Applied Statistics

Master of Science in Applied Statistics (MSAS)

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MSAS Program Mission

The Master of Science in Applied Statistics Program at Kennesaw State University is a professional degree program which seeks to prepare a diverse student body to utilize cutting edge applied statistical methods to enable correct, meaningful inferences from data obtained from business, industry, government and health services. The use of a wide variety of commercial software will be emphasized to ensure graduates can effectively analyze real-world data.

MSAS Program Description

The Master of Science in Applied Statistics (MSAS) program is a 36 semester-hour applied graduate program designed to meet the needs of business, industry and government. The program is intended for professionals or students with undergraduate degrees in the sciences or business. A key focus of the program is the continuous improvement training and practice using the Six Sigma methodology of process improvement.

The MSAS program differs from traditional statistics graduate programs in the following areas:

1. Paired Block of Courses – Each semester a course is offered in a "Methods" block and an "Applied" block.
2. Building Analysis Capability Each Semester—The paired block design provides the student increasing capability to analyze problems with each successive semester.
3. Statistical Computing—Starting the first semester the student will utilize statistical programs such as SAS, JMP and Minitab to analyze data and present graphical summaries.
4. Applications Project—Students will participate in a one-hour credit project activity for each semester. Written reports of these activities will form the basis of a Statistical Methods Portfolio demonstrating the analytical skill sets mastered by the students.
5. Boot Camp Option—The summer prior to the start of the program students will have the option of taking a refresher course in calculus and statistical software that will

focus on the methodology needed to be successful in courses in the Methods block.

General Requirements for Admission

MSAS program admission requires:

- Baccalaureate degree from an institution accredited in a manner accepted by Kennesaw State University. While a degree in Mathematics is not required, applicants should have at least 18 semester credit hours in mathematics or related (e.g. engineering) coursework.
- Minimum cumulative undergraduate adjusted grade-point average of 2.75 on a 4.0 scale.
- Official Graduate Record Examination scores. Although no specific minimum score is required, this score will be considered in the competitive review process.
- Other criteria will be considered by the MSAS Admissions Committee for applicants, including
  - coursework
  - professional certifications
  - relevant work experience
  - professional activities

International applicants have additional requirements, see Graduate Admissions section of this catalog.

Transfer Credit

A student may transfer up to nine hours of graduate credit from other accredited institutions. To be transferred, course work from other institutions must correspond to Kennesaw State University's MSAS curriculum. Students will need to provide course descriptions and syllabi whenever possible. A minimum grade of "B" must have been received in the course and the course work must be no more than five years old.

Grades

Expectations for satisfactory graduate level performance are detailed in the Academic Policies section of this catalog.

Petition to Graduate

MSAS candidates must petition to graduate at least one semester prior to completion of the program requirements.

Master of Science in Applied Statistics

		Credit Hours
COURSE REQUIREMENTS		
STAT 7000	Introduction to Mathematics for Statistics (non-credit)	
STAT 7010	Mathematics Statistics I	3
STAT 7020	Statistical Computing and Simulation	3
STAT 7030	Mathematical Statistics II	3
STAT 8110	Quality Control and Process Improvement	3
STAT 8120	Applied Experimental Design	3
STAT 8130	Measurement Systems Analysis	3
STAT 8140	Six Sigma Problem Solving	3
STAT 8210	Applied Regression Analysis	3
STAT 8310	Applied Categorical Data Analysis	3
STAT 8320	Applied Multivariate Methods	3
STAT 8940	Applied Analysis Project (taken each semester)	1 - 3

PROGRAM TOTAL: 36

MSAS Course Descriptions

STAT 7000. Introduction to Mathematics for Statistics. 3-0-0.

Prerequisite: Admission to the MSAS program or permission of the program director.

This course provides the necessary background in calculus, linear algebra and statistics software for the students enrolled in the Master of Science program who need to refresh their knowledge. Topics in calculus include: continuous functions, derivatives, applications to finding minima and maxima of functions, integrals; elements of multivariate calculus: partial derivatives, solving optimization problems, multiple integrals. Topics in linear algebra include: matrices and operations with matrices, the inverse of a matrix, vectors in nR, linearly independent vectors in nR, linear transformations on nR, eigenvalues and eigenvectors. Statistics software topics: editing data, plotting data, performing descriptive statistics of data.

STAT 7010. Mathematical Statistics I. 3-0-3.

Prerequisite: Admission to the MSAS program.

This course provides the necessary background Fundamental concepts of probability, random variables and their distributions; review of sampling distributions; theory and methods of point estimation and hypothesis testing, interval estimation, nonparametric tests, introduction to linear models.

