Mathematics (MS)

The **Master of Science (MS) in Mathematics** program is designed to provide a graduate level education for students who intend to teach at various levels, students who will continue or seek employment within the industrial sector, and students who intend to continue their education beyond the master's level at other institutions.

The Master of Science in Mathematics has a concentration in Mathematical Sciences. This program will not prepare the students for any license or certification.

***This program has the option to be completed fully ONLINE**.

Admission Requirements

Apply to the UTRGV Graduate College:

Step #1: Submit a UTRGV Graduate Application at www.applytexas.org. The university application fee of $50 ($100 for International Applicants) can be paid online by credit card or electronic check (in the online application). All application fees are nonrefundable.

Step #2: Register on the UTRGV Recommenders and Document Upload Webpage (www.utrgv.edu/gradupload). This is where you will request recommenders and upload program requirement documents, and where the graduate office will upload your transcripts. If you do not complete this step, we will not be able to process your application.

Step #3: Request your transcripts and other supporting documentation to be mailed to:
The University of Texas Rio Grande Valley
The Graduate College
Marialice Shary Shivers Bldg. 1.158
1201 W. University Drive
Edinburg, TX 78539-2999

Review and submit all Program Requirements:

- Bachelor's degree in mathematics or related field with a minimum of 12 hours of upper-division mathematics or statistics course work and a grade of 'B' or better on all upper-division mathematics and/or statistics course work.
- Undergraduate GPA of at least 3.0 in upper-level Mathematics courses.
- Official transcripts from each institution attended (must be submitted directly to UTRGV).
- Two letters of recommendation from professional or academic sources.
- Letter of Intent detailing professional goals and reasons for pursuing the graduate degree.
- GRE General Test. GRE test scores are valid for 5 years.

Additional requirements for domestic applicants who attended foreign universities:

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, click here.
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, click here.

Additional requirements for international applicants:

- TOEFL or IELTS Language Proficiency Test with minimum scores: 550 on paper-based, 213 on computer based, or 79 on internet-based for the TOEFL; 6.5 for the IELTS. TOEFL and IELTS scores are valid for 2 years. For additional information, click here.
- English translation of educational records.
- Transcript Evaluation by the Foreign Credentials Service of America (FCSA). For additional information, click here.
- Financial Documentation showing sufficient funds (minimum of $25,000) to cover all expenses (living and academic) for the first year of study. For additional information, click here.
- Immigration documents, including a current copy of your valid passport. For additional information, click here.

Program Contact

Program Director: Dr. Timothy Huber
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Deadlines

	Fall	Spring	Summer I	Summer II
Domestic	July 1	November 15	May 1	June 1
International	June 1	Novembers 1	March 1	April 1

Program Requirements

Required Courses	**9**
MATH 6330: Linear Algebra	3
MATH 6331: Algebra I	3
MATH 6352: Analysis I	3

Choose one of the following concentrations:

Mathematics Concentration

Required Courses	**6**
MATH 6332: Algebra II	3
MATH 6353: Analysis II	3
Designated Electives	**15**
Chosen from the following:	
MATH 6323: Group Theory	3
MATH 6329: Number Theory	3
MATH 6339: Complex Analysis	3
MATH 6359: Applied Analysis	3
MATH 6360: Ordinary Differential Equations	3
MATH 6361: Partial Differential Equations	3
MATH 6362: Fourier Analysis	3
MATH 6363: Integrable Systems	3
MATH 6364: Statistical Methods	3
MATH 6366: Micro-local Analysis	3
MATH 6367: Functional Analysis	3
MATH 6368: Operator Theory	3
MATH 6370: Topology	3
MATH 6371: Differential Geometry	3
MATH 6372: Analytic Number Theory	3
MATH 6373: Algebraic Geometry	3
MATH 6375: Numerical Analysis	3
MATH 6376: Numerical Methods for Partial Differential Equations	3
MATH 6385: Cryptology and Codes	3
MATH 6387: Mathematical Modeling	3
MATH 6388: Discrete Mathematics	3
MATH 6399: Special Topics in Mathematics	3

