STATISTICS (STAT)

Statistics Graduate Courses

STAT 8005 STATISTICAL METHODS I (3 credits)
An introduction to descriptive statistics, measures of central value and dispersion, probability and distributions, population and sample, simple linear regression, statistical inference: point estimation, confidence intervals, hypotheses testing, two population comparison, goodness-of-fit tests, analysis of variance. Statistical software like Minitab or Excel will be utilized in the course. (Cross-listed with STAT 3000).
Prerequisite(s): MATH 1220 or MATH 1300 or MATH 1320 or equivalent with a grade of C- or better, or permission of instructor

STAT 8416 INTRODUCTION TO DATA SCIENCE (3 credits)
Topics covered in this course include Data Technology, Methods of gathering and cleaning structured or unstructured data, Exploratory data analysis & Dynamic and interactive data visualization, Modeling data for prediction, forecasting or classification. (Cross-listed with STAT 4410).
Prerequisite(s): MATH 4740 with a C- or better or concurrent; or STAT 3800 with a C- or better or concurrent; or permission of instructor. Students should be comfortable with computer programming & have knowledge of data structures & preliminary statistical methods.

STAT 8426 EXPLORATORY DATA VISUALIZATION AND QUANTIFICATION (3 credits)
Topics covered in this course include Exploratory Data Visualization for categorical/qualitative single/multivariate data, Grammar of Graphics, Organizing Data for Visualization, Methods of Displaying Data that include dynamic and interactive visualization, Visual Diagnostics of Statistical Models and Visual Statistical Inference. Students planning to enroll in this course should be comfortable with computer programming and have knowledge of data structures and preliminary statistical methods. (Cross-listed with STAT 4420)
Prerequisite(s): STAT 3800 or STAT 8805 or MATH 4740 or MATH 8746 with a grade of C- or better or another introductory probability/statistics course with a grade of C- or better, and MATH 3200 or CSCI 1620 with a grade of C- or better, or permission of instructor.

STAT 8436 LINEAR MODELS (3 credits)
This course introduces students to linear statistical models. Topics will include: simple linear regression models, multiple linear regression models, ANOVA models including one way ANOVA, randomized block design, other designs, logistic regression models, Poisson regression models, bootstrapping/resampling models, and survival analysis. The course may also include mixed models and/or survival models. Some necessary linear algebra and mathematical statistics ideas will be reviewed at the beginning of the course. Computer software will be extensively used. (Cross-listed with STAT 4430)
Prerequisite(s): MATH 4750 or MATH 8756 w/ a grade of C- or better or STAT 3800 or STAT 8805 w/ a C- or better or instructor permission based on students' having taken a basic statistics course w/ a grade of C- or better & having a basic knowledge of calculus.

STAT 8446 TIME SERIES ANALYSIS (3 credits)
The objective of this course is to learn and apply statistical methods for the analysis of data that have been observed over time. Topics covered include: Models for Stationary and Non-Stationary Time Series, Model Specification, Parameter Estimation, Model Diagnostics, Forecasting, Seasonal Models, Time Series Regression, and Spectral Analysis. Statistical software will be used. (Cross-listed with STAT 4440)
Prerequisite(s): MATH 4750 or MATH 8756 w/ a grade of C- or better or STAT 3800 or STAT 8805 w/ a C- or better or another introductory probability/statistics course w/ a C- or better, or permission of instructor.

STAT 8456 INTRODUCTION TO MACHINE LEARNING AND DATA MINING (3 credits)
This is an introduction to machine learning and data mining which covers the following topics with an emphasis on mathematical and statistical analysis in supervised learning. Topics include machine learning workflow, evaluation metrics, validation approaches, classification models including logistic regression, decision tree, boosting, random forest, support vector machines, neural networks, Bayesian methods, etc. If time allows, text mining and unsupervised learning topics will also be introduced in the course. Statistical software will be used. (Cross-listed with MATH 4450, MATH 8456, STAT 4450)
Prerequisite(s): MATH 4740/8746 with a C- or better or STAT 3800/8805 with a C- or better or permission of instructor.

