DEPARTMENT OF MATHEMATICS

- **Bachelor of Science with a Major in Actuarial Mathematics**
- **Bachelor of Science with a Major in Applied Mathematics and Statistics**
- **Actuarial Mathematics Concentration**
- **Applied Statistics Concentration and Minor**
- **Mathematics Minor**
- **SAS Data Mining Certificate Program**

Department of Mathematics – Mission Statement

The Mathematics Department, through academic excellence, provides the theoretical foundation for critical thinking in quantitative problem solving and reasoning. We help students to develop their ability to effectively communicate mathematics. The Department prepares students for success in a career in actuarial mathematics, applied mathematics, applied statistics, or a profession of their choice.

Actuarial Mathematics – Mission Statement

The Bryant Actuarial Mathematics program is designed to prepare students for success in the actuarial field. Our student-centered curriculum promotes academic excellence with a rigorous course of study that emphasizes critical thinking, problem solving, statistical analysis skills, and strong business acumen.

Major in Actuarial Mathematics Objectives

Students who complete the Actuarial Mathematics major will:

- Demonstrate competence in the fundamental probability tools for assessing risk quantitatively.
- Demonstrate a basic understanding of the theory of interest, pension and insurance systems.
- Demonstrate competence in relevant statistical software.
- Demonstrate effective consulting skills (problem solving, oral and written presentations).

This Actuarial Mathematics major provides a foundation of analytical and communication skills that enables graduates to seek a career as an actuary or in actuarial related fields such as insurance, pensions, banking, and other financial service organizations. The combination of a strong mathematical foundation and a strong business and liberal arts background provides students with the necessary skills to succeed in these fields. Courses include advanced topics such as Interest Theory, Actuarial Mathematics, Advanced Probability and Statistics, and Pension Fundamentals.

Actuarial Mathematics Learning Goals

The Actuarial Mathematics program prepares students for success in the actuarial field by promoting the following learning goals:

- Coursework that prepares students for at least four exams given by the Society of Actuaries with an expectation that a student will successfully complete two exams by graduation.
- Coursework that requires a minor in a business discipline that develops leadership, communication, and teamwork skills, enabling the student to secure one or more actuarial internships prior to graduation.
- Coursework that emphasizes statistical skills and allows the student to complete the SAS Certification program.
- Coursework that emphasizes strong computer skills for business applications.

Applied Mathematics and Statistics - Mission Statement:

The Bryant Applied Mathematics and Statistics program is designed to prepare students for success in an analytics position, particularly a position in the fields of applied statistics or applied analysis. Our student-centered curriculum promotes academic excellence with a rigorous course study that emphasizes critical thinking, problem solving, statistical analysis skills, knowledge of computer statistical software packages, and strong business acumen.

Major in Applied Mathematics and Statistics Objectives

Students who complete the Applied Mathematics and Statistics program will:

- Demonstrate a mastery of multivariate statistics and data mining.
- Demonstrate competence in relevant statistical software.
- Demonstrate effective statistical consulting skills (problem solving, oral and written presentations).

The Bachelor of Science in Applied Mathematics and Statistics requires 10 courses of in-depth study in the field of mathematics, to complement the business and liberal arts core courses. The program provides students with the reasoning and problem-solving skills necessary to be successful in an array of industries. Mathematics and statistics are part of daily life, but they are also the foundation for a wide range of careers. Whether you want to analyze marketing data, set up the experimental design for clinical trials of a new drug, or work in government, the Bachelor of Science in Applied Mathematics and Statistics provides students a range of skills and broad knowledge required to solve real-world problems through the application of mathematical principles.

Applied Mathematics and Statistics Learning Goals

The Applied Mathematics and Statistics program prepares students for success in an analytics position, particularly a position in the fields of applied statistics or applied analytics by promoting the following learning goals:

- Coursework that prepares students with a strong foundation in theoretical calculus and statistics
- Coursework that allows the students a wide range of applied mathematical courses along with applied statistical courses
- Coursework that allows the student to study advanced statistical topics and complete the SAS Certification program
- Coursework that emphasizes strong computer skills for business applications.

