MATHEMATICS, MS

Program Description

Program Mission

The mission of the Graduate Mathematics program is to increase understanding and the ability to apply mathematics and statistics through in-depth study, novel applications, and research. The areas of emphasis are mathematics education and applications of mathematics and statistics. The faculty engages in research and scholarly activities at the forefront of their specialties, with established and developing connections with the mathematics, statistics and education communities at large, and leads students through program research activities and projects or theses. The program prepares students for careers in education, science, and industry and serves the community by providing expertise to local schools, coastal industry, business, and research centers.

Program Tracks

Students pursuing the Master of Science degree with a major in Mathematics will choose between an Applied and Computational Mathematics, a Statistics option, and a Curriculum Content option. The Applied and Computational Mathematics option will especially benefit individuals employed in scientific, technical, or education fields who seek advancement or additional training to enhance their knowledge and skills. The statistics option prepares individuals to work with statistical data analysis in science, industry or business. The Curriculum Content option specifically addresses the needs of in-service teachers wishing to enhance their knowledge and skills in learning, teaching and understanding mathematics. In each option, a capstone product allows students to focus their coursework on broad applications. The Applied and Computational Mathematics option requires a thesis; the Statistics and the Curriculum Content option allows for a thesis or project. The thesis option starts with a broad foundation, and then encourages a specialized study culminating in a thesis based upon original research, supported by the mathematical literature. The thesis requirement for the master's degree will allow a person to pursue advanced graduate study, or to obtain employment in most areas that require a detailed knowledge of a specific aspect of mathematics or statistics. The project allows a student to demonstrate particular ability with some part of the Curriculum Content or Statistics. The project will be an original work supported by a mathematical or statistics literature review. A thesis may be more scholarly oriented, while a project is more suited than a thesis to demonstrate practical experience and it may be broader in scope. The project is recommended for students targeting positions in applied science, industry or business, while the thesis may be more appropriate for students targeting academia and theory.

Fast Track Mathematics BS to Mathematics MS

The university allows the opportunity for high-achieving undergraduate students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. Students interested in the Fast Track in Mathematics should see the undergraduate catalog.

Student Learning Outcomes

Students will:

- Demonstrate a command of principles of general mathematics at the graduate level.
- Recognize mathematics outside the realm of the classroom, and apply graduate level mathematical content as a matter of professional practice.
- Communicate mathematics effectively at the graduate level, in oral and written form, with appropriate use of technology.

For Additional Information

Website:
http://math.tamucc.edu

Campus Address:
Center for Instruction, Room 301
Phone (361) 825-3754

Mailing Address:
Department of Mathematics and Statistics, Unit 5825
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412-5825

Admission Requirements

In addition to meeting all University requirements for admission to graduate study in degree-seeking status, applicants for the MS degree in mathematics must also submit an essay to the Office of Recruitment and Admissions: The essay, 300-500 words in length, should discuss the applicant's educational and professional goals, pertinent work and undergraduate experience, and other factors relating to the chosen option for graduate study. If the applicant has a GPA below 3.0 in undergraduate mathematics courses, the essay should specifically address any factors that might have hampered the applicant's undergraduate study. One or more letters of recommendation specifically addressing an applicant's ability to do graduate level study of mathematics may be submitted to strengthen an application. The letters should be submitted directly to the Math Department at the time of application at:

Center for Instruction Room 301
Texas A&M University-Corpus Christi
6300 Ocean Drive, Unit 5825
Corpus Christi, TX 78412-5825

Persons seeking admission to the MS in Mathematics should first contact the program faculty and identify a faculty member willing to serve as the graduate advisor. Applicants will not be admitted to the program without a graduate advisor.

Applicants are expected to enter the program with adequate academic preparation for their chosen option, as detailed in the degree requirements below. If the graduate committee determines that an applicant's preparation is deficient, the individual will be required to complete course work to remedy these deficiencies. Such course work will be regarded as leveling work, and will not count as credit towards the total required for completion of the MS degree in mathematics.