Choose one of the following capstone options:

Capstone Requirement	**6**
Thesis	
MATH 7300: Thesis I	3
MATH 7301: Thesis II	3

OR

Project	
MATH 6391: Master's Project	3
Additional 3 hours of electives	3

OR

Non-Thesis	
Additional 6 hours of electives	6
Written and/or Oral Comprehensive Exam	

Total graduate hours for degree:	**36**

Mathematics Teaching Concentration

Required Courses	**9**
Chosen from the following:	
MATH 6325: Contemporary Geometry	3
MATH 6327: Mathematical Modeling with Technology	3
MATH 6329: Number Theory	3
MATH 6365: Probability and Statistics	3
Designated Electives	**12**
Chosen from the following:	
MATH 6305: History of Mathematics	3
MATH 6307: Collegiate Mathematics Teaching	3
MATH 6309: Integrating Technology into Mathematics	3
MATH 6310: Mathematics Teaching and Learning	3
MATH 6323: Group Theory	3
MATH 6328: Special Topics in Mathematics Teaching	3

MATH 6399: Special Topics in Mathematics 3

Choose one of the following capstone options:

Capstone Requirement **6**
Thesis
MATH 7300: Thesis I 3
MATH 7301: Thesis II 3

OR

Project
MATH 6391: Master's Project 3
Additional 3 hours of electives 3

OR

Non-Thesis
Additional 6 hours of electives 6
Written and/or Oral Comprehensive Exam

Total graduate hours for degree: **36**

Industrial and Applied Mathematics Concentration

Required Courses **9**
MATH 6360: Ordinary Differential Equations 3
MATH 6361: Partial Differential Equations 3
MATH 6375: Numerical Analysis 3

Designated Electives **12**
Chosen from the following:
MATH 6332: Algebra II 3
MATH 6353: Analysis II 3
MATH 6362: Fourier Analysis 3
MATH 6363: Integrable Systems 3
MATH 6364: Statistical Methods 3
MATH 6365: Probability and Statistics 3
MATH 6366: Micro-local Analysis 3
MATH 6367: Functional Analysis 3
MATH 6368: Operator Theory 3
MATH 6369: Mathematical Methods 3
MATH 6376: Numerical Methods for Partial Differential Equations 3
MATH 6377: Mathematical Fluid Mechanics 3
MATH 6379: Stochastic Processes 3
MATH 6385: Cryptology and Codes 3
MATH 6388: Discrete Mathematics 3
MATH 6399: Special Topics in Mathematics 3
MATH 6455: Applied Mathematics I 4
MATH 6456: Applied Mathematics II 4

Choose one of the following capstone options:

Capstone Requirement **6**
Thesis
MATH 7300: Thesis I 3
MATH 7301: Thesis II 3

OR

Project
MATH 6391: Master's Project 3
Additional 3 hours of electives 3

OR

Non-Thesis
Additional 6 hours of electives 6
Written and/or Oral Comprehensive Exam

Total graduate hours for degree: **36**

Statistics Concentration

Required Courses **9**
MATH 6364: Statistical Methods 3
MATH 6365: Probability and Statistics 3
MATH 6375: Numerical Analysis 3

Designated Electives *Chosen from the following:* **12**
MATH 6336: Advanced Sampling 3
MATH 6353: Analysis II 3
MATH 6379: Stochastic Processes 3
MATH 6380: Time Series Analysis 3

MATH 6381: Mathematical Statistics 3
MATH 6382: Statistical Computing 3
MATH 6383: Experimental Design and Categorical Data 3
MATH 6384: Biostatistics 3
MATH 6386: Applied Research Design and Analysis 3
MATH 6387: Mathematical Modeling 3
MATH 6389: Stochastic Analysis 3
MATH 6399: Special Topics in Mathematics 3

Choose one of the following capstone options:

Capstone Requirement 6
Thesis
MATH 7300: Thesis I 3
MATH 7301: Thesis II 3

OR

Project
MATH 6391: Master's Project 3
Additional 3 hours of electives 3

OR

Non-Thesis
Additional 6 hours of electives 6
Written and/or Oral Comprehensive Exam

Total graduate hours for degree: 36

Course Descriptions

MATH 6305: History of Mathematics [3-0]
This course introduces students to the history of the development of mathematical ideas and techniques from early civilization to the present. The focus will be on both the lives and the works of some of the most important mathematicians. **Prerequisite:** Departmental approval.

