Kattchee  
Andrew Matchett  
Jenni McCool  
Sherwin Toribio  
Todd Will  
Huiya Yan  

Assistant Professor  
Matthew Chedister  
Song Chen  
Eric Eager  
Whitney George  
Joshua Hertel  
Edward Kim  
David Liss  
Chad Vidden  
Nathan Warnberg  

Lecturer  
Benjamin Anderson  
William Schilla  
Judy Young  

Associate Lecturer  
George Cherveny  
Susan Gitter  
Phillip Loehmer  
Brett Townsend  
William Truttschel  

Administrative Support  
Julie Garrels  

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Majors  
- Mathematics major - BA (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-ba)  
- Mathematics major - BS (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-bs)  
- Mathematics major with applied emphasis - BS (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-applied-bs)  
- Mathematics major with education emphasis - BS (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-education)  
- Mathematics education major (early adolescence-adolescence certification) - BS (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-education-early-adolescence)  
- Statistics major - BS (http://catalog.uwlax.edu/undergraduate/mathematics/statistics-bs)  
- Statistics major with concentration in actuarial science - BS (http://catalog.uwlax.edu/undergraduate/mathematics/statistics-actuarial-science-bs)  
- Dual degree program in mathematics and engineering (http://catalog.uwlax.edu/undergraduate/mathematics/dual-degree-program)  

Minors  
- Mathematics minor (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-minor)  
- Mathematics minor with education emphasis (http://catalog.uwlax.edu/undergraduate/mathematics/mathematics-minor-education)  
- Statistics minor (http://catalog.uwlax.edu/undergraduate/mathematics/statistics-minor)  

Honors  
- Mathematics honors program (http://catalog.uwlax.edu/undergraduate/mathematics/honors-program)  
  + next to a course number indicates a general education course  

Mathematics Courses  
MTH 050 Cr.3  
**Basic Algebra**  
A review of beginning algebra. Topics include an elementary treatment of real numbers, polynomials, linear equations, inequalities, rational expressions, systems of linear equations, radicals, and quadratic equations. Letter grade, but only "F" calculated in GPA. Transcript credit only. Offered Fall, Spring.  

MTH 051 Cr.2  
**Topics in Intermediate Algebra**  
A course to enhance the student’s skills in selected areas of intermediate algebra; areas covered include polynomials, rational expressions, exponents, equations, and inequalities. Letter grade, but only "F" calculated in GPA. Transcript credit only. Prerequisite: MTH 050 or an appropriate placement test score. Offered Fall, Spring.  

+MTH 123 Cr.4  
**Mathematics for Decision Making**  
This course is designed to teach students the mathematical skills needed for decision making in the 21st century. Topics for this course include set theory, syllogisms and fallacies, counting and probability, financial mathematics, and statistical concepts. Prerequisite: STAT 045 or MTH 050 or an appropriate placement test score. Offered Fall, Spring.
Mathematics for Elementary Teachers I
This course is designed for prospective elementary teachers. Content strands include number and operations and algebra and functions. Number and operations topics include set theory and pre-number concepts, place-value and numeracy, multiple representations and algorithms for arithmetic, number theory (e.g. divisors, multiples), and proportional reasoning. Algebra and functions topics include the concepts of variable and function, algebraic thinking, linear, polynomial, rational, and exponential functions, mathematical models, rates of change, and multiple representations of relations. Aligned with state and national standards, this course will emphasize problem solving, communication, reasoning, and representation in mathematics. Prerequisite: MTH 050 or satisfactory placement test score; EC/MC or MC/EA major. Offered Fall, Spring.

Mathematics for Elementary Teachers II
This course is designed for prospective elementary teachers. Content strands include geometry and measurement, data analysis and statistics, and probability and discrete math. Topics from these strands include: properties of geometric figures, geometric measurement (length, area, volume), congruence and similarity, and transformations; descriptive statistics, sampling design and statistical comparisons, randomness and variability, inferential statistics (including the normal distribution); counting techniques, uniform and nonuniform distributions, and representations and calculations of probabilities for simple and compound events. Aligned with state and national standards, this course will emphasize problem solving, communication, reasoning, and representation in mathematics. Prerequisite: MTH 135 with a grade of "C" or better. Offered Fall, Spring.

