Department of Mathematics

Contact Information

Chair: Michael T. Muzheve
Phone: 361-593-3517
Email: math@tamuk.edu
Building Name: Rhode Hall
Room Number: 217

The Department of Mathematics offers courses leading to the Master of Science degree in Statistical Analytics, Computing and Modeling (SACM). The program has two concentrations; Statistics and Applied Mathematics. In each case, the student can choose a Thesis or Project exit option.

Graduate level courses may also serve to provide a supporting field for other majors.

Mathematics (MATH)

MATH 5305 Graduate Research Project **3 SCH (3)**
A Graduate Research Project must be completed and submitted to the Graduate Office for a grade to be assigned, otherwise IP notations are recorded. This course is specifically designed for Plan II and Plan III students. Prerequisite: departmental approval.

MATH 5306 Thesis **3 SCH (3)**
Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

MATH 5321 Real Analysis **3 SCH (3-0)**
Lebesgue integration and Lebesgue measure. LP spaces. Differentiability properties of monotone functions.

MATH 5322 Complex Analysis **3 SCH (3-0)**
The complex field, topology of the complex plane, analytic functions, conformal mappings, power series, integration, residues.

MATH 5323 Partial Differential Equations **3 SCH (3-0)**
An introduction to the fundamental notions and/or methods in the theory of partial differential equations. Includes Fourier series, the wave equation, the potential equation and the heat equation.

MATH 5325 Advanced Linear Algebra **3 SCH (3-0)**
Vector spaces and linear transformations, orthogonality, eigenvalues, and numerical methods. Prerequisite: consent of the instructor.

MATH 5340 Matrix Methods Linear Models **3 SCH (3-0)**
Common matrix methods in statistical applications, including eigenvalues and eigenvectors; the Moore-Penrose inverse; matrix differentiation; the distribution of quadratics forms. Prerequisite: STAT 4303 and MATH 3340 or equivalents.

MATH 5341 Abstract Algebraic Theories **3 SCH (3-0)**
Groups and their generalizations. Homomorphism and isomorphism theorem. Direct sums and products. Linear spaces and representations. Field extensions and Galois groups. Prerequisite: MATH 4340 or its equivalent.

MATH 5360 Analytic Decision Theory **3 SCH (3-0)**
Introduction to mathematical decision theory and game theoretic analysis. Classification of games, definitions in game theory, sequential-/simultaneous-move games, pure and mixed strategies, equilibrium concepts and matrix games. Prerequisite: MATH 3340 or equivalent.

MATH 5374 Numerical Analysis **3 SCH (3-0)**
Underlying principles of numerical analysis. Topics include: finite differences and interpolation, numerical differentiation and integration, solving algebraic and transcendental equations, computations with matrices, the method of lease squares, and numerical solutions of differential equations. Attention is given to the solutions of problems using computer. Prerequisite: MATH 4341 or equivalent.

MATH 5390 Advanced Topics in Math **1-3 SCH (1-3)**
Different areas of advanced mathematics with emphasis on rigor, critical reasoning and the concept of proof. May be repeated as topic changes.

Statistics (STAT)

STAT 5305 Graduate Research Project **3 SCH (0-3)**
Designed for project option students. A Graduate Research Project must be completed and submitted to the Graduate Office for a grade to be assigned, otherwise S/U (Satisfactory/Unsatisfactory) notations are recorded. Prerequisite: departmental approval.

STAT 5306 Thesis **3 SCH (0-0-3)**
Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. Maximum credit applicable towards the degree is 6 semester hours.

STAT 5332 Big Data and Computing **3 SCH (3-0)**
Introduction to use of SAS (and R)/PC statistical software, including data entry, data summaries, descriptive statistics, and interpretation of SAS (and R) output for some standard statistical procedures. Prerequisites: graduate standing and approval of instructor.

STAT 5344 Predictive Analytics **3 SCH (3-0)**
Correlation, simple linear and multiple regression, one and two way ANOVA, various multiple comparison procedures, randomized block designs, applications, use of statistical software. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5346 Design of Experiments **3 SCH (3-0)**
Hypothesis testing, principles of design of an experiment, t-test, completely randomized design, randomized block design, multiple comparison techniques, factorial designs, random effect models, fixed effect models, BIBD, nested designs, analysis of covariance and split plot design. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5350 Probability for Analytics **3 SCH (3-0)**
Mathematical treatment of probability distributions, probability concepts and laws; sample spaces, combinations and permutations, Bayes' theorem, discrete/continuous random variables, expected value, distribution of functions of random variable, two-dimensional variables, central limit theorem; t, F, and chi-square distributions. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5351 Inferential Analytics **3 SCH (3-0)**
Theory of estimation and hypothesis testing, maximum likelihood, method of moments, likelihood ratio tests, consistency, bias, efficiency and sufficiency. Prerequisite: STAT 5350 or equivalent.

STAT 5361 Multivariate Statistics **3 SCH (3-0)**
An applied approach to multivariate data analysis and linear statistical models in research. Prerequisite: MATH 4341 and STAT 5344 or equivalents.

STAT 5362 Nonparametric Statistics **3 SCH (3-0)**
Estimation and hypothesis testing, models for categorical data, classical rank-based nonparametric methods, permutation tests, bootstraps methods, and curve smoothing. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5370 Survey Sampling Analytics **3 SCH (3-0)**
Survey sampling from initial planning phases through collection and storage of the data; simple random sampling, stratified random sampling, auxiliary information, estimators, chi-square contingency table analysis for two and three way tables, handling of small expected frequencies, matched pairs, measures of association; use of statistical software on big survey data. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5372 Model Assisted Survey Methods **3 SCH (3-0)**
Probability proportional to size sampling, auxiliary information, Horvitz and Thompson estimator, calibration of design weights, model assisted calibration techniques, GREG and linear regression estimator, imputation of missing data, bootstrap and jackknifing. Prerequisite: STAT 5370 [requested] or equivalent.