MATH 6307: Collegiate Mathematics Teaching [3-0]
This course provides opportunities for students to have a practical experience in teaching college-level mathematics courses supervised by faculty. **Prerequisite**: Departmental approval.

MATH 6309: Integrating Technology into Mathematics [3-0]
This is an introductory course related to the latest technological computer programs, especially in mathematics. It covers some of the following educational computer softwares: graphing calculator, dynamic geometry, computer algebra systems, publishing softwares and some multimedia and internet related softwares. **Prerequisite**: Departmental approval.

MATH 6310: Mathematics Teaching and Learning [3-0]
This course examines issues, trends and research related to the teaching/learning of secondary school mathematics. Specific topics will vary, but could include: technology in the classroom, mathematical problem solving and the use of applications in the teaching of mathematics. **Prerequisite**: Graduate standing in mathematics.

MATH 6323: Group Theory [3-0]
This course is an introduction to group theory, one of the central areas in modern algebra. Topics will include the theorems of Jordan-Holder, Sylow, and Schur-Zassenhaus, the treatment of the generalized Fitting subgroup, a first approach to solvable as well as simple groups (including theorems of Ph. Hall and Burnside). **Prerequisite**: Departmental approval.

MATH 6325: Contemporary Geometry [3-0]
This course contains selected topics in computational, combinatorial and differential geometry as well as combinatorial topology. Topics include the point location problem, triangulations, Voronoi diagrams and Delaunay triangulations, plane curves and curvature,

surfaces and polyhedrons and Euler characteristic. **Prerequisite:** Departmental approval.

MATH 6327: Mathematical Modeling with Technology [3-0]
Mathematical Modeling is the art of taking a real-world problem and stating it in mathematical terms. It often involves making simplifying assumptions. Students will gain experience in the use of technology such as MS Excel and Visual Basic programs, and learn how technology may be applied to construct mathematical models in practical. In this course, we get in the habit of doing all the parts of the math modeling cycle: modeling, solving, checking, and guessing. We will also consider many common mathematical models, and explore their properties. **Prerequisite:** Graduate standing in mathematics.

MATH 6328: Special Topics in Mathematics Teaching [3-0]
A critical analysis of issues, trends and historical developments in elementary and/or secondary mathematics teaching with emphasis on the areas of curriculum and methodology. This course may be repeated for credit when topic changes. **Prerequisite**: Graduate standing in mathematics.

MATH 6329: Number Theory [3-0]
This course is an introduction to number theory, one of the major branches of modern mathematics. Topics include arithmetic functions, multiplicativity, Moebius inversion, modular arithmetic, Dirichlet characters, Gauss sums, primality testing, distribution of primes, primitive roots, quadratic reciprocity, Diophantine equations, and continued fractions. Applications and further topics include cryptography, partitions, representations by quadratic forms, elliptic curves, modular forms, irrationality, and transcendence. **Prerequisite**: Departmental approval.

MATH 6330: Linear Algebra [3-0]
Topics include the proof-based theory of matrices, determinants, vector spaces, linear spaces, linear transformations and their matrix representations, linear systems, linear operators, eigenvalues and eigenvectors, invariant subspaces of operators, spectral decompositions, functions of operators and applications to science, industry and business. **Prerequisite**: MATH 2318 Linear Algebra with a grade of "C" or higher.

MATH 6331: Algebra I [3-0]
This course is an extension of the undergraduate course in abstract algebra. Topics include polynomial rings over a field and finite field extensions. **Prerequisite:** MATH 3363 Modern Algebra I with a grade of "C" or higher.