Students who major in Applied Mathematics and Statistics may also earn SAS certification in data mining. Four courses are required for the certification:

MATH 455	SAS Programming and Applied Statistics
MATH 460	Applied Data Mining
MATH 461	Applied Multivariate Statistics
MATH 475	Applied Analytics Using SAS
or MATH 47(	Statistical Design and Analysis of Experiments

Actuarial Concentration

Students, who may want to pursue a career as an actuary while keeping their options open by choosing a major in a different subject, can obtain a concentration in Actuarial Mathematics. The concentration is based on a strong calculus foundation and requires the completion of a two semester course sequence in preparation for at least one preliminary actuarial exam. In addition students are required to choose two actuarial electives, which can include courses that prepare them for a second preliminary actuarial exam. This is an 18 credit concentration only. Students must have a primary concentration in the College of Business or a major in the College of Arts and Sciences.

Applied Statistics Concentration

With an additional six credits (two courses) an Applied Statistics minor can achieve a concentration. This option requires many of the same courses as our Actuarial Mathematics major for the first two years. The concentration can be taken with either a strong calculus foundation as in the major or in a more applied mode for students who choose not to follow the calculus and calculus-based statistics courses. There are several applied statistics courses for such students. This is an 18 credit concentration only. Students must have a primary concentration in the College of Business or a major in the College of Arts and Sciences.

SAS-Bryant University Academic Specialization in Data Mining

By satisfactorily completing four SAS-based statistics courses, undergraduate students at Bryant University will achieve a Tier 3 (Top Tier) SAS Academic Specialization in Data Mining. Students with this specialization develop the skills and knowledge required to solve real-world problems by applying mathematical principles. The students also develop an understanding of mathematical and statistical concepts along with computer skills for business applications.

The four SAS courses can satisfy requirements in our Applied Mathematics and Statistics major, our Applied Statistics concentration, and our Applied Statistics minor. For our Applied Statistics minors, only one additional course beyond the minor is necessary to complete the SAS Specialization requirements. In order to receive the Specialization, a student must achieve at least a B average in all these courses with no grade lower than a C in any one course.

Applied Statistics Minor

Many disciplines are dependent on the information provided by statistics. Through this course of study, students can deepen and extend their knowledge and skills in statistics and enhance their ability to solve more complex quantitative problems.

Mathematics Minor

Employers often seek graduates with mathematical and analytical skills. Students who desire a more in-depth understanding of mathematics may select this minor. All of the courses in this minor focus on problem solving. Many of the courses emphasize the use of technology and include various computer software programs that may not be covered in other courses.

Faculty

Department Chair:
Dr. Richard Gorvett

Professor
James Bishop

Professor
Richard Gorvett

Professor
Kristin T. Kennedy

Professor
Alan D. Olinsky

Professor
John T. Quinn

Professor
Richard M. Smith

Assistant Professor
Alicia Lamere

Assistant Professor
Son Nguyen

Assistant Professor
Gao Niu

Senior Lecturer
Nanci Beausoleil

Senior Lecturer
Louise Hasenfus

Lecturer
Joseph A. Capalbo

Lecturer
Karen A. Pitts

Lecturer
William H. Zywiak

Majors

- Bachelor of Science with an Actuarial Mathematics Major (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/bsactuarialmathematics/)
- Bachelor of Science with an Applied Mathematics and Statistics Major (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/bsappliedmathematicsstatistics/)

Concentration

- Actuarial Mathematics Concentration (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/actuarialconcentration/)

- Applied Statistics Concentration (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/appliedstatisticsconcentration/)

Minors

- Applied Statistics Minor (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/appliedstatisticsminor/)
- Mathematics Minor (http://catalog.bryant.edu/undergraduate/collegeofartsandsciences/departmentofmathematics/mathematicsminor/)

Actuarial Mathematics Courses

AM 230. Actuarial Statistics I. 3 Credit Hours.
This is the first course in probability and statistics for actuarial students.Topics include sample spaces, probability rules, counting techniques, Bayes rule, random variables, probability distributions and density functions, expected values and moment generating functions, and special probability distributions and densities.
Pre/Corequisites: MATH 223
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

AM 231. Actuarial Statistics II. 3 Credit Hours.
This course is a continuation of AM 230. Topics include transformation of variables; sampling distributions and order statistics, the central limit theorem; max likelihood estimates; method of moment estimates and hypothesis testing.
Prerequisites: MATH 223 and AM 230
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

AM 332. Actuarial Statistics III. 3 Credit Hours.
This course is an applied statistics course for actuaries. It covers the topics necessary for analysis of data. Topics include: Hypothesis testing, chi-square tests, Analysis of Variance, Simple and Multiple Regression, Time Series and Index Numbers.
Prerequisites: AM 231 or MATH 201
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