1. Applicants for the Applied and Computational Mathematics option should have the equivalent of an undergraduate mathematics major, or an undergraduate mathematics minor and a minor in science. Specific leveling course work

Code	Title	Hours
MATH 3315	Differential Equations	3
MATH 3311	Linear Algebra	3

MATH 2415	Calculus III	4
MATH 4301	Introduction to Analysis	3

Students with no computer programming experience may find themselves at a disadvantage in certain courses without an introductory programming course.

2. Applicants for the Statistics option should have the equivalent of an undergraduate mathematics major or statistics major, or an undergraduate mathematics or statistics minor and a minor in science. Specific leveling course work is

Code	Title	Hours
MATH 3311	Linear Algebra	3
MATH 3342	Applied Probability and Statistics	3
or MATH 3345	Statistical Modeling and Data Analysis	
MATH 2415	Calculus III	4

Students with no computer programming experience may find themselves at a disadvantage in certain courses without an introductory programming course.

3. Applicants for the Curriculum Content option should have an interest in the teaching and learning of mathematics. Applicants seeking initial certification should consult the SMTE Coordinator or College of Education to make plans for certification. Applicants planning to teach at the post-secondary level should work closely with an advisor to plan electives and additional, appropriate course work. Specific leveling course work within Mathematics is

Code	Title	Hours
MATH 2305	Discrete Mathematics I	3
MATH 2413	Calculus I	4
MATH 3311	Linear Algebra	3

Program Requirements

The course of study for the MS program in mathematics consists of the components listed below. Graduation requirements are slightly different for the Applied and Computational Mathematics and Curriculum Content options.

Applied and Computational Mathematics Option

Code	Title	Hours
Core Courses		15
Electives from mathematics or closely related field [1]		15
MATH 5994 & MATH 5995	Proposal Research and Thesis	6-9
Total Hours		**36-39**

1

Electives from mathematics or closely related field: 12-15 hrs.

Code	Title	Hours
Core Courses		
MATH 5333	Numerical Linear Algebra	3
MATH 5339	Numerical Analysis	3
MATH 5341	Statistical Methods and Data Analysis	3
MATH 5351	Real Analysis	3
MATH 5378	Mathematical Modeling	3
Electives		
Select 12-15 hours from the following or closely related field: [1]		15
MATH 5336	Advanced Differential Equations	
MATH 5337	Theory and Applications of Partial Differential Equations	
MATH 5342	Linear Statistical Models	
MATH 5343	Mathematical Theory of Statistics	
MATH 5345	Computational Methods for Statistics	
MATH 5348	Optimization	
MATH 5360	Combinatorics and Graph Theory	
MATH 5370	Modeling of Natural Systems	
MATH 5375	Applied Analysis	
MATH 5993	Literature Review and Research	
MATH 6344	Spatial Statistics	
Thesis		
MATH 5994	Proposal Research	3
MATH 5995	Thesis	3-6
Total Hours		**36-39**

1

With prior approval from the Department Chair, a student may select offerings of MATH 5390 Special Topics (1-3 sch) or MATH 5396 Directed independent Study (3 sch) or graduate courses from outside the Department as electives.

Thesis

Each student in the Applied and Computational Mathematics option is encouraged to participate in the departmental seminar and may simultaneously take MATH 5994 Proposal Research (1-9 sch) for one to three semesters at a rate of 1 to 3 credit hours per semester. A total of three semester hours credit for MATH 5994 Proposal Research (1-9 sch) is required. The final time MATH 5994 Proposal Research (1-9 sch) is taken, the student will prepare a thesis proposal. When a student is within 18 semester hours of graduation, the student may form a graduate committee and defend the proposal for the thesis. (Guidelines for writing the thesis, including the required format and style, are available at the department website.) Immediately upon approval of the thesis proposal, the student registers for MATH 5995 Thesis (1-9 sch), Thesis. The student continues to register for MATH 5995 Thesis (1-9 sch) each successive semester (Fall or Spring required, Summer by choice) until the thesis is completed. A student who does not complete a thesis in the semester for which the student has registered will receive a grade of IP (In Progress). Not completing a thesis in four long semesters, earning a grade of U or failure to register for MATH 5995 Thesis (1-9 sch) in the next semester after receiving a grade of IP will terminate the thesis and will require that the entire process be repeated starting with the preparation of a new proposal.

