# DIVISION OF MATHEMATICS

**Web Site:** https://twu.edu/mathematics/

***Division Lead:*** *Brandi Falley, Ph.D.*
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## Graduate Degrees Offered

- M.S. in Mathematics (https://catalog.twu.edu/graduate/arts-sciences/mathematics/mathematics-ms/)

The Division of Mathematics offers graduate studies leading to the following degree: Master of Science in Mathematics.

The Master of Science prepares the student to enter the workforce or to pursue doctoral degree programs in mathematics, statistics, applied mathematics, or related fields.

The Master of Science in Mathematics also provides the student an opportunity to include computer science and statistics in the plan of study.

The Master of Arts in Teaching (M.A.T.) degree offered through the College of Professional Education prepares graduate students to be future mathematics teachers at the 4-8 or the 7-12 levels in mathematics. Mathematics courses required for the degree are determined in consultation with a departmental advisor.

All students must meet the University requirements as outlined in the Admission to the TWU Graduate School (https://catalog.twu.edu/graduate/graduate-school/admission-graduate-school/) section of the catalog.

The academic program may have additional admission criteria that must also be completed as outlined on the program's website.

## Minors

Mathematics minors consist of a minimum of six semester credit hours of organized graduate courses in the Division of Mathematics as defined by the mathematics representative on the candidate's advisory committee.

## Faculty

*FALLEY, BRANDI N., Professor of Mathematics; Division Lead of Mathematics, B.A., Ouachita Baptist University; M.S., Baylor University; Ph.D., Baylor University

*GRIGORIEVA, ELLINA, Professor of Mathematics, B.S., Lomonosov Moscow State University, Russia; M.S., Lomonosov Moscow State University, Russia; Ph.D., Lomonosov Moscow State University, Russia

*HAMNER, MARK S., Professor of Mathematics; Vice Provost of Institutional Research and Improvement, B.A., University of Texas at Austin; M.S., Baylor University; Ph.D., Baylor University

*HARDESTY, ALEXIS, Assistant Professor, B.A., Texas Tech Univerisity; M.S., Texas Tech University; Ph.D., Texas Tech University

*NAVARRA-MADSEN, JUNALYN, Professor of Mathematics, B.S.Ed., University of St. La Salle; M.S., University of Texas at Dallas; Ph.D., University of Texas at Dallas

*SMITH, SHAWNDA, Associate Professor of Mathematics, B.A., University of Texas at Austin; M.A., University of Texas at Austin; Ph.D., Texas State University

*WHEELER, ANN M., Professor of Mathematics, B.S., Henderson State University; M.S.E., Henderson State University; Ph.D., University of Northern Colorado

## Courses

***Contact hours identified in the course descriptions are based on a 15-week term. Students who enroll in Summer or mini-terms are expected to meet the same total number of contact hours as a 15-week term.***

**MATH 5033. Advanced Calculus.** Development of the limit processes including continuity, sequences, series, differentiation, and integration. Emphasis on proofs of the fundamental theorems of mathematical analysis, including Rolle's and Lagrange's theorems. Multivariable analysis, constrained optimization. Prerequisite: Permission of advisor. Three lecture hours a week. Credit: Three hours.

**MATH 5203. Problem Solving in the Math Classroom.** Study of problems with multiple solutions or alternative approaches in grades 4-12; strategies for solving problems; assessment techniques; cooperative grouping methods; critical thinking skills. Three lecture hours a week. Credit: Three hours.

**MATH 5303. Secondary Mathematics in the Classroom.** Patterns, relationships, ordered pairs, prime and composite numbers, orders of operations, exponents, number sentences, ratios, proportions, percentages, modeling, formulas, equations, graphs, functions, systems of equations, geometry, probability, and statistics with an emphasis on problem-solving and methods. Three lecture hours a week. Credit: Three hours.

**MATH 5313. Geometry in the Mathematics Classroom.** Topics in geometry with an emphasis in problem solving, shapes, angles, polygons, circles, Pythagorean Theorem, symmetry, transformations, measurement of area, and volume with an emphasis on technology. Three lecture hours a week. Credit: Three hours.

**MATH 5323. Euclidean Geometry.** Euclidean geometry from a problem solving approach. Topics include shapes, measurement, perimeter, area, volume, geometric proofs, congruence, triangles, quadrilaterals, similarity, circles, and coordinate geometry. Three lecture hours a week. Credit: Three hours.

**MATH 5333. Technology in the Math Classroom.** Technologies and their use in teaching mathematical concepts in grades 4-12; includes graphing calculators, and computer software programs and pedagogical technology. Prerequisite: Permission of academic advisor. Three lecture hours a week. Credit: Three hours.