AM 333. Advanced Probability. 3 Credit Hours.
This course is devoted to the study of distribution classes and credibility. It is designed to prepare actuarial students for many of the topics covered in Exam STAM given by the Society of Actuaries. The topics of study include Risk Measures, Distribution Families, Coverage Modifications, Frequentist and Bayesian Estimation, and Credibility Theory. This course includes both theoretical analysis as well as applied problems that arise naturally in the insurance industry.
Prerequisites: AM 231
Session Cycle: Fall
Yearly Cycle: Annual.

AM 340. Mathematical Interest Theory I. 3 Credit Hours.
This course includes the measurement of interest; accumulation and discount of money; present value of a future amount; forces of interest and discount; equations of value; investment return; inflation; annuities (simple and complex); perpetuities; amortization and sinking funds; yield rates; spot and forward rates; and bond pricing. This course is designed to help prepare the student for Exam FM.
Prerequisites: MATH 223
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

AM 341. Mathematics of Finance, Insurance, and Pensions. 3 Credit Hours.
This course will review the mathematics of basic compound interest for determining the future amounts and present values of single and periodic investments. Advanced topics in the mathematics of finance will include complex annuities of fixed periodic amounts, annuities where the periodic payment amount increases arithmetically and/or geometrically, bonds, including duration analyses, investment rates of return, both dollar- and time-weighted, and reverse mortgages. Topics in the mathematics of insurance will include the development of mortality tables and computation functions for the determination of the present and accumulated values of life annuities, premium determination, and settlement payment options. Topics in the mathematics of pensions will include the mathematics of social security, defined benefit and defined contribution pension plans. Students receiving credit for AM 340 or AM 421 will not receive credit for this course.
Prerequisites: MATH 110 or equivalent
Session Cycle: Fall
Yearly Cycle: Alternate Years.

AM 342. Mathematical Interest Theory II. 3 Credit Hours.
This course, combined with Mathematical Interest Theory I, prepares students for Exam FM given by the Society of Actuaries. The topics cover fundamental actuarial theory as it pertains to interest and investments. This course includes mathematical valuation of securities and dividends; options, put-call parity, duration, evaluation and payoff and profit of derivative contracts, forwards, futures, and swaps. Additional topics include immunization and cash flows. This course not only helps the student prepare for Exam FM, but it also helps provide a cross-over in preparing for Exam IFM and 3F.
Prerequisites: AM 340
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

AM 391. Actuarial Math Internship. 3 Credit Hours.
Actuarial mathematic internships give students the opportunity for supervised employment in an area where they can apply actuarial mathematic theories and principles. Interns work at least ten hours a week, meet periodically with supervising faculty member, do research on their field of employment, and prepare a substantive report on work experience and research.
Prerequisites: Junior standing and approval by a supervising faculty member and the department chair.

AM 393. Exam P Seminar. 2 Credit Hours.
The goal of this course is to help students synthesize content from AM 230 (and some content from AM 231) and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam P. In addition this course will also develop students computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam P.
Pre/Corequisites: AM 231
Session Cycle: Spring
Yearly Cycle: Annual.

AM 394. Exam FM Seminar. 2 Credit Hours.
The goal of this course is to help students synthesize content from AM 340 (and some content from AM 342) and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam FM. In addition this course will also develop students computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this class should put students on track for taking Exam FM.
Pre/Corequisites: AM 342
Session Cycle: Fall
Yearly Cycle: Annual.

AM 421. Life Contingencies I. 3 Credit Hours.
This course is a study of single life functions including the measurement of mortality; life annuities; life insurance; and net annual premiums. This course, in conjunction with AM 422, is designed to help prepare actuarial students for Exam LTAM given by the Society of Actuaries.
Prerequisites: AM 230 and AM 340
Session Cycle: Fall
Yearly Cycle: Annual.

AM 422. Life Contingencies II. 3 Credit Hours.
A continuation of AM 421, including net premium reserves; gross premium reserves including expenses; joint-life functions; contingent functions; compound contingent functions; reversionary annuities; and multiple decrement functions. The course provides a theoretical basis of contingent payment models and the application of those models to insurance and other financial risks. This course, in conjunction with AM 421, is designed to help prepare actuarial students for Exam LTAM given by the Society of Actuaries.
Prerequisites: AM 421
Session Cycle: Spring
Yearly Cycle: Annual.