Each student in the Applied and Computational Mathematics option must defend their thesis, ordinarily during their final semester. The student's graduate committee will administer the defense. For more information, see the Department's Thesis Guidelines.

Statistics Option

Code	Title	Hours
Core Courses		15
Electives from mathematics or closely related field [1]		15
Select one of the following:		6-9
MATH 5994 & MATH 5995	Proposal Research and Thesis	

MATH 5994 & MATH 5997	Proposal Research and Project	
Total Hours		**36-39**

1

Electives from mathematics or closely related field: 12-15 hrs.

Code	Title	Hours
Core Courses		
MATH 5341	Statistical Methods and Data Analysis	3
MATH 5342	Linear Statistical Models	3
MATH 5343	Mathematical Theory of Statistics	3
MATH 5345	Computational Methods for Statistics	3
MATH 5378	Mathematical Modeling	3
Electives		
Select 12-15 hours from the following or closely related field: [1]		15
MATH 5333	Numerical Linear Algebra	
MATH 5336	Advanced Differential Equations	
MATH 5337	Theory and Applications of Partial Differential Equations	
MATH 5339	Numerical Analysis	
MATH 5348	Optimization	
MATH 5351	Real Analysis	
MATH 5360	Combinatorics and Graph Theory	
MATH 5370	Modeling of Natural Systems	
MATH 5375	Applied Analysis	
MATH 5993	Literature Review and Research	
MATH 6344	Spatial Statistics	
Thesis or Project		
Select one of the following:		6-9
MATH 5994 & MATH 5995	Proposal Research and Thesis	
MATH 5994 & MATH 5997	Proposal Research and Project	
Total Hours		**36-39**

1

With prior approval from the Department Chair, a student may select offerings of MATH 5390 Special Topics (1-3 sch) or MATH 5396 Directed independent Study (3 sch) or graduate courses from outside the Department as electives.

Thesis or Project

Each student in the Statistics track option is encouraged to participate in the departmental seminar and may simultaneously take MATH 5994 Proposal Research (1-9 sch) for one to three semesters at a rate of 1 to 3 credit hours per semester. A total of three semester hours credit for MATH 5994 Proposal Research (1-9 sch) is required. The final time MATH 5994 Proposal Research (1-9 sch) is taken, the student will prepare a thesis or project proposal. When a student is within 18 semester hours of graduation, the student may form a graduate committee and defend the proposal for the thesis or project. (Guidelines for writing the thesis or project, including the required format and style, are available at the department website.) Immediately upon approval of the thesis or project proposal, the student registers for either MATH 5995 Thesis (1-9 sch) or MATH 5997 Project (1-9 sch). The student continues to register for MATH 5995 Thesis (1-9 sch), or MATH 5997 Project (1-9 sch) each successive semester (Fall or Spring required, Summer by choice) until the thesis or project is completed. A student who does not complete a thesis or project in the semester for which the student has registered will receive a grade of IP (In Progress). Not completing the thesis or project in four long semesters or failure to register for an incomplete thesis or project in the next long semester will terminate the thesis or project and will require that the entire thesis or project process be repeated starting with the preparation of a new thesis or project proposal.

Each student in the Statistics option must defend their thesis or project, ordinarily during their final semester. The student's graduate committee will administer the defense. For more information, see the Department's Project Guidelines.