College Algebra
A college algebra course on the properties, graphs, and applications of elementary functions. Topics include the real and complex numbers, concepts from analytic geometry, solutions to equations and inequalities, the elementary algebraic functions, and the logarithmic and exponential functions. Prerequisite: MTH 051 or two years of high school algebra and an appropriate placement test score. (Successful completion of MTH 151, MTH 175, or MTH 207 precludes taking MTH 150 for credit.) Offered Fall, Spring, Summer.

Precalculus
A precalculus course on properties, graphs, and applications of elementary transcendental functions. Topics include concepts from analytic geometry; theory of equations; the logarithmic, exponential, trigonometric, and inverse trigonometric functions; and analytic trigonometry. Prerequisite: grade of "C" or better in MTH 150 or two years of high school algebra and appropriate placement test score. (Successful completion of MTH 151 precludes taking MTH 150. Successful completion of MTH 207 precludes taking MTH 151.) Offered Fall, Spring, Summer.

Geometry for Elementary and Middle School Teachers
This course explores the fundamental ideas of measurement and geometry concepts in K-8 mathematics. Content includes the investigation of measurement concepts; the analysis and classification of two- and three-dimensional geometric figures; and the exploration and application of geometric transformations, tessellations, symmetry, congruence, and similarity. Aligned with national and state standards, this course will emphasize intuitive direct and indirect proof and reasoning, the investigation and discovery of geometric structures, and the use of manipulative materials and technology. Prerequisite: grade of "C" or better in MTH 135 and MTH 136. Offered Fall.

Applied Calculus
Basic concepts and methods from differential and integral calculus. Logarithmic and exponential functions are included, but not trigonometric functions. Emphasis of the course is on models and applications in business and the social, life, and physical sciences. Prerequisite: grade of "C" or better in MTH 150 or two years of high school algebra and appropriate placement test score. (Successful completion of MTH 175 precludes taking MTH 150. Successful completion of MTH 207 precludes taking MTH 175.) Offered Fall, Spring, Summer.

Calculus I
A rigorous introduction to calculus. Topics include limits, rules for differentiation, derivatives of trigonometric, logarithmic and exponential functions, the Mean Value Theorem, integration, and the Fundamental Theorem of Calculus. In the area of applications, the course covers problems on related rates, extrema, areas, volumes, and Newton's Second Law. Prerequisite: grade of "C" or better in MTH 151 or four years of high school mathematics, including trigonometry, and appropriate placement score. (Successful completion of MTH 207 precludes taking MTH 150, MTH 151, or MTH 175 for credit.) Offered Fall, Spring, Summer.

Calculus II
A continuation of Calculus I with a rigorous introduction to sequences and series. Topics include techniques of integration and indeterminate forms, improper integrals, applications of integrals to the physical sciences, tests for the convergence of series, absolute convergence, power series, and Taylor's Theorem with Remainder. First order linear differential equations are explored, as well as the geometry of space. Prerequisite: grade of "C" or better in MTH 207. Offered Fall, Spring.

Foundations of Advanced Mathematics
An introduction to mathematical reasoning. Mathematical logic, including quantification and the predicate calculus is introduced and used to discuss set theory, relations, functions, counting, graphs, and algorithms. Elementary proofs, including proofs by induction are stressed. Prerequisite: grade of "C" or better in MTH 175 or MTH 207. Course not open to those who have credit in CS 225. Offered Fall, Spring.

Mathematical Models in Biology
An introduction to the use of calculus and stochastic based models to the biological sciences. Mathematical tools such as discrete and continuous differential equations, linear algebra, phase portraits, probability theory and descriptive and inferential statistics that are necessary to analyze and interpret biological models will be covered. Biological topics may include single species and interacting population dynamics, modeling infectious diseases, enzyme kinetics, and quantitative genetics. Prerequisite: grade of "C" or better in MTH 175 or MTH 207. Offered Spring.