MATH 6332: Algebra II [3-0]
The purpose of this course is to provide essential background in groups, rings and fields, train the student to recognize algebraic structures in various settings and apply the tools and techniques made available by algebraic structures. Topics include groups, structure of groups, rings, modules, Galois theory, structure of fields, commutative rings and modules. **Prerequisite:** MATH 6331.

MATH 6336: Advanced Sampling [3-0]
This course will focus on planning, execution and analysis of sampling from finite populations; simple, stratified, multistate and systematic sampling; ratio estimates. **Prerequisite**: Departmental approval.

MATH 6339: Complex Analysis [3-0]
This course is an introduction to the fundamentals of complex analysis. Topics include: The Riemann sphere and stereographic projection, elementary functions, analytic functions, the theory of complex integration, power series, the theory of residues, the Cauchy-Riemann equations, conformal and isogonal diffeomorphisms, Weierstrass products, the Mittag-Leffler theorem. **Prerequisite**: Departmental approval.

MATH 6352: Analysis I [3-0]
The purpose of this course is to provide the necessary background for all branches of modern mathematics involving analysis and to train the student in the use of axiomatic methods. Topics include metric spaces, sequences, limits, continuity, function spaces, series, differentiation and the Riemann integral. **Prerequisite:** MATH 3372 Real Analysis I with a grade of "C" or higher.

MATH 6353: Analysis II [3-0]
The purpose of this course is to present advanced topics in analysis. Topics may be chosen from (but not restricted to) normed linear spaces, Hilbert spaces, elementary spectral theory, complex analysis, measure and integration theory. **Prerequisite**: MATH 6352.

MATH 6359: Applied Analysis [3-0]
This course provides an introduction to methods and applications of mathematical analysis. Topics include: function spaces, linear spaces, inner product spaces, Banach and Hilbert spaces; linear operators on Hilbert spaces, eigenvalues and eigenvectors of operators and orthogonal systems; Green's functions as inverse operators; relations between integral and ordinary differential equations and methods of solving integral equations. Some special functions important for applications are shown.
Prerequisites: MATH 2318 Linear Algebra, MATH 3341 Differential Equations, and MATH 4344 Boundary Value Problems or equivalent. MATH 6352 is recommended.

MATH 6360: Ordinary Differential Equations [3-0]
This course examines existence and uniqueness theorems, methods for calculating solutions to systems of ordinary differential equations, the study of algebraic and qualitative properties of solutions, iterative methods for numerical solutions of ordinary differential equations and an introduction to the finite element methods. **Prerequisite**: MATH 3341 Differential Equations with a grade of "C" or higher, or consent of instructor.

MATH 6361: Partial Differential Equations [3-0]
This course considers the existence, uniqueness and approximation of solutions to linear and non-linear ordinary, partial and functional differential equations. It also considers the relationships of differential equations with functional analysis. Computer-related methods of approximation are also discussed. **Prerequisite**: MATH 3341 Differential Equations with a grade of "C" or higher, or consent of instructor.

MATH 6362: Fourier Analysis [3-0]
The course includes trigonometric series and Fourier Series, Dirichlet Integral, convergence and summability of Fourier Series, uniform convergence and Gibbs phenomena, L2 space, properties of Fourier coefficients, Fourier transform and applications, Laplace transform and applications, distributions, Fourier series of distributions, Fourier transforms of generalized functions and orthogonal systems. **Prerequisite**: MATH 6353 or consent of instructor.

MATH 6363: Integrable Systems [3-0]
This course includes solitons and integrable systems. The purpose of the course is to show students how to analyze nonlinear partial differential equations for physical problems and how to solve the equations using traveling wave settings. **Prerequisite**: MATH 3349 with a grade of "C" or higher or consent of instructor

MATH 6364: Statistical Methods [3-0]
This is a course in the concepts, methods and usage of statistical data analysis. Topics include test of hypotheses and confidence intervals; linear and multiple regression analysis; concepts of experimental design, randomized blocks and factorial analysis; a brief introduction to non-parametric methods; and the use of statistical software. **Prerequisite:** Departmental approval.