Curriculum Content Option

Code	Title	Hours
Core Courses		15
Electives		12
MATH 5993 & MATH 5994	Literature Review and Research and Proposal Research	6
MATH 5995 or MATH 5997	Thesis Project	3
Total Hours		**36**

Code	Title	Hours
Core Courses		
MATH 5325	Structure of Number Concepts	3
MATH 5326	Structure of Patterns and Algebra	3
MATH 5327	Structure of Geometry and Measurement	3
MATH 5341	Statistical Methods and Data Analysis	3
MATH 5378	Mathematical Modeling	3
Electives		
Select 12 hours, with prior approval of the Department Chair, from the following or any couse with significant and appropriate mathematical content:		12
MATH 5321	Problem Solving and Mathematical Reasoning for Teachers	
MATH 5322	Mathematics Assessment	
MATH 5323	Mathematics instruction and Mentoring	
MATH 5324	Principles of Reforming Mathematics Instruction	
MATH 5328	Structure of Probability and Statistics	
MATH 5329	Structure of Modeling with Rates of Change	
MATH 5331	Evolution of Mathematical Systems	
MATH 5332	Integrating Technology in Mathematics Education	
MATH 5370	Modeling of Natural Systems	
Capstone Courses		
MATH 5993 & MATH 5994	Literature Review and Research and Proposal Research	6
MATH 5995 or MATH 5997	Thesis Project	3
Total Hours		**36**

Capstone Course

All students in the Curriculum Content option will take MATH 5993 Literature Review and Research (1-9 sch) as an introduction to relevant literature, research methods, followed by MATH 5994 Proposal Research

(1-9 sch) to prepare and present a proposal. These courses serves as preparation for either a thesis or project.

1. Thesis or Project. A thesis requires a student to articulate a problem in mathematics education related to significant mathematical content, propose a solution, and collect and analyze data in creating a solution of the problem. A project requires a student to demonstrate his or her ability to undertake a significant curriculum development, perform the appropriate research needed to implement the development, and communicate orally and in writing their understanding of that process.
2. Students writing a thesis or project will prepare a proposal in MATH 5994 Proposal Research (1-9 sch) based on work done in MATH 5993 Literature Review and Research (1-9 sch). When a student is within 18 semester hours of graduation, the student may form a graduate committee and defend the proposal. Guidelines for writing the thesis or project, including the required format and style, are available on the Mathematics Department website.) Immediately upon approval of the proposal the student registers for MATH 5995 Thesis (1-9 sch) or MATH 5997 Project (1-9 sch), as appropriate. The student continues to register for MATH 5995 Thesis (1-9 sch) or MATH 5997 Project (1-9 sch) each successive semester (Fall or Spring required, Summer by choice) until the thesis or project is completed. A student who does not complete a thesis or project in the semester for which the student has registered will receive a grade of IP (In Progress). Not completing a thesis or project in four long semesters, earning a grade of U or failure to register for MATH 5995 Thesis (1-9 sch) or MATH 5997 Project (1-9 sch) in the next semester after receiving a grade of IP will terminate the thesis or project and will require that the entire process be repeated starting with the preparation of a new proposal.

Each student in the Curriculum Content Option must defend their thesis or project, ordinarily during their final semester. The student's graduate committee will administer the defense.

Courses

MATH 5301 Foundations for Advanced Mathematics
3 Semester Credit Hours (3 Lecture Hours)
This course is an advanced treatment of the foundations of calculus, linear algebra and differential equations. Major focus on the proofs of theorems in the ares of analysis, linear algebra and differential equations. Topics are as follows: • Analysis: properties of the real numbers, sequences and series, limits, convergence, continuity, the derivative, and the Riemann integral. • Linear Algebra: matrix theory, system of equations, vector spaces, eigenvalues and eigenvectors, diagonalization and orthogonalization, change of basis. • Differential Equations: ordinary differential equations, solutions in series, solutions using Laplace transforms, systems of dfferential equations, applications.
Prerequisite: MATH 2415.

MATH 5310 Topics in Mathematics
3 Semester Credit Hours (3 Lecture Hours)
May not be used for graduate credit towards the MS in mathematics. Course included to provide a suitable vehicle for anticipated future service courses.

