MATHEMATICAL SCIENCES

Academic Year

2014-2015

School

School of Science, Engineering and Technology School Web site

School Dean

Winston F. Erevelles, Ph.D. werevelles@stmarytx.edu

Department

Mathematics

Department Chair

Ian Martines, Ph.D. imartines@stmarytx.edu

Description of Program/Major

Mathematics is more than just the theory of numbers. It discovers tools from which a quantitative understanding of our world is made possible. Moreover, the language of mathematics is truly a universal language, transcending ethnic, societal, and national boundaries. Finally, mathematics also is a critical filter, opening doors to exciting and high-paying careers in business, government, teaching and research.

Students majoring in mathematics at St. Mary's University are exposed to the theoretical foundations of mathematics and experience its applications in a variety of disciplines. Innovative teaching and learning environments allow students to develop critical thinking and general problem solving strategies. In addition, our mathematics graduates understand the power and usefulness of computers equipped with graphing and symbolic algebra. Classroom assignments enhance the students' abilities to communicate mathematics effectively both orally and in writing. Students have the opportunity to hear about current research and present their own research at the undergraduate mathematics seminar.

Degree Requirements

Core Curriculum (SMC)

St. Mary's University Core (30 Hours)
All St. Mary's Core SMC13## "Reflection" courses must be completed before registering for SMC23## "Practice" courses. "Reflection" courses can be taken in any order followed by "Practice" courses in any order.

SMC 1301	Foundations of Civilization	3
SMC 1311	Foundations of Reflection: Self	3
SMC 1312	Foundations of Reflection: Nature	3
SMC 1313	Foundations of Reflection: Others	3
SMC 1314	Foundations of Reflection: God	3
SMC 2301	Foundations of Practice: Ethics	3
SMC 2302	Foundations of Practice: Civic Engagement and Social Action	3
SMC 2303	Foundations of Practice: Fine Arts and Creative Process	3
SMC 2304	Foundations of Practice: Literature	3

SMC 4301	Capstone Seminar: Prospects for Community and Civilization	3

School Specific Core (SSC)

School of Science, Engineering, and Technology Specific Core (21 Hours)

Speech	SE 1321 (for international students), SE 1341, SE 2333, SE 3391	3
Composition and Rhetoric (grade of "C" or better)	EN 1311, EN 1313 (for international students)	3
Foreign Languages	Six hours at the sophomore level (2311, 2312) in a Foreign Language previously studied for a minimum of one year; Or, 6 hours of introductory level (1311, 1312) in a Foreign Language not previously studied; Or, 12 hours of CLEP credit for a language previously studied.	6
Social Science	BA 1310, BA 3325, CJ 2300, CJ 3300, EC 2301, EC 2303, PO 1311, PO 1312, PO 1314, PS 1301, PS 3386, SC/CR 1311, SC 3321, HU 3300, HU 3303	3
Theology	Advanced Theology 33XX	3
Fine Arts	AR, DM, MU or Literature: EN 2321, 2322, 2353, 2354, 2355, 2356	3

Four Year Degree Plan

Sample Degree Plan

Department Courses and Descriptions

MT 0301
Intermediate Algebra (3)
Development of algebraic skills necessary as a prerequisite for students not meeting standards for entry into credit courses.

MT 0401
Math Skills (4)
A four-hour non-credit course combining review of fundamental mathematics and algebraic skills necessary for entry into college-level courses. AEP students enrolled in this course are not required to take the COMPASS Math test but must take the AEP's pre- and post-course diagnostic tests in algebra. Passing Math 0401 with a C or better allows students to enroll in credit math courses required by their major course of study. Strict adherence to the university attendance policy, including weekly participation in small-group study sessions led by a peer tutor, is necessary to complete this course.

MT 1111
Trigonometry (1)
Trigonometric and inverse trigonometric functions; their basic properties and their graphs. Trigonometric identities and equations.

MT 1301
Concepts I (3)
A mathematics course designed for liberal arts students. A variety of concepts are covered. Topics will be drawn from the following areas: introductory treatments of sets, logic, number systems, number theory, geometry, relations, functions, graph theory, optimization algorithms, linear programming, and coding theory. Prerequisite: MT0301 or COMPASS College Algebra score ? 45 or COMPASS Algebra score ? 66

MATHEMATICAL SCIENCES

MT 1302
Concepts II (3)
A mathematics course designed for liberal arts students. Elementary probability and statistics is the main focus of the course. Concepts I is not a prerequisite for Concepts II. Prerequisite: MT0301 or COMPASS College Algebra score ? 45 or COMPASS Algebra score ? 66

MT 1303
College Algebra (3)
Linear and quadratic functions, graphing, inverse functions. Polynomial, exponential, logarithmic functions and their graphs. Linear and exponential regression models. Systems of equations, matrices and determinants. Prerequisite: MT0301 or COMPASS College Algebra score ? 45 or COMPASS Algebra score ? 66

