

DEPARTMENT OF MATHEMATICS AND STATISTICS

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Website: Department of Mathematics and Statistics (<http://www.shsu.edu/academics/mathematics-and-statistics/>)

Mission

The Department of Mathematics and Statistics will provide all students with the opportunity to receive an educational experience in mathematics and statistics of the highest quality, both inside and outside the classroom. By actively engaging in research and professional development, the faculty will promote quality scholarship among themselves as well as their students.

Highlights

- Opportunities for research through numerous grants with industry, government and education agencies
- Support for travel and presentations at local and national professional meetings
- Opportunities for discipline-related employment, including classroom teaching, grading and tutoring

Career Opportunities

- Accounting and Finance
- Computer Programming
- Data Science
- Sales and Marketing
- Management and Related Positions
- Actuarial Science
- Computer Systems Analysis
- Engineering
- Statistics
- Mathematics
- Operations Research
- Modeling
- Academic Positions - High School or College
- Master of Arts in Mathematics (<http://catalog.shsu.edu/graduate-and-professional/college-departments/science-and-engineering-technology/mathematics-statistics/mathematics-education-ma/>)
- Master of Science in Mathematics (<http://catalog.shsu.edu/graduate-and-professional/college-departments/science-and-engineering-technology/mathematics-statistics/mathematics-ms/>)
- Master of Science in Statistics and Data Science (<http://catalog.shsu.edu/graduate-and-professional/college-departments/science-and-engineering-technology/mathematics-statistics/statistics-data-science-ms/>)

Student Organizations

- American Mathematical Society (AMS) Student Chapter
- Mathematical Association of America (MAA)
- Pi-Mu-Epsilon Mathematics Honor Society
- Stat Club

Assistantships

The Department of Mathematics and Statistics offers a significant number of graduate teaching assistantships each year. For more information, call (936) 294-1564.

Scholarships

The Department of Mathematics and Statistics offers several scholarships each year and Sam Houston State University offers additional, university-wide scholarships. For information on departmental scholarships, visit the departmental website (<https://www.shsu.edu/academics/mathematics-and-statistics/scholarships.html>). Information on University scholarships may be obtained from the Financial Aid and Scholarships Office (<http://www.shsu.edu/dept/financial-aid/scholarships/>).

Mathematics

MATH 5300. Mathematics Internship. 3 Hours.

Students engage in a supervised work environment that provides applied experience in fields related to the mathematical sciences. This work may take place within a public, non-profit, or private organization. Under the supervision of a faculty internship coordinator, students will apply mathematical theory and techniques learned in the classroom to real world applications, gain practical skills like software coding and applied analysis, and be introduced to professional networking opportunities for their future careers. Students are required to document their completion of 240 hours of internship experience in the coordinated work environment.

Prerequisite: Departmental Approval.

MATH 5360. Special Topics. 3 Hours.

Topics and courses are selected to suit individual needs of students. Methods of independent study and research are stressed. The course may be repeated for additional credit.

Prerequisite: Consent of program coordinator.

MATH 5361. Theory and Applications Of Probability. 3 Hours.

Topics include probability axioms and properties, conditional probability, random variables, probability distributions, moment generating functions, laws of large numbers, and the Central Limit Theorem. Also listed as STAT 5361.

Prerequisite: STAT 4372 (or equivalent) or consent of the instructor.

MATH 5365. Introductory Analysis. 3 Hours.

Students engage in a more thorough treatment of the material traditionally considered in elementary calculus. Topics may include sets, functions, properties of the real number system and sequences. NOTE: Students who have taken Math 4361 may not take MATH 5365.

Prerequisite: Graduate Standing.

MATH 5366. Elementary Analysis. 3 Hours.

Students study limits, continuity, differentiation, Riemann integration, infinite series and sequences, and series of functions. NOTE: Students who have taken Math 4366 may not take MATH 5366.

Prerequisite: Graduate Standing and MATH 4365 or MATH 5365.