AM 440. Actuarial Mathematical Models and Stochastic Calculus. 3 Credit Hours.
The primary goal of this course is to provide the student a background in the mathematics of stochastic processes, risk, and financial economics as it relates to actuarial models. The underlying foundation of this course is the mathematics and economics of the pricing of financial options. The course will cover the theoretical basis of corporate finance and financial models, and it will highlight the application of those models to insurance and other financial risks. Taking this course will make it possible for the student to prepare for the Society of Actuaries Exam IFM and the Casualty Actuarial Society Exam 3F.
Prerequisites: AM 342 or FIN 465
Session Cycle: Fall
Yearly Cycle: Annual.

AM 451. Pension Fundamentals. 3 Credit Hours.
This one-semester course is designed to introduce the student to the social security system of the United States and to various deferred compensation concepts including defined benefit, defined contribution, target benefit, and profit sharing pension plans. Both the accumulation and distribution of pension funds are discussed via annuities certain and life annuities. Appropriate aspects of the Internal Revenue Code which govern deferred compensation will be discussed.
Prerequisites: One of the following: MATH 129, AM 340 or AM 341 or FIN 312
Session Cycle: Fall
Yearly Cycle: Annual.

AM 471. Fundamentals of Property and Casualty Reserving. 3 Credit Hours.
The reserve for unpaid claim liabilities is a major item on the balance sheet of every property and casualty (P&C) insurer. Estimating this quantity is a core responsibility of actuaries. This course will cover basic mathematical and accounting concepts relating to reserving, the triangluar loss development, deterministic reserve projection methods (e.g., loss-ratio and Bornhuetter-Ferguson techniques), common diagnostic statistics, characteristics of different US P&C lines of business, and GLM-based stochastic reserving methods, that utilize bootstrapping.
Prerequisites: AM 332
Session Cycle: Spring
Yearly Cycle: Annual.

AM 481. Ratemaking. 3 Credit Hours.
This course will cover the basic techniques of property and casualty ratemaking. Ratemaking is corefunction of actuaries, and is a necessary tool for satisfying an organization's strategic, operational, and regulatory goals and requirements. This course will cover much of the material on the ratemaking portion of the syllabus for Exam 5 of the Casualty Actuarial Society (CAS).
Prerequisites: AM 231 and AM 340 and junior standing
Session Cycle: Fall
Yearly Cycle: Annual.

AM 492. Advanced Actuarial Mathematics Seminar Exam LTAM. 2 Credit Hours.
The goal of this course is to help students synthesize content from the two life contingencies courses (AM 421 and AM 422), and apply that knowledge to solving actuarial problems such as those encountered in the context of the Society of Actuaries' Exam LTAM. In addition, this course will also develop the students' computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put the student on track for taking Exam LTAM.
Pre/Corequisites: AM 422
Session Cycle: Varies
Yearly Cycle: Varies.

AM 493. Advanced Actuarial Mathematics Seminar Exam STAM. 2 Credit Hours.
The goal of this course is to help students synthesize content on probability and stochastic modeling topics from the following courses: AM 231, AM 332, and AM 333. The synthesized knowledge will be applied to solving actuarial problems such as those encountered in the context of Exam STAM. In addition this course will also develop your computational skills and tacit knowledge of problem solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam STAM.
Pre/Corequisites: AM 333
Session Cycle: Varies
Yearly Cycle: Varies.

AM 494. Advanced Actuarial Exam Seminar IFM and 3F. 2 Credit Hours.
The goal of this course is to help students synthesize content on options (AM 342 or FIN 481) and stochastic calculus (AM 440), and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam IFM and 3F. In addition this course will also develop students computational skills and tacit knowledge of problem solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam IFM and 3F.
Pre/Corequisites: AM 440
Session Cycle: Varies
Yearly Cycle: Varies.

Mathematics Courses

MATH 101. Pre-Calculus. 3 Credit Hours.
MATH 101 is a pre-calculus course. Topics covered will include linear functions, power functions, graphical concepts, quadratic functions, rational functions, and exponential and logarithmic functions. In addition, there will be an extensive review of algebraic concepts. It is expected that, upon completion of this course, students will be prepared to take MATH 110. This course does not fulfill a Mathematics requirement.
Prerequisites: Math Placement Exam
Session Cycle: Fall
Yearly Cycle: Annual.

