MATHEMATICS (MATH)

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.
Session Cycle: Fall
Yearly Cycle: Annual.

MATH 110. Mathematical Analysis. 3 Credit Hours.
MATH 110 is an applied mathematics course that presents a mathematical way of thinking and provides students with experiential opportunities to explore how to quantitatively analyze complex problems. Four general areas are covered: a review of mathematical functions and their applications; the mathematics of finance; creation, use, and interpretation of models involving real-world data; and linear programming and optimization. Applications are relevant for sustainability issues, business and management, economics and finance, and the social and natural sciences. Students will be placed, by the Math Department, in the appropriate course based on standardized testing and previous math course performance.

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, in the context of real-world-type data analysis and modeling. Topics include descriptive statistics, classical probability, probability distributions, confidence intervals, and hypothesis testing, chi-square analysis, simple linear regression, and correlation. One or more case studies, accompanied by references to survey creation and data collection, provide experiential opportunities for students. Students will be placed, by the Math Department, in the appropriate course based on standardized testing and previous math course performance.

MATH 202. Biostatistics. 3 Credit Hours.
This course serves as an introduction to applying statistical thinking to biological problems. Topics include numerical and graphical summaries of data, basic probability concepts, sampling distributions, basic concepts for estimation, estimation for population means and proportions, basic concepts for hypothesis testing, hypothesis tests for population means and proportions, analysis of variance, sample size calculations, inferences from two samples, correlation and regression.
Session Cycle: Every Semester.

MATH 203. Sports Statistics I. 3 Credit Hours.
This course provides a fundamental understanding of basic probability and statistics with a focus on sports applications. Methods and theory behind commonly used statistics will be applied in a sports setting. As an aid in statistical analysis, Excel "Data Analysis" functions will be used. All major US sports will be considered as well as selected international sports. Assignments will often allow the student to study a sport of their own choosing. Fantasy sports, betting, and e-sports will also be considered where applicable.
Session Cycle: Every Semester.

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 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.

MATH ST310. Spec. Topics in Mathematics: Culture, History, Business Environment, and Analytical Research Aboard. 3 Credit Hours.
This course studies the cultural, history, and business environment of Japan. Multiple analytical research projects will be carried out throughout the trip, including business culture study, population and aging study, US-Japan economics analysis, climate change impact in east Asia, insurance risk overview, and analytics study. Students are also required to complete an after-trip comprehensive paper with a topic of their choice. This course will count towards one of the 3 advanced topics in actuarial mathematics for actuarial math major or one of the 3 advanced electives for applied mathematics and statistics major.
Session Cycle: Fall Semester.