STAT 5374 Survey Models Social Science **3 SCH (3-0)**
Sensitive data and privacy issues in survey sampling. Randomized response models and variations. Estimation of prevalence of two or more sensitive characteristics. Use of Cramer-Rao lower bound of variance. Measures of protection of respondents. Models using complex designs. Prerequisite: PSYC/SOCI 3381.

STAT 5375 Operations Research **3 SCH (3-0)**
Geometric linear programming, the Simplex method, duality theory, sensitivity analysis, project planning and integer programming. Optional topics include, but are not limited to: the transportation problem, the upper bounding technique, the dual Simplex method, parametric linear programming, queuing theory, decision analysis, and simulation. Prerequisite: Any introductory course in linear algebra.

STAT 5380 Survival Analysis **3 SCH (3-0)**
Statistical analysis of time-to-event or survival data. Basic Terminology and both parametric and non-parametric techniques. Continuous and discrete time regression models and partial likelihood estimation. Includes competing risk models, unobserved heterogeneity, and multivariate survival models including event history. Prerequisite: STAT 5350 and STAT 5351 or equivalents.

STAT 5390 Advanced Topic in Statistics **3 SCH (3-0)**
Different areas of advanced statistics will be covered at separate offerings of this course. Topics include sampling techniques, multivariate analysis, quality control techniques. May be repeated once. Prerequisite: 6 semester hours of advanced statistics or the equivalent.
Fee: $15.00

Statistical Analytics, Computing and Modeling (SACM), M.S.

This program is designed to provide the student with competency in the major areas of statistical and mathematical application, a working knowledge of mathematical and/or statistical software and enough theoretical background to serve as a foundation for continued professional development.

The Master of Science in Statistical Analytics, Computing and Modeling (SACM) has two tracks, a Statistics Concentration, and an Applied Mathematics Concentration. In each case, the student can choose the Thesis option (Total 30 SCH) or the Project Option (Total 36 SCH).

A student entering the program is expected to have completed at least 6 semester hours of advanced mathematics beyond multivariate calculus and differential equations. Students lacking these prerequisites may be admitted conditionally.

Thesis Option

The thesis option requires 30 SCH to complete the M.S. degree of which 24 hours must be from core courses including Thesis. Elective courses comprise 6 hours of the curriculum. Students have the flexibility to select the elective hours from a list of courses to meet degree requirements. Elective hours may be taken from other disciplines with advisor's approval.

Project Option

The project option requires 36 SCH to complete the M.S. degree of which 21 hours must be from core courses including Project. Elective courses comprise 15 hours of the curriculum. Students have the flexibility to select the electives hours from a list of courses to meet degree requirements. Elective hours may be taken from other disciplines with advisor's approval.

Applied Mathematics Concentration

Code	Title	Semester Credit Hours
Required Courses		**15**
MATH 5325	Advanced Linear Algebra	
MATH 5374	Numerical Analysis	
MATH 5321	Real Analysis	
MATH 5390	Advanced Topics in Math [1]	
MATH 5390	Advanced Topics in Math [2]	
Thesis Option		**30**
MATH 5306	Thesis (This course must be taken twice for six semester credit hours.)	6
Elective Courses		9
Project Option		**36**
MATH 5305	Graduate Research Project	3
Elective Courses		18

Code	Title	Semester Credit Hours
Elective Courses		
Select 9 hours (thesis option) or 18 hours (project option) from the following or closely related field with advisor's approval.		
MATH 5322	Complex Analysis	3
MATH 5323	Partial Differential Equations	3
MATH 5324		
MATH 5340	Matrix Methods Linear Models	3
MATH 5341	Abstract Algebraic Theories	3
MATH 5360	Analytic Decision Theory	3
MATH 5390	Advanced Topics in Math [3]	3

[1] Topic in Differential Equations with Applications
[2] Topic in (Applied) Modern Algebra
[3] May be repeated if a different topic

Statistics Concentration

Code	Title	Semester Credit Hours
Required Courses		**18**
MATH 5325	Advanced Linear Algebra	
MATH 5374	Numerical Analysis	
STAT 5350	Probability for Analytics	
STAT 5351	Inferential Analytics	
STAT 5332	Big Data and Computing	

STAT 5344	Predictive Analytics	
Thesis Option		**30**
STAT 5306	Thesis	6
Elective Courses		6
Project Option		**36**
STAT 5305	Graduate Research Project	3
Elective Courses		

Code	Title	Semester Credit Hours
Elective Courses		
Select 6 hours (thesis option) or 15 hours (project option) from the following or closely related field with advisor's approval.		
STAT 5361	Multivariate Statistics	3
STAT 5362	Nonparametric Statistics	3
STAT 5346	Design of Experiments	3
STAT 5370	Survey Sampling Analytics	3
STAT 5372	Model Assisted Survey Methods	3
STAT 5374	Survey Models Social Science	3
MATH 5375		
STAT 5380	Survival Analysis	3
MATH 5340	Matrix Methods Linear Models	3
MATH 5360	Analytic Decision Theory	3
MATH 5323	Partial Differential Equations	3