MATH 5311 Statistical Learning
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce students the problem of supervised (classification and regression) and unsupervised learning (dimension reduction and clustering) from the perspective of statistical learning. It aims to go far beyond the classical statistical methods. Students will learn a collection of flexible tools and techniques for using data to construct prediction algorithms and perform data analysis. Topics will include splines & generalized additive models, model selection & regularization methods (ridge and lasso), tree-based methods, random forests & boosting as well as classical linear approaches such as Logistic Regression, Linear Discriminant Analysis, K-Means, Clustering and Nearest Neighbors. Programming in R will be used to provide hands-on training and examples.

MATH 5315 Statistical Methods in Research I
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
STATISTICAL METHODS IN RESEARCH I This course is for graduate students in other disciplines and is designed to prepare them to use statistical methods in their research. This is a non-calculus exposition of the concepts, methods and usage of statistical data collection and analysis. Topics include descriptive statistics, the t-test, the one and two-way analysis of variance, multiple comparison tests, and multiple regression. Students also learn how to conduct these analyses using computer software and how to properly report their findings.

MATH 5316 Statistical Methods in Research II
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
STATISTICAL METHODS IN RESEARCH II This course is a continuation of MATH 5315. Topics include: statistical experimental design, randomized blocks and factorial analysis, multiple regression, chi-squared tests, analysis of covariance, non-parametric methods and sample surveys. Emphasis will be placed on the computer analysis of research data and how to properly report statistical findings.
Prerequisite: MATH 5315.

MATH 5321 Problem Solving and Mathematical Reasoning for Teachers
3 Semester Credit Hours (3 Lecture Hours)
An investigation of problems that span a variety of domains with a focus on making and evaluating mathematical arguments, using tools such as manipulatives and technology, identifying and analyzing the connections within and outside of mathematics-, and using symbols and representations to communicate mathematical ideas.

MATH 5322 Mathematics Assessment
3 Semester Credit Hours (3 Lecture Hours)
A historical overview of assessment of mathematics, statistical description of norm- and criterion-reference tests, scaling of standardized exams, varieties of assessment and rubrics, the mathematical analysis of error patterns, and equity.

MATH 5323 Mathematics instruction and Mentoring
3 Semester Credit Hours (3 Lecture Hours)
A study of how the use of appropriate mathematical content can create and support a mathematics classroom environment in which students are engaged in mathematical problem solving and how to use these understandings to be effective in supporting teacher development.

MATH 5324 Principles of Reforming Mathematics Instruction
3 Semester Credit Hours (3 Lecture Hours)
This course introduces participants to the theory and practice of teacher-led inquiry within mathematics education. The course prepares teachers to engage in a school-based mathematics education action research project. It is intended for in-service mathematics teachers.

MATH 5325 Structure of Number Concepts
3 Semester Credit Hours (3 Lecture Hours)
An in-depth investigation of real and complex number systems, base ten and other number bases, operations and algorithms, divisibility, Euclidean algorithm, congruence, modular arithmetic, and the Fundamental Theorem of Arithmetic, with an emphasis on quantitative and qualitative reasoning.

MATH 5326 Structure of Patterns and Algebra
3 Semester Credit Hours (3 Lecture Hours)
Algebraic reasoning incorporating the use of technology. This course includes investigations of patterns, relations, functions, and analysis, with a focus on representations and the relationships among them.

MATH 5327 Structure of Geometry and Measurement
3 Semester Credit Hours (3 Lecture Hours)
An investigation of concepts and principles in geometry and measurement with emphases on deductive reasoning and on inductive reasoning with the use of dynamic geometry software.

MATH 5328 Structure of Probability and Statistics
3 Semester Credit Hours (3 Lecture Hours)
An investigation of the principles and applications of probability and descriptive and inferential statistics.

MATH 5329 Structure of Modeling with Rates of Change
3 Semester Credit Hours (3 Lecture Hours)
A study of rates of change through modeling. Direct applications of rates of change to number concepts, algebra, geometry, probability, and statistics.