Algebraic Reasoning and Problem Solving
A study of the mathematical processes and techniques that are used to solve a variety of routine and non-routine problems encountered in school mathematics. Emphasis is on communicating logical arguments, applying a variety of problem solving strategies, and developing mathematical models. Topics include investigations in number and algebraic relationships appropriate to the elementary and middle school classroom. Prerequisite: grade of "C" or better in MTH 135 and MTH 136. Offered Spring.
MTH 299 Cr.1

Mathematics and Statistics Tutor Training Practicum
This course is designed to offer training and supervision for tutors in the Murphy Learning Center. The course will include an overview of peer tutoring and learning theory, an overview of the general tutoring process, and an examination of best practices for tutoring various client populations. Students will develop a reflective tutoring practice based on readings and course discussions. The course must be taken during the student's first year of employment in the Learning Center. Failure to complete the course will result in termination from the Learning Center. Students who repeat the course will engage more deeply with the content and provide meaningful insights for their peers. Repeatable for credit - maximum three. Consent of instructor. Pass/Fail grading. Offered Fall, Spring.

MTH 309 Cr.4
Linear Algebra with Differential Equations
A systematic study of linear algebra, and its interactions with differential equations. Topics include: vectors, matrices, systems of linear equations, determinants, vector spaces, subspaces, basis and dimension, linear transformations and their matrix representations, similar matrices and diagonalization, systems of first order linear differential equations, and higher order linear differential equations. Prerequisite: grade of "C" or better in MTH 208. Offered Fall, Spring.

MTH 310 Cr.4
Calculus III: Multivariable Calculus
A course in higher dimensional calculus, partial derivatives, and multiple integrals. Topics include parametric curves, polar (and other) coordinate systems, vector fields, scalar fields, the gradient vector, chain rule, Jacobian, Green's Theorem, Stokes' Theorem, and the Divergence Theorem. Prerequisite: grade of "C" or better in MTH 208. Offered Fall, Spring.

MTH 311 Cr.3
Number Theory
Topics are selected from such areas as: divisibility and factorization, congruence, distribution of prime numbers, and Diophantine equations. Problem-solving strategies and unsolved problems are stressed. Applications are developed in related areas. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 309 or concurrent enrollment. Offered Fall - Even Numbered Years.

MTH 317 Cr.3
Graph Theory
An introduction to graph theory-emphasizing algorithms. Topics include graphs and sub graphs, isomorphism, degree sequences, digraphs, networks, algorithm complexity and NP-completeness, trees, Euler circuits and Hamilton cycles, planarity and graph coloring. Prerequisite: CS 120; grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 309. Offered Fall - Odd Numbered Years.

MTH 320 Cr.3
History of Mathematics
A study of the evolution of mathematics. Discussion and evaluation of major periods of development including the lives and works of preeminent mathematicians. A sampling of problem solving methods from various historical periods. Emphasis is on Western mathematics from earliest recorded history through the initial developments of calculus and modern mathematics. Prerequisite: grade of "C" or better in MTH 309 or concurrent enrollment. Offered Spring - Odd Numbered Years.

MTH 321 Cr.3
Teaching Mathematics with Technology
This course covers traditional, emerging, and interactive technologies used in the teaching and learning of mathematics. Teacher education candidates will gain an understanding of the use and application of instructional technology. They will explore how software, hardware, and instructional media can be used to enhance mathematics instruction in grades 6-12. Topics include instructional technology for visualizing and exploring mathematics, enhancing and delivering lessons, as well as interactive communication tools. Prerequisite: grade of "C" or better in either MTH 175 or MTH 207; CT 100 or CS 120; admission to teacher education program or consent of instructor. Offered Fall.

MTH 331 Cr.3
Modern Geometry
A thorough discussion of transformations and their use in proving congruence of geometric figures; selected theorems concerning the triangle and circle, and constructions possible given different parts of a triangle. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 309 or concurrent enrollment. Offered Spring.

MTH 335 Cr.3
Differential Equations
A first course on the modern study of differential equations including mathematical modeling and numerical solutions. Topics include the formulation of differential equations and interpretation of solutions, fundamental existence and uniqueness theory, first-order linear and separable equations, a dynamical systems approach to linear and nonlinear first order systems, numerical methods and qualitative analysis, and Laplace transforms. Applications and modeling of real world phenomena will be integrated throughout. Prerequisite: grade of "C" or better in MTH 309 and MTH 310. Offered Fall, Spring.