MATH 110. Mathematical Analysis. 3 Credit Hours.
MATH 110 is an applied mathematics course. Although it is weighted more heavily toward calculus and its applications, many pre-calculus topics will be reviewed prior to the corresponding calculus topic. Topics covered will include differentiation, integration, curve sketching and optimization techniques. Applications are keyed to management, economics, finance, and the social and natural sciences. A brief unit on Mathematics of Finance will also be covered.
Prerequisites: Math Placement Exam
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 121. Calculus and Analytic Geometry I. 3 Credit Hours.
This is the first course for Actuarial Mathematics, Applied Math and Statistics, Applied Economics, Biology and Environmental Science majors, and those concentrating in Applied Statistics. The course is also recommended for the math minors. Topics include limits, continuity, derivatives, and integrals, along with their application to the Mean Value Theorem, curve sketching and optimization, the calculus of transcendental functions, and area between curves.
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 122. Calculus and Analytic Geometry II. 3 Credit Hours.
This course is a continuation of MATH 121, designed for Actuarial Mathematics, Applied Math and Statistics, Applied Economics, Biology and Environmental Science majors, and those concentrating in Applied Statistics. It is recommended for the math minors also. Topics include L'Hopital's Rule, the calculus involving inverse trigonometric functions, integration methods, modeling with differential equations, geometric series, MacLaurin and Taylor Polynomials and Series, introduction to partial derivatives and multiple integrals.
Prerequisites: MATH 121
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 129. Mathematics of Finance. 3 Credit Hours.
This course is an intensive study of mathematics that can be applied in business and finance. Topics include simple and ordinary interest, simple bank discount, compound interest, simple and complex annuities, annuities in perpetuity, and geometrically varying annuities. The mathematics for determining present value, future amount, and periodic annuity payments is developed. Further, the concepts of exponential and logarithmic functions are presented in order to be able to determine time duration. The students are shown interest rates in annuities, which cannot be determined explicitly by algebraic methods but can be determined by use of Goal Seek function in Excel. Fundamental linear programming and breakeven models (that include time delayed revenue and borrowed funds) are also presented. Students that receive credit for MATH 110 or MATH 110 Honors cannot receive credit for MATH 129.
Session Cycle: Fall
Yearly Cycle: Annual.

MATH 201. Statistics I. 3 Credit Hours.
In this course students are taught the concepts necessary for statistical analysis and inference. Topics include descriptive statistics, classical probability, probability distributions, confidence intervals, and hypothesis testing, chi-square analysis, simple linear regression and correlation.
Prerequisites: MATH 110 or equivalent
Session Cycle: Fall, Spring, Summer
Yearly Cycle: Annual.

MATH 223. Calculus and Analytic Geometry III. 3 Credit Hours.
This course is the third of three calculus courses required of actuarial and applied mathematics and statistics majors. Topics include the conic sections, circles, parabolas, ellipses, and hyperbolas, polar coordinates, vectors and vector-valued functons, functions of more than one variable dealing with partial derivatives with its mathematical applications and the calculation of double and triple integrals.
Prerequisites: MATH 122
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 226. Linear Algebra. 3 Credit Hours.
This course is an introduction to the topic of Linear Algebra. The topics covered will include the study of matrices, determinants, vector spaces, subspaces, row and column spaces, null spaces, linear transformations, and eigenvalues and eigenvectors.
Prerequisites: MATH 121
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 228. Discrete Structures. 3 Credit Hours.
This course introduces the foundations of discrete mathematics as they apply to information technology, focusing on providing a solid theoretical foundation for further work. Topics include propositional logic, sets, growth of functions, simple proof techniques, elementary number theory, counting techniques, relations and graph theory.
Pre/Corequisites: MATH 110 or equivalent
Session Cycle: Spring
Yearly Cycle: Varies.