MATH 5331 Evolution of Mathematical Systems
3 Semester Credit Hours (3 Lecture Hours)
Covers the evolution of mathematical concepts and thought from ancient to modern times, including women and men who played key roles, from original and secondary sources. Provides a better understanding of the historical development of larger context for topics studied in other courses, and deepens understanding and appreciation of these topics. This course is intended to benefit current and future mathematics teachers.
Prerequisite: MATH 5321.

MATH 5332 Integrating Technology in Mathematics Education
3 Semester Credit Hours (3 Lecture Hours)
An introduction to technology appropriate for the mathematics classroom, including calculators, CAS systems, handhelds, computer software and multimedia. This course is intended for in-service mathematics teachers at the middle/high school level.
Prerequisite: MATH 5321.

MATH 5333 Numerical Linear Algebra
3 Semester Credit Hours (3 Lecture Hours)
Direct methods for linear systems. Least square solutions. Symmetric and nonsymmetric eigenvalue problems. Iterative methods. Algorithms.
Prerequisite: MATH 3311.

MATH 5336 Advanced Differential Equations
3 Semester Credit Hours (3 Lecture Hours)
A continuation of MATH 3315, Differential Equations. Relying heavily on linear algebra concepts, this course covers linear systems of differential equations; introductory operator theory; existence, uniqueness and continuity of solutions; stability of equilibria; planar nonlinear systems; and the Poincaré-Bendixson Theorem. Several applications are covered to illustrate the mathematical concepts.
Prerequisite: MATH 3311 and 3315.

MATH 5337 Theory and Applications of Partial Differential Equations
3 Semester Credit Hours (3 Lecture Hours)
The purpose of this course is to study the mathematical theory and real-world applications of the three major categories of partial differential equations: elliptic equations, parabolic equations, and hyperbolic equations. Specific topics to be covered include: first-order equations, second-order elliptic equations, second-order parabolic equations, and second-order hyperbolic equations.
Prerequisite: MATH 3311, 3315, 4301 and 4315.

MATH 5338 Finite Elements Method
3 Semester Credit Hours (3 Lecture Hours)
This is a one-semester course on finite element method for the numerical solution of partial differential equations. The course will focus on basic concepts of the finite element method for elliptic boundary value problems. Topics include: the weak (variational) formulation of prototypical problems, coercivity and continuity arguments, inf-sup conditions, approximation theory of finite elements, error analysis, stability, and a discussion of variational "crimes".

MATH 5339 Numerical Analysis
3 Semester Credit Hours (3 Lecture Hours)
Error estimation. Solution of non-linear equations. Interpolation. Numerical differentiation and integration. Finite differences and finite elements. Numerical methods for ODE's and PDE's.
Prerequisite: MATH 3311, 3315, 3470 and 4315 and (COSC 5311 or 1435).

MATH 5340 Numerical Solutions of Partial Differential Equations
3 Semester Credit Hours (3 Lecture Hours)
The course introduces numerical methods, especially the finite difference method for solving partial differential equations. The main numerical issues such as convergence and stability will be discussed. It also includes an introduction to the finite volume method, finite element method and spectral method. The course is enhanced by the computational and graphical capabilities of PYTHON.

MATH 5341 Statistical Methods and Data Analysis
3 Semester Credit Hours (3 Lecture Hours)
Introduction to the basic concepts of probability, common distributions, statistical methods, data analysis and a wide variety of statistical inference techniques. Demonstrations of the interplay between probability models and statistical inference. Data sets will be analyzed using the R software package.
Prerequisite: (MATH 3342 or 3345).

MATH 5342 Linear Statistical Models
3 Semester Credit Hours (3 Lecture Hours)
Review of basic concepts in probability theory. Principles of estimation and model building. Linear models, especially ANOVA and regression. Non-parametric alternatives.
Prerequisite: MATH 3311, 3342 and 3470.

MATH 5343 Mathematical Theory of Statistics
3 Semester Credit Hours (3 Lecture Hours)
This course is intended for graduate students that need a solid background on statistical theory. This is a one-semester course in probability and mathematical statistics. Topics include: basic probability, random variables, transformations and expectations, distributions and important families thereof, multiple random variables, random samples, notions of convergence, and an overview of point estimates and hypothesis tests.
Prerequisite: MATH 3311, 2415 and 3342.