MTH 362 Cr.3
Complex Variables
Introduction to complex numbers and functions of one complex variable. Topics include Cauchy–Riemann equations, Cauchy integral formula, power series, contour integrals, the residue calculus, conformal maps and applications. Prerequisite: grade of "C" or better in MTH 309 and MTH 310. Offered Spring - Even Numbered Years.

MTH 371 Cr.3
Numerical Methods
This course introduces students to the formulation, methodology, and programming techniques for numerical solution of problems in science and engineering. Topics covered include: fundamental principles of digital computing, idea of approximation, algorithm accuracy and stability, the numerical solution of linear and nonlinear equations, numerical interpolation, differentiation and integration, spline functions, fundamentals of finite-difference solutions to ordinary differential equations, and error and convergence analysis. Optional topics include least-square method, Fourier series, Monte Carlo methods and linear programming. Prerequisite: CS 120; grade of "C" or better in MTH 309. Offered Spring.

MTH 395 Cr.1-3
Special Topics in Mathematics
Special topics in mathematics not covered by regular courses taught in this department. The particular topic is decided mutually by the student and instructor. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.
MTH 407 Cr.3
Real Analysis I
This course covers the basic theory underlying the differential and integral calculus. Convergence of sequences is examined. Theoretical concepts of calculus are examined and particular attention is given to writing proofs. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 309 and MTH 310. Offered Fall.

MTH 408 Cr.3
Real Analysis II
This course covers convergence of series and basic theory of power series. Further study of real analysis via selected topics such as the theory of convergence, Lebesque-Stieltjes integration, Fourier Analysis, probability theory, approximation theory and metric spaces. Prerequisite: grade of "C" or better in MTH 407. Offered Spring - Odd Numbered Years.

MTH 411 Cr.3
Abstract Algebra I
A rigorous approach to algebraic systems including the study of groups, rings, integral domains and fields with application to polynomials. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 309. Offered Fall, Spring.

MTH 412 Cr.3
Abstract Algebra II
Continuation of MTH 411. Further study of rings, integral domains and fields. Prerequisite: grade of "C" or better in MTH 411. Offered Spring - Even Numbered Years.

MTH 415 Cr.3
Topology
An introduction to the study of topological spaces and their structure-preserving (continuous) functions. We develop concepts from point-set topology including methods of construction of topological spaces, continuity, connectedness, compactness, and Hausdorff condition. Prerequisite: grade of "C" or better in MTH 225 or CS 225, MTH 309, and MTH 310. Offered Spring.

MTH 421 Cr.4
Teaching and Learning Mathematics and Computer Science in the Secondary School
This course will be integrated with a field experience. In the context of a real classroom, teacher candidates will learn how to plan for and assess student learning in mathematics and computer science. With a focus on content knowledge, teacher candidates will plan a variety of meaningful learning experiences, assess student learning, and monitor and modify instruction to best support the individual learners in the classroom. The teacher candidate will design, enact, and assess activities that advance student understanding to more complex levels. Teacher candidates will gain experience in monitoring the obstacles and barriers that some students or groups of students face in school and learn how to design learning experiences to support all learners. Prerequisite: EDS 351; grade of "C" or better in MTH 321. Offered Fall, Spring.

MTH/PHY 461 Cr.3
Mathematical Physics
In depth study of topics from vector analysis, Fourier analysis and special functions with emphasis on modeling physical phenomena involving conservative fields, fluid flow, heat conduction, and wave motion. MTH 461 may be counted towards both a MTH and PHY major. Prerequisite: grade of "C" or better in MTH 353. (Cross-listed with MTH/PHY; may only earn credit in one department.) Offered Spring - Odd Numbered Years.

MTH 480 Cr.3
Studies in Applied Mathematics
Advanced studies of applications of mathematics and computation to solve problems and understand processes from a variety of fields (for example, industry, medicine and the physical and life sciences.) Requirements include an application/ modeling project with a written report and class presentation. Prerequisite: grade of "C" or better in MTH 353. Offered Spring - Even Numbered Years.