MATH 350. Statistics II. 3 Credit Hours.
A continuation of MATH 201, this course provides students further concepts necessary for statistical analysis and inference. Topics include analysis of variance, multiple regression and correlation, model building, chi-square tests, and nonparametric statistics.
Prerequisites: MATH 201
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 354. Software Application for Mathematics. 3 Credit Hours.
This course introduces students to the use of Microsoft Visual Basic behind Excel spreadsheets. Students are taught to write computer programs based on specified criteria. Excel functions and Goal Seek are used in a variety of applied project assignments. Topics typically include simulation, mathematical distributions, and statistical analyses. Additional topics may include writing of stand-alone programs with Visual Basic forms, manipulation of data in Excel or Microsoft Access, and/or the use of statistical packages such as SAS.
Prerequisites: MATH 201 or AM 230
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 391. Applied Mathematics and Statistics Internship. 3 Credit Hours.
Applied mathematics and/or statistics internships give students the opportunity for supervised employment in an area where they can apply their theories and principles. Interns work at least ten hours a week, meet periodically with a supervising faculty member, conduct research on their field of employment, and prepare a substantive report on work experience and research.
Prerequisites: Junior standing and approval by a supervising faculty member and the department chair.

MATH 409. Elementary Number Theory. 3 Credit Hours.
This course will cover topics such as divisibility, prime numbers, Fundamental Theorem of Arithmetic, Euclid's Algorithm, Pascal's Triangle, Fibonacci numbers, congruences and residue classes, Diophantine equations, Euler's Phi Function, Fermat's Last Theorem, and Pythagorean Triples. A major application in the course will be to Cryptography. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 201 or permission of the instructor
Session Cycle: Spring
Yearly Cycle: Annual.

MATH 421. Statistical Analysis With R. 3 Credit Hours.
This course covers the application of R in a wide range of subjects in data analysis. The statistical topics include descriptive statistics; hypothesis testing; probability distribution; Bayesian statistics; predictive modelling; and unsupervised learning. Students will also learn how to write functions in R, Rmarkdown, and various R famous packages such as ggplot2, caret, mosaic, dplyr.
Prerequisites: MATH 350 or AM 332
Session Cycle: Fall
Yearly Cycle: Annual.

MATH 435. Geometry. 3 Credit Hours.
Since the time of Euclid (330 BC) the study of Geometry has been regarded as s foundation of western education and the preferred context in which to teach young adults the purpose and value of logical thinking. This course is offered to provide undergraduate and graduate level mathematics education students and others an introduction to and a mastery of both the classical and analytic aspects of Euclidean Geometry. The ideas of point, line, plane, triangle, quadrilaterals, parallelism and lack of it, similarity, congruence, area, volume and Loci will be formally presented through an axiomatic method using definitions, postulates and geometric proofs. The structure, the pedagogy and the presentation of the above topics will also be emphasized throughout the course. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 110 or permission of instructor
Session Cycle: Spring
Yearly Cycle: Varies.

MATH 455. SAS Programming and Applied Statistics. 3 Credit Hours.
This course provides an introduction to SAS programming. It also covers statistical applications utilizing both SAS and Enterprise Guide. Some of the topics covered in the first part of this course include: reading raw data files and SAS data sets; investigating and summarizing data by generating frequency tables and descriptive statistics; creating SAS variables and recoding data values; subsetting data; combining multiple SAS files; creating listing, summary, HTML, and graph reports; managing SAS data set input and output, working with different data types, and manipulating data. In the second part of the course, we apply SAS and Enterprise Guide to the analysis of data using the topics of ANOVA, regression, and logistic regression. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 350 or AM 332 or ECO 210 or ECO 315
Session Cycle: Spring
Yearly Cycle: Annual.

MATH 456. Statistical and Mathematical Decision Making. 3 Credit Hours.
This course provides an introduction to the concepts and methods of Decision Science, which involves the application of mathematical modeling to problems of decision making under uncertainty. It also provides a foundation in modeling with spreadsheets. Topics include linear programming, goal programming, nonlinear programming, decision analysis, and simulation.
Prerequisites: MATH 201 or AM 231
Session Cycle: Spring
Yearly Cycle: Varies.