**MATH 5423. History of Mathematics.** A survey of the historical development of various mathematical topics, including geometry, algebra, and number theory. A study of the work of past mathematicians, including Archimedes, Euclid, Fermat, Newton, and mathematicians of the 19th and 20th centuries. Three lecture hours a week. Credit: Three hours.

**MATH 5483. Theory of Probability and Statistics I.** Basic principles of probability; combinations and permutations; conditional probability and independence; common discrete and continuous probability distributions, their properties, and applications. Three lecture hours a week. Credit: Three hours.

**MATH 5493. Theory of Probability and Statistics II.** Sampling distribution theory and the Central Limit Theorem; point and interval estimation; hypothesis testing. Prerequisite: MATH 5483 or equivalent. Three lecture hours a week. Credit: Three hours.

**MATH 5513. Matrix Algebra.** Development of theory of solutions of simultaneous linear equations. Matrices, determinants, matrix inversion, eigenvalue problems, real quadratic forms, and Cayley-Hamilton Theorem. Matrix Calculus. Applications. Three lecture hours a week. Credit: Three hours.

**MATH 5523. Introduction to Number Theory.** Understanding and creating proofs related to divisibility, congruences, Diophantine equations, and applications. Three lecture hours a week. Credit: Three hours.

**MATH 5543. Symbolic Logic.** Development of Symbolic Logic as a mathematical system. Starting with axioms and definitions, theorems will be proved. Application of Symbolic Logic to set theory is considered. Three lecture hours a week. Credit: Three hours.

**MATH 5573. Statistical Methods I.** Probability distributions, graphical representations, curve fitting, hypothesis testing, regression and correlation, and applications. Prerequisite: Permission of the instructor. Three lecture hours a week. Credit: Three hours.

**MATH 5583. Statistical Methods II.** Statistical research tools including analysis of variance, chi-square tests, regression (simple and multiple), logistic regression, correlation, non parametric method, and survival analysis. Use of SPSS for the PC. Prerequisite: MATH 5573 or consent of instructor. Three lecture hours a week. Credit: Three hours.

**MATH 5593. Differential Equations.** The existence and uniqueness for differential equations and systems of differential equations. General theory to specific types of differential equations of a single variable. Basic theory for linear and nonlinear systems; linearization; stability; Hamiltonian Systems; applications with MAPLE. Three lecture hours a week. Credit: Three hours.

**MATH 5833. Computer-Aided Mathematical Modeling.** Using mathematics to model economic, biological, physical, and other real life processes. Study of deterministic and stochastic models, discrete, and continuous models. Implementation of models in software packages and programming languages used in computer-aided mathematical modeling. Three lecture hours a week. Credit: Three hours.

**MATH 5863. Applied Statistics and Convex Optimization.** Organizing, analyzing, and summarizing data through statistical methods. Combination of computational and statistical methods and convex optimization techniques to find solutions to big data found in diverse fields such as business, engineering, biological, and health sciences. Regularized and large-scale modeling techniques such as boosting and the lasso as well as model averaging techniques. Consideration of both Frequentist and Bayesian perspectives. Prerequisites: Calculus, probability, and statistical concepts; or permission of instructor. Three lecture hours a week. Credit: Three hours.

**MATH 5873. Real Analysis and Topology.** Metric Spaces and Measure and Integration Theories such as integration theory on general measure spaces including the Lebesgue integral and Lebesgue-Stieltjes integral on the line, Lusin's Theorem, Egoroff's Theorem, Fatou's Lemma, and the Monotone and Dominated Convergence Theorems. Three lecture hours a week. Credit: Three hours.

**MATH 5903. Special Topics.** Variable content. May be repeated for additional credit. Three lecture hours a week. Credit: Three hours.

**MATH 5911. Independent Study.** Selected topics in advanced mathematics. May be repeated for additional credit. Credit: One hour.

**MATH 5913. Independent Study.** Selected topics in advanced mathematics. May be repeated for additional credit. Credit: Three hours.

**MATH 5953. Internship.** Cooperative work-study arrangement between business, industry, or selected institutions with the University. Nine practicum hours a week. Credit: Three hours.

**MATH 5973. Professional Paper.** Credit: Three hours.

**MATH 5981. The Professional Portfolio.** Development of a professional portfolio by students in the Master of Arts in Teaching program demonstrating the student's growth in the Learner-Centered Competencies. Pass-fail grade only. May be repeated. Credit: One hour.

**MATH 5983. Thesis.** Credit: Three hours.

**MATH 5993. Thesis.** Prerequisite: MATH 5983. Credit: Three hours.