STAT 7020. Statistical Computing and Simulation. 3-0-3.

Corequisite: STAT 7010.

Topics covered in STAT 7020 will include stochastic modeling, random number generators based on probability distributions, discrete-event simulation approaches, simulated data analysis, non-parametric analysis and sampling techniques. Given the importance of the SAS software to these types of applications, students will, by definition, refine and improve their SAS-programming skills. The class will utilize real-world datasets from a variety of disciplines including, finance, manufacturing and medicine. The course will involve lecture notes, case studies, and student projects.

STAT 7030. Mathematical Statistics II. 3-0-3.

Corequisite: STAT 7010.

Point estimation, method of moments, maximum likelihood, and properties of point estimators; confidence intervals and hypothesis testing; sufficient statistics; Neyman-Pearson theorem, uniformly most powerful tests, and likelihood ratio tests; Fisher information and the Cramer-Rao inequality. Additional topics may include nonparametric statistics, decision theory and linear models.

STAT 8110. Quality Control and Process Improvement. 3-0-3.

Prerequisite: STAT 7010.

Classical quality control methods, including control charts and sampling plans, will be integrated with process improvement tools such as process flowcharts and simple graphical tools.

STAT 8120. Applied Experimental Design. 3-0-3.

Prerequisite: STAT 7010 and STAT 7020.

Methods for constructing and analyzing designed experiments are considered. The concepts of experimental unit, randomization, blocking, replication, error reduction and treatment structure are introduced. The design and analysis of completely randomized, randomized complete block, incomplete block, Latin square, split-plot, repeated measures, factorial and fractional factorial designs will be covered. Statistical software will be utilized.

STAT 8130. Measurement System Analysis. 3-0-3.

Prerequisite: STAT 7010 and STAT 7020.

The analysis of the measurement system is a key part of scientific experimentation or industrial problem solving. This analysis is the focus of this course. Quantifying repeatability, reproducibility and gauge bias is the intent of the gauge studies that will be a key element of the course. Interpreting the gauge system variation relative to the overall process/system variation will be addressed.

STAT 8140. Six Sigma Problem Solving. 3-0-3.

Prerequisite: STAT 8110 and STAT 8120

The focus of this course is applying Six Sigma methods such as DMAIC to industrial problems using the statistical methods studied in prior courses. Students will analyze industrial data and brainstorm appropriate approaches utilizing Six Sigma methods. Since Six Sigma methods will be utilized throughout the program, this course is a synthesis of prior learning. Students will take the American Society for Quality practice Black Belt exam to help prepare them for the actual Black Belt exam. The class will review exam questions and address areas where students are having difficulty.

STAT 8210. Applied Regression Analysis. 3-0-3.
Prerequisite: STAT 7010 and STAT 7020
Topics include simple linear regression, inferences, diagnostics and remedies, matrix representations, multiple regression models, generalized linear model, multicollinearity, polynomial models, qualitative predictor variables, model selection and validation, identifying outliers and influential observations, diagnostics for multicollinearity, and logistic regression.

STAT 8310. Applied Categorical Data Analysis. 3-0-3.
Prerequisite: STAT 7010, STAT 7030, and STAT 8210.
This course will cover methods of contingency table analysis, including data categorization, dose-response and trend analysis, and calculation of measures of effect and association. The students will learn to use generalized linear regression models including logistic, polychotomous logistic, Poisson and repeated measures (marginal and mixed models), and apply these appropriately to real-world data. Applications to Statistical software packages such as JMP, MINITAB, and/or SAS will be used.

STAT 8320. Applied Multivariate Data Analysis. 3-0-3.
Prerequisite: STAT 8120 and STAT 8210.
Survey course in statistical analysis techniques. Through a combination of textbook and real-world data sets, students will gain hands-on experience in understanding when and how to utilize the primary multivariate methods – Data Reduction techniques, including Principal components Analysis and Common Factor Analysis, ANOVA/MANOVA/MANCOVA, Cluster Analysis, Survival Analysis and Decision Trees.

STAT 8940. Applied Analysis Project. 1-9.
Prerequisite: Must be approved by graduate program director.
Students will work with a Department faculty member on an analysis approach using real data. The data may be generated from a problem in their workplace or from any other source that illustrates the statistical method being studied. In the first part of the semester, the theory of the method will be studied to obtain a solid foundation in the methodology. Later, data will be analyzed using ore or more statistical software packages. Students will prepare a written report that will become part of their Statistical Methods Portfolio.