MT 1305
Finite Mathematics (3)
Systems of linear equations and matrices, mathematics of finance, probability, probability distributions and statistics. Excel software package will be used. Prerequisite: MT0301 or COMPASS College Algebra score ? 45 or COMPASS Algebra score ? 66

MT 1306
Calculus for Business (3)
Differential and integral calculus of algebraic, exponential, and logarithmic functions and models with applications to business. Excel software package will be used. Prerequisite: MT 1303 or MT1411 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 1411
PreCalculus (4)
Functions, graphing, and inverse functions. Properties and graphs of exponential and logarithmic functions. Trigonometric functions of angles with right triangle applications. Trigonometric functions of real numbers, inverses, graphs. Trigonometric identities and equations, conic sections and polar coordinates. Prerequisite: MT 1303 or MT1411 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 2303
Introduction to Probability and Statistics (3)
This is a non-calculus introduction to the basic principles and practices of statistics. The course begins with the description and display of one - variable and two variable data sets, including histograms, stemplots, and scatterplots, as well as the computation and interpretation of mean, standard deviation, and correlation. Sufficient probability theory is developed to provide the foundation for the simpler inferential methods treated in the course: confidence intervals and tests of significance for one and two populations. A statistical software package is used throughout the course, including student homework projects. Prerequisite: MT 1303 or 1306 or MT2412 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 2412
Calculus I (4)
Limits, continuity, derivatives, and integrals of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions; indeterminate forms; applications. Prerequisite: MT 1411 or COMPASS Trigonometry score ? 46

MT 2413

Calculus II (4)
Applications of integrals; formal integration techniques; numerical integration; improper integrals; sequences; series; power series; Taylor series; applications of series. Prerequisite: MT 2412 or equivalent

MT 3304
Essential Elements in Math I (3)
A study of topics from elementary mathematics with a problem - solving approach. The course is designed for and is to be taken only by elementary education majors. Topics for the course include problem-solving, sets, numeration systems, the real numbers, number theory, probability, statistics, geometry, motion geometry, and concepts of measurement. Prerequisite: MT 1303 or MT 1411 or MT2412 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 3305
Essential Elements in Math II (3)
Strategies for teaching are developed concurrently with content from the elementary mathematics curriculum. National and state educational standards in mathematics will be addressed. An in-depth analysis of the state assessment standards for both teachers and students will be included. Students will learn and experience research based instructional strategies that promote mathematical excellence in the classroom. This course is intended for Elementary Education majors.

MT 3306
Essential Elements of Mathematics III (3)
A study of topics from elementary mathematics with an inquiry-based learning approach. Topics for the course include foundations of geometry, measurement, area, volume, geometry of motion and change, probability and statistics, and pictorial representation of data. Technology will be integrated throughout the course. Prerequisite: MT 1303 or MT 1411 or MT2412 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 3311
Differential Equations (3)
First-order equations; linear equations of second order and higher; applications; systems of linear differential equations; the Laplace Transform. Prerequisite: MT 2413.

MT 3312
Advanced Math for Engineers (3)
Linear algebra; fundamental concepts of classical optimization; vector differential calculus, vector fields; complex variables; calculus of several variables. Prerequisite: MT 3311 or MT 3324

MT 3313
Advanced Math for Industrial Engineering (3)
Multidimensional differential calculus with emphasis on real-valued functions. Fundamental concepts of classical optimization, non-linear programming and elementary linear algebra. Prerequisites: MT 3311 or MT 3324. Students can not receive credit for both MT 3313 and MT 3315.

MT 3315
Advanced Math for Electrical Engineering (3)
Vector differential calculus with emphasis on gradient, divergence and curl. Vector integral calculus with emphasis on Green's theorem, Stoke's theorem and the divergence theorem of Gauss. Elementary complex algebra and functions, Elementary linear algebra. Prerequisites: MT 2413. Students cannot receive credit for both MT 3313 and MT 3315.

MT 3321
Introduction to Modern Algebra (3)
Algebraic structures with emphasis on the theory of groups. Prerequisite: MT 2413.

MT 3323
Discrete Math Structures (3)
Logic, argument forms, methods of proof, proof writing, set theory, counting principles, recursion relations, graphs and trees. Prerequisite: MT 1303 or MT 1411 or MT2412 or COMPASS College Algebra score ? 46 or COMPASS Trigonometry score ? 45

MT 3324
Linear Algebra (3)
Linear systems and matrices; determinants; vectors and vector spaces; linear transformations and matrices, eigenvalues and eigenvectors; applications. A computer software package is integrated through out the course. Prerequisite: MT 2413

MT 3361
History of Math (3)
The history of Mathematics is covered from the time of Pythagorus to the creation of non- Euclidean geometries in the mid-19th century. This course could be taken by non- Majors.