MTH 495/595 Cr.1-3
Special Topics in Mathematics
Special topics in mathematics not covered by regular courses taught in this department, such as topology, set theory and advanced numerical analysis. The particular topic is decided mutually by the students and the instructor. Repeatable for credit - maximum six. Prerequisite: junior standing. Consent of department. Offered Occasionally.

MTH 499 Cr.1-3
Independent Study
Directed readings or presentation of material not available in formal departmental courses under the supervision of a faculty member. Registration by written consent of supervising faculty member and department chair. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.

MTH 499 Cr.1-3
Research Topics
An opportunity to pursue individual research topics under the direction of a faculty member. Depending on the nature of the research project, study is expected to involve substantial computational or theoretical work in addition to literature review and instruction. In addition to a written report to the supervising faculty member, expected outcomes may include: software, papers and presentations to the department and regional meetings. Not applicable to a mathematics major or minor. Registration by written consent of supervising faculty member. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.

Statistics Courses
STAT 045 Cr.2
Pre-Statistics
A preparatory course for elementary statistics. Topics include introductory treatment of algebra, inequalities, interval notation, mathematical formulas and notation, variables, descriptive statistics, elementary probability, normal probability distributions, and the concept of statistical inference. Letter grade, but only "F" calculated in GPA. Credit does not count toward graduation. Transcript credit only. Offered Fall, Spring.

+STAT 145 Cr.4
Elementary Statistics
An introductory course covering fundamentals of modern statistical methods. Topics include descriptive statistics, the binomial and normal distributions, estimation, and hypothesis testing. The z, t, F and chi-square test statistics are introduced. Instruction in computer use is included, and statistics software is used throughout the course for analyzing data files and carrying out statistical procedures. Prerequisite: STAT 045 or MTH 050 or an appropriate placement test score. Offered Fall, Spring, Summer.
STAT 245 Cr.4
**Probability and Statistics**
An initial course in probability and statistics for students strong in mathematics. Probability topics include sample spaces, random variables, independence, and the binomial, Poisson, normal, and exponential distributions and their applications. Calculus-based methods will be used for analyzing continuous distributions. Statistics topics include descriptive statistics, sampling distributions, confidence intervals, hypothesis testing, regression, and ANOVA. Prerequisite: grade of "C" or better in MTH 208 or concurrent enrollment. Offered Fall, Spring.

STAT 345 Cr.3
**Statistical Computing**
An introductory course covering fundamentals of modern statistical computing. Topics include core programming concepts such as functions, data structures and debugging. Stochastic simulations and random variable generation are introduced, as well as accessing, filtering, and analyzing data from other resources. The R language will be used. Prerequisite: STAT 245 and CS 120. Offered Spring.

STAT 405/505 Cr.3
**Statistical Methods**
A survey of statistical methods from the point of view of how these methods are implemented with a standard statistics software package. Topics include descriptive statistics, graphical methods, tests of location, goodness of fit, simple and multiple regression, design of experiments, ANOVA, multiple comparisons, chi-square tests. Both parametric and nonparametric methods are treated. Computer use is an integral part of the course. Prerequisite: grade of "C" or better in STAT 145 or STAT 245; junior standing. Offered Fall, Spring.

STAT 440 Cr.1
**Statistical Consulting**
Experiences will include interpersonal, written, and oral communication and interdisciplinary exposure as well as opportunities to apply statistical knowledge in a broad variety of situations. Students will take part in consultations (i.e. extracting information, listening, asking appropriate questions), apply knowledge in experimental design, data modeling, use of statistical software, and/or sampling; diagnose and conduct appropriate statistical procedures and interpret and communicate results. Reading past and present literature on statistical consulting also will be required. Repeatable for credit - maximum three. Prerequisites: grade of "C" or better in STAT 245 or STAT 405; consent of the Statistical Consulting Center director. Consent of instructor. Pass/ Fail grading. Offered Fall, Spring, Summer.

STAT 441/541 Cr.3
**Mathematical Statistics I**
Review of discrete and continuous random variables. Moment generating functions, multivariate probability distributions, marginal and conditional probability distributions, functions of random variables, order statistics, Central Limit Theorem, point estimation and confidence intervals. This slash course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 245 and MTH 310; junior standing. Offered Fall.