MATH 5344 Environmental Statistics
3 Semester Credit Hours (3 Lecture Hours)
SPATIAL STATISTICS An introduction to methods of spatial statistics commonly used in scientific settings. Topics include the nature of geospatial sampling, analysis and modeling of spatial point patterns, and development and analysis of common continuous spatial models such as kriging. Additional topics to be covered, as time and student interest permit, include Bayesian modeling, hierarchical environmental modeling, and spatiotemporal modeling. Use of appropriate software is emphasized.
Prerequisite: MATH 3342 or 5315.

MATH 5345 Computational Methods for Statistics
3 Semester Credit Hours (3 Lecture Hours)
An introduction to computing tools needed by the modern statistician. Topics include: floating point numbers, reformatting large datasets, important statistical algorithms, and parallel processing.

MATH 5348 Optimization
3 Semester Credit Hours (3 Lecture Hours)
Unconstrained optimization, necessary and sufficient conditions for solutions, basic algorithms. Constrained optimization, KKT conditions, linear programming, convex programming, algorithms.
Prerequisite: MATH 4301.

MATH 5351 Real Analysis
3 Semester Credit Hours (3 Lecture Hours)
This course includes such topics as sequences and series of constants and functions, the Riemann integral, Fourier Series, and an introduction to Lebesgue measure and integration.
Prerequisite: MATH 4301.

MATH 5360 Combinatorics and Graph Theory
3 Semester Credit Hours (3 Lecture Hours)
Topics to include basic counting rules, connectivity, graph coloring and applications, chromatic polynomials, trees and their applications to searching and sorting, generating functions, recurrence relations, the Pigeonhole Principle, Eulerian and Hamiltonian chains and paths, and applications.
Prerequisite: MATH 2305 and 3313.

MATH 5370 Modeling of Natural Systems
3 Semester Credit Hours (3 Lecture Hours)
This course is designed to expose science and technology majors to models of real problems arising in the environment and ecology. Students will learn how to create solvable models of the real world situations and how to find answers on the posted questions by using tools of mathematics and computing. There will be modeling and simulations of tides in the Gulf of Mexico, multi-species models of the food chains, circulation of carbon, water, and oxygen. Students will learn some new tools based on calculus and elementary statistics such as numerical algorithms, Monte-Carlo methods, Markov Processes, multivariate analysis, evaluation of stability, methods of extrapolation (predictions) and interpolations.
Prerequisite: (MATH 1442 or 2342) and (MATH 2413 or 5329).

MATH 5375 Applied Analysis
3 Semester Credit Hours (3 Lecture Hours)
Topics to include basic theory of Euclidean, Banach and Hilbert spaces, calculus of variations and optimal control, elements of system analysis, and elements of complex analysis. All theoretical topics will be illustrated by real application.
Prerequisite: MATH 4301 or 5351.

MATH 5378 Mathematical Modeling
3 Semester Credit Hours (3 Lecture Hours)
Modeling of applied problems using analytical, stochastic, and dynamical methods.

MATH 5390 Special Topics
1-3 Semester Credit Hours (1-3 Lecture Hours)
An advanced study of a mathematical topic. May be repeated with full credit in another area of mathematics. Topics vary by semester and offering.

MATH 5393 Literature Review and Research
3 Semester Credit Hours (3 Lecture Hours)
LITERATURE REVIEW AND RESEARCH METHODOLOGY Reading, analyzing, and synthesizing mathematics education research literature for the purpose of informing teaching practice. Includes a study of qualitative research with a focus on the components of a research study (research question(s), literature review, conceptual framework, methods, analysis, findings) and the relationships among them.