MATH 460. Applied Data Mining. 3 Credit Hours.
Employing SAS Enterprise Miner software with real-world case studies, this course introduces students to the current theories, practices, statistical tools and techniques in "data mining," which embodies cutting-edge methods to reveal competitive insight, market advantage, and strategic opportunities. This course will cover the most useful statistical tools in data mining such as cluster analysis, logistic regression, classification trees, and neural networks. In addition, a comprehensive real-world data project will be required along with a presentation to the class and other interested parties of key aspects of the project with an analysis of the results. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 350 or AM 332
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 461. Applied Multivariate Statistics. 3 Credit Hours.
After a brief review of multiple regression and analysis of variance, students are introduced to multivariate statistical techniques including principal components analysis, factor analysis, cluster analysis, discriminant analysis, logistic regression and multivariate analysis of variance. This course will emphasize practical applications rather than theory. The computer package SAS will be used for analysis. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 350 or AM 332
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH 470. Statistical Design and Analysis of Experiments. 3 Credit Hours.
This course is an introduction to the design and analysis of statistical experiments. It will cover the main elements of statistical thinking in the context of experimental design and ANOVA. Students will learn to choose sound and suitable design structures and also how to explore real data sets using a variety of graphs and numerical methods and analyze these data sets from designed experiments and reach justifiable conclusions based on the analyses. This will be an applied course and will utilize the SAS statistical package. This is a SAS Certified class. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 350 or AM 332
Session Cycle: Fall
Yearly Cycle: Annual.

MATH 475. Applied Analytics Using SAS. 3 Credit Hours.
This course will include an in-depth review of applied analytical approaches, challenges, and solutions. A hands-on approach will be emphasized throughout the semester. A brief review of analytical techniques through material covered in MATH 350 or AM 332 will be included, as well as an introduction to further analytical tools such as multivariate analysis, predictive modeling, time series analysis and survey analysis. The SAS statistical package will be utilized for applying hand-on analysis to real world data problems. This is a SAS Certified course. For qualified students, this course may be taken as a 500 level graduate content course. Permission of the instructor is required.
Prerequisites: MATH 350 or AM 332
Session Cycle: Spring
Yearly Cycle: Annual.

MATH 488. Sports Statistics. 3 Credit Hours.
This course introduces a number of statistical methods beyond the elementary level and combines theory with application. The goal is for the student to develop the ability to compare and contrast a number of statistical methods focusing on their application to the sports industry. A major component of this course is to understand the strengths and weaknesses of various statistical methods.
Prerequisites: AM 231 or MATH 350
Session Cycle: Spring
Yearly Cycle: Annual.

MATH 490. Applied Mathematics and Statistics Capstone Seminar. 3 Credit Hours.
The students will be required to research and write an applied mathematical or statistical thesis, and make oral presentations of the results. This course will develop the student's research skills and ability to write and present applied mathematical or statistical topics. Projects that solve problems of an interdisciplinary nature are encouraged.
Prerequisites: Senior standing and permission of the instructor
Session Cycle: Spring
Yearly Cycle: Annual.

MATH 497. Directed Study in Mathematics. 3 Credit Hours.
This is an opportunity for students to do independent, in-depth research for academic credit. The student works on an individual basis under the direction of a member of the mathematics department. The main requirement of the course is the development of a substantial paper or project.

MATH E110. Mathematical Analysis. 3 Credit Hours.
MATH 110 is an applied mathematics course. Although it is weighted more heavily toward calculus and its applications, many pre-calculus topics will be reviewed prior to the corresponding calculus topic. Topics covered will include differentiation, integration, curve sketching and optimization techniques. Applications are keyed to management, economics, finance, and the social and natural sciences. A brief unit on Mathematics of Finance will also be covered. This course meets five days a week.
Prerequisites: Math Placement exam
Session Cycle: Fall, Spring
Yearly Cycle: Annual.

MATH E201. Statistics I. 3 Credit Hours.
In this course students are taught the concepts necessary for statistical analysis and inference. Topics include descriptive statistics, classical probability, probability distributions, confidence intervals, and hypothesis testing, chi-square analysis, simple linear regression and correlation. This course meets five days a week.
Prerequisites: MATH 110 or equivalent
Session Cycle: Fall, Spring, Summer
Yearly Cycle: Annual.

MATH ST300. Special Topics in Mathematics Mathematics of the Arts and Creativity. 3 Credit Hours.
This applied Mathematics course will consist of a comprehensive review of the mathematical underpinnings of visual art, music, and creativity (and to a lesser extent architecture). Mathematics will include, geometry, base 7, base 8, fractals, and differential equations. Course assignments will include using the open access programming software R to generate a fractal image or fractal video. This course is designed to enhance the student's appreciation and understanding of Math and the Arts, and to facilitate the student's creating new visual art and music by using mathematical approaches. This course may also help students develop more engaging presentations (eye-catching visuals/ear-catching audio).
Prerequisites: AM 231 or MATH 201 or permission of the instructor
Session Cycle: Fall
Yearly Cycle: Annual.