MATH 5370. Fourier Analysis & Application. 3 Hours.

This course is a study of applied harmonic analysis. Topics include Fourier analysis, wavelet analysis, and applications of these topics.

Prerequisite: MATH 4366 or MATH 5388 or the consent of the instructor.

MATH 5375. Partial Differential Equations. 3 Hours.

Students solve problems involving partial differential equations from the natural sciences. Topics may include derivation of the heat/diffusion and wave equations, the method of separation of variables to solve the heat, wave, and Laplace equations on finite domains, Fourier series, Sturm-Liouville eigenvalue problems, the Fourier transform method to solve equations on infinite domains, the method of characteristics, and d'Alembert's solution of the wave equation. NOTE: Students who have taken MATH 4375 may not take MATH 5375.

Prerequisite: Graduate Standing.

MATH 5377. Algebraic Structures. 3 Hours.

Students study basic structures of abstract algebra: groups, rings, and fields. Topics may include elementary number theory, equivalence relations, groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, rings, polynomial rings, quotient fields, principal ideal domains, and Euclidean domains. Note: Students who have taken Math 4377 may not take MATH 5377.

Prerequisite: Graduate Standing.

MATH 5380. Research Project In Mathematics Education. 3 Hours.

In this course, the student will develop a project based on one of the core areas (Algebra, Geometry, Analysis, or Probability and Statistics) appropriate for use in teaching. This course is a capstone for candidates pursuing the degree of MA of Mathematics.

Prerequisite: MATH 5386, MATH 5387, MATH 5388, MATH 5389.

MATH 5381. Algebra: Structures and Applications. 3 Hours.

This course includes the study of algebraic structures (such as groups, rings, integral domains, and fields) and their properties, and activities and concepts related to the algebra of real numbers that are applicable to middle school teachers. The course is designed for in-service middle school mathematics teachers.

MATH 5382. Discrete Mathematics for Teachers. 3 Hours.

This course will include a study of graph theory, combinatorics and recursion, social choice and apportionment, algorithms, and iteration, with an emphasis on real-world problem solving applications and mathematical connections to the school curriculum. This course is specifically designed for middle and high school teachers, with a mathematics specialization, obtaining a Master's Degree in Education with a minor in mathematics.

Prerequisite: Middle or secondary school mathematics certification, or equivalent.

MATH 5383. Seminar in Geometry and Measurement for Teachers. 3 Hours.

This course will include a study of congruency, similarity, transformations, coordinate geometry, and measurement. It is specifically designed for teachers with a mathematics specialization who wish to obtain the master's degree in education with a minor in mathematics.

Prerequisite: Middle school mathematics certification and MATH 3383 or equivalent.

MATH 5384. Seminar in Mathematical Systems for Teachers. 3 Hours.

This course will include a study of the development of the natural number system, the development of the integers, the development of the rational number system, and the development of the real number system. It is specifically designed for teachers with a mathematics specialization who wish to obtain the master's degree in education with a minor in mathematics.

Prerequisite: Middle school mathematics certification and MATH 3384 or equivalent.

Statistics

STAT 5333. Design and Analysis of Experiments. 3 Hours.

Topics include the design, analysis and interpretation of results from standard experimental design models including the completely randomized design, the randomized complete block, the incomplete block, factorial models, Latin squares, Greco-Latin squares, screening designs, fractional factorials, and general fixed, mixed and random effects ANOVA models.

Prerequisite: STAT 4372 (or equivalent).

STAT 5360. Special Topics In Statistics. 3 Hours.

Topics are selected from emerging areas in statistics that are not covered in regular courses. Such topics as data mining, statistical learning, pattern recognition, spatial statistics, statistical methods in finance, functional data analysis, life contingencies may be included. Also listed as MATH 5360.

Prerequisite: Consent of instructor.

STAT 5361. Theory and Application of Probability. 3 Hours.