MATH 5394 Research Methods in Mathematics
1-3 Semester Credit Hours
RESEARCH METHODS IN MATHEMATICS This course develops an ability to independently investigate a technical topic of interest, and the skills necessary to successfully communicate on that topic. The student learns how to find, organize, assimilate, and report on technical information derived from published sources. Specific areas of study include literature searches, technical word processing, technical writing style, and oral presentation techniques. The instructor and selected additional faculty members review and critique oral and written reports submitted throughout the semester. A final paper and a formal presentation are submitted in lieu of a final exam in the final semester. This course is a co-requisite for all other courses (except thesis) taken by students in the Environmental Modeling option.

MATH 5396 Directed independent Study
3 Semester Credit Hours
Study in areas of current interest. See College description for further details.

MATH 5993 Literature Review and Research
1-9 Semester Credit Hours
Reading, analyzing, and synthesizing appropriate mathematics and/or mathematics education research literature under supervision. May be repeated for credit.

MATH 5994 Proposal Research
1-9 Semester Credit Hours
This course develops an ability to independently investigate a technical topic of interest, and the skills necessary to successfully communicate on that topic. The student learns how to find, organize, assimilate, and report on technical information derived from published sources. Specific areas of study include literature searches, technical word processing, technical writing style, and oral presentation techniques. A final paper and a formal presentation are submitted in lieu of a final exam in the final semester.

MATH 5995 Thesis
1-9 Semester Credit Hours
Students work with an advisor to complete and present their proposed thesis. Students may register for 3 to 9 semester hours per semester. Only 3 hours total will count toward the MS degree in mathematics.
Prerequisite: MATH 5994.

MATH 5997 Project
1-9 Semester Credit Hours
Students work with an advisor to complete and present their proposed research project. Students may register for 3 to 9 semester hours of directed research per semester. Only 3 hours total will count toward the MS degree in mathematics.
Prerequisite: MATH 5994.

MATH 6315 Statistical Methods in Research I
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
This course is for graduate students in other disciplines and is designed to prepare them to use statistical methods in their research. This is a non-calculus exposition of the concepts, methods and usage of statistical data collection and analysis. Topics include descriptive statistics, the t-test, the one and two-way analysis of variance, multiple comparison tests, and multiple regression. Students also learn how to conduct these analyses using computer software and how to properly report their findings.

MATH 6316 Statistical Methods Research II
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
This course is a continuation of MATH 6315 . Topics include: statistical experimental design, randomized blocks and factorial analysis, multiple regression, chi-squared tests, analysis of covariance, non-parametric methods and sample surveys. Emphasis will be placed on the computer analysis of research data and how to properly report statistical findings.
Prerequisite: MATH 6315.

MATH 6317 Mixed Effects Models for Scientists
3 Semester Credit Hours (3 Lecture Hours)
This course will deal with extensions to the regression and ANOVA that are frequently useful in dealing with ecological data. Topics include: using bootstrapping for significance testing; generalized additive models; using generalized least squares to deal with non-homogeneous data; working with fixed and random factors; handling temporally correlated and spatially correlated data; and the generalized linear model (Poisson, logistic, and negative binomial regression).
Prerequisite: MATH 6315 or 6316.

MATH 6318 An Introduction to Bayesian Statistics
3 Semester Credit Hours (3 Lecture Hours)
An introduction to Bayesian Statistics for scientists. Topics include: Bayesian paradigm, with advantages and disadvantages; brief coverage of probability and calculus; basics of Markov Chain Monte Carlo methods, including the Gibbs sampler and the Metropolis-Hastings algorithm; validating, comparing, and interpreting Bayesian models; and examples from literature relevant to students interests. The course assumes no prior exposure to calculus or programming.

MATH 6344 Spatial Statistics
3 Semester Credit Hours (3 Lecture Hours)
An introduction to methods of spatial statistics commonly used in scientific settings. Topics include the nature of geospatial sampling, analysis and modeling of spatial point patterns, and development and analysis of common continuous spatial models such as kriging. Additional topics to be covered, as time and student interest permit, include Bayesian modeling, hierarchical environmental modeling, and spatiotemporal modeling. Use of appropriate software is emphasized.
Prerequisite: MATH 3342 or 5315.