

# MATHEMATICAL SCIENCES

## Academic Year

2011-2012

## School

School of Science, Engineering and Technology [School Web site](#)

## School Dean

Winston F. Erevelles, Ph.D. [werevelles@stmarytx.edu](mailto:werevelles@stmarytx.edu)

## Department

Mathematics

## Department Chair

Mary Wagner-Krankel, Ph.D. [mwagnerkrankel@stmarytx.edu](mailto:mwagnerkrankel@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 (Formerly PL 1310) | 3 |
| SMC 1312 | Foundations of Reflection: Nature                  | 3 |

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|          |   |   |
|----------|---|---|
| SMC 1313 | Foundations of Reflection: Others   | 3 |
| SMC 1314 | Foundations of Reflection: God (Formerly TH 2301)   | 3 |
| SMC 2301 | Foundations of Practice: Ethics (Formerly PL 2332)  | 3 |
| SMC 2302 | Foundations of Practice: Civic Engagement and Social Action                                     | 3 |
| SMC 2303 | Foundations of Practice: Fine Arts and Creative Process<br>(Formerly FA 1101, FA 1102, FA 1103) | 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<br>(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 4-year degree plan](#)

## Department Courses and Descriptions

### Math Skills (4)

#### MT 0401

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.

### Trigonometry (1)

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MT 1111

Trigonometric and inverse trigonometric functions; their basic properties and their graphs. Trigonometric identities and equations.

## **Concepts I (3)**

MT 1301

A mathematics course designed for liberal arts students. A variety of concepts are covered. The topics include networks, optimization algorithms, planning, scheduling, linear programming, coding, and web searching.

## **Concepts II (3)**

MT 1302

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.

## **College Algebra (3)**

MT 1303

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.

## **Finite Mathematics (3)**

MT 1305

Systems of linear equations and matrices, mathematics of finance, probability, probability distributions and statistics. Excel software package will be used.

## **Calculus for Business (3)**

MT 1306

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 equivalent

## **College Algebra and Trigonomet (4)**

MT 1411

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 1306 or equivalent.

## **Intro to Probability and Stati (3)**

MT 2303

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.

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Prerequisite: MT 1303 or the equivalent.

## **Univariate Calculus I (4)**

MT 2412

Limits, continuity, derivatives, and integrals of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions; indeterminate forms; applications. Prerequisite: MT 1411 or equivalent.

## **Univariate Calculus II (4)**

MT 2413

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

## **Intermediate Algebra (3)**

MT 301

Development of algebraic skills necessary as a prerequisite for students not meeting standards for entry into credit courses.

## **Essential Elements in Math I (3)**

MT 3304

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

## **Essential Elements in Math II (3)**

MT 3305

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.

## **Essential Elements of Mathematics III (3)**

MT 3306

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

## **Differential Equations (3)**

MT 3311

First-order equations; linear equations of second order and higher; applications; systems of linear differential equations; the Laplace Transform. Prerequisite: MT 2413.

## **Advanced Math for Engineers (3)**

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MT 3312

Linear algebra; fundamental concepts of classical optimization; vector differential calculus, vector fields; complex variables; calculus of several variables. Prerequisite: MT 3311 or MT 3324 or consent of instructor.

## **Advanced Math for Indu Engineer (3)**

MT 3313

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.

## **Advanced Math for Ele Engineer (3)**

MT 3315

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.

## **Intro to Modern Algebra (3)**

MT 3321

Algebraic structures with emphasis on the theory of groups. Prerequisite: MT 2413 or consent of instructor.

## **Discrete Math Structures (3)**

MT 3323

Logic, argument forms, methods of proof, proof writing, set theory, counting principles, recursion relations, graphs and trees. Prerequisite: MT 1303 or MT 1411.

## **Linear Algebra (3)**

MT 3324

Linear systems and matrices; determinants; vectors and vector spaces; linear transformations and matrices, eigenvalues and eigenvectors; applications. A computer software package is integrated throughout the course. Prerequisite: MT 2413 or consent of instructor.

## **History of Math (3)**

MT 3361

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.

## **Math Modeling (3)**

MT 3372

Creative model construction and the modeling process, model fitting and models requiring optimization, empirical model construction, modeling dynamic behavior.

## **Topics in Applied Statistics (3)**

MT 3384

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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: An introductory statistics course such as PS, SC, 3381, MT 2303, or consent of the instructor. When different topics are treated, the number may be repeated for additional credit.

## **Elementary Math Analysis (3)**

MT 3392

Sequences, subsequences, convergence, Heine- Borel Theorem, functions, limits, continuity, uniform continuity, compactness, derivatives, Mean- Value Theorem, L'Hospital'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: At least one of MT 3321/3323/3324.

## **Multivariate Calculus (4)**

MT 3414

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

## **Complex Variables (3)**

MT 4311

Complex Numbers; Analytic Functions; Elementary Functions; Mapping by Elementary Functions; Integrals; Series; Residues and Poles. Prerequisites: MT 3414 or consent of Instructor.

## **Boundary Value Problems (3)**

MT 4312

Fourier Series, Fourier and Laplace transforms and boundary value problems of partial differential equations.

## **Probability and Statistics I (3)**

MT 4331

Discrete and continuous probability spaces; random variables and their distribution. Prerequisite: MT 2413.

## **Probability and Statistics II (3)**

MT 4332

Descriptive statistics. Sampling distributions, estimation, tests of hypotheses, regression and correlation. Prerequisite: MT 4331 or consent of Instructor.

## **Modern Geometry (3)**

MT 4341

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.

## **Topics in Geometry (3)**

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MT 4342

When different topics are treated, MT 4342 may be repeated for additional credit on approval of the Chairperson.

## **Numerical Analysis I (3)**

MT 4351

Roots of Equations; interpolation and approximation; numerical differentiation and integration; solutions of linear systems of equations and matrix inversion. Prerequisite: MT 2413.

## **Numerical Analysis II (3)**

MT 4352

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 or consent of instructor.

## **Senior Mathematics Seminar (3)**

MT 4395

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 covered (topics may vary). Prerequisite: MT3324 and either MT3321 or MT3392 or MT4331.

## **Independent Study (1)**

MT 5160

Prerequisite: Consent of instructor and Chairperson.

## **Independent Study (2)**

MT 5260

Prerequisite: Consent of instructor and Chairperson.

## **Topics in Analysis (3)**

MT 5311

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.

## **Independent Study (3)**

MT 5360

Prerequisite: Consent of instructor and Chairperson.

## **Department Faculty**

[Mathematical Sciences Faculty Website](#)

## **Department Website**

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[Mathematical Sciences Website](#)