Topics include probability axioms and properties, conditional probability, random variables, probability distributions, moment generating functions, laws of large numbers and the Central Limit Theorem. Also listed as MATH 5361.

Prerequisite: STAT 4372 (or equivalent) or consent of instructor.

STAT 5362. Theory and Application of Statistics. 3 Hours.

Topics include convergence in probability and distribution, point estimation, hypothesis testing, interval estimation, maximum likelihood methods, properties of estimators such as efficiency, sufficiency and completeness, exponential family of distributions, most powerful tests, uniformly most powerful tests, and likelihood ratio tests.

Prerequisite: STAT 5361 (or equivalent) or consent of instructor.

STAT 5364. Applied Multivariate Statistical Analysis. 3 Hours.

Topics include the multivariate normal distribution, inferences about a mean vector, comparisons of several multivariate means, principal components analysis, clustering, discriminant and classification analysis.

Prerequisite: STAT 4372 (or equivalent) or consent of instructor.

STAT 5365. Linear Statistical Models. 3 Hours.

Topics include the statistical properties of quadratic forms, the full-rank general linear statistical model, the less-than-full-rank model, the linear model structure of regression models, ANOVA models, ANCOVA models, the general characteristics of the fixed, mixed and random effects models and model diagnostics considerations.

Prerequisite: STAT 4372 or STAT 5362 (or equivalents).

STAT 5366. Sampling Methods. 3 Hours.

Topics include the theory and applications of standard methods for performing scientific-based sampling. Among these are simple random sampling, cluster sampling, stratified random sampling, systematic sampling, probability proportional to size (pps) sampling, sampling from finite populations and ratio regression estimation.

Prerequisite: STAT 4372, STAT 5362, or consent of instructor.

STAT 5367. Reliability Analysis and Quality Control. 3 Hours.

Topics include measures of failure, reliability functions, failure models, life testing and censoring, system reliability, parameter estimation and testing, control charting, acceptance sampling plans, software reliability and process control.

Prerequisite: STAT 4372, STAT 5362, or consent of instructor.

STAT 5368. Regression Modeling & Analysis. 3 Hours.

Topics include model estimation and testing, simple and multiple regression models, residual analysis, variables selection, polynomial regression, multicollinearity, ridge regression, logistic regression and real data analysis and applications.

Prerequisite: STAT 4372, STAT 5362, or consent of instructor.

STAT 5369. Statistical Computing and Consulting. 3 Hours.

This course consists of a detailed study of the SAS package including SAS/BASICS, SAS/STAT, SAS/GRAPH and SAS/IML with emphasis on applying these tools in a consulting environment. Techniques and principles important in working with representatives of user disciplines are included.

Prerequisite: STAT 3380 and graduate standing.

STAT 5370. Nonparametric Statistics. 3 Hours.

Topics include order statistics, contingency analysis, rank tests (Wilcoxin signed-rank test, Mann-Whitney U test and others), distribution-free tests of location and scale, nonparametric regression, Kendall's tau and related areas.

Prerequisite: STAT 4372 (or equivalent) or consent of instructor.

STAT 5390. Statistical Learning. 3 Hours.

Students learn essential modeling and prediction techniques and toolsets for classical and modern statistical learning and concentrate on their applications to statistical modeling and prediction problems. Particularly, students implement statistical learning models using well-established statistical software packages and tools in R, Python, and MATLAB, and analyze patterns and information discovered from target data. Topics may include linear regression, classification, resampling methods, shrinkage approaches, tree-based methods, support vector machines, clustering, deep learning, survival analysis, multiple testing, and recent research trends.

Prerequisite: Approval by the Graduate Advisor.

STAT 6060. Independent Study. 1-3 Hours.

Students research a subject in depth under the direct supervision of a faculty member with expertise in the particular area of study. The topic of study will be mutually selected and approved by the student and Statistics faculty member. Variable Credit (1 to 3).

Prerequisite: Consent of instructor.

Director/Chair: **Damon Martin Hay**

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