MATH 6365: Probability and Statistics [3-0]
Topics in this course include set theory and concept of probability, conditional probability, random variables, discrete and continuous probability distributions, distribution and expectations of random variables, moment generating functions, transformation of random variables, order statistics, central limit theorem and limiting distributions. **Prerequisite**: MATH 2415 Calculus III with a grade of "C" or higher, or consent of instructor.

MATH 6366: Micro-local Analysis [3-0]
Topics include: basic concepts and computational technique of distributions (generalized functions, the singular support of distributions, the convolutions of distributions, the structure of distributions, approximations by test functions, Schwartz space; Fourier transforms of test functions and distributions, Paley-Wiener theorem. Schwartz kernel theorem. Sobolev spaces, symbols, pseudo-differential operators (PDOs), the kernel of pseudo-local operators, PDOs and Sobolev spaces, amplitude functions and PDOs, transposed and adjoint to PDO operators. Proper PDOs, Product of PDOs, asymptotic series and expansions, product formula for PDOs, symbols of transposed and adjoint operators, symbol of composition and commutator of PDOs, elliptic operators, wave front set of distributions; Fourier integral operators. **Prerequisite**: Departmental approval.

MATH 6367: Functional Analysis [3-0]
This course provides an introduction to methods and applications of functional analysis. Topics include: topological vector spaces; locally convex spaces (Hahn-Banach Theorem, weak topology, dual pairs); normed spaces; theory of distributions (space of test functions, convolution, Fourier transform; Sobolev spaces); Banach spaces (Uniform Boundedness Principle, Open Mapping Theorem, Closed Graph Theorem and applications, Banach-Alaoglus Theorem, Krein-Milman Theorem); C(X) as a Banach space (Stone-Weierstrass Theorem, Riesz Theorem, compact operators); Hilbert spaces; linear operators on Hilbert spaces; eigenvalues and eigenvectors of operators. **Prerequisite:** MATH 3372 Real Analysis I with a grade of "C" or higher or consent of instructor.

MATH 6368: Operator Theory [3-0]
This course primarily covers bounded linear operators on a Hilbert spaces. The topics are: linear and bilinear functionals, inner product and norm; Hilbert space; subspace; operators; spectrum of operators; spectral theorem for normal operators; Polar decomposition; contractions; isometries; quasinormal operators; subnormal operators; hyponormal operators; invariant subspaces. **Prerequisite:** MATH 3372 Real Analysis I with a grade of "C" or higher or consent of instructor.

MATH 6369: Mathematical Methods [3-0]
Special functions, perturbation methods, asymptotic expansion, partial differential equation models, existence and uniqueness, integral transforms, Green functions for ODEs and PDEs, calculus of variations, methods of least squares, Ritz-Rayleigh and other approximate methods, integral equations, generalized functions. **Prerequisite**: Graduate standing, and MATH 2415 Calculus III with a grade of "C" or higher.

MATH 6370: Topology [3-0]
This course is a foundation for the study of analysis, geometry and algebraic topology. Topics include set theory and logic, topological spaces and continuous functions, connectedness, compactness, countability and separation axioms. **Prerequisite:** MATH 4355 Topology with a grade of "C" or higher, or consent of instructor.

MATH 6371: Differential Geometry [3-0]
The course will introduce students to the study of smooth manifolds, fiber bundles, differential forms, and Lie groups. Thereafter, Euclidean geometries and their common generalizations Klein and Riemannian geometries will be

discussed with a focus on examples. If time allows the unifying notion of a Cartan geometry will also be introduced. **Prerequisites**: MATH 6352 or consent of instructor.

MATH 6372: Analytic Number Theory

[3-0]

This course serves as an introduction to fundamental results from analytic number theory. Its primary aim is to introduce real and complex analytic techniques in the theory of numbers. Topics include the distribution of primes, the prime number theorem, primes in an arithmetic progression, averages of arithmetic functions, Dirichlet Series, Euler products, and representations by quadratic forms. **Prerequisites:** MATH 3372 Real Analysis I and MATH 3365 Number Theory with grades of "C" or higher, or consent of instructor.