MT 3372
Math Modeling (3)
Creative model construction and the modeling process, model fitting and models requiring optimization, empirical model construction, modeling dynamic behavior.

MT 3375
Theory of Interest (3)
An introductory course covering topics related to interest theory and financial derivatives. Topics with include the growth of money, equations of value and yield rates, annuities, amortizations, bonds, and stocks. Additional advanced topics from financial derivatives may also be included. This course is suitable for students intending to take professional actuarial exams. Prerequisite: MT2412.

MT 3384
Topics in Applied Statistics (3)
One semester courses currently available under the following titles: 1) Introduction to Non- parametric Statistical Inference; 2) Introduction to Applied Regression and Correlation; 3) Fundamentals of Sampling; 4) Analysis of Variance. Prerequisite: MT 2303. When different topics are treated, the number may be repeated for additional credit.

MT 3392
Elementary Math Analysis (3)
Sequences, sub sequences, convergence, Heine- Borel Theorem, functions, limits, continuity, uniform continuity, compactness, derivatives, Mean- Value Theorem, L'Hos pital's Rule, Inverse Function Theorem, Riemann integration, and Fundamental Theorem of Calculus. Emphasis is on rigorous proof and communicating mathematics in verbal and written form. Prerequisites: MT3321 or MT3323 or MT3324.

MT 3414
Calculus III (4)

Partial derivatives, multiple integration, three- dimensional vector calculus. Prerequisite: MT 2413.

MT 4311
Complex Variables (3)
Complex Numbers; Analytic Functions; Elementary Functions; Mapping by Elementary Functions; Integrals; Series; Residues and Poles. Prerequisite: MT 3414.

MT 4312
Boundary Value Problems (3)
Fourier Series, Fourier and Laplace transforms and boundary value problems of partial differential equations. Prerequisite: MT3311

MT 4331
Probability Theory (3)
Discrete and continuous probability spaces; random variables and their distribution. Prerequisite: MT 2413.

MT 4332
Statistics (3)
Descriptive statistics. Sampling distributions, estimation, tests of hypotheses, regression and correlation. Prerequisite: MT 2413

MT 4333
Applied Statistical Methods (3)
This course will cover regression analysis and time series. The topics in regression will include: single and multiple linear regression, hypothesis testing and confidence intervals, testing of models, data analysis and appropriateness of models. The topics in time series/forecasting will include: linear time series models, moving average, regression-based and/or ARIMA models, estimation, data analysis and forecasting with time series models, forecast errors and confidence intervals. Prerequisite: MT4332

MT 4341
Modern Geometry (3)
A study of elementary geometry from an advanced point of view. Designed primarily for secondary school teachers. Topics include the history of geometry, the axiomatic method and theorem proving, Euclidean constructions, non- Euclidean geometries, curriculum and learning issues involving geometry, and technology and the use of software in the teaching of geometry.

MT 4342
Topics in Geometry (3)
When different topics are treated, MT 4342 may be repeated for additional credit on approval of the Chairperson.

MT 4351
Numerical Analysis I (3)
Roots of Equa tions; interpolation and approximation; numerical differentiation and integration; solutions of linear systems of equations and matrix inversion. Prerequisite: MT 2413.

MT 4352

Numerical Analysis II (3)
The numerical solution of ordinary differential equations; introduction to partial differential equations; numerical solutions of nonlinear systems of equations. Prerequisite: MT 3311 and MT 4351.

MT 4395
Senior Mathematics Seminar (3)
A capstone course for mathematics majors in the Bachelor of Sciences programs. Each student selects a mathematical area of interest, researches the selected area, generates a reference list and research paper, and presents the paper to a seminar of faculty and students. Advanced mathematical topics will also be convered (topics may vary). Prerequisite: MT3324 and either MT3321 or MT3392 or MT4331.

MT 4396
Exam P/1 Preperation (3)
This course will prepare students in the actuarial sciences concentration for the professional actuarial Exam P/1. Emphasis will be placed on problem solving and exam taking techniques. Topics reviewed will cover calculus, general probability, univariate probability distributions, multivariate probability distributions, moment generating functions, transformations, and other topics typically encountered on the Exam P/1. Prerequisite: MT 4331. Can only be taken by students seeking the B.A. in Mathematics with a concentration in Actuarial Science degree or students with a strong interest in passing actuary exams.

MT 5160
Independent Study (1)
Prerequisite: Consent of instructor and Chairperson.

MT 5260
Independent Study (2)
Prerequisite: Consent of instructor and Chairperson.

MT 5311
Topics in Analyisis (3)
When different topics are treated, MT 5311 may be repeated for additional credit on approval of the Chairperson. Prerequisite: MT 3414 or consent of instructor.

MT 5360
Independent Study (3)
Prerequisite: Consent of instructor and Chairperson.

Department Faculty

Mathematical Sciences Faculty Website

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