STAT 8670 TOPICS IN PROBABILITY AND STATISTICS (3 credits)
Advanced treatment of a specific topic in the area of probability and/or statistics not available in the regular curriculum. Topics, developed by individual faculty members, will reflect their special interests and expertise. The course may be repeated for credit as topics differ. (Cross-listed with MATH 8670).
Prerequisite(s): MATH 4750/MATH 8756 or STAT 3800/STAT 8805 or permission from instructor

STAT 8700 BAYESIAN STATISTICS (3 credits)
The objective of this course is to introduce the Bayesian approach to statistical inference. Topics covered include: Review of probability, Bayes theorem, and Likelihood; The Bayesian methodology, prior and posterior distributions; Choices of prior distribution, conjugate and Jeffreys priors; Credible intervals and inference; Bayesian computation - Markov Chain Monte Carlo and the Gibbs Sampler; Hierarchical models; Regression models.
Prerequisite(s): MATH 8756 or equivalent or permission of instructor.

STAT 8710 DESIGN AND ANALYSIS OF EXPERIMENTS (3 credits)
Introduction to design and analysis of controlled experiments. The goal of experimental design is to be able to construct an experiment to identify which factors most impact the response and do so in an efficient manner. Statistical software will be used. Types of designs studied include: Randomized Block Designs, Latin Square Designs, Incomplete Block Designs, Factorial Designs, and Nested Designs.
Prerequisite(s): MATH 4750/8756 or permission of instructor.

STAT 8720 RELIABILITY THEORY (3 credits)
This course covers the probabilistic and statistical aspects of reliability theory. Reliability theory is concerned with the probability that a component or system is successfully working over a given time period or at a specific time instance. (Cross-listed with MATH 8720).
Prerequisite(s): Either MATH 4740 or STAT 3800 or permission of the instructor. Some basics of mathematical analysis are helpful when discussing limit theorems, but not required.

STAT 8730 ADVANCED STATISTICAL MACHINE LEARNING (3 credits)
This course will introduce machine learning models from a statistical perspective. Comparing to the introductory machine learning course, this course will focus more on (1) probability and statistical theory for machine learning methods; (2) relationship between machine learning and high-dimensional multivariate statistical analysis; (3) evolution and frontier of machine learning methods; (4) algorithm development for research purpose. Programming software will be used.
Prerequisite(s): MATH 4750/8756 with a C or better or permission of instructor.

STAT 8805 APPLIED ENGINEERING PROBABILITY AND STATISTICS (3 credits)
An introduction to the application of probability and statistics to engineering problems. Topics include: probability and probability distributions, mathematical expectation, distribution of random variables, binomial, Poisson, hypergeometric, gamma, normal, and t-distributions, Central Limit Theorem, confidence intervals, hypothesis testing. If time allows, some linear regression and contingency tables. Credit for both MATH 4740 and STAT 3800 will not be given. (Cross-listed with STAT 3800)
Prerequisite(s): MATH 1970

STAT 8950 DATA SCIENCE CAPSTONE PROJECT (3 credits)
The Data Science Capstone Project completes the Data Science Master (MS) student's graduate experience. Students will work on individual tasks and team-based activities on a real-world project. This course intends to provide experience in the industrial practice of real-world data science pipeline-building projects. Furthermore, this course allows MS students to integrate and improve the technical skills they learned throughout their graduate education and will enable them to enhance professional skills such as communication and teamwork. (Cross-listed with DSCI 8950).
Prerequisite(s): Complete all core courses of the MS Data Science program (STAT 8416, STAT 8426, ECON 8320, ECON 8310/BSAD 8080, ISQA 8206, ITIN 8300/ISQA 8060) and Permission from the Instructor. Not open to non-degree graduate students.

STAT 8960 MASTER'S PROJECT (1-6 credits)
An applied project, designed and executed under the supervision of both a faculty and industry advisor. In the project the student will apply their mathematical and/or statistical skills to an applied problem. The student will present their results via a written report and oral presentation. (Cross-listed with MATH 8960).
Prerequisite(s): Permission of faculty advisor and graduate program chair. Not open to non-degree graduate students.