MATH 6373: Algebraic Geometry

[3-0]

The course will begin with an introduction to polynomials and ideals, Grobner bases, and affine varieties. This includes the Hilbert Basis Theorem, the Nullstellensatz, and the ideal-variety correspondence. Thereafter, the course will focus on examples and computations. Topics include solving systems by elimination, resultants, computations in local rings, modules and syzygies, and polytopes and toric varieties. **Prerequisite**: MATH 6331 or consent of instructor.

MATH 6375: Numerical Analysis

[3-0]

This course provides a fundamental introduction to numerical techniques used in mathematics, computer science, physical sciences and engineering. The course covers basic theory on classical fundamental topics in numerical analysis such as: computer arithmetic, approximation theory, numerical differentiation and integrations, solution of linear and nonlinear algebraic systems, numerical solution of ordinary differential equations and error analysis of the abovementioned topics. Connections are made to contemporary research in mathematics and its applications to the real world. **Prerequisites**: MATH 2318 Linear Algebra and 2415 Calculus III with grades of "C" or better; and computer programming; or consent of instructor.

MATH 6376: Numerical Methods for Partial Differential Equations

[3-0]

This course provides a fundamental introduction to numerical techniques used in mathematics, computer science, physical sciences and engineering. The course covers basic theory and applications in the numerical solutions of elliptic, parabolic and hyperbolic partial differential equations. **Prerequisites**: MATH 2318 Linear Algebra, 2415 Calculus III and MATH 3349 Numerical Methods with "C" or better or graduate-level Numerical Analysis with a "B" or better, some familiarity with ordinary and partial differential equations and computer programming or consent of instructor.

MATH 6377: Mathematical Fluid Mechanics

[3-0]

This course provides an introduction to fundamental aspects of mathematical fluid mechanics. Topics include classification of fluids, flow characteristics, dimensional analysis, derivations of Euler, Bernoulli and Navier-Stokes equations, complex analysis for two-dimensional potential flows, exact solutions for simple cases of flow such as plane Poiseuille flow, and Couette flow. **Prerequisite**: Departmental approval.

MATH 6378: Inverse Problem and Image Reconstructions

[3-0]

Topics include: inverse problem of linear PDEs, Maxwell equation and Fourier integral operator, Back-projection operator and applications in radar image reconstruction, including synthetic aperture radar image and inverse synthetic aperture radar images arranged by antenna. **Prerequisite**: Departmental approval.

MATH 6379: Stochastic Processes [3-0]
Discrete and Continuous Time Markov Processes, Poisson Processes, Renewal Processes, Diffusion Processes, Brownian Motion. **Prerequisite.** MATH 6365.

MATH 6380: Time Series Analysis [3-0]
This course is an introduction to statistical time series analysis. Topics include: ARIMA and other time series models, forecasting, spectral analysis, and time domain regression. Model identification, estimation of parameters, and diagnostic checking are included. **Prerequisite:** MATH 6379.

MATH 6381: Mathematical Statistics [3-0]
This course in mathematical Statistics includes theory of estimation and hypothesis testing; point estimation, interval estimation, sufficient statistics, decision theory, most powerful tests, likelihood ration tests, chi-square tests, minimum variance estimation, Neyman-Pearson theory of testing hypotheses, elements of decision theory. **Prerequisite**: MATH 6365.

MATH 6382: Statistical Computing [3-0]
A course in modern computationally-intensive statistical methods including simulation, optimization methods, Monte Carlo integration, maximum likelihood /EM parameter estimation, Markov chain Monte Carlo methods, resampling methods, non-parametric density estimation. **Prerequisite:** Consent of instructor.