STAT 442/542 Cr.3
**Mathematical Statistics II**
Methods of estimating, including method of moments and maximum likelihood. Sufficient statistics, hypothesis testing, power of tests, likelihood ratio tests and introduction to regression and analysis of variance. This slash course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 441; junior standing. Offered Spring.

STAT 443/543 Cr.3
**Categorical Data Analysis**
An introduction to categorical data analysis covering summaries and inference for categorical response and count data, analysis of contingency tables, generalized linear models for binary and count data, logistic regression, multivariate logit models and loglinear models for contingency tables with an emphasis on applications and implementation using computer software. Prerequisites: grade of "C" or better in STAT 245 or STAT 405; junior standing. Offered Fall - Even Numbered Years.

STAT 445/545 Cr.3
**Correlation and Regression Analysis**
An introduction to simple linear regression, multiple regression, polynomial regression. Inferences, appropriateness of model, model diagnostics/adequacy, difficulties in the application of models are discussed. A computer package will be used. Course requirements will be involved with hands-on statistical applications and consulting. Prerequisite: grade of "C" or better in STAT 245 or STAT 405; junior standing. Offered Fall.

STAT 446/546 Cr.3
**Analysis of Variance and Design of Experiments**
An introduction to single factor, multiple factor, and randomized block designs in analysis of variance. Inferences, appropriateness of model, model diagnostics/adequacy, difficulties in the application of models are discussed. Design or structure of an experiment will be discussed. A computer package will be used. Course participants will be involved with hands-on statistical applications and consulting. Prerequisite: grade of "C" or better in STAT 245 or STAT 405; junior standing. Offered Spring.

STAT 447/547 Cr.3
**Nonparametric Statistics**
An introductory course presenting the theory and procedures for using distribution-free methods in data analysis. Standard procedures, such as the Wilcoxon tests, Kruskal-Wallis, Kolmogorov-Smirnov, nonparametric confidence intervals, regression analysis, and powers of the tests will be included. Computer programs will be used when appropriate. Prerequisite: grade of "C" or better in STAT 245 or STAT 405; junior standing. Offered Spring - Odd Numbered Years.

STAT 448 Cr.3
**Operations Research**
An introductory course which applies mathematics/statistics to management decision making. Included are methods of optimizing systems, game theory, decision analysis, simulation, and reliability. Various programming techniques are introduced with the computer used as a tool where appropriate. Prerequisites: grade of "C" or better in STAT 245 or STAT 405. Offered Spring - Odd Numbered Years.

STAT 449/549 Cr.3
**Applied Multivariate Statistics**
An introduction to applied multivariate statistical methods covering multivariate analysis of variance, multivariate analysis of covariance, repeated measures design, factor analysis, principle component analysis, cluster analysis, discriminate analysis, and multivariate regression. Course participants will be involved with hands-on statistical applications. Prerequisite: grade of "C" or better in STAT 245 or STAT 405; junior standing. Offered Fall - Odd Numbered Years.

STAT 496/596 Cr.1-3
**Special Topics in Statistics**
Special topics in statistics not covered by regular courses taught in this department. The particular topic is decided by the instructor. Repeatable for credits - maximum six. Prerequisite: junior standing. Consent of department. Offered Occasionally.
STAT 498 Cr.1-3

**Independent Study**
Directed readings or presentation of material not available in formal departmental courses under the supervision of a faculty member. Registration by written consent of supervising faculty member and department chair. Repeatable for credit - maximum six. Consent of instructor. Offered Occasionally.

STAT 499 Cr.1-3

**Research Topics**
An opportunity to pursue individual research topics under the direction of a faculty member. Depending on the nature of the research project, study is expected to involve substantial computational or theoretical work in addition to literature review and instruction. In addition to a written report to the supervising faculty member, expected outcomes may include: software, papers and presentations to the department and regional meetings. Not applicable to a statistics and mathematics major or minor. Registration by written consent of supervising faculty member. Repeatable for credit - maximum six. Offered Occasionally.