MATH 6383: Experimental Design and Categorical Data [3-0]
Design and analysis of experiments, including one-way and two-way layouts; factorial experiments; balanced incomplete block designs; crossed and nested classifications; fixed, random, and mixed models; split plot designs, inference for categorical data, contingency tables, generalized linear models, logistic regression, logit and loglinear models. **Prerequisite:** MATH 6364.

MATH 6384: Biostatistics [3-0]
This course is a survey of crucial topics in biostatistics; application of regression in biostatistics; analysis of correlated data; logistic and Poisson regression for binary or count data; survival analysis for censored outcomes; design and analysis of clinical trials; sample size calculation by simulation; bootstrap techniques for assessing statistical significance; data analysis using R. **Prerequisite:** Consent of instructor.

MATH 6385: Cryptology and Codes [3-0]
Topics include: elementary ciphers, error-control codes, public key ciphers, random number generator- error codes, and Data Encryption Standard. Supporting topics from number theory, linear algebra, group theory, and ring theory will also be studied. **Prerequisite**: MATH 3363 Modern Algebra I with a grade of "C" or better.

MATH 6386: Applied Research Design and Analysis [3-0]
The content of this course will include different types of research designs (experimental design, quasi-experimental design, nonexperimental research design , and survey design); proper procedures for research design; different types of research methods (introduce both quantitative and qualitative methods, but mainly focus on quantitative methods); how to use statistical software to perform statistical analysis procedures including logistic regression, factor analysis, multivariate data analysis, etc., and applications in respective student-oriented research projects. **Prerequisite**: Consent of instructor.

MATH 6387: Mathematical Modeling [3-0]
This course presents the theory and application of mathematical modeling. Topics will be selected from dynamic models, stable and unstable motion, stability of linear and nonlinear systems, Liapunov functions, feedback, growth and decay, the logistic model, population models, cycles, bifurcation, catastrophe, biological and biomedical models, chaos, strange attractors, deterministic and random behavior. **Prerequisite**: Consent of instructor.

MATH 6388: Discrete Mathematics [3-0]
This course is an introduction to modern finite mathematics. Topics include methods of enumeration, analytic methods, generating functions, the theory of partitions, graphs, partially ordered sets, and an introduction to Polya's theory of enumeration. **Prerequisite**: MATH 3363 Modern Algebra I or consent of instructor.

MATH 6389: Stochastic Analysis [3-0]
The main objective of this course is to study discrete stochastic processes and their applications. Topics include Markov process and Markov chains, convergence theorems, stopping times, martingales, and applications in trading and marketing. **Prerequisite:** Departmental approval.

MATH 6391: Master's Project [3-0]
Individual work or research on advanced mathematical problems conducted under the direct supervision of a faculty member. The course, including a written report, could be taken twice. **Prerequisites**: Consent of instructor.

MATH 6399: Special Topics in Mathematics [3-0]
This course covers special topics in graduate level mathematics that are not taught elsewhere in the department. May be repeated for credit when topic is different. **Prerequisite**: Consent of instructor.

MATH 6455: Applied Mathematics I [3-0]
The course offers engineering students an in-depth look into the following topics: linear algebra including matrices, vectors, determinants, linear systems and matrix eigenvalue problems; vector differential calculus and vector integral calculus including Integral theorems; complex numbers and functions including complex integration; power series and Taylor series; numeric linear algebra; and probability and statistics. **Prerequisite**: MATH 2415 Calculus III with a grade of "C" or better.

MATH 6456: Applied Mathematics II [3-0]
The course offers engineering students an In-depth look Into the following topics: first-order ODEs, second-order linear ODEs, higher order ODEs and systems of ODEs; series solutions of ODEs and special functions; Laplace transforms; Fourier series, integrals, and transforms; partial differential equations (PDEs); and numerics for ODEs and PDEs. **Prerequisite**: MATH 6455.

MATH 7300: Thesis I [3-0]
First part of two course sequence.
Prerequisites: Graduate standing and consent of thesis advisor.

MATH 7301: Thesis II [3-0]
Second part of two course sequence**.**
Prerequisites: Graduate standing and consent of thesis advisor.